

**INTERNATIONAL ECOLOGICAL
CLASSIFICATION STANDARD:**

TERRESTRIAL ECOLOGICAL CLASSIFICATIONS

**Alliances and Groups of the
Northern Basin & Range / Columbia Plateau Ecoregions**

Appendix Accompanying Report and Field Keys for the Northern Basin and Range / Columbia Plateau Ecoregions: [NatureServe_2017_NVC Field Keys and Report_Nov_2017_NBR.pdf](#)

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by

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This subset of the International Ecological Classification Standard covers vegetation alliances and groups of the Northern Basin & Range / Columbia Plateau Ecoregions. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Mary J. Russo, Central Ecology Data Manager, NC <mary_russo@natureserve.org> and Marion Reid, Senior Regional Ecologist, Boulder, CO <marion_reid@natureserve.org>.



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¹ NatureServe is an international organization including NatureServe regional offices, a NatureServe central office, U.S. State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean. Ecologists from the following organizations have contributed the development of the ecological systems classification:

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Central NatureServe Office, Arlington, VA; Eastern Regional Office, Boston, MA; Midwestern Regional Office, Minneapolis, MN; Southeastern Regional Office, Durham, NC; Western Regional Office, Boulder, CO; Alabama Natural Heritage Program, Montgomery AL; Alaska Natural Heritage Program, Anchorage, AK; Arizona Heritage Data Management Center, Phoenix AZ; Arkansas Natural Heritage Commission Little Rock, AR; Blue Ridge Parkway, Asheville, NC; California Natural Heritage Program, Sacramento, CA; Colorado Natural Heritage Program, Fort Collins, CO; Connecticut Natural Diversity Database, Hartford, CT; Delaware Natural Heritage Program, Smyrna, DE; District of Columbia Natural Heritage Program/National Capital Region Conservation Data Center, Washington DC; Florida Natural Areas Inventory, Tallahassee, FL; Georgia Natural Heritage Program, Social Circle, GA; Great Smoky Mountains National Park, Gatlinburg, TN; Gulf Islands National Seashore, Gulf Breeze, FL; Hawaii Natural Heritage Program, Honolulu, Hawaii; Idaho Conservation Data Center, Boise, ID; Illinois Natural Heritage Division/Illinois Natural Heritage Database Program, Springfield, IL; Indiana Natural Heritage Data Center, Indianapolis, IN; Iowa Natural Areas Inventory, Des Moines, IA; Kansas Natural Heritage Inventory, Lawrence, KS; Kentucky Natural Heritage Program, Frankfort, KY; Louisiana Natural Heritage Program, Baton Rouge, LA; Maine Natural Areas Program, Augusta, ME; Mammoth Cave National Park, Mammoth Cave, KY; Maryland Wildlife & Heritage Division, Annapolis, MD; Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA; Michigan Natural Features Inventory, Lansing, MI; Minnesota Natural Heritage & Nongame Research and Minnesota County Biological Survey, St. Paul, MN; Mississippi Natural Heritage Program, Jackson, MI; Missouri Natural Heritage Database, Jefferson City, MO; Montana Natural Heritage Program, Helena, MT; National Forest in North Carolina, Asheville, NC; National Forests in Florida, Tallahassee, FL; National Park Service, Southeastern Regional Office, Atlanta, GA; Navajo Natural Heritage Program, Window Rock, AZ; Nebraska Natural Heritage Program, Lincoln, NE; Nevada Natural Heritage Program, Carson City, NV; New Hampshire Natural Heritage Inventory, Concord, NH; New Jersey Natural Heritage Program, Trenton, NJ; New Mexico Natural Heritage Program, Albuquerque, NM; New York Natural Heritage Program, Latham, NY; North Carolina Natural Heritage Program, Raleigh, NC; North Dakota Natural Heritage Inventory, Bismarck, ND; Ohio Natural Heritage Database, Columbus, OH; Oklahoma Natural Heritage Inventory, Norman, OK; Oregon Natural Heritage Program, Portland, OR; Pennsylvania Natural Diversity Inventory, PA; Rhode Island Natural Heritage Program, Providence, RI; South Carolina Heritage Trust, Columbia, SC; South Dakota Natural Heritage Data Base, Pierre, SD; Tennessee Division of Natural Heritage, Nashville, TN; Tennessee Valley Authority Heritage Program, Norris, TN; Texas Conservation Data Center, San Antonio, TX; Utah Natural Heritage Program, Salt Lake City, UT; Vermont Nongame & Natural Heritage Program, Waterbury, VT; Virginia Division of Natural Heritage, Richmond, VA; Washington Natural Heritage Program, Olympia, WA; West Virginia Natural Heritage Program, Elkins, WV; Wisconsin Natural Heritage Program, Madison, WI; Wyoming Natural Diversity Database, Laramie, WY

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1. FOREST & WOODLAND

Tropical, temperate and boreal forests, woodlands and tree savannas characterized by broadly mesomorphic (including scleromorphic) tree growth forms (including *broad-leaved*, *needle-leaved*, *sclerophyllous*, *palm*, *bamboo trees*, and *tree ferns*), typically with at least 10% cover (but tropical tree savannas up to 40% cover, when trees <8 m tall), irregular horizontal spacing of vegetation structure, and spanning humid to seasonally dry tropical to boreal and subalpine climates and wet to dry substrate conditions. Includes native forests, as well as managed, and some plantation forests where human management is infrequent.

1.B. Temperate & Boreal Forest & Woodland

Temperate & Boreal Forest & Woodland is typically dominated by broad-leaved deciduous and needle-leaved trees, with some broad-leaved evergreens in warmer regions, and a climate that varies from warm-temperate with only rare frosts to very cold subarctic conditions. It is found across the globe in the mid-latitudes, typically between 25° and 60-70°N and S latitude, and includes boreal, cool-temperate, and warm-temperate/Mediterranean forests.

1.B.2. Cool Temperate Forest & Woodland

Cool Temperate Forest & Woodland includes temperate deciduous forest and woodland, temperate needle-leaved forest and woodland, and temperate rainforest, dominated by broad-leaved or needle-leaved tree growth forms.

1.B.2.Nb. Rocky Mountain Forest & Woodland

This division is composed of forests, woodlands and savannas of the lower montane to subalpine zones of the continental temperate climates of western North America characterized by the conifers *Abies concolor*, *Abies grandis*, *Abies lasiocarpa*, *Abies religiosa*, *Juniperus* spp. (*Juniperus osteosperma*, *Juniperus scopulorum*), *Larix lyallii*, *Larix occidentalis*, *Picea engelmannii*, *Picea engelmannii x glauca* hybrids, *Picea pungens*, *Pinus albicaulis*, *Pinus aristata*, *Pinus contorta* var. *latifolia*, *Pinus flexilis*, *Pinus hartwegii*, *Pinus longaeva*, *Pinus ponderosa* (var. *brachyptera*, var. *ponderosa*, var. *scopulorum*), *Pseudotsuga menziesii* var. *glauca*, *Thuja plicata*, and *Tsuga heterophylla*.

M501. Central Rocky Mountain Dry Lower Montane-Foothill Forest

Conifer forests, woodlands and savannas of *Pinus ponderosa* and *Pseudotsuga menziesii*, with *Pinus flexilis* and *Juniperus scopulorum*, found on dry settings of the lower montane to foothill zones of the interior Pacific Northwest, and extending east into the northwestern Great Plains regions.

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

1.B.2.Nb.2.a. M501 Central Rocky Mountain Dry Lower Montane-Foothill Forest

G213. Central Rocky Mountain Ponderosa Pine Open Woodland

Type Concept Sentence: This inland Pacific Northwest woodland and savanna group is found in the foothills of the central Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia, occurring at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests, typically on warm, dry, exposed sites. This group includes two physiognomic phases: true woodlands of *Pinus ponderosa* with shrubby or grassy understories, and "wooded steppes" with widely spaced, scattered *Pinus ponderosa* trees over generally shrubby but sparse understories.

OVERVIEW

Scientific Name: *Pinus ponderosa* var. *ponderosa* Central Rocky Mountain Open Woodland Group

Common Name (Translated Scientific Name): Ponderosa Pine Central Rocky Mountain Open Woodland Group

Colloquial Name: Central Rocky Mountain Ponderosa Pine / Herb Open Woodland

Type Concept: This inland Pacific Northwest group occurs in the foothills of the central Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. It also occurs east across Idaho into the eastern foothills of the Montana Rockies. This group includes two physiognomic phases: true woodlands of *Pinus ponderosa* with shrubby or grassy understories, and "wooded steppes" with widely spaced, scattered *Pinus ponderosa* trees

over generally shrubby but sparse understories. The former are generally fire-maintained, while the later are often too dry and with widely spaced vegetation to carry fire. *Pinus ponderosa* var. *ponderosa* is the predominant conifer; *Pseudotsuga menziesii* or *Pinus flexilis* may be present in the tree canopy but are usually absent. The understory can be shrubby, with *Amelanchier alnifolia*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Physocarpus malvaceus*, *Purshia tridentata*, *Rosa* spp., *Symphoricarpos albus*, or *Symphoricarpos oreophilus* as common species. In transition areas with sagebrush steppe, *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tripartita*, and *Purshia tridentata* may be common in fire-protected sites such as rocky areas. Deciduous shrubs, such as *Physocarpus malvaceus*, *Spiraea betulifolia*, or *Symphoricarpos albus*, can be abundant in more northerly sites or more moist climates. Herbaceous vegetation in the true savanna occurrences is predominantly fire-resistant grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. These more open stands support grasses such as *Achnatherum* spp., dry *Carex* species (*Carex inops*), *Elymus elymoides*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa* spp., or *Pseudoroegneria spicata*. These woodlands and savannas occur at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests, typically on warm, dry, exposed sites. These interior Pacific Northwest woodlands receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Central Rockies. However, sites are often too droughty to support a closed tree canopy. Elevations range from less than 500 m in British Columbia to 1600 m in the central Idaho mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops and plateaus are most common. This group generally occurs on most geological substrates from weathered rock to glacial deposits to eolian deposits. Characteristic soil features include good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, and periods of drought during the growing season. Some occurrences may occur as edaphic climax communities on very skeletal, infertile and/or excessively drained soils, such as pumice, cinder or lava fields, and scree slopes. Surface textures are highly variable in this group, ranging from sand to loam and silt loam. Exposed rock and bare soil consistently occur to some degree in all the associations. The more mesic portions of this group may include *Calamagrostis rubescens* or *Carex geyeri*, species more typical of Central Rocky Mountain Douglas-fir - Pine Forest Group (G210). Mixed fire regimes and surface fires of variable return intervals maintain these woodlands, typically with a shrub-dominated or patchy shrub layer, depending on climate, degree of soil development, and understory density. Historically, many of these woodlands and savannas lacked the shrub component as a result of 3- to 7-year fire-return intervals.

Classification Comments: This includes the northern race of Interior Ponderosa Pine old-growth (USFS Region 6, USFS Region 1). The FEIS site describes different varieties of *Pinus ponderosa* and associated species. This group of the Central Rockies is primarily *Pinus ponderosa* var. *ponderosa* (Habeck 1992). Johansen and Latta (2003) have mapped the distribution of two varieties (*Pinus ponderosa* var. *scopulorum* and *Pinus ponderosa* var. *ponderosa*) using mitochondrial DNA. They hybridize along the Continental Divide in Montana backing up the FEIS information. Southern Rocky Mountain Ponderosa Pine Forest & Woodland Group (G228) and Southern Rocky Mountain Ponderosa Pine Open Woodland Group (G229) mostly contain *Pinus ponderosa* var. *scopulorum*, *Pinus ponderosa* var. *brachyptera*, and *Pinus arizonica* var. *arizonica*. The transition from this group to G228 is now defined to occur in the montane zones of the Bighorns (USFS section M331B) and Laramie Range (USFS section M331I) and to the east and south of these mountains. The Southern Rocky Mountain group will also occur in other isolated mountain ranges of central Wyoming, but not in eastern Wyoming. It does not occur farther north than Wyoming; all western Montana ponderosa pine woodlands are placed into this Central Rocky Mountain Ponderosa Pine Open Woodland Group (G213). Ponderosa woodlands and "steppes" in eastern Wyoming, eastern and central Montana, including the Missouri River Breaks, are now included in Black Hills-Northwestern Great Plains Ponderosa Pine Forest & Woodland Group (G216), which is predominantly *Pinus ponderosa* var. *scopulorum*. Ponderosa pine woodlands found in the Great Plains do show some floristic similarities to those found within the forested mountains of the Central Rockies, but typically have herbaceous floristics related to the Great Plains "mixedgrass." South of the Modoc Plateau in California, *Pinus ponderosa* forests and woodlands are included in Californian Montane Conifer Forest & Woodland Group (G344).

Woodlands dominated by *Pseudotsuga menziesii* found in breaks along rivers and on escarpments in central and eastern Montana and Wyoming are not included in this group, they are placed with Middle Rocky Mountain Montane Douglas-fir Forest & Woodland Group (G215) or Central Rocky Mountain Douglas-fir - Pine Forest Group (G210). Hot, dry Douglas-fir types with grass are also not included here, although they are floristically similar. In southern interior British Columbia, *Pseudotsuga menziesii* or *Pinus flexilis* may form woodlands or fire-maintained savannas with and without *Pinus ponderosa* var. *ponderosa* at the lower treeline transition into grassland or shrub-steppe. In interior British Columbia, *Pseudotsuga menziesii* is the characteristic canopy dominant. These Douglas-fir and limber pine associations are currently placed into other groups.

A meeting of Pacific Northwest ecologists for Landfire concluded that the "true savannas" of high-frequency / low-intensity fires and grassy understories are now rare. See Dynamics section for more information.

Similar NVC Types:

- G228 Southern Rocky Mountain Ponderosa Pine Forest & Woodland
- G229 Southern Rocky Mountain Ponderosa Pine Open Woodland
- G216 Black Hills-Northwestern Great Plains Ponderosa Pine Forest & Woodland
- G210 Central Rocky Mountain Douglas-fir - Pine Forest

- G344 Californian Montane Conifer Forest & Woodland

Diagnostic Characteristics: *Pinus ponderosa* var. *ponderosa* woodlands, savannas and "wooded steppes" in the central Rocky Mountains and eastern Cascades, lacking other conifers and oaks. Generally other floristic components are Central Rockies or somewhat similar to the northern Basin and Range region.

VEGETATION

Physiognomy and Structure: These are conifer-dominated woodlands, forests, and savannas, with grassy or shrubby understories. Shrubs can be broad-leaved deciduous or microphyllous evergreen (sagebrush), while the graminoids are primarily bunch grasses, along with rhizomatous grasses. Understories are generally low to moderate in cover, especially in the most droughty and rocky sites. In some cases due to a climate-edaphic interaction, the structure is that of widely scattered trees over "shrub-steppe" of sage, bitterbrush, or sparsely distributed grasses.

Floristics: This group includes two physiognomic phases: true woodlands of *Pinus ponderosa* with shrubby or grassy understories, and "wooded steppes" with widely spaced, scattered *Pinus ponderosa* trees over generally shrubby but sparse understories. The former are generally fire-maintained, while the later are often too dry and with widely spaced vegetation to carry fire. *Pinus ponderosa* var. *ponderosa* is the predominant conifer; *Pinus flexilis* or *Pseudotsuga menziesii* may be present in the tree canopy but are usually absent. The understory can be shrubby, with *Amelanchier alnifolia*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Ceanothus velutinus*, *Cercocarpus ledifolius*, *Physocarpus malvaceus*, *Purshia tridentata*, *Rosa* spp., *Symphoricarpos albus* or *Symphoricarpos oreophilus*, and *Vaccinium cespitosum* as common species. In transition areas with big sagebrush steppe systems, *Artemisia arbuscula*, *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tripartita*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tripartita*, and *Purshia tridentata* may be common in fire-protected sites such as rocky areas. Deciduous shrubs, such as *Physocarpus malvaceus*, *Spiraea betulifolia*, or *Symphoricarpos albus*, can be abundant in more northerly sites or more moist climates. Understory vegetation in the true savanna occurrences is predominantly fire-resistant grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. These more open stands support grasses such as *Achnatherum* spp., dry *Carex* species (*Carex inops*), *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa* spp., or *Pseudoroegneria spicata*. The more mesic portions of this group may include *Calamagrostis rubescens* or *Carex geyeri*, species more typical of Central Rocky Mountain Douglas-fir - Pine Forest Group (G210).

ENVIRONMENT & DYNAMICS

Environmental Description: This group within the interior Pacific Northwest region occurs at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests typically in warm, dry, exposed sites at elevations ranging from 500-1600 m (1600-5248 feet). These interior Pacific Northwest woodlands receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Central Rockies. However, these sites are often too droughty to support a closed tree canopy. They can occur on all slopes and aspects; however, they commonly occur on moderately steep to very steep slopes or ridgetops and plateaus. Substrates include glacial till, glacio-fluvial sand and gravel, dunes, basaltic rubble and scablands, colluvium, or deep loess or volcanic ash-derived soils, all with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. In the Oregon "pumice zone" this group occurs as matrix-forming, extensive woodlands on rolling pumice plateaus and other volcanic deposits.

Climate: This group within the interior Pacific Northwest region occurs at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests typically in warm, dry, exposed sites at elevations ranging from 500-1600 m (1600-5248 feet). These interior Pacific Northwest woodlands receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Central Rockies.

Soil/substrate/hydrology: These sites are often too droughty to support a closed tree canopy. They can occur on all slopes and aspects; however, they commonly occur on moderately steep to very steep slopes or ridgetops and plateaus. Substrates include glacial till, glacio-fluvial sand and gravel, dunes, basaltic rubble and scablands, colluvium, or deep loess or volcanic ash-derived soils, all with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. In the Oregon "pumice zone" this group occurs as matrix-forming, extensive woodlands on rolling pumice plateaus and other volcanic deposits.

Dynamics: *Pinus ponderosa* is a drought-resistant, shade-intolerant conifer which usually occurs at lower treeline in the major ranges of the western United States. Historically, surface fires and drought were influential in maintaining open-canopy conditions in these woodlands. With settlement and subsequent fire suppression, occurrences have become denser. Presently, some occurrences contain understories of more shade-tolerant species, such as *Pseudotsuga menziesii* and/or *Abies* spp., as well as younger cohorts of *Pinus ponderosa*. These altered structures have affected fuel loads and fire regimes. Presettlement fire regimes were primarily frequent (5- to 15-year return intervals), low-intensity surface fires triggered by lightning strikes or deliberately set fires by Native Americans. With fire suppression and increased fuel loads, fire regimes are now less frequent and often become intense crown fires,

which can kill mature *Pinus ponderosa* (Reid et al. 1999). Establishment is erratic and believed to be linked to periods of adequate soil moisture and good seed crops as well as fire frequencies, which allow seedlings to reach sapling size. Longer fire-return intervals have resulted in many occurrences having dense subcanopies of overstocked and unhealthy young *Pinus ponderosa*, along with *Pseudotsuga menziesii* on moist sites (Reid et al. 1999).

Additional associations included in this group are subject to periodic drought that limits tree establishment. This climate-edaphic interaction results in widely scattered trees over "shrub-steppe" of sagebrush, bitterbrush, or sparsely distributed grasses. Tree growth is likely episodic, with regeneration episodes in years with available moisture. Tree density is limited in some areas by available growing space due to rocky conditions of the site. Hence the tree canopy in these associations will never reach woodland density or close due to the interaction of climate and edaphic factors, even in the absence of fire. They burn occasionally, but the vegetation is sparse enough that fires are typically not carried through the stand. Fire frequency is speculated to be 30-50 years. Some stands also occur on areas of sand dunes, scablands, and pumice where the edaphic conditions limit tree abundance.

A meeting of Pacific Northwest ecologists for Landfire concluded that the "true savannas" of high-frequency / low-intensity fires and grassy understories are now rare. Most areas that may have been savanna in the past are now more nearly closed-canopy woodlands/forests. Conclusion was that these true savannas should be included with this woodland group, along with the climatically-edaphically controlled "wooded steppes" which are also in this group. The wooded steppes included here are not fire-maintained; they occur on sites too droughty to support a closed tree canopy. They do burn with a high-frequency / low-intensity regime, but fire is not carried because of the sparse vegetation of the edaphically constrained sites (rock outcrops, dunes, super-dry, sparse trees over shrubs and sometimes grasses but widely spaced). Louisa Evers (pers. comm. 2006) notes that she has not found any evidence that ponderosa pine savanna existed historically in north-central and central Oregon. In north-central Oregon, the savanna would have been oak or pine-oak. In central Oregon, it may well have been western juniper. Condition surveys of the Cascades Forest Reserve and General Land Office survey notes suggest that ponderosa pine formed a woodland with grassy understories, but still was often referred to as open-parklike. Conversely pine-oak and Douglas-fir-oak savannas appeared to have once been quite common in the Willamette Valley.

DISTRIBUTION

Geographic Range: This group is found in the Fraser River drainage of southern British Columbia south along the Cascades and central Rocky Mountains of Washington, Oregon and the Modoc Plateau of northeastern California. In the northeastern part of its range, it extends across the central Rocky Mountains west of the Continental Divide into northwestern Montana, south to the Snake River Plain in Idaho, and east into the foothills of western Montana (but not into central or eastern Montana). In Oregon, it is most common in south-central Oregon, in lands managed by the Lakeview District of the BLM, and by the adjacent Fremont and Deschutes national forests. It also occurs on the marginal lands coming south out of the Blue Mountains, on the edge of the northern Basin and Range.

Spatial Scale & Pattern [optional]: Matrix

Nations: CA, US

States/Provinces: AB, BC, CA, ID, MT, NV?, OR, WA

TNC Ecoregions [optional]: 3:?, 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 26:?, 68:C

USFS Ecoregions (2007): 331A:CC, 342B:CC, 342C:CC, 342D:CP, 342H:CC, 342I:CC, M242B:CC, M242C:CC, M242D:CC, M261G:CC, M331A:PP, M332A:CC, M332B:CC, M332D:CP, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A3447 *Pinus ponderosa* / Herbaceous Understory Central Rocky Mountain Open Woodland Alliance
- A3446 *Pinus ponderosa* / Shrub Understory Central Rocky Mountain Woodland Alliance

AUTHORSHIP

Primary Concept Source: R.F. Daubenmire and J.B. Daubenmire (1968)

Author of Description: M.S. Reid, K.A. Schulz and M. Manning

Acknowledgments: M. Manning

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: MSR 3-10, mod. KAS/MM 5-13, mod. KAS 11-15

REFERENCES

References: Camp et al. 1997, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Everett et al. 2000, Evers pers. comm., Eyre 1980, Faber-Langendoen et al. 2017a, Franklin and Dyrness 1973, Habeck 1992a, Johansen and Latta 2003, Mehl 1992, Meidinger and Pojar 1991, Pfister et al. 1977, Reid et al. 1999, Shiflet 1994, USFS 1993a

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G213. Central Rocky Mountain Ponderosa Pine Open Woodland

A3447. *Pinus ponderosa* / Herbaceous Understory Central Rocky Mountain Open Woodland Alliance

Type Concept Sentence: These *Pinus ponderosa*-dominated woodlands and savannas occur at the lower treeline/ecotone between grasslands, typically on warm, dry, exposed sites and are characterized by grassy understories that are generally fire-maintained. This inland Pacific Northwest alliance occurs in the foothills of the central Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. It also occurs east across Idaho into the eastern foothills of the Montana Rockies.

OVERVIEW

Scientific Name: *Pinus ponderosa* / Herbaceous Understory Central Rocky Mountain Open Woodland Alliance

Common Name (Translated Scientific Name): Ponderosa Pine / Herbaceous Understory Central Rocky Mountain Open Woodland Alliance

Colloquial Name: Central Rocky Mountain Ponderosa Pine / Herb Open Woodland

Type Concept: This alliance is characterized by *Pinus ponderosa*-dominated woodlands with grassy understories and savannas. *Pinus ponderosa* var. *ponderosa* is the predominant conifer with *Pseudotsuga menziesii* or *Pinus flexilis* occasionally present in the tree canopy. The understory is dominated by herbaceous vegetation composed of predominantly fire-adapted grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. Characteristic graminoids include *Achnatherum* spp., *Carex inops*, *Elymus glaucus*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, or *Pseudoroegneria spicata*. The more mesic portions of this alliance may include *Calamagrostis rubescens* or *Carex geyeri*, species more typical of alliances in Central Rocky Mountain Douglas-fir - Pine Forest Group (G210). Forb cover is typically low, although occasionally forbs such as *Wyethia mollis* dominate the understory. Scattered shrubs may be present in some stands, but they have low cover (<10%) and do not characterize the understory. Species include *Amelanchier alnifolia*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Physocarpus malvaceus*, *Purshia tridentata*, *Rosa* spp., *Symphoricarpos albus*, or *Symphoricarpos oreophilus*. This inland Pacific Northwest alliance occurs in the foothills of the central Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. It also occurs east across Idaho into the eastern foothills of the Montana Rockies. These woodlands and savannas occur at the lower treeline/ecotone between grasslands, typically on warm, dry, exposed sites. They receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Central Rockies. However, sites are often too droughty to support a closed tree canopy. Elevations range from less than 500 m in British Columbia to 1600 m in the central Idaho mountains. Occurrences are found on all slopes and aspects; however, moderately steep slopes or ridgetops and plateaus are most common. This group generally occurs on most geological substrates from weathered rock to glacial deposits to eolian deposits. Surface textures are variable ranging from sand to loam and silt loam. Exposed rock and bare soil are common. Mixed fire regimes and surface fires of variable return intervals maintain these woodlands, depending on climate, degree of soil development, and understory density. Historically, many of these woodlands and savannas lacked the shrub component as a result of 3- to 7-year fire-return intervals. With fire suppression, tree canopies may become moderately dense and the grass component is reduced.

Classification Comments: Taxonomists (Kartesz 1999) recognize two varieties of *Pinus ponderosa*, a Pacific form, *Pinus ponderosa* var. *ponderosa*, and an interior form, *Pinus ponderosa* var. *scopulorum*. Associations dominated by either variety are included in this alliance. The classification status of all associations formerly placed in *Pinus ponderosa* Forest Alliance (A.124) should be reviewed and verified.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3446 *Pinus ponderosa* / Shrub Understory Central Rocky Mountain Woodland Alliance: is similar but is characterized by a shrub layer instead of a graminoid layer.

Diagnostic Characteristics: This alliance is characterized by an open tree canopy (10-40% cover) dominated by *Pinus ponderosa* with graminoids typically dominating the understory. Characteristic graminoids include *Achnatherum* spp., dry *Carex* species (*Carex*

inops), *Elymus elymoides*, *Elymus glaucus*, *Festuca campestris*, *Hesperostipa comata*, *Festuca idahoensis*, or *Pseudoroegneria spicata*. More mesic sites may have *Calamagrostis rubescens* or *Carex geyeri*. Stands with understory dominated by forbs such as *Wyethia mollis* are also included in this alliance.

VEGETATION

Physiognomy and Structure: This alliance includes open to moderately dense woodland and savanna stands of needle-leaved evergreen trees 10-30 m in height. The understory is characterized by a sparse to moderately dense herbaceous layer dominated perennial graminoids or occasionally by perennial forbs.

Floristics: This alliance is characterized by *Pinus ponderosa*-dominated woodlands with grassy understories and savannas. They are generally fire-maintained. *Pinus ponderosa* var. *ponderosa* is the predominant conifer; *Pseudotsuga menziesii* or *Pinus flexilis* may be present in the tree canopy but are usually absent. Herbaceous vegetation in the true savanna occurrences is predominantly fire-adapted grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. These more open stands support graminoids such as *Achnatherum* spp., *Carex inops* (and other dry sedges), *Elymus elymoides*, *Elymus glaucus*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Koeleria macrantha*, *Leucopoa kingii* (= *Festuca kingii*), or *Pseudoroegneria spicata*. The more mesic portions of this alliance may include *Calamagrostis rubescens* or *Carex geyeri*, species more typical of alliances in Central Rocky Mountain Douglas-fir - Pine Forest Group (G210). Forb cover is typically low although occasionally forbs such as *Wyethia mollis* may dominate the understory. Scattered shrubs may be present in some stands, but they have low cover (<10%) and do not characterize the understory. Species may include *Amelanchier alnifolia*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Physocarpus malvaceus*, *Purshia tridentata*, *Rosa* spp., *Symphoricarpos albus*, or *Symphoricarpos oreophilus*.

ENVIRONMENT & DYNAMICS

Environmental Description: This inland Pacific Northwest alliance occurs in the foothills of the central Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. It also occurs east across Idaho into the eastern foothills of the Montana Rockies. This alliance is characterized by woodlands with grassy understories and tree savannas. They are generally fire-maintained. These woodlands and savannas occur at the lower treeline/ecotone between grasslands, typically on warm, dry, exposed sites. These interior Pacific Northwest woodlands receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Central Rockies. However, sites are often too droughty to support a closed tree canopy. Elevations range from less than 500 m in British Columbia to 1600 m in the central Idaho mountains. Occurrences are found on all slopes and aspects; however, moderately steep slopes or ridgetops and plateaus are most common. This alliance generally occurs on most geological substrates from weathered rock to glacial deposits to eolian deposits. Characteristic soil features include good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, and periods of drought during the growing season. Surface textures are highly variable in this alliance ranging from sand to loam and silt loam. Exposed rock and bare soil consistently occur to some degree in all the associations. Mixed fire regimes and surface fires of variable return intervals maintain these woodlands, depending on climate, degree of soil development, and understory density. Historically, many of these woodlands and savannas lacked the shrub component as a result of 3- to 7-year fire-return intervals.

Dynamics: *Pinus ponderosa* is a drought-resistant, shade-intolerant conifer which usually occurs at lower treeline in the major ranges of the western United States. Historically, surface fires and drought were influential in maintaining open-canopy conditions in these woodlands. With settlement and subsequent fire suppression, stands have become more dense. Presently, many stands contain understories of more shade-tolerant species, such as *Pseudotsuga menziesii* and/or *Abies* spp., as well as younger cohorts of *Pinus ponderosa*. These altered stand structures have affected fuel loads and altered fire regimes. Presettlement fire regimes were primarily frequent (5- to 15-year return intervals), low-intensity surface fires triggered by lightning strikes or deliberately set fires by Native Americans. With fire suppression and increased fuel loads, fires are now less frequent and often become intense crown fires which can kill mature *Pinus ponderosa*. Establishment is erratic and believed to be linked to periods of adequate soil moisture and good seed crops, as well as fire frequencies which allow seedlings to reach sapling size. Longer fire intervals have resulted in many stands having dense subcanopies of overstocked and unhealthy young *Pinus ponderosa*.

DISTRIBUTION

Geographic Range: This alliance is found in southern British Columbia south along the Cascades and central Rocky Mountains of Washington, Oregon and the Modoc Plateau of northeastern California. In the northeastern part of its range, it extends across the central Rocky Mountains west of the Continental Divide into northwestern Montana, south to the Snake River Plain in Idaho, and east into the foothills of western Montana (but not into central or eastern Montana). In Oregon, it is most common in south-central Oregon, in lands managed by the Lakeview District of the BLM, and by the adjacent Fremont and Deschutes national forests. It also occurs on the marginal lands coming south out of the Blue Mountains, on the edge of the northern Basin and Range.

Nations: CA, US

States/Provinces: AB, BC, CA, ID, MT, NV?, OR, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Pinus ponderosa* / *Agropyron spicatum* Association (Daubenmire 1952)
- > *Pinus ponderosa* / *Carex geyeri* Habitat Type (Alexander et al. 1986)
- > *Pinus ponderosa* / *Elymus glaucus* Forest (Hall 1973)
- > *Pinus ponderosa* / *Festuca campestris* Habitat Type (Pfister et al. 1977)
- > *Pinus ponderosa* / *Festuca idahoensis* (Cooper et al. 1985)
- > *Pinus ponderosa* / *Festuca idahoensis* Habitat Type (Daubenmire and Daubenmire 1968)
- > *Pinus ponderosa* / *Pseudoroegneria spicata* Habitat Type (Steele et al. 1981)
- > *Pinus ponderosa* / *Roegneria spicata* Habitat Type (Daubenmire and Daubenmire 1968)
- > *Pinus ponderosa* / *Stipa comata* (Bourgeron and Engelking 1994)
- >< Interior Ponderosa Pine: 237 (Eyre 1980)
- >< Westside Ponderosa Pine Forest (#84210) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEG000185 *Pinus ponderosa* / *Festuca campestris* Woodland
- CEG000181 *Pinus ponderosa* / *Calamagrostis rubescens* Forest
- CEG000865 *Pinus ponderosa* / *Pseudoroegneria spicata* Woodland
- CEG000184 *Pinus ponderosa* / *Elymus glaucus* Forest
- CEG000182 *Pinus ponderosa* / *Carex geyeri* Woodland
- CEG000879 *Pinus ponderosa* / *Hesperostipa comata* Woodland
- CEG000857 *Pinus ponderosa* / *Festuca idahoensis* Woodland
- CEG000206 *Pinus ponderosa* / *Wyethia mollis* Woodland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Manning and Marion Reid.

Version Date: 2014/01/08

REFERENCES

References: Alexander 1985, Alexander 1986, Alexander et al. 1986, Atzet and Wheeler 1984, Atzet et al. 1996, Blackburn et al. 1969e, Bourgeron and Engelking 1994, Brayshaw 1965, Brown 1971, Clausnitzer and Zamora 1987, Cooper et al. 1985, Cooper et al. 1987, Currie 1975, Daubenmire 1952, Daubenmire 1970, Daubenmire and Daubenmire 1968, Dealy 1971, Dyrness 1960, Eyre 1980, Faber-Langendoen et al. 2017b, Fischer and Clayton 1983, Franklin and Dyrness 1973, Franklin et al. 1972, Ganskopp 1979, Graybosch and Buchanan 1983, Hall 1967, Hall 1973, Head 1959, Holland 1986b, Hopkins 1979a, Hopkins 1979b, Johnson 1985a, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Johnson and Simon 1987, Kartesz 1999, Mauk and Henderson 1984, McLean 1970, Mehl 1992, Moir et al. 1973b, Pfister 1977, Pfister et al. 1977, Roberts 1980, Rummell 1951, Schuller and Evans 1986, Sherman 1969, Steele et al. 1981, Tiedemann and Klock 1977, Tisdale and McLean 1957, Volland 1976, WNDD unpubl. data, WNHP unpubl. data, Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b, Zamora 1983

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G213. Central Rocky Mountain Ponderosa Pine Open Woodland

A3446. *Pinus ponderosa* / Shrub Understory Central Rocky Mountain Woodland Alliance

Type Concept Sentence: These are *Pinus ponderosa*-dominated woodlands with shrub-dominated understories and "wooded steppes" with widely spaced, scattered *Pinus ponderosa* trees over generally shrubby but sparse understories that occur at the lower treeline/ecotone on warm, dry, exposed sites. This inland Pacific Northwest alliance occurs in the foothills of the central Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. It also occurs east across Idaho into the eastern foothills of the Montana Rockies.

OVERVIEW

Scientific Name: *Pinus ponderosa* / Shrub Understory Central Rocky Mountain Woodland Alliance

Common Name (Translated Scientific Name): Ponderosa Pine / Shrub Understory Central Rocky Mountain Woodland Alliance

Colloquial Name: Central Rocky Mountain Ponderosa Pine / Shrub Woodland

Type Concept: This alliance is characterized by *Pinus ponderosa*-dominated woodlands with shrub-dominated understories, and "wooded steppes" with widely spaced, scattered *Pinus ponderosa* trees over generally shrubby but sparse understories. *Pinus ponderosa* var. *ponderosa* is the predominant conifer with *Pseudotsuga menziesii* or *Pinus flexilis* occasionally present in the tree canopy. The understory is characterized by shrubs that form an open to moderately dense layer. If shrub cover is sparse (<10% cover), then it exceeds herbaceous cover. Common shrubs include *Amelanchier alnifolia*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Artemisia arbuscula*, *Artemisia tridentata*, *Artemisia tripartita*, *Ceanothus velutinus*, *Cercocarpus ledifolius*, *Physocarpus malvaceus*, *Purshia tridentata*, *Rosa* spp. *Spiraea betulifolia*, *Symphoricarpos albus*, *Symphoricarpos oreophilus*, or *Vaccinium cespitosum*. Herbaceous vegetation varies from sparse to moderately dense, but typically has less cover than the shrubs. Species may include *Achnatherum hymenoides*, *Achnatherum occidentale*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex inops*, *Elymus glaucus*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Poa nervosa*, or *Pseudoroegneria spicata*. This inland Pacific Northwest alliance occurs in the foothills of the central Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. It also occurs east across Idaho into the eastern foothills of the Montana Rockies. These woodlands occur at the lower treeline/ecotone between shrublands and more mesic coniferous forests, typically on warm, dry, exposed sites that are often too dry and with widely spaced vegetation to carry fire. These interior Pacific Northwest woodlands receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Central Rockies. Elevations range from less than 500 m in British Columbia to 1600 m in the central Idaho mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops and plateaus are most common. Soils are shallow, often gravelly or coarse textured, and well-drained with periods of drought during the growing season. Some occurrences may occur as edaphic climax communities on very skeletal, infertile and/or excessively drained soils, such as pumice, cinder or lava fields, and scree slopes. Mixed fire regimes and surface fires of variable return intervals maintain these woodlands typically with a shrub-dominated or patchy shrub layer, depending on climate, degree of soil development, and understory density.

Classification Comments: This alliance is broadly defined and includes two physiognomic phases: true woodlands and "wooded steppes" with widely spaced, scattered over generally shrubby but sparse understories. It may be possible to split this alliance into two and assign associations accordingly, but it is not possible at this time. It may be possible to split this alliance into dry-mesic and mesic-wet upland forests and woodlands, but it needs further review.

Taxonomists (Kartesz 1999) recognize two varieties of *Pinus ponderosa*, a Pacific form, *Pinus ponderosa* var. *ponderosa*, and an interior form, *Pinus ponderosa* var. *scopulorum*. Associations dominated by either variety are included in this alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3447 *Pinus ponderosa* / Herbaceous Understory Central Rocky Mountain Open Woodland Alliance: is similar but is characterized by a graminoid layer rather than shrubs.

Diagnostic Characteristics: This alliance is characterized by an open to moderately dense tree canopy dominated by *Pinus ponderosa* with shrubs characterizing the understory. If grasses are abundant, then a distinct shrub layer is present with at least 10% cover. Other sites are so xeric that only scattered shrubs are present in understory. Characteristic shrubs include *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Physocarpus malvaceus*, *Purshia tridentata*, *Spiraea betulifolia*, *Symphoricarpos oreophilus*, or *Symphoricarpos albus*, *Amelanchier alnifolia*, and *Rosa* spp. common species. Herbaceous species are variable and not diagnostic.

VEGETATION

Physiognomy and Structure: This alliance includes open to moderately dense woodland and savanna stands of needle-leaved evergreen trees 10-30 m in height. The understory is characterized by tall- or short-shrub layers (>10% cover) of sclerophyllous or cold-deciduous species. A sparse to moderately dense herbaceous layer dominated by perennial forbs is important in some stands.

Floristics: This inland Pacific Northwest alliance is characterized by *Pinus ponderosa*-dominated woodlands with shrub-dominated understories, and "wooded steppes" with widely spaced, scattered *Pinus ponderosa* trees over generally shrubby but sparse understories. The former are generally fire-maintained, while the latter are often too dry and with widely spaced vegetation to carry fire. *Pinus ponderosa* var. *ponderosa* is the predominant conifer; *Pseudotsuga menziesii* or *Pinus flexilis* may be present in the tree canopy but are usually absent. The understory is characterized by shrubs; common species include *Amelanchier alnifolia*,

Arctostaphylos patula, *Arctostaphylos uva-ursi*, *Artemisia arbuscula*, *Artemisia tridentata*, *Artemisia tripartita*, *Ceanothus velutinus*, *Cercocarpus ledifolius*, *Physocarpus malvaceus*, *Purshia tridentata*, *Rosa* spp. *Spiraea betulifolia*, *Symphoricarpos albus*, *Symphoricarpos oreophilus*, or *Vaccinium cespitosum*. In transition areas with sagebrush steppe, *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, and *Artemisia tripartita*, and *Purshia tridentata* may be common in fire-protected sites such as rocky areas. Deciduous shrubs, such as *Physocarpus malvaceus*, *Spiraea betulifolia*, *Symphoricarpos albus*, or *Spiraea betulifolia*, can be abundant in more northerly sites or more moist climates. Herbaceous vegetation varies from sparse to moderately dense, but typically has less cover than the shrubs. Species may include *Achnatherum hymenoides*, *Achnatherum occidentale*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex inops*, *Elymus glaucus*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Poa nervosa*, or *Pseudoroegneria spicata*. The more mesic portions of this alliance may include *Calamagrostis rubescens* or *Carex geyeri*, species more typical of alliances in Central Rocky Mountain Douglas-fir - Pine Forest Group (G210). Forb cover is sparse but may be diverse and include species of many other genera, such as *Antennaria*, *Arenaria*, *Erigeron*, *Eriogonum*, *Heterotheca*, *Lupinus*, and *Lathyrus*.

ENVIRONMENT & DYNAMICS

Environmental Description: This inland Pacific Northwest alliance occurs in the foothills of the central Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. It also occurs east across Idaho into the eastern foothills of the Montana Rockies. These woodlands occur at the lower treeline/ecotone between shrublands and more mesic coniferous forests, typically on warm, dry, exposed sites that are often too dry and with widely spaced vegetation to carry fire. Generally, these woodlands occur in areas which receive 25-60 cm of precipitation annually, with some seasonal drought. These interior Pacific Northwest woodlands receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Central Rockies. However, sites are often too droughty to support a closed tree canopy. Elevations range from less than 500 m in British Columbia to 1600 m in the central Idaho mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops and plateaus are most common. This group generally occurs on most geological substrates from weathered rock to glacial deposits to eolian deposits. Characteristic soil features include good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, and periods of drought during the growing season. Some occurrences may occur as edaphic climax communities on very skeletal, infertile and/or excessively drained soils, such as pumice, cinder or lava fields, and scree slopes. Surface textures are highly variable in this group ranging from sand to loam and silt loam. Exposed rock and bare soil consistently occur to some degree in all the associations. Mixed fire regimes and surface fires of variable return intervals maintain these woodlands, typically with a shrub-dominated or patchy shrub layer, depending on climate, degree of soil development, and understory density.

Dynamics: These woodlands occur at the lower treeline/ecotone between shrublands and more mesic coniferous forests, typically on warm, dry, exposed sites. Some occurrences may occur as edaphic climax communities on very skeletal, infertile and/or excessively drained soils, such as pumice, cinder or lava fields, and scree slopes that are too dry and with widely spaced vegetation to carry fire. Other sites have mixed fire regimes and surface fires of variable return intervals that maintain these woodlands, typically with a shrub-dominated or patchy shrub layer, depending on climate, degree of soil development, and understory density.

DISTRIBUTION

Geographic Range: This alliance is found in southern British Columbia south along the Cascades and central Rocky Mountains of Washington, Oregon and the Modoc Plateau of northeastern California. In the northeastern part of its range, it extends across the Central Rocky Mountains west of the Continental Divide into northwestern Montana, south to the Snake River Plain in Idaho, and east into the foothills of western Montana (but not into central or eastern Montana). In Oregon, it is most common in south-central Oregon, in lands managed by the Lakeview District of the BLM, and by the adjacent Fremont and Deschutes national forests. It also occurs on the marginal lands coming south out of the Blue Mountains, on the edge of the northern Basin and Range.

Nations: CA, US

States/Provinces: AB, BC, CA, ID, MT, NV?, OR, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Pinus ponderosa* / *Arctostaphylos patula* - *Ceanothus velutinus* / *Pteridium aquilinum* (Sherman 1969)
- > *Pinus ponderosa* / *Artemisia arbuscula* Habitat Type (DeVelice et al. 1986)
- > *Pinus ponderosa* / *Artemisia tridentata* ssp. *vaseyana* / *Poa nervosa* (Hopkins 1979a)
- > *Pinus ponderosa* / *Physocarpus malvaceus* Habitat Type (Steele et al. 1981)

NBR alliances

- > *Pinus ponderosa* / *Purshia tridentata* / *Agropyron spicatum* (Lillybridge et al. 1995)
- > *Pinus ponderosa* / *Purshia tridentata* / *Festuca idahoensis* - *Pseudoroegneria spicata* (Daubenmire 1968a)
- > *Pinus ponderosa* / *Purshia tridentata* (Clausnitzer and Zamora 1987)
- > *Pinus ponderosa* / *Symphoricarpos oreophila* Habitat Type (Steele et al. 1981)
- ? *Pseudotsuga menziesii* - *Pinus ponderosa* / *Carex geyeri* (Cole 1977b)
- >< Interior Ponderosa Pine: 237 (Eyre 1980)
- >< Pacific Ponderosa Pine: 245 (Eyre 1980)
- ? Ponderosa Pine / Bitterbrush - Manzanita / Fescue (Volland 1985)
- ? Ponderosa Pine / Bitterbrush / Fescue (Hopkins 1979a)

LOWER LEVEL UNITS

Associations:

- CEGLO00203 *Pinus ponderosa* / *Symphoricarpos albus* Forest
- CEGLO05646 *Pinus ponderosa* / *Cercocarpus ledifolius* Central Rocky Mountain Woodland
- CEGLO00062 *Pinus ponderosa* / *Arctostaphylos patula* - *Ceanothus velutinus* Woodland
- CEGLO00845 *Pinus ponderosa* / *Artemisia arbuscula* Woodland
- CEGLO00202 *Pinus ponderosa* / *Spiraea betulifolia* Forest
- CEGLO00205 *Pinus ponderosa* / *Symphoricarpos oreophilus* Forest
- CEGLO00178 *Pinus ponderosa* / *Artemisia tridentata* - *Purshia tridentata* Woodland
- CEGLO02688 *Pinus ponderosa* - *Juniperus occidentalis* / *Artemisia tridentata* - *Purshia tridentata* Woodland
- CEGLO00193 *Pinus ponderosa* / *Purshia tridentata* / *Carex inops* ssp. *inops* Forest
- CEGLO00197 *Pinus ponderosa* / *Purshia tridentata* / *Pseudoroegneria spicata* Woodland
- CEGLO00196 *Pinus ponderosa* / *Purshia tridentata* / *Achnatherum hymenoides* Woodland
- CEGLO00179 *Pinus ponderosa* / *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Woodland
- CEGLO00180 *Pinus ponderosa* / *Artemisia tridentata* ssp. *vaseyana* / *Poa nervosa* Woodland
- CEGLO02606 *Pinus ponderosa* / *Purshia tridentata* / *Carex geyeri* Woodland
- CEGLO00189 *Pinus ponderosa* / *Physocarpus malvaceus* Forest
- CEGLO00200 *Pinus ponderosa* / *Ribes montigenum* Woodland
- CEGLO00064 *Pinus ponderosa* / *Ceanothus velutinus* - *Purshia tridentata* Woodland
- CEGLO00194 *Pinus ponderosa* / *Purshia tridentata* / *Carex rossii* Woodland
- CEGLO05841 *Pinus ponderosa* / *Vaccinium cespitosum* Woodland
- CEGLO00195 *Pinus ponderosa* / *Purshia tridentata* / *Festuca idahoensis* Woodland
- CEGLO05648 *Pinus ponderosa* / *Purshia tridentata* Central Rocky Mountain Woodland
- CEGLO00063 *Pinus ponderosa* / *Arctostaphylos patula* - *Purshia tridentata* Woodland
- CEGLO00198 *Pinus ponderosa* / *Purshia tridentata* / *Achnatherum occidentale* Woodland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Manning and Marion Reid.

Version Date: 2014/01/08

REFERENCES

References: Alexander 1985, Alexander 1986, Atzet and Wheeler 1984, Atzet et al. 1996, Barrows et al. 1977, Blackburn et al. 1969e, Brayshaw 1965, Brown 1971, Clausnitzer and Zamora 1987, Cole 1977b, Cooper and Pfister 1985, Cooper et al. 1987, Currie 1975, Daubenmire 1952, Daubenmire 1968a, Daubenmire 1970, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Dyrness 1960, Eyre 1980, Faber-Langendoen et al. 2017b, Fischer and Clayton 1983, Franklin and Dyrness 1973, Franklin et al. 1972, Ganskopp 1979, Hall 1967, Hall 1973, Head 1959, Holland 1986b, Hopkins 1979a, Hopkins 1979b, Johnson 1985a, Johnson and Clausnitzer 1992, Johnson and Niederhof 1941, Johnson and Simon 1985, Johnson and Simon 1987, Kartesz 1999, Kooiman and Linhart 1986, Lillybridge et al. 1995, MTNHP unpubl. data, Mauk and Henderson 1984, McLean 1970, Moir et al. 1973b, Pfister 1977, Pfister et al. 1977, Roberts 1980, Rowdabaugh 1978, Rummell 1951, Sawyer and Keeler-Wolf 1995, Schuller and Evans 1986, Sherman 1969, Steele et al. 1981, Tiedemann and Klock 1977, Tisdale and McLean 1957, Volland 1976, Volland 1985, WNDD unpubl. data, WNHP unpubl. data, Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b, Zamora 1983

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

1.B.2.Nb.2.c. M501 Central Rocky Mountain Dry Lower Montane-Foothill Forest

G215. Middle Rocky Mountain Montane Douglas-fir Forest & Woodland

Type Concept Sentence: This *Pseudotsuga menziesii*-dominated forest and woodland group occurs throughout the middle Rocky Mountains of central and southern Idaho, south and east into the Greater Yellowstone region, including the Bighorn, Gros Ventre and Wind River ranges of Wyoming, and north into Montana on the east side of the Continental Divide to about the McDonald Pass area and also along the Rocky Mountain Front region and central "sky island" ranges of Montana.

OVERVIEW

Scientific Name: *Pseudotsuga menziesii* Middle Rocky Mountain Montane Forest & Woodland Group

Common Name (Translated Scientific Name): Douglas-fir Middle Rocky Mountain Montane Forest & Woodland Group

Colloquial Name: Middle Rocky Mountain Douglas-fir Dry-Mesic Forest & Woodland

Type Concept: This group occurs throughout the middle Rocky Mountains of central and southern Idaho (Beaverhead, Lemhi, and Lost River ranges), south and east into the Greater Yellowstone region, and the Bighorn, Gros Ventre and Wind River ranges of Wyoming. It extends north into Montana on the east side of the Continental Divide, north to about the McDonald Pass area, and also into the Rocky Mountain Front region and central "sky island" ranges of Montana. This is a *Pseudotsuga menziesii*-dominated group without the maritime floristic composition; these are forests and woodlands occurring in the Central Rockies where the southern monsoon influence is less and maritime climate regime is not important. This group includes extensive *Pseudotsuga menziesii* forests, occasionally with *Pinus flexilis* on calcareous substrates, and *Pinus contorta* at higher elevations. True firs, such as *Abies concolor*, *Abies grandis*, and *Abies lasiocarpa*, are generally absent in these occurrences, but *Picea engelmannii* can occur in some stands. *Pinus ponderosa* is not common in this group. Understory components include shrubs such as *Juniperus communis*, *Mahonia repens*, *Physocarpus malvaceus*, and *Symphoricarpos oreophilus*, and graminoids such as *Calamagrostis rubescens*, *Carex rossii*, and *Leucopoa kingii*. The fire regime is of mixed severity with moderate frequency. This group often occurs at the lower treeline immediately above valley grasslands, or sagebrush steppe and shrublands. Sometimes there may be a "bath-tub ring" of *Pinus ponderosa* at lower elevations or *Pinus flexilis* between the valley non-forested and the solid *Pseudotsuga menziesii* forest. In the Wyoming Basins, this group occurs as isolated stands of *Pseudotsuga menziesii*, with *Artemisia tridentata*, *Carex rossii*, *Leucopoa kingii*, and *Pseudoroegneria spicata*.

Classification Comments: Need to re-assess the concept of this group in relation to Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest Group (G211), East Cascades Mesic Grand Fir - Douglas-fir Forest Group (G212), and Central Rocky Mountain Douglas-fir - Pine Forest Group (G210). Also, its transition in the south to Southern Rocky Mountain White Fir - Douglas-fir Dry Forest Group (G226) needs to be clarified. It seems this group would most appropriately contain Rocky Mountain associations wherein *Pseudotsuga menziesii* is the only conifer, hence forests and woodlands that are not mixed conifer. Certainly this group is outside the range of distribution of either *Abies concolor* or *Picea pungens*, which are major components of Southern Rocky Mountain forest groups. It also does not overlap with major interior Pacific Northwest forest types which are affiliated with a more maritime climate regime, where trees such as *Abies grandis*, *Larix occidentalis*, *Pinus monticola*, *Thuja plicata*, or *Tsuga heterophylla* occur. However, it does have some overlap with Central Rocky Mountain Douglas-fir - Pine Forest Group (G210), and there are *Pseudotsuga menziesii*-dominated forests extending south in the Rockies well into New Mexico, so the floristic "transition" from middle to southern Rocky Mountains is not yet clear.

Similar NVC Types:

- G226 Southern Rocky Mountain White Fir - Douglas-fir Dry Forest
- G210 Central Rocky Mountain Douglas-fir - Pine Forest
- G211 Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest

Diagnostic Characteristics: These are *Pseudotsuga menziesii*-dominated forests and woodlands without the maritime floristic composition. They tend to be drier than *Pseudotsuga menziesii*-dominated forests further north in the Rockies, where the maritime climate regime provides more moisture during the growing season.

VEGETATION

Physiognomy and Structure: Forests and woodlands of evergreen conifers, with understory components of broad-leaved deciduous shrubs, evergreen needle-leaved shrubs, and grasses or dryland sedges.

Floristics: This group includes extensive *Pseudotsuga menziesii* forests, occasionally with *Pinus flexilis* on calcareous substrates, *Pinus contorta* at higher elevations and *Juniperus osteosperma* or *Juniperus scopulorum*. True firs, such as *Abies concolor*, *Abies grandis*, and *Abies lasiocarpa*, are generally absent in these occurrences, but *Picea engelmannii* can occur in some stands. *Pinus ponderosa* is also not common in this group. Understory components include shrubs such as *Acer glabrum*, *Amelanchier alnifolia*, *Cercocarpus ledifolius*, *Linnaea borealis*, *Juniperus communis*, *Mahonia repens*, *Physocarpus malvaceus*, *Purshia tridentata*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Symphoricarpos oreophilus*. Common graminoids include *Calamagrostis rubescens*, *Carex rossii*, *Leucopoa*

kingii, and *Piptatheropsis micrantha* (= *Piptatherum micranthum*). Forbs are variable, but typical taxa include *Arnica cordifolia*, *Osmorhiza berteroi*, *Thalictrum occidentale*, *Viola adunca*, and species of many other genera, including *Arenaria*, *Erigeron*, *Lathyrus*, *Lupinus*, *Fragaria*, *Galium*, *Penstemon*, *Vicia*, and others. This group often occurs at the lower treeline immediately above valley grasslands, or sagebrush steppe and shrublands. Sometimes there may be a "bath-tub ring" of *Pinus ponderosa* at lower elevations or *Pinus flexilis* between the valley non-forested and the solid *Pseudotsuga menziesii* forest. In the Wyoming Basins, this group occurs as isolated stands of *Pseudotsuga menziesii*, with *Artemisia tridentata*, *Carex rossii*, *Leucopoa kingii*, and *Pseudoroegneria spicata*.

ENVIRONMENT & DYNAMICS

Environmental Description: These are forests and woodlands occurring in the Central Rockies where the southern monsoon influence is less and maritime climate regime is not important. In the middle Rocky Mountains, *Pseudotsuga menziesii* forests occur under a comparatively drier and more continental climate regime, and at higher elevations than in the Pacific Northwest. Elevations range from less than 1000 m in the central Rocky Mountains to over 2400 m in the Wyoming Rockies. Lower elevation stands typically occupy protected northern exposures or mesic ravines and canyons, often on steep slopes. At higher elevations, these forests occur primarily on southerly aspects or ridgetops and plateaus. Annual precipitation ranges from 50-100 cm with moderate snowfall and a greater proportion falling during the growing season. Monsoonal summer rains can contribute a significant proportion of the annual precipitation in the southern portion of the range. Soils are highly variable and derived from diverse parent materials. *Pseudotsuga menziesii* forests are reported by most studies (Pfister et al. 1977, Steele et al. 1981, Mauk and Henderson 1984, Lillybridge et al. 1995) to show no particular affinities to geologic substrates. Rock types can include extrusive volcanics in the Yellowstone region, and sedimentary rocks elsewhere in the Rockies. The soils are typically slightly acidic (pH 5.0-6.0), well-drained, and well-aerated. They can be derived from moderately deep colluvium or shallow-jointed bedrock, and are usually gravelly or rocky.

Dynamics: Successional relationships in this group are complex. *Pseudotsuga menziesii* is less shade-tolerant than many northern or montane trees such as *Tsuga heterophylla*, *Abies concolor*, *Picea engelmannii*, or *Thuja plicata*, and seedlings compete poorly in deep shade. At drier locales, seedlings may be favored by moderate shading, such as by a canopy of *Pinus ponderosa*, which helps to minimize drought stress. In some locations, much of these forests have been logged or burned during European settlement, and present-day stands are second-growth forests dating from fire, logging, or other stand-replacing disturbances (Mauk and Henderson 1984). *Pseudotsuga menziesii* forests were probably subject to a moderate-severity fire regime in presettlement times, with fire-return intervals of 30-100 years. Many of the important tree species in these forests are fire-adapted (*Populus tremuloides*, *Pinus ponderosa*, *Pinus contorta*) (Pfister et al. 1977), and fire-induced reproduction of *Pinus ponderosa* can result in its continued codominance in *Pseudotsuga menziesii* forests (Steele et al. 1981). Seeds of the shrub *Ceanothus velutinus* can remain dormant in forest stands for 200 years (Steele et al. 1981) and germinate abundantly after fire, competitively suppressing conifer seedlings. Some stands may have higher tree-stem density than historically, due largely to fire suppression.

DISTRIBUTION

Geographic Range: This group occurs throughout the middle Rocky Mountains of central and southern Idaho (Lemhi, Beaverhead and Lost River ranges), south and east into the Greater Yellowstone region, and south and east into the Wind River, Gros Ventre and Bighorn ranges of Wyoming. It extends north into Montana on the east side of the Continental Divide to the Rocky Mountain Front and east into the "sky island" ranges of central Montana. It may also occur in scattered patches in southeastern Oregon. Some associations placed in this group also occur in Colorado.

Spatial Scale & Pattern [optional]: Matrix

Nations: CA, US

States/Provinces: CO, ID, MT, OR?, UT, WY

TNC Ecoregions [optional]: 6:P, 7:?, 8:C, 9:C, 10:C, 20:C, 26:C

USFS Ecoregions (2007): 342A:CC, 342C:CP, 342D:CP, 342J:CP, M331A:CC, M331B:CC, M331D:CP, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CP

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- < Interior Douglas-fir: 210 (Eyre 1980)

LOWER LEVEL UNITS

Alliances:

- A3462 *Pseudotsuga menziesii* Middle Rocky Mountain Dry-Mesic Forest & Woodland Alliance
- A3463 *Pseudotsuga menziesii* Middle Rocky Mountain Mesic-Wet Forest Alliance

AUTHORSHIP

Primary Concept Source: R. Steele, R.D. Pfister, R.A. Ryker, and J.A. Kittams (1981)

Author of Description: M.S. Reid and K.A. Schulz

Acknowledgments:

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: MSR 3-10, mod. KAS 11-15

REFERENCES

References: Cooper et al. 1987, Daubenmire and Daubenmire 1968, Eyre 1980, Faber-Langendoen et al. 2017a, Lillybridge et al. 1995, Mauk and Henderson 1984, Pfister et al. 1977, Steele and Geier-Hayes 1995, Steele et al. 1981

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G215. Middle Rocky Mountain Montane Douglas-fir Forest & Woodland

A3462. *Pseudotsuga menziesii* Middle Rocky Mountain Dry-Mesic Forest & Woodland Alliance

Type Concept Sentence: This forest and woodland alliance is dominated by *Pseudotsuga menziesii* and occurs on relatively dry to mesic sites throughout the middle Rocky Mountains of central and southern Idaho, the Greater Yellowstone region, and the Wind River, Gros Ventre and Bighorn ranges of Wyoming and in Montana on the east side of the Continental Divide.

OVERVIEW

Scientific Name: *Pseudotsuga menziesii* Middle Rocky Mountain Dry-Mesic Forest & Woodland Alliance

Common Name (Translated Scientific Name): Douglas-fir Middle Rocky Mountain Dry-Mesic Forest & Woodland Alliance

Colloquial Name: Middle Rocky Mountain Douglas-fir Dry-Mesic Forest & Woodland

Type Concept: Stands of this alliance are *Pseudotsuga menziesii*-dominated forests and woodlands occasionally with *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus flexilis* (on calcareous substrates), *Populus tremuloides* (on disturbed sites), and *Pinus contorta* (at higher elevations). True firs, such as *Abies concolor*, *Abies grandis*, and *Abies lasiocarpa*, are absent, but occasional *Picea engelmannii* can occur in some stands. *Pinus ponderosa* is also not common in this group. Understory components include shrubs such as *Cercocarpus ledifolius*, *Juniperus communis*, *Mahonia repens*, *Purshia tridentata*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Symphoricarpos oreophilus*. Common graminoids include *Calamagrostis rubescens*, *Carex rossii*, *Leucopoa kingii*, and *Pseudoroegneria spicata*. Forbs are variable, but typical taxa include *Arnica cordifolia*, *Thalictrum occidentale*, *Viola adunca*, and species of many other genera, including *Antennaria*, *Arenaria*, *Erigeron*, *Eriogonum*, *Lathyrus*, *Lupinus*, *Penstemon*, and *Vicia*. This alliance occurs on relatively dry to mesic sites throughout the middle Rocky Mountains of central and southern Idaho, the Greater Yellowstone region, and the Wind River, Gros Ventre and Bighorn ranges of Wyoming. It extends north into Montana on the east side of the Continental Divide, to the McDonald Pass area, and also into the Rocky Mountain Front region and central "sky island" ranges of Montana. This alliance often occurs at the lower treeline immediately above valley grasslands, or sagebrush steppe and shrublands. Stands are found on all aspects in the Central Rockies where the southern monsoon influence is less and maritime climate regime is not important. Climate is drier and more continental than at higher elevations or in the Pacific Northwest. Annual precipitation ranges from 50-100 cm with moderate snowfall and a greater proportion falling during the growing season. Monsoonal summer rains can contribute a significant proportion of the annual precipitation in the southern portion of the range. Elevations range from less than 1000 m in the central Rocky Mountains to over 2400 m in the Wyoming Rockies. Lower elevation stands typically occupy cooler, less xeric northern exposures often on steep slopes. At higher elevations, these forests occur primarily on southerly aspects or ridgetops and plateaus. Soils are highly variable and derived from diverse parent materials, including extrusive volcanics in the Yellowstone region, and sedimentary rocks elsewhere in the Rockies. The soils are typically well-drained and well-aerated. They can be derived from moderately deep colluvium or shallow-jointed bedrock, and are usually gravelly or rocky.

Classification Comments: Several associations included in this alliance are broadly defined and may occur outside the central Rocky Mountains. More review of similar groups and the associations in this alliance is needed to clarify the classification.

Internal Comments:

Other Comments:

Similar NVC Types: There are other *Pseudotsuga menziesii* alliances in several other groups that may be similar, especially in Vancouverian Dry Coastal Beach Pine Forest & Woodland Group (G205), Central Rocky Mountain Douglas-fir - Pine Forest Group (G210), Middle Rocky Mountain Montane Douglas-fir Forest & Woodland Group (G215), Rocky Mountain Douglas-fir - White Fir - Blue Spruce Mesic Forest Group (G225), and Southern Rocky Mountain White Fir - Douglas-fir Dry Forest Group (G226).

- A3463 *Pseudotsuga menziesii* Middle Rocky Mountain Mesic-Wet Forest Alliance: is similar but restricted to mesic to wet sites and has diagnostic mesic to wet species in the understory.

Diagnostic Characteristics: Open to closed-canopy woodlands and forests dominated by *Pseudotsuga menziesii* with a variety of dry-mesic site indicator species in the understory such as the shrubs *Cercocarpus ledifolius*, *Juniperus communis*, *Mahonia repens*, *Purshia tridentata*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Symphoricarpos oreophilus*, and several herbaceous species, including *Arnica cordifolia*, *Calamagrostis rubescens*, *Carex rossii*, and *Leucopoa kingii*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance is characterized by open stands of evergreen needle-leaved trees 15-50 m tall. There may be sparse cover of broad-leaved and scale-leaved trees in the subcanopy (5-15 m tall). Shrubs are typically sparse, but may be moderately dense on some sites and are typically dominated by broad-leaved, cold-deciduous shrubs <2 m tall. The herbaceous layer is sparse under denser tree canopies and on rock substrates, but is typically a moderately dense layer that is usually dominated by perennial, medium-tall bunch grasses with forbs. Occasionally perennial forbs are dominant. Annual grasses and forbs are seasonally present.

Floristics: Stands are *Pseudotsuga menziesii*-dominated forests and woodlands occasionally with *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus flexilis* (on calcareous substrates), *Populus tremuloides* (on disturbed sites), and *Pinus contorta* (at higher elevations). True firs, such as *Abies concolor*, *Abies grandis*, and *Abies lasiocarpa*, are absent, but occasional *Picea engelmannii* can occur in some stands. *Pinus ponderosa* is also not common in this group. Understory components include shrubs such as *Cercocarpus ledifolius*, *Cercocarpus montanus*, *Holodiscus dumosus*, *Juniperus communis*, *Mahonia repens*, *Purshia tridentata*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Symphoricarpos oreophilus*. Common graminoids include *Calamagrostis rubescens*, *Carex rossii*, *Festuca idahoensis*, *Leucopoa kingii*, and *Pseudoroegneria spicata*. Forbs are variable, but typical taxa include *Arnica cordifolia*, *Thalictrum occidentale*, *Viola adunca*, and species of many other genera, including *Antennaria*, *Arenaria*, *Erigeron*, *Eriogonum*, *Lathyrus*, *Lupinus*, *Penstemon*, and *Vicia*. This alliance often occurs at the lower treeline immediately above valley grasslands, or sagebrush steppe and shrublands. Sometimes there may be a "bath-tub ring" of *Pinus ponderosa* at lower elevations or *Pinus flexilis* between the valley non-forested and then solid *Pseudotsuga menziesii* forest. In the Wyoming Basins, this alliance occurs as isolated stands of *Pseudotsuga menziesii* with *Artemisia tridentata*, *Carex rossii*, *Leucopoa kingii*, and *Pseudoroegneria spicata*. Annual grasses and forbs may be present, especially on disturbed sites.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs on relatively dry to mesic sites throughout the middle Rocky Mountains of central and southern Idaho, the Greater Yellowstone region, and the Wind River, Gros Ventre and Bighorn ranges of Wyoming. It extends north into Montana on the east side of the Continental Divide, to the McDonald Pass area, and also into the Rocky Mountain Front region and central "sky island" ranges of Montana. Stands are found on all aspects in the Central Rockies where the southern monsoon influence is less and maritime climate regime is not important. Climate is drier and more continental than at higher elevations or in the Pacific Northwest. Annual precipitation ranges from 50-100 cm with moderate snowfall and a greater proportion falling during the growing season. Monsoonal summer rains can contribute a significant proportion of the annual precipitation in the southern portion of the range. Elevations range from less than 1000 m in the central Rocky Mountains to over 2400 m in the Wyoming Rockies. Lower elevation stands typically occupy protected northern exposures and canyons, often on steep slopes. At higher elevations, these forests occur primarily on southerly aspects or ridgetops and plateaus. Substrates are typically shallow, lithic, coarse-textured soils derived from colluvium and residuum. Soil texture ranges from gravelly sand to loam. There is typically high surface cover of rock, as well as coarse fragments within the soil. Soil pH varies from acidic to alkaline depending on parent material. Parent materials are extremely varied and may include andesite, basalt, dolomite, gneiss, granite, lava, limestone, mudstone, rhyolite, sandstone and tuff. Extrusive volcanics are common in the Yellowstone region, and sedimentary rocks elsewhere in the Rockies. *Pseudotsuga menziesii* forests are reported by most studies (Pfister et al. 1977, Steele et al. 1981, Mauk and Henderson 1984) to show no particular affinities to geologic substrates. These rocky, shallow soils have so little moisture-holding capacity that these sites are effectively very dry for plant growth even where there is substantial precipitation. In some cases, these sites are exposed to high winds. Wind detracts from soil moisture status by blowing off snow, directly desiccating plants, and eroding soil.

Dynamics: Successional relationships in this alliance are complex. *Pseudotsuga menziesii* is less shade-tolerant than many northern or montane trees such as *Abies concolor*, *Picea engelmannii*, *Thuja plicata*, or *Tsuga heterophylla*, and seedlings compete poorly in deep shade. At drier locales, seedlings may be favored by moderate shading, such as by a canopy of *Pinus ponderosa*, which helps to minimize drought stress. In some locations, much of these forests have been logged or burned during European settlement, and present-day stands are second-growth forests dating from fire, logging, or other stand-replacing disturbances (Mauk and Henderson 1984). *Pseudotsuga menziesii* forests were probably subject to a moderate-severity fire regime in presettlement times, with fire-return intervals of 30-100 years.

DISTRIBUTION

Geographic Range: This alliance occurs on relatively dry to mesic sites throughout the middle Rocky Mountains of central and southern Idaho, the Greater Yellowstone region, and the Wind River, Gros Ventre and Bighorn ranges of Wyoming. It extends north

into Montana on the east side of the Continental Divide, to the McDonald Pass area, and also into the Rocky Mountain Front region and central "sky island" ranges of Montana.

Nations: CA, US

States/Provinces: ID, MT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Populus tremuloides* - *Pseudotsuga menziesii* / *Symphoricarpos oreophilus* Community Type (Mueggler 1988)
- > *Pseudotsuga menziesii* - *Pinus flexilis* / *Hesperochloa kingii* Association (Cooper 1975)
- > *Pseudotsuga menziesii* / *Arnica cordifolia* Habitat Type (Pfister et al. 1977)
- > *Pseudotsuga menziesii* / *Berberis repens* Habitat Type (Hoffman and Alexander 1976)
- > *Pseudotsuga menziesii* / *Cercocarpus ledifolius* Community Type (DeVelice 1992)
- > *Pseudotsuga menziesii* / *Juniperus communis* Habitat Type (Steele et al. 1983)
- > *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type (Cooper et al. 1987)
- > *Pseudotsuga menziesii* / *Symphoricarpos albus* Habitat Type (Steele et al. 1981)
- > *Pseudotsuga menziesii* / *Symphoricarpos oreophilus* Habitat Type (Steele et al. 1981)
- < Interior Douglas-fir: 210 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEGLO00897 *Pseudotsuga menziesii* / *Cercocarpus ledifolius* Woodland
- CEGLO00462 *Pseudotsuga menziesii* / *Symphoricarpos oreophilus* Forest
- CEGLO00427 *Pseudotsuga menziesii* / *Arnica cordifolia* Forest
- CEGLO00906 *Pseudotsuga menziesii* - *Pinus flexilis* / *Leucopoa kingii* Woodland
- CEGLO00442 *Pseudotsuga menziesii* / *Mahonia repens* Forest
- CEGLO00904 *Pseudotsuga menziesii* / *Leucopoa kingii* Woodland
- CEGLO00546 *Populus tremuloides* - *Pseudotsuga menziesii* / *Symphoricarpos oreophilus* Forest
- CEGLO00440 *Pseudotsuga menziesii* / *Juniperus osteosperma* Forest
- CEGLO00457 *Pseudotsuga menziesii* / *Spiraea betulifolia* Forest
- CEGLO00903 *Pseudotsuga menziesii* / *Juniperus scopulorum* Woodland
- CEGLO00909 *Pseudotsuga menziesii* / *Purshia tridentata* Woodland
- CEGLO00439 *Pseudotsuga menziesii* / *Juniperus communis* Forest
- CEGLO00459 *Pseudotsuga menziesii* / *Symphoricarpos albus* Forest

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz and M.S. Reid

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Cooper 1975, Cooper et al. 1987, Cooper et al. 1995, DeByle and Winokur 1985, DeVelice 1992, DeVelice and Lesica 1993, DeVelice et al. 1991, DeVelice et al. 1995, Eyre 1980, Faber-Langendoen et al. 2017b, Fischer and Clayton 1983, Hoffman and Alexander 1976, Horton 1971, Mauk and Henderson 1984, Mueggler 1988, Oswald 1966, Pfister et al. 1977, Reed 1976, Roberts 1980, Roberts et al. 1979a, Steele and Geier-Hayes 1995, Steele et al. 1981, Steele et al. 1983, Youngblood and Mueggler 1981

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G215. Middle Rocky Mountain Montane Douglas-fir Forest & Woodland

A3463. *Pseudotsuga menziesii* Middle Rocky Mountain Mesic-Wet Forest Alliance

Type Concept Sentence: This forest and woodland alliance is dominated by *Pseudotsuga menziesii* without the maritime floristic composition. It occurs on relatively moist, cool to warm sites throughout the middle Rocky Mountains of central and southern Idaho, the Greater Yellowstone region, and the Wind River, Gros Ventre and Bighorn ranges of Wyoming and in Montana on the east side of the Continental Divide.

OVERVIEW

Scientific Name: *Pseudotsuga menziesii* Middle Rocky Mountain Mesic-Wet Forest Alliance

Common Name (Translated Scientific Name): Douglas-fir Middle Rocky Mountain Mesic-Wet Forest Alliance

Colloquial Name: Middle Rocky Mountain Douglas-fir Mesic-Wet Forest

Type Concept: Stands are *Pseudotsuga menziesii*-dominated forests and woodlands; occasionally *Populus tremuloides* may codominate on disturbed sites, and *Pinus contorta* may be present at higher elevations. True firs, such as *Abies concolor*, *Abies grandis*, and *Abies lasiocarpa*, are absent, but occasional *Picea engelmannii* can occur in some stands. *Pinus ponderosa* is also not common in this group. Understory components include relatively mesic species such as the shrubs *Acer glabrum*, *Amelanchier alnifolia*, *Linnaea borealis*, and *Physocarpus malvaceus*, and herbs and grasses such as *Achillea millefolium*, *Bromus carinatus*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Fragaria vesca*, *Geranium viscosissimum*, *Lathyrus* spp., *Osmorhiza berteroi*, and *Piptatheropsis micrantha* (= *Piptatherum micranthum*). This alliance is restricted to mesic to wet sites in the middle Rocky Mountains of central and southern Idaho, the Greater Yellowstone region, and the Wind River, Gros Ventre and Bighorn ranges of Wyoming. It extends north into Montana on the east side of the Continental Divide, to the McDonald Pass area, and also into the Rocky Mountain Front region and central "sky island" ranges of Montana. This alliance occurs in the Central Rockies where the southern monsoon influence is less and maritime climate regime is not important. Climate is drier and more continental than at higher elevations or in the Pacific Northwest. Annual precipitation ranges from 50-100 cm with moderate snowfall and a greater proportion falling during the growing season. Monsoonal summer rains can contribute a significant proportion of the annual precipitation in the southern portion of the range. Elevations range from less than 1000 m in the central Rocky Mountains to over 2400 m in the Wyoming Rockies. Stands typically occupy cooler northern exposures in relatively moist sites such as lower slopes, benches and valley bottoms. Lower elevation stands occupy mesic ravines and canyons on northerly aspects. Soils are highly variable and derived from diverse parent materials, including extrusive volcanics in the Yellowstone region, and sedimentary rocks elsewhere in the Rockies. The soils can be derived from moderately deep colluvium or shallow-jointed bedrock, and are usually gravelly or rocky.

Classification Comments: Several associations included in this alliance are broadly defined and may occur outside the central Rocky Mountains. More review of similar groups and the associations in this alliance is needed to clarify the classification.

Internal Comments:

Other Comments:

Similar NVC Types: There are other *Pseudotsuga menziesii* alliances in several other groups that may be similar, especially in Vancouverian Dry Coastal Beach Pine Forest & Woodland Group (G205), Central Rocky Mountain Douglas-fir - Pine Forest Group (G210), Middle Rocky Mountain Montane Douglas-fir Forest & Woodland Group (G215), Rocky Mountain Douglas-fir - White Fir - Blue Spruce Mesic Forest Group (G225), and Southern Rocky Mountain White Fir - Douglas-fir Dry Forest Group (G226).

- A3462 *Pseudotsuga menziesii* Middle Rocky Mountain Dry-Mesic Forest & Woodland Alliance: is similar but occurs more widely on drier sites and lacks the mesic to wet understory species diagnostic of A3463.

Diagnostic Characteristics: Open to closed-canopy woodlands and forests dominated by *Pseudotsuga menziesii* with mesic-wet site indicator species in the understory such as *Acer glabrum*, *Amelanchier alnifolia*, *Linnaea borealis*, *Osmorhiza berteroi*, *Physocarpus malvaceus*, and *Piptatheropsis micrantha*.

VEGETATION

Physiognomy and Structure: These forests and woodlands are characterized by a multi-tiered needle-leaved evergreen tree canopy up to 50 m high, with between 25-100% cover. A sparse subcanopy of cold-deciduous or evergreen trees is often present, particularly in northwestern coastal stands. Downed wood may also be abundant in older stands. Shrub cover is dominated by cold-deciduous species and can be dense. A sparse to dense perennial herbaceous layer is usually present and composed of either shade-tolerant forbs and ferns in the Central Rockies or mesophytic forbs and grasses.

Floristics: Stands of this alliance are *Pseudotsuga menziesii*-dominated forests and woodlands. Occasionally *Populus tremuloides* may codominate on disturbed sites, and *Pinus contorta* may be present at higher elevations. True firs, such as *Abies concolor*, *Abies grandis*, and *Abies lasiocarpa*, are absent, but occasional *Picea engelmannii* can occur in some stands. *Pinus ponderosa* is also not common in this group. Understory components include relatively mesic species such as the shrubs *Acer glabrum*, *Amelanchier alnifolia*, *Holodiscus dumosus*, *Linnaea borealis*, *Paxistima myrsinites*, *Physocarpus malvaceus*, *Rosa woodsii*, and *Salix scouleriana*,

and herbs and grasses such as *Achillea millefolium*, *Bromus carinatus*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Fragaria vesca*, *Galium boreale*, *Geranium viscosissimum*, *Lathyrus* spp., *Osmorhiza berteroi*, and *Piptatheropsis micrantha* (= *Piptatherum micranthum*).

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is restricted to mesic to wet sites in the middle Rocky Mountains of central and southern Idaho, the Greater Yellowstone region, and the Wind River, Gros Ventre and Bighorn ranges of Wyoming. It extends north into Montana on the east side of the Continental Divide, to the McDonald Pass area, and also into the Rocky Mountain Front region and central "sky island" ranges of Montana. This alliance occurs in the Central Rockies where the southern monsoon influence is less and maritime climate regime is not important. Climate is drier and more continental than at higher elevations or in the Pacific Northwest. Annual precipitation ranges from 50-100 cm with moderate snowfall and a greater proportion falling during the growing season. Monsoonal summer rains can contribute a significant proportion of the annual precipitation in the southern portion of the range. Elevations range from less than 1000 m in the central Rocky Mountains to over 2400 m in the Wyoming Rockies. Stands typically occupy cooler northern exposures in relatively moist sites such as lower slopes, benches and valley bottoms. Lower elevation stands occupy mesic ravines and canyons on northerly aspects. Soils are highly variable and derived from diverse parent materials, including extrusive volcanics in the Yellowstone region, and sedimentary rocks elsewhere in the Rockies. The soils can be derived from moderately deep colluvium or shallow-jointed bedrock, and are usually gravelly or rocky.

Dynamics: Successional relationships in this alliance are complex. *Pseudotsuga menziesii* is less shade-tolerant than many northern or montane trees such as *Abies concolor*, *Picea engelmannii*, *Thuja plicata*, or *Tsuga heterophylla*, and seedlings compete poorly in deep shade. At drier locales, seedlings may be favored by moderate shading, such as by a canopy of *Pinus ponderosa*, which helps to minimize drought stress. In some locations, much of these forests have been logged or burned during European settlement, and present-day stands are second-growth forests dating from fire, logging, or other stand-replacing disturbances (Mauk and Henderson 1984). *Pseudotsuga menziesii* forests were probably subject to a moderate severity fire regime in presettlement times, with fire-return intervals of 30-100 years.

DISTRIBUTION

Geographic Range: This alliance occurs on relatively moist, cool to warm sites throughout the middle Rocky Mountains of central and southern Idaho, the Greater Yellowstone region, and the Wind River, Gros Ventre and Bighorn ranges of Wyoming. It extends north into Montana on the east side of the Continental Divide, to the McDonald Pass area, and also into the Rocky Mountain Front region and central "sky island" ranges of Montana

Nations: CA, US

States/Provinces: ID, MT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Populus tremuloides* - *Pseudotsuga menziesii* / *Amelanchier alnifolia* Community Type (Mueggler 1988)
- > *Pseudotsuga menziesii* / *Acer glabrum* Habitat Type (Steele et al. 1981)
- > *Pseudotsuga menziesii* / *Acer glabrum* Habitat Type, *Pachistima myrsinites* Phase (Steele et al. 1983)
- > *Pseudotsuga menziesii* / *Amelanchier alnifolia* Habitat Type (Roberts 1980)
- > *Pseudotsuga menziesii* / *Osmorhiza chilensis* Habitat Type (Steele et al. 1983)
- > *Pseudotsuga menziesii* / *Physocarpus malvaceus* Habitat Type (Cooper et al. 1987)
- >< Interior Douglas-fir: 210 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEGLO00905 *Pseudotsuga menziesii* / *Piptatheropsis micrantha* Woodland
- CEGLO00445 *Pseudotsuga menziesii* / *Osmorhiza berteroi* Forest
- CEGLO00543 *Populus tremuloides* - *Pseudotsuga menziesii* / *Amelanchier alnifolia* Forest
- CEGLO00447 *Pseudotsuga menziesii* / *Physocarpus malvaceus* Forest
- CEGLO00418 *Pseudotsuga menziesii* / *Acer glabrum* Forest
- CEGLO00420 *Pseudotsuga menziesii* / *Amelanchier alnifolia* Forest
- CEGLO00441 *Pseudotsuga menziesii* / *Linnaea borealis* Forest

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz and M.S. Reid

Acknowledgments: We have incorporated significant descriptive information previously compiled by Marion Reid.

Version Date: 2014/01/08

REFERENCES

References: Cooper 1975, Cooper et al. 1987, Cooper et al. 1995, DeByle and Winokur 1985, DeVelice 1992, DeVelice and Lesica 1993, DeVelice et al. 1991, DeVelice et al. 1995, Eyre 1980, Faber-Langendoen et al. 2017b, Fischer and Clayton 1983, Hoffman and Alexander 1976, Horton 1971, Mauk and Henderson 1984, Mueggler 1988, Oswald 1966, Pfister et al. 1977, Reed 1976, Roberts 1980, Roberts et al. 1979a, Steele and Geier-Hayes 1995, Steele et al. 1981, Steele et al. 1983, Youngblood and Mueggler 1981

M500. Central Rocky Mountain Mesic Lower Montane Forest

Mesic to moist conifer forests and woodlands of the lower montane zone of the central Rocky Mountains and interior Pacific Northwest, including the eastern Cascades. *Abies grandis*, *Larix occidentalis*, *Pseudotsuga menziesii*, *Thuja plicata*, or *Tsuga heterophylla* are the major dominants.

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

1.B.2.Nb.3.a. M500 Central Rocky Mountain Mesic Lower Montane Forest

G211. Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest

Type Concept Sentence: This group includes woodlands of the central Rocky Mountains dominated by the deciduous conifer *Larix occidentalis*, in places where frequent fires maintain open woodlands, usually with abundant undergrowth dominated by low-growing shrubs and graminoids.

OVERVIEW

Scientific Name: *Abies grandis* - *Pseudotsuga menziesii* - *Larix occidentalis* Central Rocky Mountain Forest Group

Common Name (Translated Scientific Name): Grand Fir - Douglas-fir - Western Larch Central Rocky Mountain Forest Group

Colloquial Name: Central Rocky Mountain Grand Fir - Douglas-fir Forest & Woodland

Type Concept: This group also includes woodlands or "savannas" of the deciduous conifer *Larix occidentalis*; these were typically stands initiated following stand-replacing crown fires of other conifer forests, but are maintained by a higher frequency, surface-fire regime. Fire suppression has led to invasion of the more shade-tolerant tree species *Abies grandis*, *Abies lasiocarpa*, *Picea engelmannii*, or *Tsuga* spp. and loss of much of the single-story canopy woodlands. *Larix occidentalis* communities occur in settings where low-intensity, high-frequency fires create open larch woodlands, often with the undergrowth dominated by low-growing *Arctostaphylos uva-ursi*, *Cornus canadensis*, *Calamagrostis rubescens*, *Linnaea borealis*, *Spiraea betulifolia*, *Vaccinium cespitosum*, and/or *Xerophyllum tenax*. Less frequent or absence of fire creates mixed-dominance stands with often shrubby undergrowth; *Vaccinium cespitosum* is common, and taller shrubs can include *Acer glabrum*, *Ceanothus velutinus*, *Shepherdia canadensis*, *Holodiscus discolor*, *Physocarpus malvaceus*, *Rubus parviflorus*, or *Vaccinium membranaceum*.

Classification Comments: This group should be considered for merging with East Cascades Mesic Grand Fir - Douglas-fir Forest Group (G212); they share a number of floristic similarities, along with some differences. But perhaps those differences would be better handled as alliance-level distinctions. This needs review.

Similar NVC Types:

- G212 East Cascades Mesic Grand Fir - Douglas-fir Forest
- G215 Middle Rocky Mountain Montane Douglas-fir Forest & Woodland
- G210 Central Rocky Mountain Douglas-fir - Pine Forest
- G217 Central Rocky Mountain Interior Western Red-cedar - Western Hemlock Forest

Diagnostic Characteristics: Mesic conifer forests of the northern Rocky Mountains, where *Abies grandis*, *Pseudotsuga menziesii*, or *Larix occidentalis* are the major dominants.

VEGETATION

Physiognomy and Structure: Mesic conifer forests, ranging from closed-canopy to more open "savanna-like" woodlands, over deciduous shrub layer, or forb-rich herbaceous layer.

Floristics: *Abies grandis* is dominant in these forests and *Pseudotsuga menziesii* commonly shares the canopy. *Pinus monticola*, *Picea engelmannii*, *Pinus contorta*, *Abies lasiocarpa*, and *Larix occidentalis* are major associates. On most mesic sites, intermediate to older age stands of this forest group may support some *Thuja plicata* and *Tsuga heterophylla* in the overstory. Common shrubs include *Paxistima myrsinites*, *Amelanchier alnifolia*, *Rosa gymnocarpa*, *Acer glabrum*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Cornus canadensis*, *Rubus parviflorus*, *Menziesia ferruginea*, *Taxus brevifolia*, and *Vaccinium membranaceum*. Composition of the herbaceous layer reflects local climate and degree of canopy closure; it is typically highly diverse in all but closed-canopy conditions. *Clintonia uniflora*, *Linnaea borealis*, *Aralia nudicaulis*, and *Xerophyllum tenax* are common forbs in these forests. Other forbs include *Actaea rubra*, *Adenocaulon bicolor*, *Arnica latifolia*, *Galium triflorum*, *Goodyera oblongifolia*, *Orthilia secunda*, *Streptopus amplexifolius*, *Prosartes hookeri* (= *Disporum hookeri*), *Thalictrum occidentale*, and *Trillium ovatum*. *Asarum caudatum* occurs in the Kootenai and Yak river areas of extreme northwestern Montana, north-central Idaho and in the Blue Mountains in Oregon. Graminoids usually form a very minor component and typically include *Bromus vulgaris* and minor amounts of *Carex geyeri*, *Elymus glaucus*, *Festuca subulata*, and *Oryzopsis asperifolia*. This group also includes woodlands or "savannas" of the deciduous conifer *Larix occidentalis*. Important low-growing shrubs include *Arctostaphylos uva-ursi*, *Spiraea betulifolia*, and *Vaccinium cespitosum*; taller shrubs can include *Acer glabrum*, *Ceanothus velutinus*, *Shepherdia canadensis*, *Physocarpus malvaceus*, *Rubus parviflorus*, or *Vaccinium membranaceum*. Herbaceous species include *Calamagrostis rubescens*, *Clintonia uniflora*, *Linnaea borealis*, or *Xerophyllum tenax*.

ENVIRONMENT & DYNAMICS

Environmental Description: These forests occur in areas influenced by incursions of mild, wet, Pacific maritime air masses. Much of the annual precipitation occurs as rain, but where snow does occur, it is generally melted by rain during warm winter storms. Elevations range from 610 to 2195 m (2000-7200 feet). Occurrences generally are found on all slopes and aspects but grow best on sites with high soil moisture, such as valley bottoms, on benches, well-drained slopes and moist ravines. Sites supporting these forests are typically warmer and moister than the prevailing local climate. However, these are moist, non-flooded or upland sites. **Soil/substrate/hydrology:** Parent materials are non-calcareous materials, predominately sedimentary rock and argillite. Intermittent shallow A horizons overlying a dominant B horizon indicate that volcanic ash and loess deposits have significant contribution to soil development. These forests occur on gravelly loams and silt loams are slightly acidic.

Dynamics: Typically, stand-replacement fires have 150- to 500-year return intervals, with moderate-severity fire intervals of 50-100 years. *Abies grandis* forests include many sites dominated by *Pseudotsuga menziesii* and *Pinus ponderosa* which were formerly maintained by wildfire, and may now be dominated by *Abies grandis* (a fire-sensitive, shade-tolerant species) due to fire exclusion (Lillybridge et al. 1995, Chappell et al. 1997). Pre-European settlement fire regimes were typically of frequent, low-intensity surface fires, maintaining relatively open stands of a mix of fire-resistant species. With the advent of effective fire suppression, longer fire-return intervals are now the rule, and mixed-stature stands with *Abies grandis* in various size classes now create ladder fuels making these forests more susceptible to high-intensity, stand-replacing fires (Cooper et al. 1987, Lillybridge et al. 1995).

Larix occidentalis is a long-lived species (in excess of 700 years in the northern Rocky Mountains), and thus stands of western larch are themselves persistent. However, the life of *Larix*-dominated stands probably rarely exceeds 250 years due to various mortality sources and the in-growth of shade-tolerant species, especially on mesic sites. Occurrences of *Larix occidentalis* stands are generated by stand-replacing fire, the fire-return interval for which is speculated to be approximately 80 to 200 years (Cooper et al. 1987). These sites may be maintained in a seral status for hundreds of years since *Larix occidentalis* is a long-lived species and the understory is often dominated by *Pseudotsuga*, which will grow into the upper canopy. The potential dominants, typically *Abies lasiocarpa*, *Picea engelmannii*, and/or *Abies grandis* or rarely *Tsuga heterophylla* or *Thuja plicata*, establish and grow on these sites, presenting the distinct probability, given the fire-return intervals for this type, that the "climax" (long-term stable) condition is never attained. It has been noted in northern Idaho that, following disturbance (particularly logging) in some mesic-site occurrences, *Larix occidentalis* does not necessarily replace itself, the first tree-dominated successional stages being dominated by *Pseudotsuga menziesii*, *Pinus contorta*, or less frequently by more shade-tolerant species (Cooper et al. 1987); this response is a consequence of the episodic nature of favorable cone crop years in *Larix occidentalis*.

DISTRIBUTION

Geographic Range: This group occurs in the Northern Rockies of western Montana west into north-central Idaho, the Blue Mountains in Oregon, northeastern Washington and possibly southern British Columbia. *Larix occidentalis* extends beyond the typical range of this group in north-central Washington and a short distance in southern British Columbia and then jumps to the Wenatchee Mountains and south along the eastern Cascades to the Columbia River.

Spatial Scale & Pattern [optional]: Matrix

Nations: CA, US

States/Provinces: BC?, ID, MT, OR, WA

TNC Ecoregions [optional]: 6:P, 7:C, 8:C, 68:C

USFS Ecoregions (2007): 331A:CC, 342H:??, 342I:??, M331A:PP, M332A:CC, M332B:CP, M332E:C?, M332F:C?, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: High. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- >< Grand Fir: 213 (Eyre 1980) [Grand fir stands are an important component of this group.]
- < Western Larch: 212 (Eyre 1980)
- >< Western White Pine: 215 (Eyre 1980)

LOWER LEVEL UNITS

Alliances:

- A3362 *Abies grandis* - *Pseudotsuga menziesii* Central Rocky Mountain Forest & Woodland Alliance
- A0275 *Larix occidentalis* Central Rocky Mountain Forest Alliance

AUTHORSHIP

Primary Concept Source: R.F. Daubenmire and J.B. Daubenmire (1968)

Author of Description: M.S. Reid, R. Crawford and M. Manning

Acknowledgments: R. Crawford and M. Manning

Version Date: 05/30/2013

Classif Resp Region: West

Internal Author: MSR 3-10, mod. RC/MM 5-13, mod. GK 12-15

REFERENCES

References: Agee 1993, Chappell et al. 1997, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Eyre 1980, Faber-Langendoen et al. 2017a, Hessburg et al. 2000, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Leavell 2000, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Williams et al. 1995

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G211. Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest

A3362. *Abies grandis* - *Pseudotsuga menziesii* Central Rocky Mountain Forest & Woodland Alliance

Type Concept Sentence: This alliance occurs in the middle to northern Rocky Mountains and occasionally in the Cascade Range representing forest and woodland vegetation dominated by *Abies grandis* where *Pseudotsuga menziesii* may be an early-seral component, codominant or the sole dominant species.

OVERVIEW

Scientific Name: *Abies grandis* - *Pseudotsuga menziesii* Central Rocky Mountain Forest & Woodland Alliance

Common Name (Translated Scientific Name): Grand Fir - Douglas-fir Central Rocky Mountain Forest & Woodland Alliance

Colloquial Name: Central Rocky Mountain Grand Fir - Douglas-fir Forest & Woodland

Type Concept: This alliance occurs in the middle to northern Rocky Mountains and occasionally in the Cascade Range in a variety of topographic positions. These are highly variable montane coniferous forests that lie between drier *Pseudotsuga menziesii* - *Pinus ponderosa* and more moist *Tsuga heterophylla* or *Thuja plicata* forests on the moisture scale, and are warmer than forests dominated by *Abies lasiocarpa*. Stands are dominated by *Abies grandis* where *Pseudotsuga menziesii* may be an early-seral component, codominant or the sole dominant species. Several other conifers may be present in the canopy, typically as seral species, including *Larix occidentalis*, *Pinus contorta*, or *Pinus monticola*. *Picea engelmannii* and *Taxus brevifolia* become increasingly common towards the eastern edge of the range, and *Tsuga heterophylla* and *Thuja plicata* may be associates at moister sites. The shrub and herbaceous components of these forests are highly variable across the range of the alliance and are very species-diverse due to the moderate climate regime. Cold-deciduous or ericaceous shrubs can be abundant in some stands. Shrubs can include *Acer glabrum*, *Linnaea borealis*, *Menziesia ferruginea*, *Physocarpus malvaceus*, *Spiraea betulifolia*, *Symphoricarpos occidentalis*, and *Vaccinium membranaceum*. Herbaceous layers may be graminoid- or forb-dominated and may include *Asarum caudatum*, *Bromus vulgaris*, *Calamagrostis rubescens*, *Carex geyeri*, *Clintonia uniflora*, *Coptis occidentalis*, *Cornus canadensis*, *Linnaea borealis*, and *Trautvetteria carolinensis*. Elevations range from 460-1950 m. Topographic positions include montane slopes, alluvial benches and terraces, ridgetops, flats, protected coves, ravines, and valley bottoms. All aspects are represented and slopes can be flat to steep. Parent materials are highly variable, but volcanic ash is often present in the soil profile. Soils are derived from basalt colluvium and alluvium, volcanic ash, granitics, shale, sandstone, meta-sediments, gneiss, quartzite, limestone, and loess or loess-ash over colluvium or alluvium.

Classification Comments: This is the combination of old alliances *Abies grandis* Forest Alliance (A.153) and *Pseudotsuga menziesii* Forest Alliance (A.157). It was suggested during peer review that *Abies grandis* / *Calamagrostis rubescens* Woodland (CEGL000916) and *Abies grandis* / *Carex geyeri* Woodland (CEGL000917) be placed in another group as they are much colder and drier than other associations in this group.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3583 *Abies grandis* - *Pseudotsuga menziesii* Mesic Cascadian Forest Alliance: is distributed further west into the Cascades in Washington, south of Lake Chelan and south to Mount Hood in Oregon.

Diagnostic Characteristics: Tall-statured forests and woodlands of the Cascades and northern Rocky Mountains dominated by the needle-leaved evergreen trees *Abies grandis* and/or *Pseudotsuga menziesii*. Environmentally, communities of this alliance represent mesic vegetation between the drier and moist forest vegetation of the region. Understories may be herb- or shrub-dominated.

VEGETATION

Physiognomy and Structure: Associations in this alliance are characterized by a closed tree canopy of tall coniferous trees which can attain 50 m in height. Canopy cover ranges from 60-100%. A subcanopy is often present, composed of broad-leaved cold-deciduous shrubs or shade-tolerant small trees. Herbaceous cover is highly variable, ranging from 0-60% cover depending on location, precipitation, fire history, and stand age. Generally the abundance of subcanopy and herbaceous cover decreases with increasing stand age and as available light decreases.

Floristics: Canopies are dominated by *Abies grandis* and/or *Pseudotsuga menziesii*. Several other conifers may be present in the canopy, typically as seral species, including *Larix occidentalis*, *Pinus contorta*, or *Pinus monticola*. *Picea engelmannii* and *Taxus brevifolia* become increasingly common towards the eastern edge of the range, and *Tsuga heterophylla* and *Thuja plicata* may be associates at moister sites. Lillybridge et al. (1995) report that *Pinus monticola* was probably more important in the canopy prior to the introduction of white pine blister rust, a pathogen which has severely reduced populations of *Pinus monticola*. The shrub and herbaceous components of these forests are highly variable across the range of the alliance, and Cooper et al. (1987) describe these forests as being very species-diverse due to the moderate climate regime. Cold-deciduous or ericaceous shrubs can be may dominant in the understory in some stands. Shrubs can include *Acer glabrum*, *Linnaea borealis*, *Menziesia ferruginea*, *Physocarpus malvaceus*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Symphoricarpos occidentalis*, *Taxus brevifolia*, *Vaccinium cespitosum*, and *Vaccinium membranaceum*. The composition of the herbaceous layer is related to local moisture conditions and the degree of canopy closure. The herbaceous layer can be sparse or, if the shrub layer is not abundant, can be relatively species-rich. Forbs and ferns commonly dominant include *Calamagrostis rubescens*, *Carex geyeri*, *Clintonia uniflora*, *Coptis occidentalis*, *Cornus canadensis*, *Heracleum maximum*, *Linnaea borealis*, *Trautvetteria carolinensis*, and *Xerophyllum tenax*. Other species include *Adenocaulon bicolor*, *Aralia nudicaulis*, *Arnica cordifolia*, *Balsamorhiza sagittata*, *Goodyera oblongifolia*, *Gymnocarpium dryopteris*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pteridium aquilinum*, *Pyrola asarifolia*, *Thalictrum occidentale*, *Trientalis borealis* ssp. *latifolia* (= *Trientalis latifolia*), *Trillium ovatum*, and *Valeriana sitchensis*. Graminoids that can be present include *Bromus vulgaris*, *Carex concinoides*, *Festuca idahoensis*, *Festuca occidentalis*, *Koeleria macrantha*, and *Melica bulbosa*.

ENVIRONMENT & DYNAMICS

Environmental Description: Associations within this alliance are highly variable montane coniferous forests occurring within the region of maritime influence of the Pacific Northwest and northern Rocky Mountains. The climate regime with which this alliance is associated is usually submesic with annual precipitation ranging from 50-100 cm, with a maximum in winter or late spring. Snowpacks typically accumulate each winter but melt off in early spring at lower elevation sites. Elevations reported for associations in this alliance range from 460-1920 m in the northern Rocky Mountains of Idaho and Montana, 970-1955 m in the Blue Mountains of Oregon, to as low as 760 m in the eastern Cascades. Topographic positions include montane slopes, alluvial benches and terraces, ridgetops, flats, protected coves, ravines, and valley bottoms. All aspects are represented, and slopes can be flat to steep. Parent materials are highly variable, but most studies report that volcanic ash is often present in the soil profile. Soils are derived from basalt colluvium and alluvium, volcanic ash, granitics, shale, sandstone, meta-sediments, gneiss, quartzite, limestone, and loess or loess-ash over colluvium or alluvium. Soils textures cover the range from excessively rocky and well-drained to silty loams with a clay pan in the B horizon.

Dynamics: *Abies grandis* forests include many sites dominated by *Pseudotsuga menziesii* and *Pinus ponderosa* which were formerly maintained by wildfire, and may now be dominated by *Abies grandis* (a fire-sensitive, shade-tolerant species) (Lillybridge et al. 1995, Chappell et al. 1997). Pre-European settlement fire regimes were typically of frequent, low-intensity surface fires, maintaining relatively open stands of a mix of fire-resistant species. With the advent of vigorous fire suppression, longer fire-return intervals are now the rule, and mixed-stature stands with *Abies grandis* in various size classes now provide fuel "ladders," making these forests

more susceptible to high-intensity, stand-replacing fires (Cooper et al. 1987, Lillybridge et al. 1995). This alliance also includes montane forests along rivers and slopes, and in mesic "coves" which were historically protected from wildfires. They are very productive forests which have been priorities for timber production. Successional relationships in this alliance are complex.

Pseudotsuga menziesii is less shade-tolerant than many northern or montane trees such as *Abies concolor*, *Picea engelmannii*, *Thuja plicata*, or *Tsuga heterophylla*, and seedlings compete poorly in deep shade. At drier locales, seedlings may be favored by moderate shading, such as by a canopy of *Pinus ponderosa*, which helps to minimize drought stress. In some locations, much of these forests have been logged or burned during European settlement, and present-day stands are second-growth forests dating from fire, logging, or other stand-replacing disturbances (Mauk and Henderson 1984, Chappell et al. 1997). *Pseudotsuga menziesii* forests were probably subject to a moderate-severity fire regime in pre-settlement times, with fire-return intervals of 30-100 years. Many of the important tree species in these forests are fire-adapted (*Larix occidentalis*, *Pinus contorta*, *Pinus ponderosa*, *Populus tremuloides*) (Pfister et al. 1977), and fire-induced reproduction of *Pinus ponderosa* can result in its continued codominance in *Pseudotsuga menziesii* forests (Steele et al. 1981). Seeds of the shrub *Ceanothus velutinus* can remain dormant in forest stands for 200 years (Steele et al. 1981) and germinate abundantly after fire, competitively suppressing conifer seedlings. Some stands may have higher tree-stem density than historically, due largely to fire suppression. Fire suppression has also led to the succession of *Pinus ponderosa* woodlands or *Quercus* spp. woodlands to *Pseudotsuga menziesii* forests.

DISTRIBUTION

Geographic Range: This alliance is distributed from the northern Rocky Mountains from eastern Washington and Oregon to Montana. Ecoregional sections include the Okanogan Highlands, Bitterroot Mountains, Idaho Batholith, and Blue Mountains.

Nations: CA, US

States/Provinces: AB, ID, MT, OR, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGLO00288 *Abies grandis* / *Vaccinium cespitosum* Forest
- CEGLO00916 *Abies grandis* / *Calamagrostis rubescens* Woodland
- CEGLO00289 *Abies grandis* / *Vaccinium membranaceum* Rocky Mountain Forest
- CEGLO00465 *Pseudotsuga menziesii* / *Vaccinium cespitosum* Forest
- CEGLO00917 *Abies grandis* / *Carex geyeri* Woodland
- CEGLO00272 *Abies grandis* / *Clintonia uniflora* Forest
- CEGLO00281 *Abies grandis* / *Spiraea betulifolia* Forest
- CEGLO00466 *Pseudotsuga menziesii* / *Vaccinium membranaceum* Forest
- CEGLO00292 *Abies grandis* / *Vaccinium scoparium* Forest
- CEGLO00448 *Pseudotsuga menziesii* / *Physocarpus malvaceus* - *Linnaea borealis* Forest
- CEGLO00432 *Pseudotsuga menziesii* / *Cornus canadensis* Forest
- CEGLO00283 *Abies grandis* / *Taxus brevifolia* Forest
- CEGLO00267 *Abies grandis* / *Acer glabrum* Forest
- CEGLO00269 *Abies grandis* / *Asarum caudatum* Forest
- CEGLO00467 *Pseudotsuga menziesii* / *Viola adunca* var. *adunca* Forest
- CEGLO00277 *Abies grandis* / *Physocarpus malvaceus* Forest
- CEGLO00282 *Abies grandis* / *Symphoricarpos albus* Forest
- CEGLO00275 *Abies grandis* / *Linnaea borealis* Forest
- CEGLO00176 *Pinus monticola* / *Clintonia uniflora* Forest
- CEGLO00293 *Abies grandis* / *Xerophyllum tenax* Forest
- CEGLO00464 *Pseudotsuga menziesii* / *Vaccinium* spp. Forest
- CEGLO02601 *Abies grandis* / *Bromus vulgaris* Forest
- CEGLO00285 *Abies grandis* / *Trautvetteria caroliniensis* Forest
- CEGLO00461 *Pseudotsuga menziesii* / *Symphoricarpos occidentalis* Forest
- CEGLO05904 *Betula papyrifera* - Conifer / *Clintonia uniflora* Woodland
- CEGLO05853 *Pseudotsuga menziesii* / *Heraclium maximum* Forest

- CEGLO05850 *Pseudotsuga menziesii* / *Clintonia uniflora* Forest
- CEGLO05854 *Pseudotsuga menziesii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest
- CEGLO05851 *Pseudotsuga menziesii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest
- CEGLO05852 *Pseudotsuga menziesii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest
- CEGLO00273 *Abies grandis* / *Coptis occidentalis* Forest

AUTHORSHIP

Primary Concept Source: A.W. Kuchler (1964)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Chappell et al. 1997, Cooper et al. 1987, Faber-Langendoen et al. 2017b, Kuchler 1964, Lillybridge et al. 1995, Mauk and Henderson 1984, Pfister et al. 1977, Steele et al. 1981

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G211. Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest

A0275. *Larix occidentalis* Central Rocky Mountain Forest Alliance

Type Concept Sentence: These seral forests are dominated by *Larix occidentalis* and reported from the northern Rocky Mountains in northwestern Montana, and occur in Idaho, Washington, Oregon and possibly British Columbia, Canada.

OVERVIEW

Scientific Name: *Larix occidentalis* Central Rocky Mountain Forest Alliance

Common Name (Translated Scientific Name): Western Larch Central Rocky Mountain Forest Alliance

Colloquial Name: Central Rocky Mountain Western Larch Forest

Type Concept: These seral forests are reported from the northern Rocky Mountains in northwestern Montana, and occur in Idaho, Washington, Oregon and possibly British Columbia, Canada. Stands dominated by *Larix occidentalis* grow best on mesic sites, but also may occur on relatively dry sites. Sites include valley bottoms, benches and lower mountain slopes often on the more mesic north and east aspects, but it is found on all aspects in its northern extent. Substrates are variable, but may include glacial till or colluvium derived from limestone, argillite and quartzite. Soils range from gravelly to non-gravelly loams and silt loams, occasionally with finer texture subsoils. Stands are dominated by the shade-intolerant, fire-tolerant, cold-deciduous conifer *Larix occidentalis*. They are typically even-aged, developing after catastrophic disturbances such as crownfires or clearcuts. Stand height varies from 30-55 m but can be much less if trees are stunted by high stocking densities of seedlings that may form "doghair" stands similar to *Pinus contorta*. Young stands may appear to be pure stands of *Larix occidentalis*, but with time develop into mixed-species stands as slower growing, shade-tolerant species become codominant, including *Pseudotsuga menziesii* or *Abies lasiocarpa*. Unless there are frequent fires to reduce the shade-tolerant subcanopy, *Larix occidentalis* may be overtopped and quickly decline. Other than juvenile shade-tolerant trees, the understory may have shrub and herbaceous layers depending on tree canopy closure. Shrubs may include *Acer glabrum*, *Alnus viridis* ssp. *sinuata* (= *Alnus sinuata*), *Amelanchier alnifolia*, *Paxistima myrsinites*, *Physocarpus malvaceus*, *Rubus parviflorus*, *Salix scouleriana*, *Symphoricarpos albus*, and *Vaccinium* spp. The herbaceous layer is often conspicuous. Adjacent stands include other montane and subalpine forests dominated by *Pseudotsuga menziesii*, *Abies lasiocarpa*, *Picea engelmannii*, *Pinus contorta*, *Pinus ponderosa*, *Thuja plicata*, and *Tsuga heterophylla*. This alliance ranges from 500-1600 m in elevation. Stands in Montana are mostly above 1000 m. Climate is temperate, continental with influences from the Pacific maritime. Mean annual precipitation ranges from 71-81 cm, occurring mostly in the winter with about 20% of the annual precipitation falling in the growing season in May-June. July and August are typically dry. Snow is common in the middle to upper elevation and higher latitude sites. These stands are restricted by cold, short growing seasons and drought at lower elevations.

Classification Comments: This seral forest type has not been well described, but is mentioned as a component of seral stands in *Pseudotsuga menziesii*-, *Abies lasiocarpa*-, *Thuja plicata*- and *Tsuga heterophylla*-dominated habitat types (Burns and Schmidt et al. 1976, Pfister et al. 1977, Honkala 1990a). Eyre (1980) reported *Larix occidentalis* as a seral species in 11 forest cover types. This alliance only has a provisional association from Montana and needs more investigation to develop association-level classification and description of these stands throughout its range.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Forests occupying valley bottoms, benches and lower mountain slopes of the northern Rocky Mountains dominated by the needle-leaved evergreen tree species *Larix occidentalis* in young stands. In older stands, *Larix occidentalis* becomes codominant with *Pseudotsuga menziesii* or *Abies lasiocarpa*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has an open tree canopy that is dominated by deciduous needle-leaved trees. Evergreen needle-leaved trees may be present in the understory. Shrub and herbaceous layers are also typically present.

Floristics: Stands are dominated by the shade-intolerant, fire-tolerant, cold-deciduous conifer *Larix occidentalis*. Stands are typically even-aged, developing after catastrophic disturbances such as crownfires or clearcuts. Stand height varies from 30-55 m but can be much less if trees are stunted by high stocking densities of seedlings that may form "doghair" stands similar to *Pinus contorta*. Young stands may appear to be pure stands of *Larix occidentalis*, but with time develop into mixed-species stands as slower growing, shade-tolerant species become codominant, including *Pseudotsuga menziesii* or *Abies lasiocarpa*. Unless there are frequent fires to reduce the shade-tolerant subcanopy, *Larix occidentalis* may be overtopped and quickly decline. Other than juvenile shade-tolerant trees, the understory may have shrub and herbaceous layers depending on tree canopy closure. Shrubs may include *Acer glabrum*, *Alnus viridis ssp. sinuata* (= *Alnus sinuata*), *Amelanchier alnifolia*, *Paxistima myrsinites*, *Physocarpus malvaceus*, *Rubus parviflorus*, *Salix scouleriana*, *Symphoricarpos albus*, and *Vaccinium* spp. The herbaceous layer is often conspicuous with species such as *Aralia nudicaulis*, *Arctostaphylos uva-ursi*, *Arnica latifolia*, *Calamagrostis rubescens*, *Clintonia uniflora*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Linnaea borealis*, and *Xerophyllum tenax*.

ENVIRONMENT & DYNAMICS

Environmental Description: Forests included in this alliance are reported from northwestern Montana, but likely occur elsewhere in the northern Rocky Mountains and the interior northwestern U.S. This alliance ranges from 500-1600 m in elevation. Stands in Montana are mostly above 1000 m. Climate is temperate, continental with influences from the Pacific maritime. Mean annual precipitation ranges from 71-81 cm, occurring mostly in the winter with about 20% of the annual precipitation falling in the growing season in May-June. July and August are typically dry. Snow is common in the middle to upper elevation and higher latitude sites. These stands are restricted by cold, short growing seasons and drought at lower elevations. Stands dominated by *Larix occidentalis* grow best on mesic sites, but also may occur on relatively dry sites. Sites include valley bottoms, benches and lower mountain slopes often on the more mesic north and east aspects, but it is found on all aspects in its northern extent. Substrates are variable, but may include glacial till or colluvium derived from limestone, argillite and quartzite (Burns and Honkala 1990a). Soils range from gravelly to non-gravelly loams and silt loams, occasionally with finer texture subsoils.

Dynamics: *Larix occidentalis* is a highly shade-intolerant, fire-resistant, long-lived (>700 years), deciduous conifer tree species of the northern Rocky Mountains and interior Pacific Northwest (Burns and Honkala 1990a, FEIS 1998). It has very thick bark with low resins, a high and open branching habit, deep roots, low-flammability foliage, and a tendency to self-prune lower branches, which reduces ladder fuels and thus reduces the chance for stand-replacing crownfires (Schmidt et al. 1976, Peet 1988, Burns and Honkala 1990a, FEIS 1998). This tree needs full sunlight and will quickly invade and grow rapidly in openings created by fire or other large disturbance. If needles are scorched by a burn, they will quickly regrow (Burns and Honkala 1990a, FEIS 1998). In the northern Rocky Mountains, for stands on relatively dry sites with *Pseudotsuga menziesii* or *Picea engelmannii* as potential late-successional dominants, the mean fire interval ranges from 20-75 years, with stand-replacing fires occurring at greater than 100 years. Recurring low- to medium-intensity surface fires may shorten the interval. The fire regimes on moist sites with potential late-successional dominants of *Abies grandis*, *Tsuga heterophylla* or *Thuja plicata* ranges from 120-350 years for severe stand-replacing fires (FEIS 1998).

DISTRIBUTION

Geographic Range: These seral forests are reported from the northern Rocky Mountains in northwestern Montana, and occur in Idaho, Washington, Oregon and possibly British Columbia, Canada.

Nations: CA?, US

States/Provinces: BC?, ID, MT, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? Western Larch: 212 (Eyre 1980)

LOWER LEVEL UNITS**Associations:**

- CEG005880 *Larix occidentalis* / *Clintonia uniflora* Forest
- CEG005883 *Larix occidentalis* / *Vaccinium cespitosum* / *Clintonia uniflora* Forest
- CEG005882 *Larix occidentalis* / *Vaccinium cespitosum* Forest
- CEG005881 *Larix occidentalis* / *Clintonia uniflora* - *Xerophyllum tenax* Forest

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Burns and Honkala 1990a, Eyre 1980, FEIS 1998, Faber-Langendoen et al. 2017b, Pfister et al. 1977, Schmidt et al. 1976

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

1.B.2.Nb.3.c. M500 Central Rocky Mountain Mesic Lower Montane Forest

G212. East Cascades Mesic Grand Fir - Douglas-fir Forest

Type Concept Sentence: This forested group occurs in the eastern Cascades of Washington and Oregon and are dominated by a mix of *Pseudotsuga menziesii* with *Abies grandis*. Several other conifers such as *Pinus contorta*, *Pinus monticola*, and/or *Larix occidentalis* can dominate or codominate; common shrub species include *Acer circinatum*, *Cornus nuttallii*, *Mahonia nervosa*, *Paxistima myrsinites*, *Rubus parviflorus*, *Spiraea betulifolia*, and *Symphoricarpos hesperius*.

OVERVIEW

Scientific Name: *Abies grandis* - *Pseudotsuga menziesii* East Cascades Forest Group

Common Name (Translated Scientific Name): Grand Fir - Douglas-fir East Cascades Forest Group

Colloquial Name: Cascadian Grand Fir - Douglas-fir Mesic Forest

Type Concept: This forested group occurs on the upper slopes of the eastern Cascades in Washington, south of Lake Chelan to Mount Hood in Oregon. These forests are dominated by a mix of *Pseudotsuga menziesii* with *Abies grandis*. Several other conifers can dominate or codominate, including *Pinus contorta*, *Pinus monticola*, and *Larix occidentalis*. *Acer circinatum*, *Cornus nuttallii*, *Linnaea borealis*, *Mahonia nervosa*, *Paxistima myrsinites*, *Rubus parviflorus*, *Spiraea betulifolia*, *Symphoricarpos hesperius*, and *Vaccinium membranaceum* are common shrub species. The composition of the herbaceous layer reflects local climate and degree of canopy closure and contains species more restricted to the Cascades, for example, *Achlys triphylla*, *Anemone deltoidea*, and *Vancouveria hexandra*. Elevations range from 610 to 1220 m (2000-4000 feet) in a very restricted range occupying less than 5% of the forested landscape in the eastern Cascades. This group typically occurs below the Pacific silver fir forests found along the crest of the Cascades, and occurs along rivers and in mesic "coves" which were historically protected from wildfires. Typically, stand-replacement fire-return intervals are 150-500 years with moderate-severity fire-return intervals of 50-100 years. These are very productive forests in the eastern Cascades which have been priority stands for timber production. This group is associated with a submesic climate regime with annual precipitation ranging from 100 to 200 cm (40-80 inches) and maximum winter snowpacks that typically melt off in spring at lower elevations.

Classification Comments: This group includes moister *Abies grandis* associations in the eastern Cascades. This group should perhaps be merged with Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest Group (G211), which does have some similar floristic components. The problem with this group (along with many associations of the eastern Cascades) is that the associations in it have both coastal/Vancouverian floristic relationships, along with Northern Rocky Mountain affinities. Either way, it seems to the writer of this description to be a relatively fine distinction, perhaps better handled at the alliance level.

Similar NVC Types:

- G211 Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest
- G210 Central Rocky Mountain Douglas-fir - Pine Forest
- G217 Central Rocky Mountain Interior Western Red-cedar - Western Hemlock Forest

Diagnostic Characteristics: Productive conifer forests found in the eastern Cascades, dominated by *Abies grandis* or *Pseudotsuga menziesii*, in relatively mesic settings, where fire-return intervals are long.

VEGETATION

Physiognomy and Structure: Productive conifer forests, generally tall, with mixed shrub and herb understories. Shrubs are broad-leaved deciduous species, and the herbaceous component is predominantly forbs rather than grasses or sedges.

Floristics: Most occurrences of this group are dominated by a mix of *Pseudotsuga menziesii* with *Abies grandis*. Several other conifers can dominate or codominate, including *Pinus contorta*, *Pinus monticola*, and *Larix occidentalis*. Occasionally *Tsuga heterophylla* or *Thuja plicata* can be present in the canopy. *Abies grandis* and other fire-sensitive, shade-tolerant species dominate forests on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by wildfire. *Mahonia nervosa*, *Linnaea borealis*, *Paxistima myrsinites*, *Acer circinatum*, *Spiraea betulifolia*, *Symphoricarpos hesperius*, *Cornus nuttallii*, *Rubus parviflorus*, and *Vaccinium membranaceum* are common shrub species. The composition of the herbaceous layer reflects local climate and degree of canopy closure and contains species more restricted to the Cascades, for example, *Acer circinatum*, *Achlys triphylla*, *Anemone deltoidea*, *Mahonia nervosa*, *Chrysolepis chrysophylla*, *Cornus nuttallii*, and *Vancouveria hexandra*.

ENVIRONMENT & DYNAMICS

Environmental Description: This forested group occurs on the upper east slopes of the Cascades in Washington, south of Lake Chelan and south to Mount Hood in Oregon. Elevations range from 610 to 1220 m (2000-4000 feet) in a very restricted range occupying less than 5% of the forested landscape in the East Cascades. This group is associated with a submesic climate regime with annual precipitation ranging from 100 to 200 cm (40-80 inches) and maximum winter snowpacks that typically melt off in spring at lower elevations. This group is composed of variable montane coniferous forests typically below Pacific silver fir forests along the crest east of the Cascades. This group also includes montane forests along rivers and slopes, and in mesic "coves" which were historically protected from wildfires.

Dynamics: Typically, stand-replacement fire-return intervals are 150-500 years with moderate-severity fire-return intervals of 50-100 years. These are very productive forests in the eastern Cascades which have been priority stands for timber production. *Abies grandis* and other fire-sensitive, shade-tolerant species dominate forests on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by wildfire.

DISTRIBUTION

Geographic Range: This group occurs on the upper east slopes of the Cascades in Washington, south of Lake Chelan and south to Mount Hood in Oregon.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, US

States/Provinces: CA?, OR, WA

TNC Ecoregions [optional]: 4:C

USFS Ecoregions (2007): 242A:CC, 342H:CP, 342I:CC, M242B:CC, M242C:CC, M242D:CC, M261G:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A3583 *Abies grandis* - *Pseudotsuga menziesii* Mesic Cascadian Forest Alliance
- A3582 *Tsuga heterophylla* - *Abies grandis* Cascadian Mesic Cove Forest Alliance

AUTHORSHIP

Primary Concept Source: C. Topik (1989)

Author of Description: M.S. Reid, R. Crawford and G. Kittel

Acknowledgments: R. Crawford

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: MSR 3-10, mod. RC/GK 5-13, mod. GK 11-15

REFERENCES

References: Carstens et al. 2005, Eyre 1980, Faber-Langendoen et al. 2017a, Goward and Spribille 2005, Hessburg et al. 1999, Hessburg et al. 2000, Lillybridge et al. 1995, Topik 1989, Topik et al. 1988

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G212. East Cascades Mesic Grand Fir - Douglas-fir Forest

A3583. *Abies grandis* - *Pseudotsuga menziesii* Mesic Cascadian Forest Alliance

Type Concept Sentence: This alliance consists of forests dominated by *Abies grandis* or a mix of *Pseudotsuga menziesii* with *Abies grandis*. Several other conifers can dominate or codominate, including *Pinus contorta*, *Pinus monticola*, and *Larix occidentalis*. It occurs along the eastern slope of the Cascades south of Lake Chelan, in the eastern Okanogan Highlands in Washington, south to Mount Hood in Oregon.

OVERVIEW

Scientific Name: *Abies grandis* - *Pseudotsuga menziesii* Mesic Cascadian Forest Alliance

Common Name (Translated Scientific Name): Grand Fir - Douglas-fir Mesic Cascadian Forest Alliance

Colloquial Name: Cascadian Grand Fir - Douglas-fir Mesic Forest

Type Concept: This alliance consists of forests dominated by *Abies grandis* or a mix of *Pseudotsuga menziesii* with *Abies grandis*. Several other conifers can dominate or codominate, including *Pinus contorta*, *Pinus monticola*, and *Larix occidentalis*. Understory species are characteristic of the eastern Cascades and include *Acer circinatum*, *Achlys triphylla*, *Anemone deltoidea*, *Chrysolepis chrysophylla*, *Cornus nuttallii*, *Mahonia nervosa*, and *Vancouveria hexandra*. This alliance occurs along the eastern slope of the Cascades south of Lake Chelan, in the eastern Okanogan Highlands in Washington, south to Mount Hood in Oregon. Elevations range from 590 to 760 m in the eastern Cascades. All aspects are represented, and slopes can be flat to steep. Parent materials are highly variable, but volcanic ash is often present in the soil profile.

These woodlands generally occur on sites which are intermediate in moisture between forest types dominated by *Abies grandis* and low-elevation steppe grasslands or woodlands, which occupy wetter and drier sites, respectively. *Abies grandis* woodland associations occur on a wide variety of soil types but are usually associated with well-drained soils, and often occupy southerly or westerly aspects. The shrub layer is dominated by the prostrate, mat-forming *Arctostaphylos nevadensis*, with *Arctostaphylos uva-ursi* also being important in some stands. The other associations have taller shrub layers composed of cold-deciduous or ericaceous species, including *Acer circinatum*, *Acer glabrum*, *Arctostaphylos nevadensis*, *Chrysolepis chrysophylla*, *Cornus nuttallii*, *Holodiscus discolor*, *Mahonia nervosa*, and *Vaccinium membranaceum*. The herbaceous component of these woodlands is dominated by perennial bunchgrasses or cespitose sedges. *Calamagrostis rubescens* is present in almost all stands, and can be dominant (up to 70% cover), and *Carex geyeri* is another dominant species in some stands. Lichens can be common on some sites, primarily growing on exposed rock.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

- A3362 *Abies grandis* - *Pseudotsuga menziesii* Central Rocky Mountain Forest & Woodland Alliance

Diagnostic Characteristics: The composition of the herbaceous layer reflects local climate and degree of canopy closure and contains species more restricted to the Cascades, for example, *Acer circinatum*, *Achlys triphylla*, *Anemone deltoidea*, *Chrysolepis chrysophylla*, *Cornus nuttallii*, *Mahonia nervosa*, and *Vancouveria hexandra*.

VEGETATION

Physiognomy and Structure: Associations in this alliance are characterized by a closed tree canopy (averaging >60% cover) of tall coniferous trees which can attain 50 m in height. A subcanopy is often present, composed of broad-leaved cold-deciduous shrubs or shade-tolerant small trees. Herbaceous cover is highly variable, ranging from 0-60% cover depending on location, precipitation, fire history, and stand age. Generally the abundance of subcanopy and herbaceous cover decreases with increasing stand age and as available light decreases.

Floristics: These forests are dominated by *Abies grandis* or a mix of *Pseudotsuga menziesii* with *Abies grandis*. Several other conifers can dominate or codominate, including *Pinus contorta*, *Pinus monticola*, and *Larix occidentalis*. The shrub layer is dominated by the prostrate, mat-forming *Arctostaphylos nevadensis*, with *Arctostaphylos uva-ursi* also being important in some stands. The other associations have taller shrub layers composed of cold-deciduous or ericaceous species, including *Acer circinatum*, *Acer glabrum*,

Chrysolepis chrysophylla, *Cornus nuttallii*, *Holodiscus discolor*, *Mahonia nervosa*, and *Vaccinium membranaceum*. The herbaceous layer species commonly dominant include eastern Cascadian species such as *Achlys triphylla*, *Anemone deltoidea*, and *Vancouveria hexandra*.

ENVIRONMENT & DYNAMICS

Environmental Description: The climate regime with which this alliance is associated is usually submesic with annual precipitation ranging from 50-100 cm, with a maximum in winter or late spring. Snowpacks typically accumulate each winter but melt off in early spring at lower elevation sites. Elevations range between 590 and 760 m in the eastern Cascades. All aspects are represented, and slopes can be flat to steep. Parent materials are highly variable, but most studies report that volcanic ash is often present in the soil profile. Soils are derived from basalt colluvium and alluvium, volcanic ash, granitics, shale, sandstone, meta-sediments, gneiss, quartzite, limestone, and loess or loess-ash over colluvium or alluvium. Soils textures cover the range from excessively rocky and well-drained to silty loams with a clay pan in the B horizon. Soils vary, but several authors report volcanic ash over varied parent materials.

Dynamics: These woodlands include fire-maintained stands where *Abies grandis* will eventually become the canopy dominant with fire suppression. Lillybridge et al. (1995) report fire-return intervals of 30-50 years, and that all stands show evidence of fire, such as char on logs and snags, and charcoal in the soil. Other stands of this alliance includes montane forests along rivers and slopes. They are very productive forests which have been priorities for timber production.

DISTRIBUTION

Geographic Range: This forested alliance occurs on the upper to mid eastern slopes of the Cascade Range in Washington, south of Lake Chelan and south to Mount Hood in Oregon.

Nations: CA, US

States/Provinces: OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >> Grand Fir: 213 (Eyre 1980)
- >> Interior Douglas-fir: 210 (Eyre 1980)
- >> Western Needleleaf Forests: 11: Western Ponderosa Forest (*Pinus*) (Küchler 1964)
- >> Western Needleleaf Forests: 14: Grand Fir-Douglas Fir Forest (*Abies-Pseudotsuga*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEGLO02322 *Pseudotsuga menziesii* - *Picea engelmannii* x *glauca* / *Ptilium crista-castrensis* Forest
- CEGLO00921 *Abies lasiocarpa* - *Pseudotsuga menziesii* / *Acer circinatum* Woodland
- CEGLO00290 *Abies grandis* / *Vaccinium membranaceum* Forest
- CEGLO00038 *Abies grandis* / *Chrysolepis chrysophylla* Forest
- CEGLO00271 *Abies grandis* / *Mahonia nervosa* Forest
- CEGLO00915 *Abies grandis* / *Arctostaphylos nevadensis* Woodland
- CEGLO00279 *Abies grandis* / *Orthilia secunda* Forest
- CEGLO00266 *Abies grandis* / *Acer circinatum* Forest
- CEGLO00268 *Abies grandis* / *Achlys triphylla* Forest
- CEGLO01104 *Abies grandis* / *Cornus nuttallii* - *Acer glabrum* Forest
- CEGLO00040 *Abies grandis* - *Pseudotsuga menziesii* / *Trientalis borealis* ssp. *latifolia* Forest
- CEGLO00039 *Abies grandis* / *Polemonium pulcherrimum* Forest
- CEGLO00278 *Abies grandis* - *Picea engelmannii* / *Maianthemum stellatum* Forest
- CEGLO00291 *Abies grandis* / *Vaccinium membranaceum* - *Achlys triphylla* Forest
- CEGLO00274 *Abies grandis* / *Holodiscus discolor* Forest

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Agee and Kertis 1987, Agee and Wasem 1987, Atzet and Wheeler 1984, Atzet et al. 1996, Burns and Honkala 1990a, Chappell 1994, Chappell et al. 1997, Clausnitzer and Zamora 1987, Cole 1982, Collins et al. 1984, Crawford and Johnson 1985, Daubenmire 1952, Daubenmire and Daubenmire 1968, Douglas 1971, Dyrness et al. 1974a, Eyre 1980, Faber-Langendoen et al. 2017b, Fonda and Bernardi 1976, Franklin and Dyrness 1973, Franklin et al. 1988, Hall 1967, Hall 1973, Head 1959, Hemstrom et al. 1987, Henderson et al. 1989, John and Tart 1986, Johnson 1985a, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Krajina 1969, Kuchler 1964, Lillybridge et al. 1995, Spies et al. 1990, Tiedemann and Klock 1977, Topik 1989, Topik et al. 1986, Topik et al. 1988, WNHP unpubl. data, Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b, Williams et al. 1995, Wilson 1978, Zamora 1983, del Moral and Long 1977

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G212. East Cascades Mesic Grand Fir - Douglas-fir Forest

A3582. *Tsuga heterophylla* - *Abies grandis* Cascadian Mesic Cove Forest Alliance

Type Concept Sentence: These forests are dominated by *Tsuga heterophylla* often with *Thuja plicata* or *Abies grandis*. Diagnostic undergrowth species reflect Pacific Northwest and Cascadian origin with such species as *Rhododendron albiflorum*, *Tiarella trifoliata*, and *Gymnocarpium dryopteris*. Rocky Mountain species may be present, but the overall floristics of these forests are of Cascadian and Pacific Northwest origin. Stands occur in moist, protected coves on the eastern side of the Cascade Range, in the Blue Mountains and western slopes of the Rocky Mountains.

OVERVIEW

Scientific Name: *Tsuga heterophylla* - *Abies grandis* Cascadian Mesic Cove Forest Alliance

Common Name (Translated Scientific Name): Western Hemlock - Grand Fir Cascadian Mesic Cove Forest Alliance

Colloquial Name: East Cascadian Western Hemlock Mesic Cove Forest

Type Concept: These forests are dominated by *Tsuga heterophylla* often with *Thuja plicata* or *Abies grandis*. Diagnostic undergrowth species reflect Pacific Northwest and Cascadian origin with such species as *Rhododendron albiflorum*, *Tiarella trifoliata*, and *Gymnocarpium dryopteris*. Rocky Mountain species may be present, but the overall floristics of these forests are of Cascadian and Pacific Northwest origin. Stands occur in moist, protected coves on the eastern side of the Cascade Range, in the Blue Mountains and western slopes of the Rocky Mountains. Elevations range from 970-1955 m in the Blue Mountains of Oregon, to as low as 760 m in the eastern Cascades. Sites include protected coves, ravines, and valley bottoms. All aspects are represented, and slopes can be flat to steep.

Classification Comments: This alliance is differentiated from Pacific Northwest stands by its drier nature and Cascadian understory. The eastern Cascades flora came across or up the Cascades. Maybe the Middle Rockies (Blue Mountains in Oregon) have some floristic mixing from the Sierras across Oregon. See Carstens et al. (2005) and Goward and Spribille (2005).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Forest canopy of *Tsuga heterophylla* and/or *Thuja plicata* on the eastern slopes of the Cascade Range or western slopes of the Blue Mountains or Rocky Mountains.

VEGETATION

Physiognomy and Structure: Associations in this alliance are characterized by a closed tree canopy (averaging >60% cover) of tall coniferous trees which can attain 50 m in height. A subcanopy is often present, composed of broad-leaved cold-deciduous shrubs or shade-tolerant small trees. Herbaceous cover is highly variable, ranging from 0-60% cover depending on location, precipitation, fire history, and stand age. Generally the abundance of subcanopy and herbaceous cover decreases with increasing stand age and as available light decreases.

Floristics: This alliance is dominated by *Tsuga heterophylla* often with *Thuja plicata* or *Abies grandis*. Undergrowth species include *Rhododendron albiflorum*, *Tiarella trifoliata*, and *Gymnocarpium dryopteris*. Other species present include *Linnaea borealis*, *Achlys triphylla*, *Clintonia uniflora* and *Arctostaphylos nevadensis*.

ENVIRONMENT & DYNAMICS

Environmental Description: The climate regime with which this alliance is associated is usually submesic with annual precipitation ranging from 50-100 cm, with a maximum in winter or late spring. Snowpacks typically accumulate each winter but melt off in early spring at lower elevation sites. Elevations reported for associations in this alliance range from 970-1955 m in the Blue Mountains of Oregon, to as low as 760 m in the eastern Cascades. Topographic positions are protected coves, ravines, and valley bottoms. Soils textures cover the range from excessively rocky and well-drained to silty loams with a clay pan in the B horizon.

Dynamics: These forests experience a mix of high-severity and moderate-severity fires with natural return intervals of 100-600 years. *Pseudotsuga menziesii* colonizes vigorously and is favored with logging and/or fire disturbance to these forests. With increasing time since disturbance, *Tsuga heterophylla* or *Thuja plicata* become more abundant in the canopy, due to their ability to regenerate under closed-canopy conditions. *Abies grandis* forests include many sites dominated by *Pseudotsuga menziesii* and *Pinus ponderosa* which were formerly maintained by wildfire, and may now be dominated by *Abies grandis* (a fire-sensitive, shade-tolerant species) (Lillybridge et al. 1995, Chappell et al. 1997). Pre-European settlement fire regimes were typically of frequent, low-intensity surface fires, maintaining relatively open stands of a mix of fire-resistant species. With the advent of vigorous fire suppression, longer fire-return intervals are now the rule, and mixed-stature stands with *Abies grandis* in various size classes now provide fuel "ladders," making these forests more susceptible to high-intensity, stand-replacing fires (Cooper et al. 1987, Lillybridge et al. 1995)

DISTRIBUTION

Geographic Range: This alliance is found on the eastern side of the Cascade Range and in the Blue Mountains and western slopes of the Rocky Mountains.

Nations: US

States/Provinces: OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< Douglas fir-western hemlock, # 230 (Küchler 1964)
- >< Douglas-fir - Western Hemlock: 230 (Eyre 1980)
- >< Grand Fir: 213 (Eyre 1980)
- >< Western Hemlock Series (Lillybridge et al. 1995)
- >< Western Hemlock: 224 (Eyre 1980)
- >< Western Needleleaf Forests: 14: Grand Fir-Douglas Fir Forest (*Abies-Pseudotsuga*) (Küchler 1964)
- >< Western Needleleaf Forests: 2: Cedar-Hemlock-Douglas Fir Forest (*Thuja-Tsuga-Pseudotsuga*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEGL002669 *Abies grandis* - *Thuja plicata* / *Achlys triphylla* Forest
- CEGL000286 *Abies grandis* - *Tsuga heterophylla* / *Clintonia uniflora* Forest
- CEGL007305 *Tsuga heterophylla* - (*Pseudotsuga menziesii*) / *Tiarella trifoliata* - *Gymnocarpium dryopteris* Forest
- CEGL000913 *Tsuga heterophylla* / *Arctostaphylos nevadensis* Woodland
- CEGL007288 *Pseudotsuga menziesii* - *Tsuga heterophylla* / *Mahonia nervosa* / *Tiarella trifoliata* Forest
- CEGL000104 *Tsuga heterophylla* / *Linnaea borealis* Forest

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Atzet and McCrimmon 1990, Atzet and Wheeler 1984, Bigley and Hull 1992, Burns and Honkala 1990a, Carstens et al. 2005, Chappell et al. 1997, Clausnitzer and Zamora 1987, Cooper et al. 1987, Crawford and Johnson 1985, Daubenmire 1952, Daubenmire and Daubenmire 1968, Douglas 1971, Dyrness et al. 1974b, Eyre 1980, Faber-Langendoen et al. 2017b, Fonda 1974, Fonda and Bliss 1969, Franklin and Dyrness 1973, Franklin et al. 1979, Franklin et al. 1988, Goward and Spribille 2005, Hall 1967, Hall

1973, Halverson et al. 1986, Hamann 1972, Head 1959, Hemstrom and Logan 1986, Hemstrom et al. 1987, Henderson 1981, Henderson and Peter 1981, Henderson and Peter 1982, Henderson and Peter 1983, Henderson and Peter 1984, Henderson et al. 1985, Henderson et al. 1986, Henderson et al. 1989, Henderson et al. 1992, John and Tart 1986, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Küchler 1964, Lillybridge et al. 1995, McCune and Allen 1985, Steele et al. 1981, Tiedemann and Klock 1977, Topik 1989, Topik et al. 1986, Topik et al. 1988, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b, Wilson 1978, Zamora 1983, del Moral and Long 1977

M020. Rocky Mountain Subalpine-High Montane Conifer Forest

This is a diverse macrogroup of high montane and subalpine forests and woodland found throughout the mountainous regions of the western U.S. and southwestern Canada.

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

1.B.2.Nb.5.a. M020 Rocky Mountain Subalpine-High Montane Conifer Forest

G220. Rocky Mountain Lodgepole Pine Forest & Woodland

Type Concept Sentence: This group occupies upper montane and subalpine elevations of the Rocky Mountains, and is dominated by *Pinus contorta* with shrub, grass, or barren understories, typically on well-drained, gravelly, coarse-textured, and acidic parent materials.

OVERVIEW

Scientific Name: *Pinus contorta* Rocky Mountain Forest & Woodland Group

Common Name (Translated Scientific Name): Lodgepole Pine Rocky Mountain Forest & Woodland Group

Colloquial Name: Rocky Mountain Lodgepole Pine - Aspen Forest

Type Concept: This group occupies upper montane to subalpine elevations of the Rocky Mountains, north into the Canadian Rockies and east into mountain "islands" of north-central Montana. Parent materials are typically well-drained, gravelly, coarse-textured, acidic, and are rarely formed from calcareous parent materials. Other stands occur over excessively well-drained pumice deposits, glacial till and alluvium on valley floors where there is cold-air accumulation, warm and droughty shallow soils over fractured quartzite bedrock, and shallow moisture-deficient soils with a significant component of volcanic ash. In these conditions where other conifers cannot become established, stands of *Pinus contorta* may persist for longer periods. These forests are dominated by *Pinus contorta* with shrub, grass, or barren understories. Sometimes there are intermingled mixed conifer/*Populus tremuloides* stands, with the latter occurring with inclusions of deeper, typically fine-textured soils. The shrub stratum may be conspicuous to absent; common species include *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Juniperus communis*, *Ceanothus velutinus*, *Linnaea borealis*, *Mahonia repens*, *Purshia tridentata*, *Spiraea betulifolia*, *Spiraea douglasii*, *Shepherdia canadensis*, *Vaccinium scoparium*, *Vaccinium cespitosum*, *Vaccinium membranaceum*, *Symphoricarpos albus*, and *Ribes* spp. Common herbaceous species include *Festuca idahoensis*, *Elymus elymoides*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex pensylvanica*, and *Carex rossii*.

Classification Comments: The higher elevation *Pinus contorta* forests of the southern Cascades in Oregon are included in Sierra-Cascade Cold-Dry Subalpine Woodland Group (G243), corresponding to the distribution of *Pinus contorta* var. *murrayana*. In the mountains of British Columbia and western Alberta, this group transitions to a yet-to-be described boreal lodgepole group, as well as to a boreal mesic mixed conifer-hardwood group, where lodgepole mixes with boreal species such as *Picea glauca* and *Picea mariana*.

Similar NVC Types:

- G218 Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland
- G219 Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland
- G243 Sierra-Cascade Cold-Dry Subalpine Woodland

Diagnostic Characteristics: This group is characterized by needle-leaved evergreen trees, strongly dominated by *Pinus contorta* and may include smaller inclusions of *Populus tremuloides*. Understory growth forms may be conspicuous to absent, shrub- or graminoid-dominated.

VEGETATION

Physiognomy and Structure: These forests and woodlands occur most frequently as dense, even-aged, early- to mid-successional stands, or less often as uneven-aged, later-successional stands where other conifers cannot become established. The understory varies from a conspicuous or sparse layer of shrubs or grasses to nearly barren substrate.

Floristics: *Pinus contorta* is the overwhelming canopy dominant often forming dense stands. Other conifers such as spruce and fir may become established. *Populus tremuloides* can occur as a seral component or in mixed stands with the lodgepole. The understory varies and may be conspicuous to absent and dominated by shrubs or graminoids. Common shrubs include *Arctostaphylos uva-ursi*, *Arctostaphylos nevadensis*, *Artemisia tridentata*, *Juniperus communis*, *Ceanothus velutinus*, *Linnaea borealis*, *Mahonia repens*, *Purshia tridentata*, *Spiraea betulifolia*, *Spiraea douglasii*, *Shepherdia canadensis*, *Vaccinium scoparium*, *Vaccinium cespitosum*, *Vaccinium membranaceum*, *Menziesia ferruginea*, *Symphoricarpos albus*, and *Ribes* spp. Common herbaceous species include *Osmorhiza berteroi*, *Thalictrum occidentale*, *Thalictrum fendleri*, *Xerophyllum tenax*, *Clintonia uniflora*, *Carex inops* ssp. *inops*, *Arnica cordifolia*, *Festuca idahoensis*, *Elymus elymoides*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex pennsylvanica*, and *Carex rossii*.

ENVIRONMENT & DYNAMICS

Environmental Description: This group occupies upper montane to subalpine elevations of the Rocky Mountains, north into the Canadian Rockies and east into mountain "islands" of north-central Montana. Elevations range from just over 900 m in the northeastern Cascades to well over 3100 m in the Uinta Mountains in Utah and the southern Colorado Rockies.

Climate: Temperature regimes are extreme throughout this region and frequent growing season frosts occur. Annual precipitation in these montane and subalpine habitats ranges from less than 40 cm to over 150 cm, usually with the majority falling as snow. Late-melting snowpacks provide the majority of growing season moisture.

Soil/substrate/hydrology: Stands typically occur over well-drained, gravelly, coarse-textured, acidic, and rarely formed from calcareous parent materials occasionally with inclusions of deeper, typically fine-textured soils. Other stands occur over excessively well-drained pumice deposits, glacial till and alluvium on valley floors where there is cold-air accumulation, warm and droughty shallow soils over fractured quartzite bedrock, and shallow moisture-deficient soils with a significant component of volcanic ash.

Dynamics: *Pinus contorta* is an aggressively colonizing, shade-intolerant conifer which usually occurs in lower subalpine forests in the major ranges of the western United States. Establishment is episodic and linked to stand-replacing disturbances, primarily fire. The incidence of serotinous cones varies within and between varieties of *Pinus contorta*, being most prevalent in Rocky Mountain populations. Closed, serotinous cones appear to be strongly favored by fire, and allow rapid colonization of fire-cleared substrates (Burns and Honkala 1990a). Hoffman and Alexander (1980, 1983) report that in stands where *Pinus contorta* exhibits a multi-aged population structure, with regeneration occurring, there is typically a higher proportion of trees bearing nonserotinous cones. The dominance of *Pinus contorta* in associations in this group is related to fire history and topo-edaphic conditions (Pfister et al. 1977, Hoffman and Alexander 1980, Steele et al. 1981, Mauk and Henderson 1984). Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense stands of even-aged trees. These stands, while frequently persistent for more than 100 years, may succeed to spruce-fir forests or woodlands. Most (but not all) forests in this group are early- to mid-successional forests which developed following fires.

Some *Pinus contorta* forest associations occur, and will persist, on sites that are too extreme for other conifers to establish. These include excessively well-drained pumice deposits (Volland 1976), glacial till and alluvium on valley floors where there is cold-air accumulation (Steele et al. 1981), warm and droughty shallow soils over fractured quartzite bedrock (Mauk and Henderson 1984), well-drained to xeric stabilized sand dunes (Jenny et al. 1969, Kumler 1969), and shallow moisture-deficient soils with a significant component of volcanic ash (Cooper et al. 1987). Some *Pinus contorta* forests can be persistent for hundreds of years, a result of a lack of seed source or the competitive exclusion of other conifer species (Moir 1969a, Pfister et al. 1977, Despain 1973b, Hoffman and Alexander 1983, Cooper et al. 1987), or the frost tolerance of *Pinus contorta* seedlings and mature trees, which allows the development of monotypic stands in frost-prone areas (Steele et al. 1981, Burns and Honkala 1990a).

DISTRIBUTION

Geographic Range: This group occurs at upper montane to subalpine elevations of the Rocky Mountains, from Colorado north into the Canadian Rockies, west across Idaho into the eastern Cascades in Washington, the Blue Mountains in Oregon, and east onto mountain "islands" of north-central Montana.

Spatial Scale & Pattern [optional]: Matrix, Large patch

Nations: CA, US

States/Provinces: AB, BC, CA?, CO, ID, MT, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 3:C, 7:C, 8:C, 9:C, 18:C, 20:C, 26:C, 68:C

USFS Ecoregions (2007): 331A:CC, 331G:CC, 331J:CC, 331K:C?, 342A:CC, 342B:C?, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342J:CC, M242C:CC, M242D:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CP, M331G:CP, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341B:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- < LP Lodgepole pine, Interior Cedar Hemlock and Interior Douglas-fir zones (Ecosystems Working Group 1998)
- < Lodgepole Pine: 218 (Eyre 1980)
- < Montane Seral Forests (Peet 2000)
- >> PI - Huckleberry - Cladonia (ESSFwc2/02) (Lloyd et al. 1990)
- >> PI - Huckleberry - Knight's plume (SBSmw/11) (Steen and Coupé 1997)
- >> PI - Huckleberry - Velvet-leaved blueberry (SBSmw/03) (Steen and Coupé 1997)
- >> PI - Juniper - Dwarf blueberry (SBSmc3/02) (DeLong et al. 1993)
- >> PI - Juniper - Dwarf blueberry (SBSmc3/02) (Steen and Coupé 1997)
- >> PI - Juniper - Ricegrass (SBSdk/02) (DeLong et al. 1993)
- >> PI - Juniper - Ricegrass (SBSdk/02) (Steen and Coupé 1997)
- >> PI - Juniper - Ricegrass (SBSdk/02) (Banner et al. 1993)
- >> PI - Velvet-leaved blueberry - Cladonia (SBSdh1/02) (DeLong 1996)
- >> PIBI - Soopolallie - Kinnikinnick (MSdc2/04) (Steen and Coupé 1997)

LOWER LEVEL UNITS**Alliances:**

- A0424 *Pinus contorta* - *Populus tremuloides* Rocky Mountain Forest Alliance
- A4079 *Pinus contorta* Rocky Mountain Woodland Alliance
- A3366 *Pinus contorta* Rocky Mountain Forest Alliance

AUTHORSHIP

Primary Concept Source: D.G. Despain (1973b)

Author of Description: M.E. Hall

Acknowledgments: D. Tart

Version Date: 05/30/2013

Classif Resp Region: West

Internal Author: MEH 2-10, 5-13, mod. GK 12-15

REFERENCES

References: Alexander 1986, Arno et al. 1985, Banner et al. 1993, Burns and Honkala 1990a, Cooper et al. 1987, DeLong 1996, DeLong et al. 1993, Despain 1973a, Despain 1973b, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2017a, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Jenny et al. 1969, Johnson and Clausnitzer 1992, Johnston 1997, Kumler 1969, Lloyd et al. 1990, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Moir 1969a, Peet 2000, Pfister et al. 1977, Steele et al. 1981, Steen and Coupé 1997, Volland 1976, Whipple 1975, Williams and Smith 1990

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G220. Rocky Mountain Lodgepole Pine Forest & Woodland

A0424. *Pinus contorta* - *Populus tremuloides* Rocky Mountain Forest Alliance

Type Concept Sentence: This mixed evergreen-deciduous forest alliance is codominated by *Pinus contorta* and *Populus tremuloides* and has been described on mountain slopes and plateaus in Utah, Idaho, Colorado and Wyoming.

OVERVIEW

Scientific Name: *Pinus contorta* - *Populus tremuloides* Rocky Mountain Forest Alliance

Common Name (Translated Scientific Name): Lodgepole Pine - Quaking Aspen Rocky Mountain Forest Alliance

Colloquial Name: Rocky Mountain Lodgepole Pine - Aspen Forest

Type Concept: This mixed evergreen-deciduous forest alliance has been described on mountain slopes and plateaus in Utah, Colorado and Wyoming. Seral forests included in this alliance are characterized by an open to moderately closed, mixed evergreen-deciduous tree canopy that is codominated by *Populus tremuloides* and *Pinus contorta*. Several other species of conifers may be scattered within the stands, including *Abies lasiocarpa*, *Picea engelmannii*, *Picea pungens*, *Pinus flexilis*, and *Pseudotsuga menziesii*. Younger stands typically have dense *Populus tremuloides* with *Pinus contorta* mixed in. As stands age, *Populus tremuloides* cover is slowly reduced until *Pinus contorta* becomes dominant. The understory is moderately dense to sparse and becomes sparser as *Pinus contorta* becomes more dominant. The short-shrub layer is often dominated by *Juniperus communis* or *Symphoricarpos oreophilus*. Other shrubs may include *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Mahonia repens*, *Paxistima myrsinites*, *Rosa woodsii*, *Shepherdia canadensis*, and *Symphoricarpos albus*. Scattered tall shrubs *Amelanchier alnifolia* and *Prunus virginiana* may be present. The relatively sparse herbaceous layer is a mixture of graminoids and forbs and is often dominated by *Calamagrostis rubescens*, *Carex geyeri*, *Lathyrus lanszwertii*, or *Thalictrum fendleri*. Other common graminoids include *Achnatherum occidentale* (= *Stipa*

occidentalis), *Bromus carinatus*, *Carex rossii*, *Elymus glaucus*, and *Elymus trachycaulus*. Forbs, such as *Achillea millefolium*, *Arnica cordifolia*, *Balsamorhiza* spp., *Fragaria vesca*, *Geranium* spp., *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), and *Potentilla* spp., may be present. The exotic species *Poa pratensis* and *Taraxacum officinale* are common in livestock-impacted stands. Sites occur on gentle to steep slopes on all aspects. Soils are derived from alluvium and colluvium.

Classification Comments: This alliance is included in this group because disturbed stands may have significant cover of *Populus tremuloides*. However, conifers are always dominant.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Mixed deciduous-evergreen seral forests ultimately dominated by *Pinus contorta*, but in younger stands codominated by *Populus tremuloides*.

VEGETATION

Physiognomy and Structure: Vegetation included in this minor alliance has a moderately dense to dense upper canopy of mixed deciduous broad-leaved and evergreen needle-leaved trees (5-20 m tall). The understory has a moderate to sparse short-shrub layer, typically dominated by an evergreen, scale-leaved or deciduous broad-leaved shrub species. A sparse tall-shrub layer dominated by deciduous broad-leaved shrubs may be present. A moderate to sparse herbaceous layer may also be present, dominated by perennial forbs or graminoids.

Floristics: The open to moderately closed, mixed evergreen needle-leaved and deciduous broad-leaved tree canopy is composed of short to moderately tall trees, and is codominated by *Pinus contorta* and *Populus tremuloides*. Several other species of conifers may be scattered within the stands, including *Abies lasiocarpa*, *Pinus flexilis*, *Picea engelmannii*, *Picea pungens*, and *Pseudotsuga menziesii*. Younger stands typically have dense *Populus tremuloides* with *Pinus contorta* mixed in. As the stands age, *Populus tremuloides* cover is slowly reduced until *Pinus contorta* becomes dominant (Mueggler 1988). The understory is typically moderately dense to sparse and becomes sparser as *Pinus contorta* becomes more dominant. The short-shrub layer is often dominated by *Juniperus communis* or *Symphoricarpos oreophilus*. Other shrubs may include *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Mahonia repens*, *Paxistima myrsinites*, *Rosa woodsii*, *Shepherdia canadensis*, and *Symphoricarpos albus*. The tall-shrub layer consists of scattered *Amelanchier alnifolia* and *Prunus virginiana*. The relatively sparse herbaceous layer is a mixture of graminoids and forbs and is often dominated by *Calamagrostis rubescens*, *Carex geyeri*, *Lathyrus lanszwertii*, or *Thalictrum fendleri*. Other common graminoids include *Achnatherum occidentale* (= *Stipa occidentalis*), *Bromus carinatus*, *Carex rossii*, *Elymus glaucus*, and *Elymus trachycaulus*. Forbs include *Achillea millefolium*, *Arnica cordifolia*, *Balsamorhiza* spp., *Fragaria vesca*, *Geranium* spp., *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), and *Potentilla* spp. The exotic species *Poa pratensis* and *Taraxacum officinale* are common in livestock-impacted stands (Mueggler 1988). Annuals are typically uncommon.

ENVIRONMENT & DYNAMICS

Environmental Description: Elevations range above 1700-3000 m. Climate is temperate with cold winters. Mean annual precipitation is greater than 38 cm and typically greater than 50 cm. Sites occur on gentle to steep slopes on all aspects. Soils are derived from alluvium and colluvium from sedimentary, metamorphic and igneous parent materials. However, stands are found mainly on sandstone and quartzite.

Dynamics: Both *Pinus contorta* and *Populus tremuloides* are thin-barked and readily killed by fire, and both are fire-adapted species that generally need disturbance to establish and maintain dominance in a forest. These mixed forests are seral and, in the absence of stand-replacing disturbance such as fire, will slowly convert to a *Pinus contorta*-dominated forest and then eventually to a *Picea engelmannii* - *Abies lasiocarpa*-dominated forest if subalpine or a *Pseudotsuga menziesii*-dominated forest if montane (Mueggler 1988). Most of the stands sampled by Mueggler (1988) had a history of livestock grazing as evidenced by relative abundance of the exotic plants *Taraxacum officinale* and *Poa pratensis* and the scarcity of grazing-susceptible plants (Mueggler 1988).

DISTRIBUTION

Geographic Range: Forests included in this alliance are scattered in the mountains and plateaus of Utah, Wyoming, and Idaho, and may occur elsewhere in the western United States where both *Populus tremuloides* and *Pinus contorta* are common.

Nations: US

States/Provinces: CO, ID, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< Aspen: 217 (Eyre 1980)
- >< Lodgepole Pine: 218 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEGLO00537 *Populus tremuloides* - *Pinus contorta* / *Juniperus communis* Forest
- CEGLO00536 *Populus tremuloides* - *Pinus contorta* / *Carex geyeri* - *Calamagrostis rubescens* Forest
- CEGLO00538 *Populus tremuloides* - *Pinus contorta* / *Symphoricarpos oreophilus* Forest
- CEGLO00539 *Populus tremuloides* - *Pinus contorta* / *Thalictrum fendleri* Forest

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Eyre 1980, Faber-Langendoen et al. 2017b, Mueggler 1988

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G220. Rocky Mountain Lodgepole Pine Forest & Woodland

A3366. *Pinus contorta* Rocky Mountain Forest Alliance

Type Concept Sentence: This alliance is characterized by forests dominated by *Pinus contorta* and occurs in the upper montane and subalpine zones of the Rocky Mountains and the eastern Cascade Range.

OVERVIEW

Scientific Name: *Pinus contorta* Rocky Mountain Forest Alliance

Common Name (Translated Scientific Name): Lodgepole Pine Rocky Mountain Forest Alliance

Colloquial Name: Rocky Mountain-East Cascadian Lodgepole Pine Forest

Type Concept: This alliance is found in the upper montane and subalpine zones of southern Rocky Mountains, north to the Canadian Rocky Mountains and west into the Cascade Range. Forests included in this alliance are characterized by a closed to open tree canopy that is dominated by the conifer *Pinus contorta*. Stands may be even-aged or multi-aged depending on geographic location, edaphic characteristics, and how the stands were established following wildfire. Shrub and herbaceous layers may be present or absent depending on tree canopy. Other tree species such as *Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis*, *Pinus flexilis*, *Populus tremuloides*, *Pseudotsuga menziesii*, *Tsuga heterophylla*, or *Tsuga mertensiana* may be present to abundant as seedlings and saplings. On warmer sites, *Abies grandis*, *Thuja plicata*, and *Tsuga heterophylla* may be also present. Associated shrub and herbaceous species vary across the range of this alliance. Common subalpine and montane shrub species include *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Ceanothus velutinus*, *Linnaea borealis*, *Mahonia repens*, *Purshia tridentata*, *Ribes* spp., *Spiraea betulifolia*, *Spiraea douglasii*, *Shepherdia canadensis*, *Symphoricarpos albus*, *Vaccinium cespitosum*, *Vaccinium membranaceum*, and *Vaccinium scoparium*. Herbaceous cover is very sparse. The cover of the herbaceous stratum can be dominated by either graminoids or perennial forbs and tends to vary inversely with shrub cover. Important graminoids include *Achnatherum occidentale* (= *Stipa occidentalis*), *Carex pensylvanica*, *Carex geyeri*, *Carex rossii*, *Calamagrostis rubescens*, *Danthonia californica*, and *Elymus glaucus*. Important forbs are *Arnica cordifolia*, *Chimaphila umbellata*, *Orthilia secunda*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pedicularis racemosa*, *Thalictrum* spp., and *Xerophyllum tenax*. Elevations range from just over 900 m in the eastern Cascades to well over 3100 m in the Rocky Mountains. This alliance occurs in a broad array of habitats.

Classification Comments: This alliance is derived from a series concept, in which associations are distinguished by the dominance of *Pinus contorta* in the tree canopy and the near total lack of regeneration of other conifers. In the habitat-typing classification system, stands dominated by *Pinus contorta* but with significant regeneration of other conifers, such as *Abies grandis*, *Abies lasiocarpa*, *Picea engelmannii*, *Pseudotsuga menziesii*, *Thuja plicata*, or *Tsuga heterophylla*, have typically been placed into series named for those conifers. There are undoubtedly several to many associations which should be placed in this alliance, but which have been classified as belonging to other series because of the lack of regeneration of *Pinus contorta*. Future work will need to review this issue and identify additional associations belonging to this alliance.

Internal Comments:**Other Comments:****Similar NVC Types:**

- A4079 *Pinus contorta* Rocky Mountain Woodland Alliance: has more open canopies (<60% total cover).

Diagnostic Characteristics: Forests of the Rocky Mountains and eastern Cascades with canopies primarily dominated by *Pinus contorta*. Canopy cover is typically dense, and understories are variable depending on substrate and density of the canopy. Diagnostic of this upland forest alliance is the dominance of *Pinus contorta* in the tree canopy without significant regeneration of *Abies lasiocarpa* or similar shade-tolerant species.

VEGETATION

Physiognomy and Structure: These are closed-canopy (>60% cover), densely stocked stands of needle-leaved evergreen trees from 10-30 m in height. Stands can be so dense that little light penetrates the tree canopy, and understory vegetation is sparse or absent. In younger stands, the tree canopy often has a structure of same-size and even-aged classes. In older stands, there may be a taller, older, larger size class, with a relatively dense shorter tree layer composed of saplings and pole-sized conifers, often of different species than the older trees. Where densities are lower, or where canopy gaps occur, ericaceous or cold-deciduous shrubs may be locally abundant. The herbaceous layer is typically sparse and can be dominated by either shade-tolerant forbs, grasses or sedges.

Floristics: *Pinus contorta* is almost always the only mature tree in stands of this alliance, but other conifers are occasionally present. In some stands, species such as *Abies grandis*, *Abies lasiocarpa*, *Picea engelmannii*, *Pseudotsuga menziesii*, or *Tsuga mertensiana* may be present to abundant as seedlings and saplings. On warmer sites *Abies grandis*, *Thuja plicata*, and *Tsuga heterophylla* may be also present. In the eastern Cascades, northern Utah, and Rocky Mountains, *Pinus contorta* forests occupy large areas in the upper montane to lower subalpine elevation zones. Stand structure can vary from dense "dog-hair" stands established following wildfire, to a more multi-aged structure with widely spaced large older trees and a subcanopy of younger *Pinus contorta*. The dominance of *Pinus contorta* may be maintained in some of these stands by recurring surface fires that kill seedlings and saplings of other shade-tolerant conifers but allow reproduction of *Pinus contorta* (Pfister et al. 1977, Chappell et al. 1997). The shrub stratum may be conspicuous to absent depending upon canopy closure and soil moisture, but where shrubs are present, common species include *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Ceanothus velutinus*, *Linnaea borealis*, *Mahonia repens*, *Purshia tridentata*, *Ribes* spp., *Spiraea betulifolia*, *Spiraea douglasii*, *Shepherdia canadensis*, *Symphoricarpos albus*, *Vaccinium cespitosum*, *Vaccinium membranaceum*, and *Vaccinium scoparium*. The cover of the herbaceous stratum tends to vary inversely with shrub cover. Where there is a significant herbaceous layer, it can be dominated by either graminoids or perennial forbs. Important graminoids include *Achnatherum occidentale* (= *Stipa occidentalis*), *Calamagrostis rubescens*, *Carex geyeri*, *Carex pensylvanica*, *Carex rossii*, *Danthonia californica*, or *Elymus glaucus*. Important forbs are *Arnica cordifolia*, *Chimaphila umbellata*, *Orthilia secunda*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pedicularis racemosa*, *Thalictrum* spp., and *Xerophyllum tenax*.

ENVIRONMENT & DYNAMICS

Environmental Description: *Pinus contorta* occupies the broadest array of habitats of any coniferous species in the western United States, and forests dominated by this species occur in widely varying ecological settings. This includes upland plant associations found in the montane and subalpine zone of the Rocky Mountains and eastern Cascades. Elevations range from just over 900 m in the Cascades to well over 3100 m in the Rockies. Temperature regimes are extreme throughout this region and frequent growing-season frosts occur. Annual precipitation in these montane and subalpine habitats ranges from less than 40 cm to over 150 cm, usually with the majority falling as snow. Late-melting snowpacks provide the majority of growing-season moisture, particularly in the Cascades. The dominance of *Pinus contorta* in associations in this alliance is related to fire history and topo-edaphic conditions (Pfister et al. 1977, Hoffman and Alexander 1980, Steele et al. 1981, Mauk and Henderson 1984). Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense stands of even-aged trees. Over time, many of these stands can succeed to dominance by other more shade-tolerant conifer species. Most forests in this alliance are early- to mid-successional forests which developed following fires.

Some *Pinus contorta* forest associations occur, and will persist, on sites that are too extreme for other conifers to establish. These include excessively well-drained pumice deposits (Volland 1976), glacial till and alluvium on valley floors where there is cold air accumulation (Steele et al. 1981), warm and droughty shallow soils over fractured quartzite bedrock (Mauk and Henderson 1984), well-drained to xeric stabilized sand dunes (Jenny et al. 1969, Kumler 1969), and shallow moisture-deficient soils with a significant component of volcanic ash (Cooper et al. 1987). Some *Pinus contorta* forests can be persistent for hundreds of years, a result of a lack of seed source or the competitive exclusion of other conifer species (Moir 1969a, Pfister et al. 1977, Despain 1983, Hoffman and Alexander 1983, Cooper et al. 1987), or the frost tolerance of *Pinus contorta* seedlings and mature trees, which allows the development of monotypic stands in frost-prone areas (Steele et al. 1981, Burns and Honkala 1990a). Soils supporting these forests are typically well-drained, gravelly, and have textures ranging from silty to sands and gravels. They are acidic and rarely are formed from calcareous parent materials.

Dynamics: *Pinus contorta* is aggressively colonizing and shade-intolerant. Establishment is episodic and linked to stand-replacing disturbances, primarily fire. The incidence of serotinous cones varies within and among varieties of *Pinus contorta*, being most prevalent in Rocky Mountain populations. Closed, serotinous cones appear to be strongly favored by fire and allow rapid colonization of fire-cleared substrates (Burns and Honkala 1990a). Hoffman and Alexander (1980, 1983) report that in stands where *Pinus contorta* exhibits a multi-aged population structure, with regeneration occurring, there is typically a higher proportion of trees bearing nonserotinous cones. Chappell et al. (1997) report that where these forests are found on pumice, *Pinus contorta* dominance is maintained by periodic disturbance from both fires and insect infestations. Without fires and insects, stands will become dense forests and quite barren. Unlike most *Pinus contorta* forests, most of these stands are not seral to another tree species (Chappell et al. 1997). Fire is infrequent in coastal stands, but shifting sand substrates and wind-borne salt spray act to discourage competition and provide suitable conditions for perpetuation of *Pinus contorta* (Jenny et al. 1969, Kumler 1969, Chappell et al. 1997).

DISTRIBUTION

Geographic Range: These forests occur from the southern Rocky Mountains north to the Canadian Rocky Mountains, east to the Big Horn Mountains of Wyoming and west to the eastern Cascade Range of Washington and Oregon.

Nations: CA, US

States/Provinces: AB, BC, CA?, CO, ID, MT, NM, NV?, OR, UT, WA, WY, YT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< Lodgepole Pine Series (Sawyer and Keeler-Wolf 1995)
- >< Lodgepole Pine: 218 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEG000143 *Pinus contorta* / *Carex pensylvanica* Forest
- CEG000163 *Pinus contorta* / *Shepherdia canadensis* Forest
- CEG000133 *Pinus contorta* / *Arctostaphylos nevadensis* Forest
- CEG000135 *Pinus contorta* / *Arnica cordifolia* Forest
- CEG000175 *Pinus contorta* / *Xerophyllum tenax* Forest
- CEG000141 *Pinus contorta* / *Carex geyeri* Forest
- CEG000172 *Pinus contorta* / *Vaccinium scoparium* Forest
- CEG000154 *Pinus contorta* / *Mahonia repens* Forest
- CEG000168 *Pinus contorta* / *Vaccinium cespitosum* Forest
- CEG000144 *Pinus contorta* / *Carex rossii* Forest
- CEG000153 *Pinus contorta* / *Linnaea borealis* Forest
- CEG002604 *Pinus contorta* / *Spiraea douglasii* Forest
- CEG000146 *Pinus contorta* / *Danthonia californica* Forest
- CEG005933 *Pinus contorta* / *Jamesia americana* Forest
- CEG005935 *Pinus contorta* / *Vaccinium myrtillus* Forest
- CEG000156 *Pinus contorta* / *Pedicularis racemosa* Forest
- CEG000164 *Pinus contorta* / *Spiraea betulifolia* Forest
- CEG000145 *Pinus contorta* / *Ceanothus velutinus* Forest
- CEG000139 *Pinus contorta* / *Calamagrostis rubescens* Forest
- CEG000174 *Pinus contorta* / *Vaccinium scoparium* / *Calamagrostis rubescens* Forest
- CEG000170 *Pinus contorta* / *Vaccinium membranaceum* Forest
- CEG000159 *Pinus contorta* / *Purshia tridentata* / *Carex pensylvanica* Forest
- CEG000166 *Pinus contorta* / *Symphoricarpos albus* Forest
- CEG000169 *Pinus contorta* / *Vaccinium membranaceum* Rocky Mountain Forest
- CEG000155 *Pinus contorta* / *Osmorhiza berteroi* Forest
- CEG000173 *Pinus contorta* var. *latifolia* / *Vaccinium scoparium* / *Carex inops* ssp. *inops* Forest
- CEG000134 *Pinus contorta* / *Arctostaphylos uva-ursi* Forest
- CEG002731 *Pinus contorta* - *Picea mariana* / *Vaccinium vitis-idaea* / *Pleurozium schreberi* Forest

- CEGLO02733 *Pinus contorta* / *Vaccinium vitis-idaea* - *Arctostaphylos uva-ursi* / *Pleurozium schreberi* - (*Cladina* spp.) Forest
- CEGLO05928 *Pinus contorta* / *Menziesia ferruginea* Forest
- CEGLO05913 *Pinus contorta* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest
- CEGLO05923 *Pinus contorta* / *Vaccinium cespitosum* / *Clintonia uniflora* Forest
- CEGLO05916 *Pinus contorta* / *Clintonia uniflora* Forest
- CEGLO05924 *Pinus contorta* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest
- CEGLO05922 *Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest
- CEGLO00167 *Pinus contorta* / *Thalictrum occidentale* Forest

AUTHORSHIP

Primary Concept Source: F.H. Eyre (1980)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Barrows et al. 1977, Burns and Honkala 1990a, Chappell et al. 1997, Cooper et al. 1987, Despain 1973b, Despain 1983, Eyre 1980, Faber-Langendoen et al. 2017b, Harrington 1978, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Jenny et al. 1969, Kumler 1969, Mauk and Henderson 1984, Moir 1969a, Pfister et al. 1977, Sawyer and Keeler-Wolf 1995, Steele et al. 1981, Volland 1976

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G220. Rocky Mountain Lodgepole Pine Forest & Woodland

A4079. *Pinus contorta* Rocky Mountain Woodland Alliance

Type Concept Sentence: This woodland alliance is characterized by open-canopy woodlands dominated by *Pinus contorta* and is found in mainly montane and subalpine zones of the northern Rocky Mountains and eastern Cascade Range, but extends into the southern Rocky Mountains.

OVERVIEW

Scientific Name: *Pinus contorta* Rocky Mountain Woodland Alliance

Common Name (Translated Scientific Name): Lodgepole Pine Rocky Mountain Woodland Alliance

Colloquial Name: Rocky Mountain Lodgepole Pine Woodland

Type Concept: This woodland alliance includes upland plant associations found mainly in the montane and subalpine zones of the northern Rocky Mountains and eastern Cascade Range, but some associations extend into the southern Rocky Mountains. *Pinus contorta* is usually the only mature tree in these woodlands, but occasionally other conifers will be present. A short-shrub layer is usually present, but is often patchy and rarely has substantial cover. Important shrubs and dwarf-shrubs include *Amelanchier alnifolia*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Juniperus communis*, *Mahonia repens*, *Paxistima myrsinites*, *Purshia tridentata*, and *Ribes cereum*. The herbaceous layer is typically sparse and has low species richness. Cespitose graminoids or forbs tolerant of dry conditions are dominant. Diagnostic of this widespread woodland alliance is the dominance of *Pinus contorta* in a relatively open tree canopy (<60% cover) and the lack of significant *Abies lasiocarpa* regeneration. Sites include canyons, ridges, swales, plateaus, toeslopes, basins, flats, and benches. Slopes and aspects are not consistent. Soils are variable, but tend to be coarse-textured and well-drained. The open tree canopy is related to unusually dry or cold topo-edaphic situations such as excessively well-drained pumice deposits, shallow rocky soils with little water-holding capacity often on warm aspects, and well-drained to xeric stabilized sand dunes.

Classification Comments: This alliance is derived from a series concept, in which associations are distinguished by the dominance of *Pinus contorta* in the tree canopy and the lack of regeneration of other conifers. In the habitat-typing classification system, stands dominated by *Pinus contorta* but with significant regeneration of other conifers, such as *Abies grandis*, *Abies lasiocarpa*, *Picea engelmannii*, *Pseudotsuga menziesii*, *Thuja plicata*, or *Tsuga heterophylla*, have typically been placed into series named for those conifers.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3366 *Pinus contorta* Rocky Mountain Forest Alliance: has more closed canopies (>60% total cover).

Diagnostic Characteristics: Diagnostic of this widespread woodland alliance is the dominance of *Pinus contorta* in a relatively open tree canopy (<60% cover) and the lack of significant *Abies lasiocarpa* regeneration.

VEGETATION

Physiognomy and Structure: These are typically open (<60% cover), sparsely-stocked stands of needle-leaved evergreen trees from 10-30 m in height. Scattered ericaceous shrubs dominate a sparse ground layer, which may include a sparse cover of caespitose graminoids.

Floristics: Although these are usually monotypic stands dominated by *Pinus contorta*, some other trees may occasionally be present, including *Abies grandis*, *Larix occidentalis*, *Picea engelmannii*, *Pinus flexilis*, *Pinus ponderosa*, *Populus tremuloides*, *Pseudotsuga menziesii*, and *Tsuga mertensiana*. A short-shrub layer is usually present, but is often patchy and rarely has substantial cover. *Purshia tridentata* is an important shrub in several associations, particularly on ash or volcanic sands (Volland 1976, Pfister et al. 1977). Other important to dominant shrubs include *Amelanchier alnifolia*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Juniperus communis*, *Mahonia repens*, *Paxistima myrsinites*, and *Ribes cereum*. The herbaceous layer is typically somewhat sparse and dominated by caespitose graminoids or forbs tolerant of dry conditions. Important species include *Achnatherum occidentale* (= *Stipa occidentalis*), *Arnica cordifolia*, *Carex rossii*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Elymus elymoides*, *Eriogonum umbellatum*, *Festuca idahoensis*, *Potentilla fissa*, *Sedum stenopetalum*, and species of *Antennaria*, *Eriophyllum*, *Fragaria*, *Lupinus*, and *Penstemon*.

ENVIRONMENT & DYNAMICS

Environmental Description: *Pinus contorta* occupies the broadest array of habitats of any coniferous species in the western United States. This alliance occurs in the montane and subalpine zones of the Rocky Mountains and eastern Cascade Range with elevations ranging from just over 1200 m in the Cascades to over 3050 m in the Rockies. Temperature regimes are extreme throughout this region and frequent growing-season frosts occur. Annual precipitation in these montane and subalpine habitats ranges from less than 40 cm to over 150 cm annually, usually with the majority falling as snow. Late-melting snowpacks provide the majority of growing-season moisture, particularly in the Cascades. The dominance of *Pinus contorta* in associations in this alliance is related to fire history and topo-edaphic conditions (Pfister et al. 1977, Steele et al. 1983, Mauk and Henderson 1984, Hess and Alexander 1986). Following stand-replacing fires, *Pinus contorta* will rapidly colonize and dominate sites. Most woodlands in this alliance are early- to mid-successional, having developed following fires. However, the persistence of these woodland associations is related to their occurrence on unusually dry or cold topo-edaphic situations. These include excessively well-drained pumice deposits in central Oregon (Volland 1976), obsidian-sand benchlands of alluvial origin in the Yellowstone area of Montana (Pfister et al. 1977), warm and droughty soils with gravelly loam textures (Mauk and Henderson 1984, Hess and Alexander 1986), and well-drained to xeric stabilized sand dunes (Alpert 1984). Slopes and aspects are variable, and can include moderately steep to very steep ridge and canyon slopes, gentle to moderate slopes, ridges and swales, plateaus, butte toeslopes, basins, flats, and benches.

Dynamics: In *Pinus contorta* forests, establishment is episodic and linked to stand-replacing disturbances. The reproductive and seral dynamics of *Pinus contorta* woodlands are less well-described. Chappell et al. (1997) report that *Pinus contorta* woodlands on very deep Mazama pumice deposits in central Oregon are maintained by periodic disturbances from wildfire and insect infestations. Without fires and insects, stands become more closed-canopy forests and quite barren. The incidence of serotinous cones varies within and among varieties of *Pinus contorta*, being most prevalent in Rocky Mountain populations. Closed, serotinous cones appear to be strongly favored by fire, and allow rapid colonization of fire-cleared substrates (Burns and Honkala 1990a).

DISTRIBUTION

Geographic Range: Associations of this alliance occur mainly in the montane and subalpine zones of the northern Rocky Mountains and eastern Cascade Range, although some associations extend into the southern Rocky Mountains.

Nations: CA, US

States/Provinces: AB, CO, ID, MT, NV?, OR, UT, WA?, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< Lodgepole Pine: 218 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEGLO00165 *Pinus contorta* / *Achnatherum occidentale* Woodland
- CEGLO00161 *Pinus contorta* / *Purshia tridentata* - *Ribes cereum* Woodland
- CEGLO00162 *Pinus contorta* var. *latifolia* / *Purshia tridentata* / *Achnatherum occidentale* ssp. *occidentale* Woodland
- CEGLO00765 *Pinus contorta* / *Purshia tridentata* Woodland
- CEGLO00136 *Pinus contorta* / *Artemisia tridentata* / *Festuca idahoensis* Woodland
- CEGLO00137 *Pinus contorta* / *Artemisia tridentata* / *Elymus elymoides* Woodland
- CEGLO05921 *Pinus contorta* / *Clintonia uniflora* - *Xerophyllum tenax* Woodland
- CEGLO05934 *Pinus contorta* / Rock Woodland
- CEGLO00766 *Pinus contorta* Scree Woodland
- CEGLO00149 *Pinus contorta* / *Festuca idahoensis* Woodland
- CEGLO00160 *Pinus contorta* var. *latifolia* / *Purshia tridentata* / *Festuca idahoensis* Woodland
- CEGLO05915 *Pinus contorta* / *Heracleum maximum* Woodland
- CEGLO00764 *Pinus contorta* / *Juniperus communis* Woodland

AUTHORSHIP

Primary Concept Source: F.H. Eyre (1980)

Author of Description: M. E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Alpert 1984, Burns and Honkala 1990a, Chappell et al. 1997, Eyre 1980, Faber-Langendoen et al. 2017b, Hess and Alexander 1986, Mauk and Henderson 1984, Pfister et al. 1977, Steele et al. 1983, Volland 1976

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1. Forest & Woodland
 - 1.B.2.Nb. Rocky Mountain Forest & Woodland
 - 1.B.2.Nb.5.b. M020 Rocky Mountain Subalpine-High Montane Conifer Forest

G219. Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland

Type Concept Sentence: This group consists of matrix forests of the drier sites within the subalpine zone of the Cascades and Rocky Mountains with *Picea engelmannii* and *Abies lasiocarpa* dominating either mixed or alone. These forests often represent the highest elevation forests in an area, and the relatively xeric understory species are diagnostic.

OVERVIEW

Scientific Name: *Picea engelmannii* - *Abies lasiocarpa* - *Pinus contorta* Dry-Mesic Forest & Woodland Group

Common Name (Translated Scientific Name): Engelmann Spruce - Subalpine Fir - Lodgepole Pine Dry-Mesic Forest & Woodland Group

Colloquial Name: Scree & Talus Dry-Mesic Subalpine Fir - Engelmann Spruce Woodland

Type Concept: Engelmann spruce and subalpine fir forests comprise a substantial part of the subalpine forests of the Cascades and Rocky Mountains from southern British Columbia east into Alberta, and south into New Mexico and the Intermountain West region. They also occur on mountain "islands" of north-central Montana. They are the matrix forests of the subalpine zone, with elevations ranging from 1275 m in its northern distribution to 3355 m in the south (4100-11,000 feet). Despite their wide distribution, the tree canopy characteristics are remarkably similar, with *Picea engelmannii* and *Abies lasiocarpa* dominating either mixed or alone. *Pseudotsuga menziesii* may persist in occurrences of this group for long periods without regeneration. *Pinus contorta* is common in many occurrences, and patches of pure *Pinus contorta* are not uncommon, as well as mixed conifer/*Populus tremuloides* stands. In some areas, such as Wyoming, *Picea engelmannii*-dominated forests are on limestone or dolomite, while nearby codominated spruce-fir forests are on granitic or volcanic rocks. Upper elevation examples may have more woodland physiognomy, and *Pinus albicaulis* or *Pinus flexilis* can be a seral component. Relatively xeric understory species are diagnostic of this group and may include *Amelanchier alnifolia*, *Juniperus communis*, *Mahonia repens*, *Physocarpus malvaceus*, *Shepherdia canadensis*, *Vaccinium myrtillus*, or *Vaccinium scoparium*. In the Bighorn Mountains, *Artemisia tridentata* is a common shrub. These forests often represent the highest elevation forests in an area. Sites within this group are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches. Disturbance includes occasional blowdown, insect outbreaks and stand-replacing fire. Mean return interval for stand-replacing fire is 222 years as estimated in southeastern British Columbia.

Classification Comments: What have been called "ribbon forests" or "tree islands" by some authors [citations?] are included in this group; they can be found at upper treeline in many areas of the Rockies, including the central and northern ranges in Colorado and the Medicine Bow and Bighorn ranges of Wyoming. These are more typically islands or ribbons of trees within open-meadow areas.

These patterns are controlled by deposition of windblown snow where deep drifts prevent trees from establishing. The relationship of G218 and G219 may be complicated, given that they are wide-ranging groups, and it could be very hard to cleanly place associations into each group, floristically and geographically.

Similar NVC Types:

- G220 Rocky Mountain Lodgepole Pine Forest & Woodland
- G218 Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland

Diagnostic Characteristics: These subalpine forests and woodlands are characterized by diagnostic subalpine trees *Picea engelmannii*, *Abies lasiocarpa*, and sometimes with *Pinus contorta* with dry to mesic understory shrub species such as *Juniperus communis*, *Mahonia repens*, or *Vaccinium scoparium*. [expand list of diagnostic shrubs and herbs?]

VEGETATION

Physiognomy and Structure: This group is composed of needle-leaved evergreen forests and woodlands dominated by tall (>30 m) trees. Canopy is generally closed to moderately open.

Floristics: This forest and woodland group has a tree canopy typically dominated by *Picea engelmannii* and *Abies lasiocarpa*, either mixed or alone, with a xeric understory species. *Pseudotsuga menziesii* may persist in occurrences of this group for long periods without regeneration. *Pinus contorta* is common in many occurrences, and patches of pure *Pinus contorta* are not uncommon, as well as mixed conifer/*Populus tremuloides* stands. In some areas, such as Wyoming, *Picea engelmannii*-dominated forests are on limestone or dolomite, while nearby codominated spruce-fir forests are on granitic or volcanic rocks. Upper elevation examples may have more woodland physiognomy, and *Pinus albicaulis* or *Pinus flexilis* can be a seral component. Xeric understory species may include shrubs and dwarf-shrubs such as *Jamesia americana*, *Juniperus communis*, *Mahonia repens*, *Physocarpus malvaceus*, *Ribes inerme*, *Rubus parviflorus*, *Shepherdia canadensis*, *Vaccinium cespitosum*, and *Vaccinium scoparium*. In the Bighorn Mountains, *Artemisia tridentata* is a common shrub. *Vaccinium myrtillus* occurs both on dry and mesic sites. More northern occurrences often have taller, more mesic shrub and herbaceous species such as *Empetrum nigrum*. Dry to mesic herbaceous species that are characteristic of this group include *Arnica cordifolia*, *Arnica latifolia*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Carex siccata*, *Leymus triticoides*, and near alpine elevation *Geum rossii* and *Trifolium dasyphyllum*. Mosses may also dominate the understory without significant cover of vascular plants.

ENVIRONMENT & DYNAMICS

Environmental Description: Engelmann spruce and subalpine fir forests comprise a substantial part of the subalpine forests of the Cascades and Rocky Mountains from southern British Columbia east into Alberta, and south into New Mexico and the Intermountain West region. They also occur on mountain "islands" of north-central Montana. They are the matrix forests of the subalpine zone, with elevations ranging from 1275 m in its northern distribution to 3355 m in the south (4100-11,000 feet). They often represent the highest elevation forests in an area. Sites within this group are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches. In some areas, such as Wyoming, these forests are on limestone or dolomite, while nearby forests are on granitic or volcanic rocks. Stands found at upper treeline in many areas of the Rockies, including the central and northern ranges in Colorado and the Medicine Bow and Bighorn ranges of Wyoming, are more typically islands or ribbons of trees, sometimes with a krummholz form, with open-meadow areas in a mosaic. These patterns are controlled by snow deposition and wind-blown ice. *Climate:* Sites within this group are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches.

Dynamics: *Picea engelmannii* can be very long-lived, reaching 500 years of age. *Abies lasiocarpa* decreases in importance relative to *Picea engelmannii* with increasing distance from the region of Montana and Idaho where maritime air masses influence the climate. Disturbance includes occasional blowdown, insect outbreaks and fire. Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. Mean return interval for stand-replacing fire is 222 years as estimated in southeastern British Columbia. *Picea engelmannii* can rapidly recolonize and dominate burned sites, or can succeed other seral species such as *Pinus contorta* or *Populus tremuloides*. Due to great longevity, *Pseudotsuga menziesii* may persist in occurrences of this group for long periods without regeneration. Old-growth characteristics in *Picea engelmannii* forests will include treefall and windthrow gaps in the canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags [citations?].

DISTRIBUTION

Geographic Range: This group is found in the eastern Cascades and throughout the Rocky Mountains from southern interior British Columbia east into Alberta, south into New Mexico and the Intermountain West region. This type tends to be very limited in the northern Oregon Cascades.

Spatial Scale & Pattern [optional]: Matrix

Nations: CA, US

States/Provinces: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 4:C, 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 26:C, 68:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 315A:PP, 321A:CC, 331J:CC, 341A:CC, 341B:CC, 341D:CC, 341E:CP, 341F:CC, 341G:CC, 342A:CC, 342B:CP, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242B:CC, M242C:CC, M242D:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- < EF Engelmann Spruce - Sub-alpine Fir Dry Forested (Ecosystems Working Group 1998) [Dry Grouseberry/Crowberry sites, Azalea/Rhododendron sites in ESSFdv dv1 dv2 xc 3 xc4 xv1 xv2]
- < Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)

LOWER LEVEL UNITS

Alliances:

- A3645 *Abies lasiocarpa* - *Populus tremuloides* Rocky Mountain Dry-Mesic Forest Alliance
- A3643 *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Dry-Mesic Forest Alliance
- A3644 *Abies lasiocarpa* - *Picea engelmannii* Dry-Mesic Scree & Talus Woodland Alliance
- A3641 *Abies lasiocarpa* - *Picea engelmannii* Southern Rocky Mountain Dry-Mesic Forest Alliance
- A3642 *Abies lasiocarpa* - *Picea engelmannii* Treeline Dry-Mesic Forest Alliance

AUTHORSHIP

Primary Concept Source: F.H. Eyre (1980)

Author of Description: K.A. Schulz

Acknowledgments: D. Tart

Version Date: 10/08/2013

Classif Resp Region: West

Internal Author: KAS 2-10, mod. DFL/MEH 10-13, mod. GK 12-15

REFERENCES

References: Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1987, Clagg 1975, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2017a, Fitzhugh et al. 1987, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Hopkins 1979a, Hopkins 1979b, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Komarkova et al. 1988b, Lillybridge et al. 1995, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Muldavin et al. 1996, Peet 1978a, Peet 1981, Pfister 1972, Pfister et al. 1977, Romme 1982, Steele and Geier-Hayes 1995, Steele et al. 1981, Veblen 1986, Whipple and Dix 1979, Williams and Lillybridge 1983, Williams et al. 1995, Youngblood and Mauk 1985

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G219. Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland

A3644. *Abies lasiocarpa* - *Picea engelmannii* Dry-Mesic Scree & Talus Woodland Alliance

Type Concept Sentence: This forest and woodland alliance of the northern, central and southern Rocky Mountains occurs on talus and scree slopes dominated by *Abies lasiocarpa* or *Picea engelmannii*.

OVERVIEW

Scientific Name: *Abies lasiocarpa* - *Picea engelmannii* Dry-Mesic Scree & Talus Woodland Alliance

Common Name (Translated Scientific Name): Subalpine Fir - Engelmann Spruce Dry-Mesic Scree & Talus Woodland Alliance

Colloquial Name: Scree & Talus Dry-Mesic Subalpine Fir - Engelmann Spruce Woodland

Type Concept: This forest and woodland alliance of the northern, central and southern Rocky Mountains occurs on talus and scree slopes. Currently there is no floristic or environmental data available for *Abies lasiocarpa* Scree Woodland (CEGL000925), and therefore the description of this alliance is based on the other two associations attributed here. Canopy cover is open to moderately

closed and dominated by *Abies lasiocarpa* or *Picea engelmannii*. Canopy associates may include *Pseudotsuga menziesii* and occasionally *Pinus strobiformis*. Understories are distinctly shrubby. Dominant shrubs may include *Acer glabrum*, *Holodiscus dumosus*, *Jamesia americana*, *Juniperus communis*, and *Symphoricarpos oreophilus*. The herbaceous layer is poorly represented and may have sparse to moderate cover. The most common species is *Leymus triticoides*. This alliance is restricted to upper elevations above 3020 m and occurs on steep slopes with cobbly soils derived from talus and scree.

Classification Comments: This alliance is provisional as two of the member associations occur in the far southern Rocky Mountains and one occurs in the north-central Rocky Mountains leaving a substantial geographic information gap. This alliance is based upon a series concept in which *Abies lasiocarpa* or *Picea engelmannii* may not be the dominant tree canopy species but is always present in the regeneration layer, and it is assumed would dominate the site should "climax" conditions be reached. These forests and woodlands have been poorly sampled and may prove with further data to be sparsely vegetated types that should be moved into the sparse vegetation class of the USNVC.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Moderately closed to nearly sparse needle-leaved evergreen forests and woodlands of the northern, central and southern Rocky Mountains occurring on scree and talus slopes dominated by *Abies lasiocarpa* or *Picea engelmannii*.

VEGETATION

Physiognomy and Structure: These are forests dominated by needle-leaved evergreen trees up to 45 m in height and moderately closed to nearly sparse (20-100%). Although cold-deciduous trees are relatively rare, they can be prominent in some regional variants or seral stands. Stands may be so tightly stocked that little light reaches the forest floor and understory layers are depauperate. In stands with somewhat more open canopies, a moderately dense shrub layer may be present, dominated by ericaceous or cold-deciduous species. The herbaceous layer is dominated by perennial forbs or sod-forming graminoids, and herbaceous cover increases with increasing light availability and/or soil moisture. There is often significant cover of mosses and sometimes lichens on the forest floor and on downed woody material.

Floristics: Canopy cover is open to moderately closed and dominated by *Abies lasiocarpa* or *Picea engelmannii*. Canopy associates may include *Pseudotsuga menziesii* and occasionally *Pinus strobiformis*. Understories are distinctly shrubby. Dominant shrubs may include *Acer glabrum*, *Holodiscus dumosus*, *Jamesia americana*, *Juniperus communis*, and *Symphoricarpos oreophilus*. The herbaceous layer is poorly represented and may have sparse to moderate cover. The most common species is *Leymus triticoides*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is restricted to upper elevations above 3020 m and occurs on steep slopes with cobbly soils derived from talus and scree.

Dynamics: *Picea engelmannii* is susceptible to infestations by the spruce beetle (*Dendroctonus rufipennis*) or the spruce budworm (*Choristoneura occidentalis*), which can cause high mortality during outbreaks.

DISTRIBUTION

Geographic Range: Little is known about the full distribution of this alliance. Currently it is documented from the Arizona-New Mexico Mountains and the central and southern Rocky Mountains.

Nations: US

States/Provinces: AZ, MT, NM, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Abies lasiocarpa*-*Picea engelmannii* Series (Johnston 1987)
- >< *Picea* series (Pfister et al. 1977)
- >< Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)
- >< Western Needleleaf Forests: 15: Western Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)

- >< Western Needleleaf Forests: 21: Southwestern Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- C EGL000925 *Abies lasiocarpa* Scree Woodland
- C EGL000918 *Abies lasiocarpa* / *Holodiscus dumosus* Scree Woodland
- C EGL000362 *Picea engelmannii* / *Leymus triticoides* Forest

AUTHORSHIP

Primary Concept Source: E. Muldavin, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Eyre 1980, Faber-Langendoen et al. 2017b, Johnston 1987, Küchler 1964, Pfister et al. 1977

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G219. Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland

A3643. *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Dry-Mesic Forest Alliance

Type Concept Sentence: This alliance is characterized by forests and woodlands with broad distributions throughout the southern, central and northern Rocky Mountains and eastern Cascades dominated by *Abies lasiocarpa* and/or *Picea engelmannii*.

OVERVIEW

Scientific Name: *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Dry-Mesic Forest Alliance

Common Name (Translated Scientific Name): Subalpine Fir - Engelmann Spruce Rocky Mountain Dry-Mesic Forest Alliance

Colloquial Name: Rocky Mountain Dry-Mesic Subalpine Fir - Engelmann Spruce Forest

Type Concept: This alliance is characterized by forests and woodlands with broad distributions in the upper montane or subalpine zone throughout the southern, central and northern Rocky Mountains and eastern Cascades dominated by *Abies lasiocarpa* and/or *Picea engelmannii*. Canopies may be open to closed. Common associated conifers can include *Abies concolor*, *Larix occidentalis*, *Picea pungens*, *Pinus albicaulis*, *Pinus aristata*, *Pinus contorta*, *Pinus flexilis*, *Pinus strobiformis*, and *Pseudotsuga menziesii*. Understories are highly variable across the range of this alliance and can be dominated by grasses, dry sedges, mesic forbs or shrubs. Common shrub species can include *Acer glabrum*, *Amelanchier alnifolia*, *Jamesia americana*, *Juniperus communis*, *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Physocarpus monogynus*, *Ribes montigenum*, *Ribes pinetorum*, *Rosa woodsii*, *Salix scouleriana*, *Shepherdia canadensis*, *Spiraea betulifolia*, *Symphoricarpos oreophilus*, *Vaccinium myrtillus*, and *Vaccinium scoparium*. Herbaceous layers may be forb-dominated as well. Species may include *Arnica cordifolia*, *Arnica latifolia*, *Astragalus miser*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Erigeron eximius*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Frasera speciosa*, *Goodyera repens*, *Orthilia secunda*, *Pedicularis racemosa*, *Polemonium pulcherrimum*, and *Solidago multiradiata*. The most common graminoids include *Carex geyeri*, *Carex rossii*, *Luzula parviflora*, and *Poa nervosa*. This alliance occurs above the warmer and drier montane forests of the West, which are typically mixed-coniferous forests, but may extend down into the montane zone where there is cold-air drainage. Parent materials and soils are variable. Sites include gentle to very steep mountain slopes, ridgetops, plateaus, basins, alluvial terraces and benches. All aspects are represented, but northerly and easterly aspects predominate, and southerly aspects are found only at higher elevations. Soils are variable, but often gravelly or rocky, relatively shallow with thick duff layers and sometimes high moss or lichen cover.

Classification Comments: This alliance is based upon a series concept in which *Abies lasiocarpa* and/or *Picea engelmannii* may not be the dominant tree canopy species but are always present in the regeneration layer, and it is assumed would dominate the site should "climax" conditions be reached.

Internal Comments:

Other Comments:

Similar NVC Types: This alliance is distinguished in part from *Abies lasiocarpa* - *Picea engelmannii* Southern Rocky Mountain Dry-Mesic Forest Alliance (A3641) in having a much broader distribution throughout much of the Rocky Mountains.

- A3641 *Abies lasiocarpa* - *Picea engelmannii* Southern Rocky Mountain Dry-Mesic Forest Alliance: has a narrower distribution and species compositions more characteristic to the southern Rocky Mountains.

Diagnostic Characteristics: Needle-leaved evergreen forests and woodlands of the subalpine elevation zones of the Rocky Mountains with dry to mesic moisture regimes. Canopies are dominated by *Abies lasiocarpa* and/or *Picea engelmannii*. Understories are highly variable across the range of this alliance and can be dominated by grasses, dry sedges, mesic forbs or shrubs.

VEGETATION

Physiognomy and Structure: These are forests and woodlands dominated by needle-leaved evergreen trees up to 30 m in height and with open to closed canopy cover (20-100%). Although cold-deciduous trees are relatively rare, they can be prominent in some early-successional stands. Stands may have such high tree density that little light reaches the forest floor and understory layers are depauperate. In stands with somewhat more open canopies, a moderately dense shrub layer may be present, dominated by ericaceous or, less commonly, cold-deciduous species. The ground layer is dominated by perennial forbs or sod-forming graminoids, and herbaceous cover increases with increasing light availability and/or soil moisture. A nonvascular layer of predominantly mosses may be present. Old-growth stands will have hummocky topography, downed logs and snags, and lichens or fungi may cover rotting woody debris.

Floristics: These subalpine forests are characterized by a canopy typically dominated by *Abies lasiocarpa* and/or *Picea engelmannii*. In early- to mid-successional stands, other conifers can be dominant or codominant, but *Picea engelmannii* and *Abies lasiocarpa* are the most abundant seedlings and saplings. In the Northern Rockies and Cascades other important conifers can include *Larix occidentalis*, *Pinus contorta*, *Pinus flexilis*, and *Pseudotsuga menziesii*. On the east side of the Continental Divide, only *Pseudotsuga* and *Pinus contorta* are important, but in northwestern Wyoming and Utah, *Pinus flexilis* or *Pinus albicaulis* can codominate stands at higher elevations. In the southern stands of Colorado and Arizona, other important canopy species may include *Abies concolor*, *Abies lasiocarpa* var. *arizonica*, *Picea pungens*, *Pinus aristata*, *Pinus flexilis*, and *Pinus strobiformis*. The shrub layer is often sparse, but where canopies are more open can be dominated by ericaceous, cold-deciduous or evergreen species such as *Acer glabrum*, *Amelanchier alnifolia*, *Jamesia americana*, *Juniperus communis*, *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Physocarpus monogynus*, *Ribes montigenum*, *Ribes pinetorum*, *Rosa woodsii*, *Salix scouleriana*, *Shepherdia canadensis*, *Spiraea betulifolia*, *Symphoricarpos oreophilus*, *Vaccinium myrtillus*, and *Vaccinium scoparium*. The herbaceous layer can be either depauperate or species-rich, and is most often dominated by perennial forbs. Important to dominant species include *Arnica cordifolia*, *Arnica latifolia*, *Astragalus miser*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Erigeron eximius*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Frasera speciosa*, *Goodyera repens*, *Orthilia secunda*, *Pedicularis racemosa*, *Polemonium pulcherrimum*, and *Solidago multiradiata*. The most common graminoids include *Carex geyeri*, *Carex rossii*, *Luzula parviflora*, and *Poa nervosa*. One association has a depauperate understory, with only mosses having significant cover, such as *Hypnum revolutum*.

ENVIRONMENT & DYNAMICS

Environmental Description: These upper montane or subalpine forests occur in much of the Rocky Mountains and eastern Cascades where they are often the matrix forests and woodlands. They occur above the warmer and drier montane forests of the West, which are typically mixed-coniferous forests. In the Cascade Range, they occupy areas with pronounced rainshadow effects from mountains to the west, where precipitation is more limited than in the surrounding areas. Average temperatures are fairly uniform across the alliance's range, with mean July and January temperatures of 12° and -10°C, respectively (Burns and Honkala 1990a). Snowpacks can be deep, but often melt quickly, and summers are cool. Summer frosts are characteristic, especially on sites where cold air pools. Elevations of occurrence increase with decreasing latitude, ranging from less than 970-1800 m in the Cascades, from 900 m to well over 3200 m in the Northern Rockies of Montana, Idaho and Wyoming, and up to 3350 m in the Colorado Rockies. Sites where these forests and woodlands are found include gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, plateau-like surfaces, basins, alluvial terraces, and well-drained benches. In some locations where there is cold-air drainage, these forests may extend down in elevation into the montane zone, where they will occupy dry stream terraces, toeslopes, or mesic sites with cooler temperature regimes such as northern aspects. Parent materials and soils are variable across the distribution of the alliance. Parent materials include ash, tuff, lava, basalt, granitics, quartzite, dolomite, rhyolite, and other sedimentary rock types. Stands can also occur on colluvium or alluvium. Soils are typically not deep, poorly developed, and can have significant amounts of rock and gravel in the profile. Subalpine soils, such as found associated with these forests, often show evidence of podzolization processes, especially in the north, and poorly decomposed organic layers are common.

Dynamics: *Picea engelmannii* can be very long-lived, reaching 500 years of age. *Abies lasiocarpa* decreases in importance relative to *Picea engelmannii* with increasing distance from the region of Montana and Idaho where maritime air masses influence the climate. Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. *Picea engelmannii* can rapidly recolonize and dominate burned sites, or can succeed to other species such as *Pinus contorta* or *Populus tremuloides*. Due to great longevity, *Pseudotsuga menziesii* may persist in stands of this alliance for long periods without regeneration. Old-growth characteristics in *Picea engelmannii* forests will include treefall and windthrow gaps in the canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags. *Picea engelmannii* is susceptible to infestations by the spruce beetle (*Dendroctonus rufipennis*) or the spruce budworm (*Choristoneura occidentalis*), which can cause high mortality during outbreaks. In the Southwest, *Arceuthobium microcarpum* is a common cause of mortality for the species. *Abies lasiocarpa* forests develop on sites with limited, short growing seasons and

relatively deep winter snowpacks. Tree growth is very slow in these habitats, and forests are rapidly colonized by much more rapidly growing shade-intolerant species, such as *Pseudotsuga menziesii*, *Pinus contorta*, or *Populus tremuloides*, following fire, clearcut logging, or windthrow disturbance. *Abies lasiocarpa* is among the most shade-tolerant trees in the Rocky Mountains, but seedlings compete poorly in greater than 50% full sunlight (Burns and Honkala 1990a). In Oregon and Washington, many communities are bottomland, moist, upper montane forests that rarely burn. Fire is important in many of the more open sites, as well as those on steep slopes. Snow avalanches occur frequently at upper elevations, and can result in a mosaic of varying stand ages on sites affected by this disturbance type.

DISTRIBUTION

Geographic Range: This alliance occupies the subalpine elevation zones of the central, southern and northern Rocky Mountains, east to the Cascades and west to the Wyoming Basins.

Nations: US

States/Provinces: AZ, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Abies lasiocarpa*-*Picea engelmannii* Series (Johnston 1987)
- >< *Picea* series (Pfister et al. 1977)
- >< Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)
- >< Western Needleleaf Forests: 15: Western Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)
- >< Western Needleleaf Forests: 21: Southwestern Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEGLO00301 *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis rubescens* Forest
- CEGLO05638 *Abies lasiocarpa* - (*Pinus contorta*) / *Juniperus communis* - *Lomatium martindalei* Woodland
- CEGLO00298 *Abies lasiocarpa* - *Picea engelmannii* / *Arnica cordifolia* Forest
- CEGLO00323 *Abies lasiocarpa* / *Osmorhiza berteroi* Forest
- CEGLO00326 *Abies lasiocarpa* / *Physocarpus malvaceus* Forest
- CEGLO00318 *Abies lasiocarpa* / *Mahonia repens* Forest
- CEGLO00344 *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* Forest
- CEGLO00368 *Picea engelmannii* / *Hypnum revolutum* Forest
- CEGLO02676 *Picea engelmannii* / *Physocarpus malvaceus* Forest
- CEGLO00305 *Abies lasiocarpa* / *Carex rossii* Forest
- CEGLO00919 *Abies lasiocarpa* - *Picea engelmannii* / *Juniperus communis* Woodland
- CEGLO00381 *Picea engelmannii* / *Vaccinium scoparium* Forest
- CEGLO00304 *Abies lasiocarpa* - *Picea engelmannii* / *Carex geyeri* Forest
- CEGLO00306 *Abies lasiocarpa* / *Clematis columbiana* var. *columbiana* Forest
- CEGLO00324 *Abies lasiocarpa* / *Paxistima myrsinites* Woodland
- CEGLO00299 *Abies lasiocarpa* - *Picea engelmannii* / *Arnica latifolia* Forest
- CEGLO00355 *Picea engelmannii* / *Arnica cordifolia* Forest
- CEGLO05925 *Picea engelmannii* / *Juniperus communis* Forest
- CEGLO00379 *Picea engelmannii* / *Vaccinium myrtillus* Forest
- CEGLO00343 *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium myrtillus* Forest
- CEGLO00325 *Abies lasiocarpa* / *Pedicularis racemosa* Forest

AUTHORSHIP

Primary Concept Source: B.C. Johnston (1987)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Burns and Honkala 1990a, Eyre 1980, Faber-Langendoen et al. 2017b, Horton 1971, Johnson and Simon 1987, Johnston 1987, Küchler 1964, Pfister et al. 1977

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G219. Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland

A3641. *Abies lasiocarpa* - *Picea engelmannii* Southern Rocky Mountain Dry-Mesic Forest Alliance

Type Concept Sentence: This alliance is known from the Colorado Plateau, Arizona - New Mexico Mountains and southern Rocky Mountains and consists of forests dominated by *Abies lasiocarpa* and/or *Picea engelmannii*.

OVERVIEW

Scientific Name: *Abies lasiocarpa* - *Picea engelmannii* Southern Rocky Mountain Dry-Mesic Forest Alliance

Common Name (Translated Scientific Name): Subalpine Fir - Engelmann Spruce Southern Rocky Mountain Dry-Mesic Forest Alliance

Colloquial Name: Southern Rocky Mountain Dry-Mesic Subalpine Fir - Engelmann Spruce Forest & Woodland

Type Concept: These upper montane or subalpine conifer forests occur in many of the mountainous areas of the Colorado Plateau, Arizona - New Mexico Mountains and southern Rocky Mountains where they are often the matrix forests of the subalpine zone. *Abies lasiocarpa* and *Picea engelmannii* generally are dominant singly or in combination. *Picea engelmannii* will often be prominent on more moist sites or in more mature stands. Associates vary geographically. Common associated trees species, particularly in seral stands, may include *Pinus aristata*, *Pinus contorta*, *Pinus flexilis*, *Populus tremuloides*, and *Pseudotsuga menziesii*. Forest understories are highly variable across the range of this alliance and can be dominated by dry sedges, grasses, forbs or shrubs. Dominant shrubs may include *Acer glabrum*, *Jamesia americana*, *Juniperus communis*, *Lonicera utahensis*, *Paxistima myrsinites*, *Ribes pinetorum*, *Rubus idaeus*, *Salix scouleriana*, *Sambucus racemosa* var. *melanocarpa* (= *Sambucus melanocarpa*), *Symphoricarpos oreophilus*, *Vaccinium cespitosum*, *Vaccinium myrtillus*, and *Vaccinium scoparium*. Common and dominant graminoids may include *Bromus ciliatus* var. *richardsonii* (= *Bromus richardsonii*), *Carex siccata* (= *Carex foenea*), *Poa fendleriana*, and *Poa pratensis*. Forb cover is relatively low to moderate and may consist of *Actaea rubra* ssp. *arguta* (= *Actaea arguta*), *Aquilegia* spp., *Campanula rotundifolia*, *Galium* spp., *Lathyrus lanszwertii* var. *leucanthus* (= *Lathyrus arizonicus*), *Ligusticum porteri*, *Mertensia franciscana*, *Oreochrysum parryi* (= *Solidago parryi*), *Orthilia secunda* (= *Ramischia secunda*), *Osmorhiza depauperata*, *Packera sanguisorboides* (= *Senecio sanguisorboides*), *Pteridium aquilinum*, *Senecio* spp., *Trisetum spicatum* (= *Trisetum montanum*), *Vicia americana*, *Vicia americana*, *Viola canadensis*, and *Woodsia* spp., These forests occur above the warmer and drier montane forests of the West, which are typically mixed-coniferous forests, but may extend down into the montane zone where there is cold-air drainage. Parent materials and soils are variable. Sites include gentle to very steep mountain slopes, ridgetops, plateaus, basins, alluvial terraces and benches. All aspects are represented, but northerly and easterly aspects predominate, and southerly aspects are found only at higher elevations. Typically, soils are not deep, poorly developed and rocky.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types: This alliance is distinguished from *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Dry-Mesic Forest Alliance (A3643) in being characterized by associations with species compositions more characteristic to the southern Rocky Mountains.

- A3643 *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Dry-Mesic Forest Alliance: has a much broader distribution throughout much of the Rocky Mountains.

Diagnostic Characteristics: Needle-leaved evergreen forests and woodlands of the southern Rocky Mountains dominated by *Abies lasiocarpa* and/or *Picea engelmannii*. Diagnostic of forests in this alliance is that they are upland forests (non-flooded) with average tree canopy cover greater than 60%. Understories are distinguished from those of similar alliances in species compositions with distributions centered in the southern Rocky Mountains as opposed to the more ubiquitous species distributed more broadly to the north.

VEGETATION

Physiognomy and Structure: These are forests dominated by needle-leaved evergreen trees up to 45 m in height and of high cover (60-100%). Although cold-deciduous trees are relatively rare, they can be prominent in some regional variants or seral stands. Stands may be so tightly stocked that little light reaches the forest floor and understory layers are depauperate. In stands with somewhat more open canopies, a moderately dense shrub layer may be present, dominated by ericaceous or cold-deciduous species. The herbaceous layer is dominated by perennial forbs or sod-forming graminoids, and herbaceous cover increases with increasing light

availability and/or soil moisture. There is often significant cover of mosses and sometimes lichens on the forest floor and on downed woody material.

Floristics: These subalpine forests are characterized by a canopy varying from 20-45 m in height dominated by *Picea engelmannii* and/or *Abies lasiocarpa*. In early- to mid-successional stands, other conifers can be dominant or codominant, but *Picea engelmannii* and *Abies lasiocarpa* are the most abundant seedlings and saplings. Important, but usually seral, tree species include *Pinus contorta*, *Pseudotsuga menziesii*, and *Populus tremuloides*. Other trees in these stands include *Picea pungens*, *Pinus aristata*, *Pinus flexilis*, and *Pinus strobiformis*. Forest understories are highly variable across the range of this alliance and can be dominated by dry sedges, grasses, forbs or shrubs. The shrub layer may be sparse to well-developed. Dominant shrubs may include *Acer glabrum*, *Jamesia americana*, *Juniperus communis*, *Lonicera utahensis*, *Paxistima myrsinites*, *Ribes pinetorum*, *Rubus idaeus*, *Salix scouleriana*, *Sambucus racemosa* var. *melanocarpa* (= *Sambucus melanocarpa*), *Symphoricarpos oreophilus*, *Vaccinium cespitosum*, *Vaccinium myrtilloides*, and *Vaccinium scoparium*. Common and dominant graminoids may include *Bromus ciliatus* var. *richardsonii* (= *Bromus richardsonii*), include *Carex siccata* (= *Carex foenea*), *Poa fendleriana*, and *Poa pratensis*. Forb cover is low to moderate and may consist of *Actaea rubra* ssp. *arguta* (= *Actaea arguta*), *Aquilegia* spp., *Campanula rotundifolia*, *Galium* spp., *Lathyrus lanszwertii* var. *leucanthus* (= *Lathyrus arizonicus*), *Ligusticum porteri*, *Mertensia franciscana*, *Oreochrysum parryi* (= *Solidago parryi*), *Orthilia secunda* (= *Ramischia secunda*), *Osmorhiza depauperata*, *Packera sanguisorboides* (= *Senecio sanguisorboides*), *Pteridium aquilinum*, *Senecio* spp., *Trisetum spicatum* (= *Trisetum montanum*), *Vicia americana*, *Viola canadensis*, and *Woodsia* spp.

ENVIRONMENT & DYNAMICS

Environmental Description: These upper montane or subalpine forests occur in many of the mountainous areas of the Colorado Plateau, Arizona - New Mexico Mountains and southern Rocky Mountains, where they are often the matrix forests of the subalpine zone. They occur above the warmer and drier montane forests of the West, which are typically mixed-coniferous forests. Average temperatures are fairly uniform across the alliance's range, with mean July and January temperatures of 12° and -10°C, respectively (Burns and Honkala 1990a). Snowpacks can be deep, but often melt quickly, and summers are cool. Summer frosts are characteristic, especially on sites where cold air pools. Elevations range from 2600-3500 m. Sites include gentle to very steep mountain slopes, ridgetops, and plateaus. In some locations where there is cold-air drainage, these forests may extend down in elevation into the montane zone, where they will occupy dry stream terraces, toeslopes, with cooler temperature regimes such as northern aspects. Parent materials and soils are variable across the distribution of the alliance. Parent materials include ash, tuff, lava, basalt, granitics, quartzite, dolomite, rhyolite, and other sedimentary rock types. Stands can also occur on colluvium or alluvium. Soils are typically not deep, poorly developed, and can have significant amounts of rock and gravel in the profile. Subalpine soils, such as those found associated with these forests, often show evidence of podzolization processes, especially in the north, and poorly decomposed organic layers are common.

Dynamics: *Abies lasiocarpa* and *Picea engelmannii* forests develop on sites with limited, short growing seasons and relatively deep winter snowpacks. Tree growth is very slow in these habitats, and forests are rapidly colonized by much more rapidly growing shade-intolerant species, such as *Pseudotsuga menziesii*, *Pinus contorta*, or *Populus tremuloides*, following fire, clearcut logging, or windthrow disturbance. *Abies lasiocarpa* is among the most shade-tolerant trees in the Rocky Mountains, but seedlings compete poorly in greater than 50% full sunlight (Burns and Honkala 1990a). Snow avalanches occur frequently at upper elevations, and can result in a mosaic of varying stand ages on sites affected by this disturbance type. *Picea engelmannii* is susceptible to infestations by the spruce beetle (*Dendroctonus rufipennis*) or the spruce budworm (*Choristoneura occidentalis*), which can cause high mortality during outbreaks. In the Southwest, *Arceuthobium microcarpum* is a common cause of mortality for the species.

DISTRIBUTION

Geographic Range: This alliance occurs in the Colorado Plateau, Arizona - New Mexico Mountains and southern Rocky Mountains of Arizona, Colorado, Nevada, Wyoming, New Mexico and possibly Utah.

Nations: US

States/Provinces: AZ, CO, NM, NV, UT?, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Abies lasiocarpa*-*Picea engelmannii* Series (Johnston 1987)
- >< *Picea* series (Pfister et al. 1977)
- >< Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)

- >< Western Needleleaf Forests: 15: Western Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)
- >< Western Needleleaf Forests: 21: Southwestern Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEGLO00333 *Abies lasiocarpa* / *Packera sanguisorboides* Forest
- CEGLO00371 *Picea engelmannii* / Moss Forest
- CEGLO00321 *Abies lasiocarpa* - *Picea engelmannii* / Moss Forest
- CEGLO00303 *Abies lasiocarpa* - *Picea engelmannii* / *Carex siccata* Forest
- CEGLO00313 *Abies lasiocarpa* / *Lathyrus lanszwertii* var. *leucanthus* Forest
- CEGLO00312 *Abies lasiocarpa* / *Jamesia americana* Forest

AUTHORSHIP

Primary Concept Source: M.S. Reid and D. Sarr, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Burns and Honkala 1990a, Eyre 1980, Faber-Langendoen et al. 2017b, Johnston 1987, Küchler 1964, Pfister et al. 1977

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G219. Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland

A3642. *Abies lasiocarpa* - *Picea engelmannii* Treeline Dry-Mesic Forest Alliance

Type Concept Sentence: Forests occurring at or near treeline in the Front Range of the Rocky Mountains in Wyoming and Colorado and dominated by *Abies lasiocarpa* and/or *Picea engelmannii*.

OVERVIEW

Scientific Name: *Abies lasiocarpa* - *Picea engelmannii* Treeline Dry-Mesic Forest Alliance

Common Name (Translated Scientific Name): Subalpine Fir - Engelmann Spruce Treeline Dry-Mesic Forest Alliance

Colloquial Name: Treeline Dry-Mesic Subalpine Fir - Engelmann Spruce Forest

Type Concept: These forests occur at or near treeline in the Front Range of the Rocky Mountains. Canopies are dominated by *Abies lasiocarpa* and/or *Picea engelmannii* and stand structure may take on a ribbon or tree island form. *Abies lasiocarpa*, *Pinus flexilis*, and *Pinus aristata* are minor components in the canopy and very infrequent in the understory. The shrub layer is sparse and species-poor although *Ribes montigenum* and *Vaccinium scoparium* may be present. Herbaceous species may be absent or sparse and typically include the forbs *Geum rossii* and *Trifolium dasyphyllum*. These forests occur at 3300-3450 m (10,810-11,320 feet) elevation, just below krummholz timberline. Sites are gentle to moderately steep slopes that are relatively xeric, cold and exposed.

Classification Comments: This alliance is based upon four associations, for which only one has detailed floristic and environmental information. Furthermore, the composition of tree islands and ribbon forests has not been adequately sampled. Therefore, further information will be required to complete a more comprehensive description of this alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Open- to closed-canopy needle-leaved evergreen forests occurring at or near treeline dominated by *Abies lasiocarpa* and/or *Picea engelmannii*. Diagnostic of this alliance in part are forests with ribbon or tree island structures.

VEGETATION

Physiognomy and Structure: These are forests dominated by needle-leaved evergreen with open to high cover (20-100%). Understory layers are typically depauperate.

Floristics: Canopies are dominated by *Abies lasiocarpa* and/or *Picea engelmannii* and stand structure may take on a ribbon or tree island form. *Abies lasiocarpa*, *Pinus flexilis*, and *Pinus aristata* are minor components in the canopy and very infrequent in the understory. The shrub layer is sparse and species-poor although *Ribes montigenum* and *Vaccinium scoparium* may be present. Herbaceous species may be absent or sparse and typically include the forbs *Geum rossii* and *Trifolium dasyphyllum*.

ENVIRONMENT & DYNAMICS

Environmental Description: These forests occur at 3300-3450 m (10,810-11,320 feet) elevation, just below krummholz timberline. Sites are gentle to moderately steep slopes that are relatively xeric, cold and exposed.

Dynamics: *Abies lasiocarpa* forests develop on sites with limited, short growing seasons and relatively deep winter snowpacks. Tree growth is very slow in these habitats, and forests are rapidly colonized by much more rapidly growing shade-intolerant species, such as *Pseudotsuga menziesii*, *Pinus contorta*, or *Populus tremuloides*, following fire, clearcut logging, or windthrow disturbance. *Abies lasiocarpa* is among the most shade-tolerant trees in the Rocky Mountains, but seedlings compete poorly in greater than 50% full sunlight (Burns and Honkala 1990a). Snow avalanches occur frequently at upper elevations, and can result in a mosaic of varying stand ages on sites affected by this disturbance type.

DISTRIBUTION

Geographic Range: This alliance is known from the central and southern Rocky Mountains of Wyoming and Colorado. Stands may also occur in Arizona and Utah.

Nations: US

States/Provinces: AZ?, CO, UT?, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Abies lasiocarpa*-*Picea engelmannii* Series (Johnston 1987)
- >< *Picea* series (Pfister et al. 1977)
- >< Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)
- >< Western Needleleaf Forests: 15: Western Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)
- >< Western Needleleaf Forests: 21: Southwestern Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)

LOWER LEVEL UNITS**Associations:**

- CEGLO00328 *Abies lasiocarpa* - *Picea engelmannii* Ribbon Forest
- CEGLO00366 *Picea engelmannii* / *Geum rossii* Forest
- CEGLO00377 *Picea engelmannii* / *Trifolium dasyphyllum* Forest
- CEGLO00329 *Abies lasiocarpa* - *Picea engelmannii* Tree Island Forest

AUTHORSHIP

Primary Concept Source: B.C. Johnston (1984)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Burns and Honkala 1990a, Eyre 1980, Faber-Langendoen et al. 2017b, Johnston 1984, Johnston 1987, Küchler 1964, Pfister et al. 1977

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G219. Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland

A3645. *Abies lasiocarpa* - *Populus tremuloides* Rocky Mountain Dry-Mesic Forest Alliance

Type Concept Sentence: This forest alliance of the southern and central Rocky Mountains and Intermountain West is composed of forests with mixed canopies dominated by *Abies lasiocarpa* and *Populus tremuloides*.

OVERVIEW

Scientific Name: *Abies lasiocarpa* - *Populus tremuloides* Rocky Mountain Dry-Mesic Forest Alliance

Common Name (Translated Scientific Name): Subalpine Fir - Quaking Aspen Rocky Mountain Dry-Mesic Forest Alliance

Colloquial Name: Rocky Mountain Dry-Mesic Subalpine Fir - Aspen Forest

Type Concept: Stands included in this mixed evergreen-deciduous forest alliance have been described from mountain slopes and plateaus in the central Rocky Mountains and Intermountain West. The mixed coniferous and deciduous tree canopy is open to moderately closed and dominated by *Populus tremuloides* and *Abies lasiocarpa* or *Picea engelmannii*. Several other species of conifers may be scattered within the stands, including *Abies concolor*, *Picea pungens*, *Pinus contorta*, *Pinus flexilis*, and *Pseudotsuga menziesii*. Younger stands typically have dense *Populus tremuloides*, with *Abies lasiocarpa* or *Picea engelmannii* mixed in. As the stands age in this typically seral forest alliance, *Populus tremuloides* is slowly reduced until conifers become dominant. Mixed stands must have at least 25% relative tree cover of both aspen (deciduous) and conifers. The understory is typically composed of a short-shrub layer often dominated by *Juniperus communis*, *Shepherdia canadensis*, or *Symphoricarpos oreophilus*. Other shrubs may include *Mahonia repens*, *Paxistima myrsinites*, *Physocarpus malvaceus*, and *Rosa woodsii*. If present, the tall-shrub layer often consists of scattered *Amelanchier alnifolia*, *Acer grandidentatum*, and *Prunus virginiana*. The relatively sparse herbaceous layer is a mixture of graminoids and forbs and is often dominated by *Bromus carinatus*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Pedicularis racemosa*, or *Thalictrum fendleri*. Stands occur on gentle to steep slopes on all aspects but are most common on cooler and more mesic, north and east aspects. Soils are derived from alluvium and colluvium from sedimentary, metamorphic and igneous parent materials.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of these seral forests is the open to moderately closed, mixed coniferous and deciduous tree canopy codominated by *Populus tremuloides* and *Abies lasiocarpa* or *Picea engelmannii*. Stands must have at least 25% relative tree cover of both aspen (deciduous) and conifers.

VEGETATION

Physiognomy and Structure: Vegetation included in this minor alliance has a moderately dense to dense upper canopy of mixed deciduous broad-leaved and evergreen needle-leaved trees (5-20 m tall). The understory has a moderate to sparse short-shrub layer typically dominated by evergreen, scale-leaved or deciduous broad-leaved shrub species. A sparse tall-shrub layer, dominated by deciduous broad-leaved shrubs, may be present. A moderate to sparse herbaceous layer may also be present, dominated by perennial forbs or graminoids.

Floristics: Seral forests are included in this Rocky Mountain alliance. The open to moderately closed, mixed evergreen needle-leaved and deciduous broad-leaved tree canopy is composed of short to moderately tall trees and is codominated by *Populus tremuloides* and *Abies lasiocarpa* or *Picea engelmannii*. Several other species of conifers may be scattered within the stands, including *Abies concolor*, *Picea pungens*, *Pinus contorta*, *Pinus flexilis*, and *Pseudotsuga menziesii*. Younger stands typically have dense *Populus tremuloides*, with *Abies lasiocarpa* or *Picea engelmannii* mixed in. As the stands age in this typically seral forest alliance, *Populus tremuloides* is slowly reduced until conifers become dominant (Mueggler 1988). Mixed stands must have at least 25% relative tree cover of both aspen (deciduous) and conifers. The understory is typically moderately dense to sparse and becomes sparser as *Abies lasiocarpa* or *Picea engelmannii* become more dominant. The understory is typically dominated by a short-shrub layer, with sparse tall-shrub and herbaceous layers. The short-shrub layer is often dominated by *Juniperus communis* or *Shepherdia canadensis*. Other shrubs may include *Mahonia repens*, *Paxistima myrsinites*, *Physocarpus malvaceus*, and *Rosa woodsii*. If present, the tall-shrub layer often consists of scattered *Amelanchier alnifolia*, *Acer grandidentatum*, and *Prunus virginiana*. The relatively sparse herbaceous layer is a mixture of graminoids and forbs and is often dominated by *Bromus carinatus*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Pedicularis racemosa*, or *Thalictrum fendleri*. Other common graminoids include *Achnatherum occidentale* (= *Stipa occidentalis*), *Bromus ciliatus*, *Elymus glaucus*, and *Elymus trachycaulus*. Forbs such as *Achillea millefolium*, *Arnica cordifolia*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Eucephalus engelmannii* (= *Aster engelmannii*), *Fragaria vesca*, *Geranium* spp., *Lathyrus* spp., *Lupinus* spp., *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Senecio serra*, and *Pseudostellaria jamesiana* (= *Stellaria jamesiana*) are common. The exotic species *Poa pratensis* and *Taraxacum officinale* are common in livestock-impacted stands (Mueggler 1988). Annuals are typically uncommon.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands included in this mixed evergreen-deciduous forest alliance have been described from mountain slopes and plateaus in the central Rocky Mountains and parts of the Intermountain West. Elevations range from 1700 to 3000 m. Climate is temperate with cold winters. Mean annual precipitation is greater than 38 cm and typically greater than 50 cm. Sites occur on gentle to steep slopes on all aspects but are most common on north and east aspects. Soils are derived from alluvium and colluvium from sedimentary, metamorphic and igneous parent materials.

Dynamics: Stems of *Populus tremuloides* are thin-barked and readily killed by fire. It is a fire-adapted species that generally needs fire or some other stand-replacing disturbance to establish and maintain dominance in a forest. These mixed forests are seral and in the absence of disturbance will slowly convert to late-successional forests dominated by *Abies lasiocarpa* or *Picea engelmannii* (Mueggler 1988). Most of the stands sampled by Mueggler (1988) have had a history of livestock grazing as evidenced by relative abundance of the exotic plants *Taraxacum officinale* and *Poa pratensis* and the scarcity of grazing-susceptible plants (Mueggler 1988).

DISTRIBUTION

Geographic Range: Forests included in this alliance are scattered in the mountains and plateaus of Utah, Wyoming, Colorado, and Idaho

Nations: US

States/Provinces: CO, ID, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Abies lasiocarpa* Series (Mauk and Henderson 1984) [Early-seral stands in this habitat type may have significant *Populus tremuloides*.]
- >< Aspen: 217 (Eyre 1980)
- >< Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- C EGL000525 *Populus tremuloides* - *Abies lasiocarpa* / *Carex geyeri* - *Calamagrostis rubescens* Forest
- C EGL000526 *Populus tremuloides* - *Abies lasiocarpa* / *Carex rossii* Forest
- C EGL000524 *Populus tremuloides* - *Abies lasiocarpa* / *Amelanchier alnifolia* Forest
- C EGL000528 *Populus tremuloides* - *Abies lasiocarpa* / *Pedicularis racemosa* Forest
- C EGL000527 *Populus tremuloides* - *Abies lasiocarpa* / *Juniperus communis* Forest
- C EGL000529 *Populus tremuloides* - *Abies lasiocarpa* / *Shepherdia canadensis* Forest

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Eyre 1980, Faber-Langendoen et al. 2017b, Mauk and Henderson 1984, Mueggler 1988, Mueggler and Campbell 1986

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

1.B.2.Nb.5.c. M020 Rocky Mountain Subalpine-High Montane Conifer Forest

G218. Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland

Type Concept Sentence: This is a high-elevation forest group of mesic sites within the Rocky Mountains and eastern Cascades dominated by *Picea engelmannii* and *Abies lasiocarpa* where occurrences are typically found in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer. Moisture-loving understory species are diagnostic of this group.

OVERVIEW

Scientific Name: *Picea engelmannii* - *Abies lasiocarpa* - *Tsuga mertensiana* Moist Forest & Woodland Group

Common Name (Translated Scientific Name): Engelmann Spruce - Subalpine Fir - Mountain Hemlock Moist Forest & Woodland Group

Colloquial Name: Rocky Mountain Subalpine Fir - Engelmann Spruce Moist Forest

Type Concept: This is a high-elevation group of the Rocky Mountains and eastern Cascades dominated by *Picea engelmannii* and *Abies lasiocarpa*. It extends westward into the northeastern side of Mount Rainier in Washington, and as far east as mountain

"islands" of north-central Montana. *Picea engelmannii* is generally more important in southern forests than those in the Pacific Northwest. Occurrences are typically found in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They can extend down in elevation below the subalpine zone in places where cold-air ponding occurs; northerly and easterly aspects predominate. These forests are found on gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, plateaulike surfaces, basins, alluvial terraces, well-drained benches, and inactive stream terraces. In the northern Rocky Mountains of northern Idaho and Montana, *Tsuga mertensiana* occurs as small to large patches within the matrix of this mesic spruce-fir group and only in the most maritime of environments (the coldest and wettest of the more Continental subalpine fir forests). In parts of the northern Cascades, the climate is more maritime than typical for this group, but due to the lower snowfall in these rainshadow areas, summer drought may be more significant than snowpack in limiting tree regeneration in burned areas. *Picea engelmannii* is rare in these areas. *Populus tremuloides* is a common codominant tree in many disturbed stands. Moisture-loving understory species are diagnostic of this group and may include shrubs *Cornus canadensis*, *Ledum glandulosum* (rare), *Menziesia ferruginea*, *Phyllodoce empetriformis*, *Rhododendron albiflorum*, *Rubus parviflorus*, *Salix* spp. and *Vaccinium membranaceum*. The understory may also be dominated by mesic herbaceous species such as *Actaea rubra*, *Calamagrostis canadensis*, *Clintonia uniflora*, *Erigeron eximius*, *Gymnocarpium dryopteris*, *Luzula glabrata* var. *hitchcockii*, *Maianthemum stellatum*, *Rubus pedatus*, *Saxifraga bronchialis*, *Thalictrum* spp., *Tiarella* spp., and *Valeriana sitchensis*. Disturbances include occasional blowdown, insect outbreaks (30-50 years), mixed-severity fire, and stand-replacing fire (every 150-500 years). The more summer-dry climatic areas also have occasional high-severity fires.

Classification Comments: This group is similar to Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland Group (G219) but is distinguished by its occurrence on mesic to wet microsites within the matrix of the drier (and warmer) subalpine spruce-fir or lodgepole pine forests. The microsites include north-facing slopes, swales or ravines, toeslopes, cold pockets, and other locations where available soil moisture is higher or lasts longer into the growing season. This group is NOT confined to the northern Rocky Mountains or Pacific Northwest (it is not geographically defined, rather by topographic settings in the subalpine). In the Canadian Rockies, this group transitions to a yet-to-be described Boreal mesic mixed-conifer group, where *Abies lasiocarpa* and *Picea engelmannii* occur with boreal taxa, such as *Picea mariana* or *Picea glauca*.

While the name of this group suggests a Rocky Mountain distribution, floristic affinities of Engelmann spruce-subalpine fir forests in the eastern Cascades of Washington and Oregon are such that the spruce-fir forests of those regions are included in this group. The subalpine fir and Engelmann spruce-dominated forests of the northeastern side of Mount Rainier are included here. They are more similar to subalpine fir forests on the eastern slopes of the Cascades than they are to mountain hemlock forests. Subalpine fir forests found on the Olympic Peninsula and west of the Cascade crest are typically mixed with *Tsuga mertensiana*, *Abies amabilis*, *Callitropsis nootkatensis*, and other species with "Vancouverian rainforest" affinities, and are not included in this group.

The following associations need further review to confirm their placement in this group: *Abies lasiocarpa* / *Cornus canadensis* Forest (CEGL000309) (swamp type?); *Abies lasiocarpa* - *Picea engelmannii* / *Ribes* (*montigenum*, *lacustre*, *inermis*) Forest (CEGL000331) (a hodge-podge of indicators); *Populus tremuloides* - *Abies lasiocarpa* / *Symphoricarpos oreophilus* / *Bromus carinatus* Forest (CEGL000530) (G219?); *Populus tremuloides* - *Abies lasiocarpa* / *Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000531) (G219?); and *Populus tremuloides* - *Abies lasiocarpa* / *Symphoricarpos oreophilus* / *Thalictrum fendleri* Forest (CEGL000532) (G219?).

Similar NVC Types:

- G220 Rocky Mountain Lodgepole Pine Forest & Woodland
- G223 Northern Rocky Mountain Whitebark Pine - Subalpine Larch Woodland: could also be considered as one or two alliances within the spruce-fir group.
- G219 Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland

Diagnostic Characteristics: These subalpine forest and woodlands are characterized by diagnostic subalpine trees *Picea engelmannii*, *Abies lasiocarpa*, and sometimes with *Tsuga mertensiana* with mesic to wet understory shrub species such as *Cornus canadensis*, *Ledum glandulosum*, *Menziesia ferruginea*, *Phyllodoce empetriformis*, *Rhododendron albiflorum*, *Rubus parviflorus*, *Salix* spp., and *Vaccinium membranaceum*, or mesic to wet herbaceous species such as *Actaea rubra*, *Calamagrostis canadensis*, *Clintonia uniflora*, *Erigeron eximius*, *Gymnocarpium dryopteris*, *Luzula glabrata* var. *hitchcockii*, *Maianthemum stellatum*, *Rubus pedatus*, *Saxifraga bronchialis*, *Thalictrum fendleri*, *Tiarella* spp., and *Valeriana sitchensis*.

VEGETATION

Physiognomy and Structure: This group is composed of needle-leaved evergreen forests and woodlands dominated by tall (>30 m) trees. Canopy is generally closed to moderately open.

Floristics: This is a high-elevation group of the Rocky Mountains and dry eastern Cascades typically dominated by *Picea engelmannii* and *Abies lasiocarpa*. In the northern Rocky Mountains of northern Idaho and Montana, *Tsuga mertensiana* occurs as small to large patches within the matrix of this mesic spruce-fir group and only in the most maritime of environments (the coldest and wettest of the more Continental subalpine fir forests). *Populus tremuloides* is a common codominant tree in many disturbed stands. Moisture-

loving wet understory species are diagnostic of this group and may include shrubs *Cornus canadensis*, *Ledum glandulosum*, *Menziesia ferruginea*, *Phyllodoce empetrifoliosa*, *Rhododendron albiflorum*, *Rubus parviflorus*, *Salix brachycarpa*, *Salix glauca*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Vaccinium membranaceum*. The understory may also be dominated by herbaceous species such as *Actaea rubra*, *Calamagrostis canadensis*, *Carex siccata*, *Clintonia uniflora*, *Erigeron eximius*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Gymnocarpium dryopteris*, *Heracleum maximum*, *Luzula glabrata* var. *hitchcockii*, *Maianthemum stellatum*, *Osmorhiza berteroi*, *Osmorhiza occidentalis*, *Packera cardamine*, *Packera sanguisorboides*, *Pedicularis racemosa*, *Rubus pedatus*, *Rudbeckia occidentalis*, *Saxifraga bronchialis*, *Thalictrum fendleri*, *Tiarella* spp., *Valeriana occidentalis*, *Valeriana sitchensis*, and *Xerophyllum tenax*.

ENVIRONMENT & DYNAMICS

Environmental Description: Occurrences are typically found at high elevations in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They can extend down in elevation below the subalpine zone in places where cold-air ponding occurs; northerly and easterly aspects predominate. These forests are found on gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, plateaulike surfaces, basins, alluvial terraces, well-drained benches, and inactive stream terraces. *Climate:* Sites within this group are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches. Occurrences are typically found in locations with ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They can extend down in elevation below the subalpine zone in places where cold-air ponding occurs; northerly and easterly aspects predominate.

Dynamics: Disturbances include occasional blowdown, insect outbreaks (30-50 years), mixed-severity fire, and stand-replacing fire (every 150-500 years). The more summer-dry climatic areas also have occasional high-severity fires.

DISTRIBUTION

Geographic Range: This group is found at high elevations of the Rocky Mountains, extending west into the northeastern side of Mount Rainier in Washington, and as far east as mountain "islands" of north-central Montana.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, US

States/Provinces: AB, AZ, BC, CA?, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 4:C, 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 26:C, 68:C

USFS Ecoregions (2007): 242A:CC, 313A:CC, 313B:CC, 315A:??, 331J:CC, 341A:CC, 341B:CC, 341D:CC, 341E:CP, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CP, 342D:CC, 342E:CC, 342H:CC, 342I:C?, 342J:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- < Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)
- >< Mountain Hemlock: 205 (Eyre 1980) [Mountain hemlock in the northern Rockies of MT, ID and northeast WA is included in this group.]

LOWER LEVEL UNITS

Alliances:

- A3617 *Tsuga mertensiana* Rocky Mountain Forest Alliance
- A0422 *Abies lasiocarpa* - *Populus tremuloides* Rocky Mountain Moist Forest Alliance
- A3614 *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Moist Forest Alliance
- A3616 *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Talus & Scree Woodland Alliance
- A3615 *Abies lasiocarpa* - *Picea engelmannii* Southern Rocky Mountain Moist Forest Alliance

AUTHORSHIP

Primary Concept Source: F.H. Eyre (1980)

Author of Description: K.A. Schulz

Acknowledgments: D. Tart

Version Date: 10/08/2013

Classif Resp Region: West

Internal Author: KAS 2-10, mod. DFL 10-13, mod. GK 12-15

REFERENCES

References: Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1987, BCMF 2006, Banner et al. 1993, Clagg 1975, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2017a, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Komarkova et al. 1988b, Lillybridge et al. 1995, MacKinnon et al. 1990, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Muldavin et al. 1996, Peet 1978a, Peet 1981, Pfister 1972, Pfister et al. 1977, Steele et al. 1981, Steen and Coupé 1997, Williams and Lillybridge 1983, Williams et al. 1995, Youngblood and Mauk 1985

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G218. Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland

A3614. *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Moist Forest Alliance

Type Concept Sentence: These upper montane and subalpine forests and woodlands of the northern Rocky Mountains are dominated by *Abies lasiocarpa* and/or *Picea engelmannii*.

OVERVIEW

Scientific Name: *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Moist Forest Alliance

Common Name (Translated Scientific Name): Subalpine Fir - Engelmann Spruce Rocky Mountain Moist Forest Alliance

Colloquial Name: Rocky Mountain Subalpine Fir - Engelmann Spruce Moist Forest

Type Concept: This alliance consists of upper montane and subalpine conifer-dominated forests and woodlands of the Rocky Mountains. *Abies lasiocarpa* and *Picea engelmannii* dominate the canopy either singly or together. Some sites are codominated by *Populus tremuloides* depending on stand age. Associates vary geographically. Common associated conifers can include *Larix occidentalis*, *Picea pungens*, *Pinus albicaulis*, *Pinus contorta*, and *Pseudotsuga menziesii*. Understories are highly variable across the range of this alliance and can be dominated by grasses, dry sedges, ferns, mesic forbs or shrubs (typically ericaceous). Dominant shrubs may include *Menziesia ferruginea*, *Rhododendron albiflorum*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Vaccinium cespitosum*, and *Vaccinium scoparium*. Important herbaceous species may include *Actaea rubra*, *Clintonia uniflora*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Gymnocarpium dryopteris*, *Linnaea borealis*, *Luzula glabrata* var. *hitchcockii*, *Maianthemum stellatum*, *Senecio triangularis*, *Streptopus amplexifolius*, *Thalictrum occidentale*, and *Xerophyllum tenax*. Elevations range from 970-3200 m. Sites where these forest and woodlands are found include gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, basins, alluvial terraces, well-drained benches, and inactive stream terraces.

Classification Comments: Many of the spruce-fir associations of this ecological group were formally grouped into one alliance, but are now split apart to reflect northern and southern distributions.

Internal Comments:**Other Comments:****Similar NVC Types:**

- A3615 *Abies lasiocarpa* - *Picea engelmannii* Southern Rocky Mountain Moist Forest Alliance: has species with more southern distributions.

Diagnostic Characteristics: This alliance is characterized by open to closed canopies dominated by *Abies lasiocarpa* and/or *Picea engelmannii* singly or in combination with associated species of more northern affinities. Sites are montane to subalpine with relatively moist substrates.

VEGETATION

Physiognomy and Structure: These forests and woodlands are dominated by needle-leaved evergreen trees up to 30 m in height and of low to dense cover (20-100%). Although cold-deciduous trees are relatively rare, they can be prominent in some regional variants or seral stands. A moderately dense shrub layer is usually present, dominated by ericaceous or, less commonly, cold-deciduous species. The herbaceous layer is dominated by perennial forbs or sod-forming graminoids. In some regions, a nonvascular layer dominated by mosses covers the ground surface.

Floristics: *Abies lasiocarpa* and/or *Picea engelmannii* are dominant singly or together. *Picea engelmannii* will often be prominent on more moist sites or in more mature stands. *Populus tremuloides* may be codominant in younger stands. Total canopy cover ranges

from 20-100%. Canopy associates vary geographically. Common associated conifers can include *Larix occidentalis*, *Picea pungens*, *Pinus albicaulis*, *Pinus contorta*, and *Pseudotsuga menziesii*. Understories are highly variable across the range of this alliance and can be dominated by grasses, dry sedges, ferns, mesic forbs or shrubs (typically ericaceous). The shrub layer is typically less than 2 m in height, and can be up to 80% in cover, although in some stands may be under 20% and a reflection of dry conditions. Dominant shrubs may include *Menziesia ferruginea*, *Rhododendron albiflorum*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Vaccinium cespitosum*, and *Vaccinium scoparium*. Important herbaceous species may include *Actaea rubra*, *Clintonia uniflora*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Gymnocarpium dryopteris*, *Linnaea borealis*, *Luzula glabrata* var. *hitchcockii*, *Maianthemum stellatum*, *Senecio triangularis*, *Streptopus amplexifolius*, *Thalictrum occidentale*, and *Xerophyllum tenax*.

ENVIRONMENT & DYNAMICS

Environmental Description: These upper montane or subalpine forests and woodlands occur in many of the mountainous areas of the middle to northern Rocky Mountains where they are often the matrix forests of the subalpine zone. They occur above the warmer and drier montane forests of the West, which are typically mixed-coniferous forests. Average temperatures are fairly uniform across the alliance's range, with mean July and January temperatures of 12° and -10°C, respectively (Burns and Honkala 1990a). Snowpacks can be deep, but often melt quickly, and summers are cool. Summer frosts are characteristic, especially on sites where cold air pools. Elevations range from 1300-1950 m in the eastern Cascades, and increase with decreasing latitude from roughly 2200 m in central Idaho to over 3500 m in Colorado. Sites where these forests are found include gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, plateau-like surfaces, basins, alluvial terraces, well-drained benches, and inactive stream terraces. All aspects and slopes are represented, but northerly and easterly aspects predominate. Southerly aspects are found only at higher elevations than where these forests occur in a given region. In some locations where there is cold-air drainage, these forests may extend down in elevation into the montane zone, where they will occupy dry stream terraces, toeslopes, or mesic sites with cooler temperature regimes such as northern aspects. Parent materials and soils are variable across the distribution of the alliance. Parent materials include ash, tuff, lava, basalt, granitics, quartzite, dolomite, rhyolite, and other sedimentary rock types. Stands can also occur on colluvium or alluvium. Soils are typically not deep, poorly developed, and can have significant amounts of rock and gravel in the profile. Subalpine soils, such as found associated with these forests, often show evidence of podzolization processes, especially in the north, and poorly decomposed organic layers are common.

Dynamics: *Abies lasiocarpa* forests develop on sites with limited, short growing seasons and relatively deep winter snowpacks. Tree growth is very slow in these habitats, and forests are rapidly colonized by faster growing shade-intolerant species, such as *Pseudotsuga menziesii*, *Pinus contorta*, or *Populus tremuloides* following fire, clearcut logging, or windthrow disturbance. *Abies lasiocarpa* is among the most shade-tolerant trees in the Rocky Mountains, but seedlings compete poorly in greater than 50% full sunlight (Burns and Honkala 1990a). In Oregon and Washington, many communities are bottomland, moist, upper montane forests that rarely burn. Fire is important in many of the more open sites, as well as those on steep slopes. Snow avalanches occur frequently at upper elevations, and can result in a mosaic of varying stand ages on sites affected by this disturbance type.

Picea engelmannii can be very long-lived, reaching 500 years of age. *Abies lasiocarpa* decreases in importance relative to *Picea engelmannii* with increasing distance from the region of Montana and Idaho where maritime air masses influence the climate. Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. *Picea engelmannii* can rapidly recolonize and dominate burned sites, or can succeed to other species such as *Pinus contorta* or *Populus tremuloides*. Due to great longevity, *Pseudotsuga menziesii* may persist in stands of this alliance for long periods without regeneration. Old-growth characteristics in *Picea engelmannii* forests will include treefall and windthrow gaps in the canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags.

DISTRIBUTION

Geographic Range: This alliance occurs in the subalpine zones of the central and northern Rocky Mountains and eastern Cascade Range.

Nations: CA, US

States/Provinces: CA?, CO, ID, MT, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEGLO02323 *Picea engelmannii* x *glauca* / *Spiraea douglasii* var. *douglasii* Woodland
- CEGLO02327 *Abies lasiocarpa* var. *lasiocarpa* / *Vaccinium membranaceum* / *Brachythecium* spp. Woodland
- CEGLO00335 *Abies lasiocarpa* / *Spiraea betulifolia* Forest
- CEGLO00315 *Abies lasiocarpa* - *Picea engelmannii* / *Linnaea borealis* Forest
- CEGLO00341 *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* Rocky Mountain Forest
- CEGLO00340 *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium cespitosum* Forest
- CEGLO00360 *Picea engelmannii* / *Clintonia uniflora* Forest
- CEGLO00406 *Picea* (*engelmannii* x *glauca*, *engelmannii*) / *Clintonia uniflora* Forest
- CEGLO00337 *Abies lasiocarpa* - *Picea engelmannii* / *Symphoricarpos albus* Forest
- CEGLO00295 *Abies lasiocarpa* - *Picea engelmannii* / *Actaea rubra* Forest
- CEGLO00319 *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* Forest
- CEGLO00346 *Abies lasiocarpa* / *Xerophyllum tenax* Forest
- CEGLO00338 *Abies lasiocarpa* - *Picea engelmannii* / *Thalictrum occidentale* Forest
- CEGLO02613 *Abies lasiocarpa* / *Rhododendron albiflorum* / *Senecio triangularis* Woodland
- CEGLO02689 *Picea engelmannii* / *Linnaea borealis* Forest
- CEGLO00311 *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest
- CEGLO00415 *Picea engelmannii* / *Maianthemum stellatum* Forest
- CEGLO00309 *Abies lasiocarpa* / *Cornus canadensis* Forest
- CEGLO05918 *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium cespitosum* / *Clintonia uniflora* Forest
- CEGLO05917 *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest
- CEGLO05919 *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Thalictrum occidentale* Forest
- CEGLO05914 *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest
- CEGLO05920 *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* - *Luzula glabrata* var. *hitchcockii* Woodland
- CEGLO00317 *Abies lasiocarpa* - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland
- CEGLO00342 *Abies lasiocarpa* / *Vaccinium membranaceum* Forest
- CEGLO05908 *Populus tremuloides* - *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest
- CEGLO05892 *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest
- CEGLO05893 *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest
- CEGLO05894 *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* - *Vaccinium scoparium* Forest
- CEGLO05895 *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest
- CEGLO05912 *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest
- CEGLO05896 *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Luzula glabrata* var. *hitchcockii* Woodland
- CEGLO05897 *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Streptopus amplexifolius* Woodland
- CEGLO05898 *Abies lasiocarpa* - *Picea engelmannii* / *Xerophyllum tenax* - *Luzula glabrata* var. *hitchcockii* Woodland
- CEGLO05926 *Picea engelmannii* / *Vaccinium cespitosum* Forest
- CEGLO02174 *Picea engelmannii* / *Galium triflorum* Forest
- CEGLO05637 *Abies lasiocarpa* / *Vaccinium membranaceum* / *Lupinus arcticus* ssp. *subalpinus* Woodland
- CEGLO05635 *Abies lasiocarpa* / *Rhododendron albiflorum* / *Rubus lasiococcus* Forest
- CEGLO02611 *Abies lasiocarpa* / *Gymnocarpium dryopteris* Forest
- CEGLO00308 *Abies lasiocarpa* / *Coptis occidentalis* Forest

AUTHORSHIP

Primary Concept Source: F.H. Eyre (1980)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Burns and Honkala 1990a, Eyre 1980, Faber-Langendoen et al. 2017b

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G218. Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland

A3616. *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Talus & Scree Woodland Alliance

Type Concept Sentence: These woodlands of the subalpine Rocky Mountains are associated with talus and scree substrates and dominated by *Abies lasiocarpa* and/or *Picea engelmannii*.

OVERVIEW

Scientific Name: *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Talus & Scree Woodland Alliance

Common Name (Translated Scientific Name): Subalpine Fir - Engelmann Spruce Rocky Mountain Talus & Scree Woodland Alliance

Colloquial Name: Rocky Mountain Subalpine Fir - Engelmann Spruce Talus & Scree Woodland

Type Concept: These upper montane or subalpine conifer woodlands are found scattered throughout the Rocky Mountains within cool and relatively dry climate regimes. In mature stands, the association is characterized by *Abies lasiocarpa* as the dominant tree species, often with *Picea engelmannii*. In seral stands, other conifers can be important or even dominant, but *Abies lasiocarpa* is always present in the regeneration layer. Other tree associates include *Callitropsis nootkatensis* (= *Chamaecyparis nootkatensis*), *Larix* spp., *Pinus albicaulis*, *Pinus contorta*, *Picea glauca*, *Pseudotsuga menziesii*, and *Tsuga* spp. Stands have sparse shrub layers, typically a reflection of dry conditions related to poorly developed soils, and may include species such as *Acer circinatum*, *Holodiscus dumosus*, *Juniperus communis*, *Ribes* spp., *Salix brachycarpa*, and *Salix glauca*. The herbaceous layer is generally sparse. Important forbs include species of *Arnica*, *Fragaria*, *Lupinus*, *Pedicularis*, and *Thalictrum*. Graminoids are rarely important in these woodlands. These woodlands are found on scree and talus slopes where marginal growing conditions produce an open tree canopy. Parent materials and soils are variable across the distribution of the alliance.

Classification Comments: This alliance is a subset of associations of a former larger woodland alliance (A.559), but is now considered environmentally unique in occupying scree and talus slopes. Associations in this alliance have been poorly sampled and may prove with further data to be sparsely vegetated types that should be moved into the sparse vegetation class of the USNVC.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: *Abies lasiocarpa* and/or *Picea engelmannii* form open canopies and occur on talus and scree habitats in upper montane and subalpine environments. Diagnostic of woodlands in this alliance is that they are upland (non-flooded) with average tree canopy of less than 60% cover that is either dominated by *Abies lasiocarpa* or has *Abies lasiocarpa* as the predominant conifer in the tree-regeneration layer.

VEGETATION

Physiognomy and Structure: These woodlands are dominated by needle-leaved evergreen trees up to 30 m in height and of low to moderate cover (20-60%). Although cold-deciduous trees are relatively rare, they can be prominent in some regional variants or seral stands. A sparse to moderately dense shrub layer may be present, dominated by ericaceous or, less commonly, cold-deciduous species. The herbaceous layer is variable and is typically dominated by perennial forbs. In some regions, a nonvascular layer dominated by mosses covers the ground surface.

Floristics: Older stands of these woodlands are characterized by *Abies lasiocarpa* as the dominant tree species in an open tree canopy, often with *Picea engelmannii*. Total canopy cover averages <60%, but some stands may have somewhat higher cover. In younger stands, other conifers can be important or even dominant, but *Abies lasiocarpa* is always present in the regeneration layer. Canopy associates may include *Pinus contorta*, *Populus tremuloides*, and *Pseudotsuga menziesii*. Associations in this alliance have poorly to well-developed shrub layers, with the herbaceous layer being relatively depauperate and sparse. The shrub layer is typically less than 2 m in height, and can be up to 80% in cover, although in some stands may be under 20% and a reflection of dry conditions and poorly developed soils. Important to dominant species include *Acer circinatum*, *Holodiscus dumosus*, *Juniperus communis*, *Ribes* spp., *Salix brachycarpa*, and *Salix glauca*. Important forbs include *Arnica cordifolia*, *Arnica latifolia*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Galium triflorum*, *Orthilia secunda*, *Polemonium pulcherrimum*, *Saxifraga bronchialis*, and species of *Fragaria*, *Lupinus*, *Pedicularis*, and *Thalictrum*. Graminoids are rarely important in these woodlands. Where these woodlands occur on sites with some soil development, there may be a nonvascular layer composed primarily of mosses on the ground surface (Steele et al. 1981, Henderson et al. 1989).

ENVIRONMENT & DYNAMICS

Environmental Description: These upper montane or subalpine woodlands are found scattered throughout the Rocky Mountains in cool and relatively dry climate regimes. These woodlands occur on droughty, well-drained substrates such as scree and talus slopes on southerly or westerly slopes and ridgetops. Snowpacks can be deep, and summers are cool. Summer frosts are characteristic, especially in sites where cold air pools. Elevations range from roughly 2200 m in central Idaho to over 3200 m in Utah, Colorado and New Mexico. In some locations where there is cold-air drainage, these woodlands extend down in elevation into the montane zone. Soils are typically shallow, poorly developed, with significant amounts of rock and gravel in the profile.

Dynamics:

DISTRIBUTION

Geographic Range: The distribution of this alliance is poorly documented. It has been documented primarily from the southern Rocky Mountains of Colorado, Wyoming and New Mexico with occurrences known also from the northern Rocky Mountains in Glacier-Waterton International Peace Park in Montana and Alberta, Canada.

Nations: CA, US

States/Provinces: AB, CO, MT, NM, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Abies lasiocarpa*-*Picea engelmannii* Series (Johnston 1987)
- >< Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)
- >< Western Needleleaf Forests: 15: Western Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)
- >< Western Needleleaf Forests: 21: Southwestern Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)

LOWER LEVEL UNITS**Associations:**

- CEG000923 *Abies lasiocarpa* / *Salix glauca* Scree Woodland
- CEG005823 *Abies lasiocarpa* - *Picea engelmannii* / *Valeriana sitchensis* Woodland
- CEG000922 *Abies lasiocarpa* / *Salix brachycarpa* Scree Woodland
- CEG000924 *Abies lasiocarpa* / *Saxifraga bronchialis* Scree Woodland

AUTHORSHIP

Primary Concept Source: M.S. Reid and D. Sarr, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Eyre 1980, Faber-Langendoen et al. 2017b, Henderson et al. 1989, Johnston 1987, Küchler 1964, Steele et al. 1981

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G218. Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland

A3615. *Abies lasiocarpa* - *Picea engelmannii* Southern Rocky Mountain Moist Forest Alliance

Type Concept Sentence: These subalpine forests and woodlands of the Rocky Mountains with southern distributions are dominated by *Abies lasiocarpa* and/or *Picea engelmannii*.

OVERVIEW

Scientific Name: *Abies lasiocarpa* - *Picea engelmannii* Southern Rocky Mountain Moist Forest Alliance

Common Name (Translated Scientific Name): Subalpine Fir - Engelmann Spruce Southern Rocky Mountain Moist Forest Alliance

Colloquial Name: Southern Rocky Mountain Subalpine Fir - Engelmann Spruce Moist Forest

Type Concept: These conifer forests occur predominantly in the southern Rocky Mountains where they are often the matrix forests of the upper montane and subalpine zones. These are closed-canopy forests (60-100% cover) dominated by *Abies lasiocarpa* and/or *Picea engelmannii*. *Abies lasiocarpa* may not be present where sites are too dry or cold. Canopy associates are variable depending on location. Common associates include *Abies concolor*, *Picea pungens*, *Pinus strobiformis*, *Populus tremuloides*, and *Pseudotsuga menziesii*. Forest understories are highly variable across the range of this alliance and can be dominated by grasses, dry sedges, mesic forbs or shrubs. The shrub layer is sparse to moderately dense. Important shrubs may include *Acer glabrum*, *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Physocarpus malvaceus*, *Ribes* spp., *Rosa* spp., *Rubus parviflorus*, *Symphoricarpos* spp., and *Vaccinium* spp. Forb cover is often sparse, but diverse with species including *Arnica* spp., *Aquilegia* spp., *Caltha leptosepala*, *Cardamine cordifolia*, *Chamerion angustifolium*, *Erigeron eximius*, *Lupinus argenteus*, *Mertensia* spp., *Mitella pentandra*, *Orthilia secunda*, *Osmorhiza berteroi*, *Oxypolis fendleri*, *Packera* spp., *Pyrola* spp., and *Stellaria* spp. Graminoid cover is generally low but may include *Achnatherum lettermanii* (= *Stipa lettermanii*), *Bromus carinatus*, *Carex geyeri*, *Carex rossii*, *Festuca idahoensis*, *Luzula parviflora*, and *Trisetum spicatum*. Associations occur on cool, relatively mesic to moist sites with gentle to steep

slopes on all aspects (especially northerly) and also on lower slopes of canyon drainages and riparian areas. Elevations range from 2200-3500 m.

Classification Comments: Many of the spruce - fir associations of this ecological group were formally grouped into one alliance, but split apart to reflect northern and southern distributions. There are some associations placed here, such as *Abies lasiocarpa* - *Picea engelmannii* / *Acer glabrum* Forest (CEGL000294), which have very broad northern and southern distributions and may require further review to be parsed into two different associations.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3614 *Abies lasiocarpa* - *Picea engelmannii* Rocky Mountain Moist Forest Alliance: has species with more northern distributions.

Diagnostic Characteristics: This alliance is characterized by open to closed forest canopies dominated by *Abies lasiocarpa* and/or *Picea engelmannii* singly or in combination with associated species of more southern affinities. Canopy cover is typically 60-100%, but may be lower in some occurrences. Shrub and herbaceous composition is highly variable depending on location. This alliance represents the matrix forest vegetation of the upper montane and subalpine zones of the southern Rocky Mountains.

VEGETATION

Physiognomy and Structure: These forests are dominated by needle-leaved evergreen trees up to 45 m in height and of high cover (60-100%). Although cold-deciduous trees are relatively rare, they can be prominent in some regional variants or seral stands. Stands may be so tightly stocked that little light reaches the forest floor and understory layers are depauperate. In stands with somewhat more open canopies, a moderately dense shrub layer may be present and dominated by ericaceous or cold-deciduous species. The herbaceous layer is dominated by perennial forbs or sod-forming graminoids, and herbaceous cover increases with increasing light availability and/or soil moisture. There is often significant cover of mosses and sometimes lichens on the forest floor and on downed woody material.

Floristics: Despite the wide distribution of these subalpine forests, their tree canopy characteristics are remarkably similar across their range of distribution. *Abies lasiocarpa* and/or *Picea engelmannii* are dominant singly or together. Both species are typically present in most stands. In some stands, *Picea engelmannii* may be absent altogether, or *Abies lasiocarpa* may only occur as seedlings and saplings. *Picea engelmannii* will often be prominent on more moist sites or in more mature stands. *Populus tremuloides* is a major seral species, and *Pinus contorta* occurs less frequently. Other common canopy associates may include *Abies concolor*, *Picea pungens*, and *Pseudotsuga menziesii*. The shrub and herbaceous layers of these forest associations are highly variable. Forest understories can be dominated by grasses or dry sedges in the more open forests, or by ericaceous shrubs or moist forbs in closed-canopy, moist sites. Shrub layers where they do occur are typically less than 1 m tall. Important to dominant shrubs include *Acer glabrum*, *Jamesia americana*, *Juniperus communis*, *Mahonia repens*, *Physocarpus monogynus*, *Ribes* spp., *Shepherdia canadensis*, *Vaccinium cespitosum*, *Vaccinium myrtillus*, and *Vaccinium scoparium*. Forb cover is often sparse, but diverse with species including *Arnica* spp., *Aquilegia* spp., *Caltha leptosepala*, *Cardamine cordifolia*, *Chamerion angustifolium*, *Erigeron eximius*, *Lupinus argenteus*, *Mertensia* spp., *Mitella pentandra*, *Orthilia secunda*, *Osmorhiza berteroi*, *Oxypolis fendleri*, *Packera* spp., *Pyrola* spp., and *Stellaria* spp. Graminoid cover is generally low but may include *Achnatherum lettermanii* (= *Stipa lettermanii*), *Bromus carinatus*, *Carex geyeri*, *Carex rossii*, *Festuca idahoensis*, *Luzula parviflora*, and *Trisetum spicatum*.

ENVIRONMENT & DYNAMICS

Environmental Description: These forests occur in the southern Rocky Mountains where they are often the matrix forests of the upper montane and subalpine zones. They occur above the warmer and drier montane forests. Average temperatures are fairly uniform across the alliance's range, with mean July and January temperatures of 12° and -10°C, respectively (Burns and Honkala 1990a). Snowpacks can be deep, but often melt quickly, and summers are cool. Summer frosts are characteristic, especially on sites where cold air pools. Elevations range from 2200-3500 m. Associations occur on cool, relatively mesic to moist sites with gentle to steep slopes on all aspects. In some locations where there is cold-air drainage, these forests may extend down in elevation into the montane zone, where they will occupy dry stream terraces, toeslopes, or mesic sites with cooler temperature regimes such as northern aspects. Parent materials and soils are variable across the distribution of the alliance. Parent materials include ash, tuff, lava, basalt, granitics, quartzite, dolomite, rhyolite, and other sedimentary rock types. Stands can also occur on colluvium or alluvium. Soils are typically not deep, poorly developed, and can have significant amounts of rock and gravel in the profile. Subalpine soils, such as found associated with these forests, often show evidence of podzolization processes and poorly decomposed organic layers are common.

Dynamics: *Picea engelmannii* can be very long-lived, reaching 500 years of age. *Abies lasiocarpa* decreases in importance relative to *Picea engelmannii* with increasing distance from the region of Montana and Idaho where maritime air masses influence the climate.

Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. *Picea engelmannii* can rapidly recolonize and dominate burned sites, or can succeed to other species such as *Pinus contorta* or *Populus tremuloides*. Due to great longevity, *Pseudotsuga menziesii* may persist in stands of this alliance for long periods without regeneration. Old-growth characteristics in *Picea engelmannii* forests will include treefall and windthrow gaps in the canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags. *Picea engelmannii* is susceptible to infestations by spruce beetle (*Dendroctonus rufipennis*) or spruce budworm (*Choristoneura occidentalis*), which can cause high mortality during outbreaks. In the Southwest, dwarf mistletoe *Arceuthobium microcarpum* is a common cause of mortality for the species.

Abies lasiocarpa forests develop on sites with limited, short growing seasons and relatively deep winter snowpacks. Tree growth is very slow in these habitats, and forests are rapidly colonized by much more rapidly growing shade-intolerant species, such as *Pseudotsuga menziesii*, *Pinus contorta*, or *Populus tremuloides*, following fire, clearcut logging, or windthrow disturbance. *Abies lasiocarpa* is among the most shade-tolerant trees in the Rocky Mountains, but seedlings compete poorly in greater than 50% full sunlight (Burns and Honkala 1990a). Fire is important in many of the more open sites, as well as those on steep slopes. Snow avalanches occur frequently at upper elevations, and can result in a mosaic of varying stand ages on sites affected by this disturbance type.

DISTRIBUTION

Geographic Range: This alliance occurs in the upper montane and subalpine zones of the central and southern Rocky Mountains, but extends west in the Utah High Plateaus, Great Basin, and Columbia Plateau and east into the Wyoming Basins.

Nations: US

States/Provinces: AZ, CO, ID, MT, NM, NV, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Abies lasiocarpa-Picea engelmannii* Series (Johnston 1987)
- >< *Picea* series (Pfister et al. 1977)
- >< Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)
- >< Western Needleleaf Forests: 15: Western Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)
- >< Western Needleleaf Forests: 21: Southwestern Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEG000375 *Picea engelmannii* / *Packera cardamine* Forest
- CEG000354 *Picea engelmannii* / *Acer glabrum* Forest
- CEG000374 *Picea engelmannii* / *Ribes montigenum* Forest
- CEG000294 *Abies lasiocarpa* - *Picea engelmannii* / *Acer glabrum* Forest
- CEG000373 *Abies lasiocarpa* - *Picea engelmannii* / *Polemonium pulcherrimum* Forest
- CEG000310 *Abies lasiocarpa* / *Erigeron eximius* Forest
- CEG000332 *Abies lasiocarpa* / *Rubus parviflorus* Forest
- CEG000331 *Abies lasiocarpa* - *Picea engelmannii* / *Ribes* (*montigenum*, *lacustre*, *inermis*) Forest
- CEG000364 *Picea engelmannii* / *Erigeron eximius* Forest

AUTHORSHIP

Primary Concept Source: F.H. Eyre (1980)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/07

REFERENCES

References: Burns and Honkala 1990a, Eyre 1980, Faber-Langendoen et al. 2017b, Johnston 1987, Küchler 1964, Pfister et al. 1977

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G218. Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland

A0422. *Abies lasiocarpa* - *Populus tremuloides* Rocky Mountain Moist Forest Alliance

Type Concept Sentence: This mixed evergreen-deciduous forest alliance is codominated by *Populus tremuloides* and *Abies lasiocarpa* and has been described from mountain slopes and plateaus in the Rocky Mountains from Alberta, Canada, south to Montana, Wyoming, Colorado, and west into Utah.

OVERVIEW

Scientific Name: *Abies lasiocarpa* - *Populus tremuloides* Rocky Mountain Moist Forest Alliance

Common Name (Translated Scientific Name): Subalpine Fir - Quaking Aspen Rocky Mountain Moist Forest Alliance

Colloquial Name: Rocky Mountain Moist Subalpine Fir - Aspen Forest

Type Concept: The mixed coniferous and deciduous tree canopy is open to moderately closed and is dominated by *Populus tremuloides* and *Abies lasiocarpa*. Several other species of conifers may be scattered within the stands, including *Abies concolor*, *Picea engelmannii*, *Picea pungens*, *Pinus contorta*, *Pinus flexilis*, and *Pseudotsuga menziesii*. Younger stands typically have dense *Populus tremuloides*, with *Abies lasiocarpa* or other conifers mixed in. As the stands age in this typically seral forest association, *Populus tremuloides* is slowly reduced until conifers become dominant. Mixed stands must have at least 25% relative tree cover of both aspen (deciduous) and conifers. The understory is most often composed of a short-shrub layer often dominated by *Symphoricarpos oreophilus*. Other shrubs may include *Amelanchier alnifolia*, *Mahonia repens*, *Paxistima myrsinites*, *Physocarpus malvaceus*, and *Rosa woodsii*. The herbaceous layer is variable and may compete with shrub species for understory dominance or in some stands be dominant over shrubs. It is a mixture of graminoids and forbs. Characteristic herbaceous species may include *Delphinium x occidentale*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Heracleum maximum*, *Osmorhiza occidentalis*, *Pedicularis racemosa*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, and *Valeriana occidentalis*. Stands included in this mixed evergreen-deciduous forest alliance have been described from mountain slopes and plateaus in the Rocky Mountains from Alberta, Canada, south to Montana, Wyoming, Colorado and west into Utah. They occur on gentle to steep slopes on all aspects, but are most common on cooler and more mesic, north and east aspects. Soils are derived from alluvium and colluvium from sedimentary, metamorphic and igneous parent materials.

Classification Comments: This alliance is composed of five associations for which only two have descriptive material. Further review of undescribed associations will be required to produce a more thorough description of this alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of these seral forests is the open to moderately closed, mixed coniferous and deciduous tree canopy codominated by *Populus tremuloides* and *Abies lasiocarpa* that occupy the upper montane and subalpine zones of the Rocky Mountains.

VEGETATION

Physiognomy and Structure: Vegetation included in this minor alliance has a moderately dense to dense upper canopy of mixed deciduous broad-leaved and evergreen needle-leaved trees (5-20 m tall). The understory has a moderate to sparse short-shrub layer typically dominated by evergreen scale-leaved or deciduous broad-leaved shrub species. A sparse tall-shrub layer dominated by deciduous broad-leaved shrubs may be present. A moderate to sparse herbaceous layer may also be present, most often dominated by tall perennial forbs.

Floristics: Seral forests are included in this Rocky Mountain alliance. The open to moderately closed, mixed evergreen needle-leaved and deciduous broad-leaved tree canopy is composed of short to moderately tall trees and is codominated by *Populus tremuloides* and *Abies lasiocarpa*. Several other species of conifers may be scattered within the stands, including *Abies concolor*, *Picea engelmannii*, *Picea pungens*, *Pinus contorta*, *Pinus flexilis*, and *Pseudotsuga menziesii*. Younger stands typically have dense *Populus tremuloides*, with *Abies lasiocarpa* mixed in. As the stands age in this typically seral forest association, *Populus tremuloides* is slowly reduced until conifers become dominant (Mueggler 1988). Mixed stands must have at least 25% relative tree cover of both aspen (deciduous) and conifers. The understory is typically moderately dense to sparse and becomes sparser as *Abies lasiocarpa* becomes more dominant. The understory is most often dominated by a short-shrub layer dominated by *Symphoricarpos oreophilus*. Other shrubs may include *Mahonia repens*, *Paxistima myrsinites*, *Physocarpus malvaceus*, and *Rosa woodsii*. The herbaceous layer is variable and may compete with shrub species for understory dominance or in some stands be more prominent over shrubs. It is a mixture of graminoids and forbs. Characteristic herbaceous species may include *Delphinium x occidentale*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Heracleum maximum*, *Osmorhiza occidentalis*, *Pedicularis racemosa*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, and *Valeriana occidentalis*.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands included in this mixed evergreen-deciduous forest alliance have been described from mountain slopes and plateaus in the Rocky Mountains from Alberta, Canada, south to Montana, Wyoming and Colorado and west into Utah. Elevations range from 2200 to 3500 m. Climate is temperate with cold winters. Mean annual precipitation is typically greater than 50 cm. Sites occur on gentle to steep slopes on all aspects, but are most common on north and east aspects. Soils are derived from alluvium and colluvium from sedimentary, metamorphic and igneous parent materials.

Dynamics: Stems of *Populus tremuloides* are thin-barked and readily killed by fire. It is a fire-adapted species that generally needs fire or some other stand-replacing disturbance to establish and maintain dominance in a forest. These mixed forests are seral and in the absence of disturbance will slowly convert to late-successional forests dominated by *Abies lasiocarpa* or *Picea engelmannii* (Mueggler 1988).

DISTRIBUTION

Geographic Range: Forests included in this alliance are scattered in the Rocky Mountains of Alberta, Canada, Montana, Idaho, Wyoming, Colorado and Utah.

Nations: CA, US

States/Provinces: AB, CO, ID, MT, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Abies lasiocarpa* Series (Mauk and Henderson 1984) [Early seral stands in this habitat type may have significant *Populus tremuloides*.]
- >< Aspen: 217 (Eyre 1980)
- >< Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)

LOWER LEVEL UNITS**Associations:**

- CEG000533 *Populus tremuloides* - *Abies lasiocarpa* / Tall Forbs Forest
- CEG000532 *Populus tremuloides* - *Abies lasiocarpa* / *Symphoricarpos oreophilus* / *Thalictrum fendleri* Forest
- CEG0005911 *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest
- CEG000534 *Populus tremuloides* - *Abies lasiocarpa* / *Thalictrum fendleri* Forest
- CEG000531 *Populus tremuloides* - *Abies lasiocarpa* / *Symphoricarpos oreophilus* / Tall Forbs Forest
- CEG000530 *Populus tremuloides* - *Abies lasiocarpa* / *Symphoricarpos oreophilus* / *Bromus carinatus* Forest

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Eyre 1980, Faber-Langendoen et al. 2017b, Mauk and Henderson 1984, Mueggler 1988, Mueggler and Campbell 1986

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G218. Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland

A3617. Tsuga mertensiana Rocky Mountain Forest Alliance

Type Concept Sentence: The forests are known from the middle and northern Rocky Mountains and eastern Cascades and characterized by a canopy dominated by *Tsuga mertensiana*.

OVERVIEW

Scientific Name: *Tsuga mertensiana* Rocky Mountain Forest Alliance

Common Name (Translated Scientific Name): Mountain Hemlock Rocky Mountain Forest Alliance

Colloquial Name: Rocky Mountain Hemlock Forest

Type Concept: These forests are characterized by a canopy of *Tsuga mertensiana*, a needle-leaved evergreen tree which can approach 35 m in height. Other conifers that may be present include *Abies grandis*, *Abies lasiocarpa*, *Picea engelmannii*, and *Pinus monticola*. The understory is often sparse due to dense canopy shading. Characteristic understory shrubs may include *Lonicera utahensis*, *Menziesia ferruginea*, *Paxistima myrsinites*, *Rhododendron albiflorum*, *Taxus brevifolia*, and *Vaccinium membranaceum*. Herbaceous species include *Asarum caudatum*, *Athyrium filix-femina*, *Clintonia uniflora*, *Coptis occidentalis*, *Gymnocarpium dryopteris*, *Maianthemum stellatum* (= *Smilacina stellata*), *Prosartes hookeri* (= *Disporum hookeri*), *Tiarella trifoliata*, *Trillium ovatum*, *Viola orbiculata*, and *Xerophyllum tenax*. This forest alliance occurs in the middle and northern Rocky Mountains and eastern Cascade Range from Oregon, Idaho and Montana. It occurs in cold, snowy subalpine environments and is generally associated with areas of incursions of maritime air masses, which moderate temperatures and produce deep winter snowpacks. Although this alliance typically occurs in subalpine habitats, it may occur in montane forest environments, such as slope benches or canyon bottoms, which are prone to cold-air drainage. Most soils can be characterized as loose, coarse-textured, and well-drained.

Classification Comments: This alliance is now defined for mountain hemlock forests of the subalpine zones of the Rocky Mountains and was formerly included with associations found further north. Very little descriptive material exists for associations in this alliance and further review will be required to adequately describe its attributions.

Internal Comments: mjr 3-16: *Tsuga mertensiana* does not occur in WY (removed).

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Forests of the subalpine zones of the northern Rocky Mountains and eastern Cascades with canopies dominated by *Tsuga mertensiana* in association with other conifer species.

VEGETATION

Physiognomy and Structure: Associations in this alliance are characterized by a dense canopy of needle-leaved evergreen trees, resulting in low light intensities at the forest floor and low understory cover. Trees are often large and widely spaced, with an open understory of occasional shrubs. When present, the shrub layer is often composed of low ericaceous shrubs which are sparsely scattered. An herbaceous layer of graminoids is occasionally present.

Floristics: These forests are characterized by a canopy of *Tsuga mertensiana*, a needle-leaved evergreen tree which can approach 35 m in height. Other conifers that may be present include *Abies grandis*, *Abies lasiocarpa*, *Picea engelmannii*, and *Pinus monticola*. The understory is often sparse due to dense canopy shading. Understory shrubs are largely ericaceous, including *Lonicera utahensis*, *Menziesia ferruginea*, *Paxistima myrsinites*, *Rhododendron albiflorum*, *Taxus brevifolia*, and *Vaccinium membranaceum*. Herbaceous species include *Asarum caudatum*, *Athyrium filix-femina*, *Clintonia uniflora*, *Coptis occidentalis*, *Gymnocarpium dryopteris*, *Maianthemum stellatum* (= *Smilacina stellata*), *Prosartes hookeri* (= *Disporum hookeri*), *Tiarella trifoliata*, *Trillium ovatum*, *Viola orbiculata*, and *Xerophyllum tenax*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs in cold, snowy subalpine environments of the northern Rocky Mountains. It is generally associated with areas of incursions of maritime air masses, which moderate temperatures and produce deep winter snowpacks. Although this alliance typically occurs in subalpine habitats, it may occur in montane forest environments, such as slope benches or canyon bottoms, which are prone to cold-air drainage. Most soils can be characterized as loose, coarse-textured, and well-drained.

Dynamics: *Tsuga mertensiana* is a slow-growing, long-lived conifer, which can regenerate under its own canopy. Forests dominated by this species can be seral to forests dominated by other shade-tolerant conifers, such as *Tsuga heterophylla* or *Callitropsis nootkatensis* at the lower or northern edges of its range, respectively.

DISTRIBUTION

Geographic Range: This alliance occurs in the subalpine zones of the central and northern Rocky Mountains and eastern Cascade Range.

Nations: US

States/Provinces: ID, MT, OR, WA?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL**USNVC Confidence Level with Comments:** Low.**SYNONYMY**

- >< Mountain Hemlock: 205 (Eyre 1980)
- >< Western Needleleaf Forests: 4: Fir-Hemlock Forest (*Abies-Tsuga*) (Küchler 1964)

LOWER LEVEL UNITS**Associations:**

- C EGL000508 *Tsuga mertensiana* / *Rhododendron albiflorum* Forest
- C EGL000504 *Tsuga mertensiana* / *Clintonia uniflora* Forest
- C EGL007383 *Tsuga mertensiana* / *Luzula glabrata* var. *hitchcockii* Forest
- C EGL000516 *Tsuga mertensiana* / *Xerophyllum tenax* Forest
- C EGL000506 *Tsuga mertensiana* / *Menziesia ferruginea* Forest
- C EGL000514 *Tsuga mertensiana* / *Vaccinium membranaceum* Forest

AUTHORSHIP**Primary Concept Source:** S.V. Cooper K. E. Neiman, R. Steele, and D. W. Roberts (1987)**Author of Description:** M.E. Hall**Acknowledgments:****Version Date:** 2014/01/08**REFERENCES****References:** Atzet and McCrimmon 1990, Atzet and Wheeler 1984, Cooper et al. 1987, Eyre 1980, Faber-Langendoen et al. 2017b, Küchler 1964

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- 1. Forest & Woodland
 - 1.B.2.Nb. Rocky Mountain Forest & Woodland
 - 1.B.2.Nb.5.d. M020 Rocky Mountain Subalpine-High Montane Conifer Forest

G222. Rocky Mountain Subalpine-Montane Aspen Forest & Woodland

Type Concept Sentence: This group consists of upland forests dominated by *Populus tremuloides* without significant conifer cover and an understory structure of complex multiple shrub and herbaceous layers, or simply just an herbaceous layer. It is widespread in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S., south into northern Mexico and north into Canada.

OVERVIEW**Scientific Name:** *Populus tremuloides* Rocky Mountain Forest & Woodland Group**Common Name (Translated Scientific Name):** Quaking Aspen Rocky Mountain Forest & Woodland Group**Colloquial Name:** Bigtooth Maple Montane Forest

Type Concept: This widespread group is more common in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S., south into northern Mexico and north into Canada. An eastern extension occurs along the Rocky Mountains foothill front, in mountain "islands" in Montana (Big Snowy and Highwood mountains), and the Black Hills of South Dakota. In California, this group is in the Sierra Nevada adjacent to the Great Basin. Large stands are found in the Inyo and White mountains, while small stands occur on the Modoc Plateau. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Distribution of this group is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand. Secondly, it is limited by the length of the growing season or low temperatures. These are upland forests and woodlands dominated by *Populus tremuloides* without a significant conifer component (<25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids and/or forbs. Associated shrub species include *Symphoricarpos* spp. (*Symphoricarpos oreophilus* being the most widespread and *Symphoricarpos albus* and *Symphoricarpos mollis* having limited distribution), *Rubus parviflorus*, *Amelanchier alnifolia*, *Prunus virginiana*, and *Arctostaphylos uva-ursi*.

Classification Comments: This group differs from Northwestern Great Plains Aspen Woodland Group (G328), which is limited to plains environments. The scattered occurrences in the Trans-Pecos of Texas are of interest as they represent disjunct outliers of the type occurring under highly limited circumstances. In Alberta and interior British Columbia, these forests transition to Alaskan-Yukon Boreal Dry Aspen Forest Group (G349). Associations where aspen is mixed with one or more Rocky Mountain conifers in the canopy, or even in the undergrowth, are placed into their respective conifer forest groups (e.g., into a spruce-fir group, or a mixed montane

conifer group). Typically, in those associations, the floristics and species richness are more similar to conifer forest groups, than to the aspen group.

Similar NVC Types:

- G328 Northwestern Great Plains Aspen Woodland

Diagnostic Characteristics: Open to dense canopies of broad-leaved deciduous trees dominated by *Populus tremuloides*. It has Rocky Mountain floristics associated with it, as opposed to boreal floristics. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. Common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia tridentata*, *Juniperus communis*, *Prunus virginiana*, *Rosa woodsii*, *Rhamnus alnifolia*, *Lonicera utahensis*, *Shepherdia canadensis*, *Symphoricarpos oreophilus*, and the dwarf-shrubs *Mahonia repens* and *Vaccinium* spp. The herbaceous layers may be lush and diverse. Common graminoids may include *Bromus carinatus*, *Calamagrostis rubescens*, *Carex siccata*, *Carex geyeri*, *Carex rossii*, *Elymus glaucus*, *Elymus trachycaulus*, *Festuca thurberi*, and *Hesperostipa comata*. Associated forbs may include *Achillea millefolium*, *Eucephalus engelmannii*, *Delphinium* spp., *Aconitum columbianum*, *Geranium viscosissimum*, *Heracleum sphondylium*, *Ligusticum filicinum*, *Lupinus argenteus*, *Osmorhiza berteroi*, *Pteridium aquilinum*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, *Valeriana occidentalis*, *Wyethia amplexicaulis*, and many others.

VEGETATION

Physiognomy and Structure: Occurrences typically have a somewhat closed canopy of trees 5-20 m tall that is dominated by the cold-deciduous, broad-leaved tree *Populus tremuloides*. Conifers may contribute up to 15% of the canopy cover. The open-spaced stems of *Populus tremuloides* often give way to a lush understory consisting of complex multiple shrub and herbaceous layers, or just an herbaceous layer.

Floristics: Occurrences have a somewhat closed canopy of trees of 5-20 m tall that is dominated by the cold-deciduous, broad-leaved tree *Populus tremuloides*. Conifers that may be present but typically in minor amounts include *Abies concolor*, *Abies lasiocarpa*, *Picea engelmannii*, *Picea pungens*, *Pinus contorta*, *Pinus ponderosa*, and *Pseudotsuga menziesii*. Conifer species may contribute up to 15% of the tree canopy before the occurrence is reclassified as a mixed occurrence. Because of the open growth form of *Populus tremuloides*, enough light can penetrate for lush understory development. Depending on available soil moisture and other factors such as disturbance, the understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. Common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia tridentata*, *Juniperus communis*, *Prunus virginiana*, *Rosa woodsii*, *Rhamnus alnifolia*, *Lonicera utahensis*, *Shepherdia canadensis*, *Symphoricarpos oreophilus*, and the dwarf-shrubs *Mahonia repens* and *Vaccinium* spp. The herbaceous layers may be lush and diverse. Common graminoids may include *Bromus carinatus*, *Calamagrostis rubescens*, *Carex siccata* (= *Carex foenea*), *Carex geyeri*, *Carex rossii*, *Elymus glaucus*, *Elymus trachycaulus*, *Festuca thurberi*, and *Hesperostipa comata*. Associated forbs may include *Achillea millefolium*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Delphinium* spp., *Aconitum columbianum*, *Geranium viscosissimum*, *Heracleum sphondylium*, *Ligusticum filicinum*, *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pteridium aquilinum*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, *Valeriana occidentalis*, *Wyethia amplexicaulis*, and many others. In California, *Symphyotrichum spathulatum* (= *Aster occidentalis*) is a common forb. Exotic grasses such as the perennials *Poa pratensis* and *Bromus inermis* and the annual *Bromus tectorum* are often common in occurrences due to grazing disturbance.

ENVIRONMENT & DYNAMICS

Environmental Description: Topography is variable; sites range from level to steep slopes. Aspect varies according to the limiting factors. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations, occurrences are restricted by lack of moisture and are found on cooler north aspects and mesic microsites.

Climate: Climate is temperate with a relatively long growing season, typically cold winters and deep snow. Mean annual precipitation is greater than 38 cm (15 inches) and typically greater than 51 cm (20 inches), except in semi-arid environments where occurrences are restricted to mesic microsites such as seeps or where large snow drifts develop. Distribution of this group is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondarily, its range is limited by the length of the growing season or low temperatures (Mueggler 1988).

Soil/substrate/hydrology: The soils are typically deep and well-developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loam. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but it appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Dynamics: Occurrences in this group often originate from, and are likely maintained by, stand-replacing disturbances such as avalanche, crownfire, disease and windthrow, or clearcutting by man or flooding by beaver. The stems of these thin-barked, clonal trees are easily killed by surface fires, but they can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1994). The stems are relatively short-lived (100-150 years), and the occurrences often succeed to longer-lived conifer forest

if undisturbed. Occurrences are favored by fire in the conifer zone (Mueggler 1988). With adequate disturbance, a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because the long moist conditions required to establish them are rare in the habitats where they occur. Superficial soil drying will kill seedlings (Knight 1994).

DISTRIBUTION

Geographic Range: This group is more common in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S., south into northern Mexico and north into Canada. An eastern extension occurs along the Rocky Mountains foothill front, in mountain "islands" in Montana (Big Snowy and Highwood mountains), and the Black Hills of South Dakota. In California, this group is in the Sierra Nevada adjacent to the Great Basin. Large stands are found in the Inyo and White mountains, while small stands occur on the Modoc Plateau. Very small occurrences may be found in a few scattered locations of the Trans-Pecos of Texas.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, MX, US

States/Provinces: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, TX, UT, WA, WY

TNC Ecoregions [optional]: 1:P, 3:C, 4:P, 5:P, 7:C, 8:C, 9:C, 11:C, 12:P, 18:C, 19:C, 20:C, 21:P, 25:C, 26:C, 81:P

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313D:CC, 315H:PP, 321A:CC, 322A:CC, 331A:CC, 331F:CC, 331G:CC, 331I:C?, 331J:CC, 331K:CP, 331N:CP, 332F:??, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242B:CP, M242C:CC, M242D:CC, M261D:CC, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CP, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CP, M333D:CC, M334A:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- < Aspen Woodland (411) (Shiflet 1994)
- < Aspen: 217 (Eyre 1980)
- > Douglas-fir-White Fir (=Mixed Conifer) Series, *Populus tremuloides* subclimax Association - 122.314 (Brown et al. 1979)
- > Engelmann Spruce-Alpine Fir Series, *Populus tremuloides* subclimax Association - 121.316 (Brown et al. 1979)
- > Pine Series, *Populus tremuloides* subclimax Association - 122.326 (Brown et al. 1979)

LOWER LEVEL UNITS

Alliances:

- A3371 *Acer grandidentatum* Montane Forest Alliance
- A2036 *Populus tremuloides* Rocky Mountain Forest & Woodland Alliance
- A3367 *Betula papyrifera* Rocky Mountain Forest & Woodland Alliance
- A4078 *Populus tremuloides* Southern Rocky Mountain Woodland & Scrub Alliance

AUTHORSHIP

Primary Concept Source: F.H. Eyre (1980)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 06/05/2013

Classif Resp Region: West

Internal Author: MEH 2-10, 6-13, mod. GK 12-15

REFERENCES

References: Bartos 1979, Bartos and Campbell 1998, Bartos and Mueggler 1979, Brown 1982a, Brown et al. 1979, DeByle and Winokur 1985, DeVelice et al. 1986, Eyre 1980, Faber-Langendoen et al. 2017a, Henderson et al. 1977, Hess and Wasser 1982, Johnston and Hendzel 1985, Knight 1994, Mueggler 1988, Powell 1988a, Shepperd et al. 2006, Shiflet 1994, Swanson et al. 2010, Youngblood and Mauk 1985

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G222. Rocky Mountain Subalpine-Montane Aspen Forest & Woodland

A3371. *Acer grandidentatum* Montane Forest Alliance

Type Concept Sentence: This alliance includes mainly deciduous forests dominated by *Acer grandidentatum* occurring in relatively moist lower montane areas of the Utah-Wyoming Rocky Mountains and Columbia Plateau.

OVERVIEW

Scientific Name: *Acer grandidentatum* Montane Forest Alliance

Common Name (Translated Scientific Name): Bigtooth Maple Montane Forest Alliance

Colloquial Name: Bigtooth Maple Montane Forest

Type Concept: This alliance includes mainly deciduous forests dominated by *Acer grandidentatum* occurring in relatively moist lower montane areas of the Utah-Wyoming Rocky Mountains and Columbia Plateau. Forests in this alliance are dominated by a dense canopy of *Acer grandidentatum*, often occurring with *Quercus* spp. and *Juniperus* spp. Shrub and herb strata are relatively sparse throughout the range of the alliance and are composed of short shrubs and annual or perennial graminoids and forbs. Tree and shrub associates include *Amelanchier alnifolia*, *Artemisia tridentata*, *Paxistima myrsinites*, *Physocarpus malvaceus*, *Populus tremuloides*, *Prunus virginiana*, *Quercus gambelii*, and *Symphoricarpos* spp. The alliance can occur on all aspects but is best developed on north-facing valleys or canyons with moderate insolation and favorable soil moisture. In the southern part of the range, these communities are typically associated with protected topographic positions with relatively moist soils and lower fire frequencies than surrounding hillsides. Elevations range from 1200-2600 m.

Classification Comments: This alliance excludes associations of *Acer grandidentatum* found in Trans-Pecos Texas.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3214 *Acer grandidentatum* - *Quercus muehlenbergii* - *Juglans major* Forest & Woodland Alliance
- A3109 *Acer grandidentatum* - *Quercus gravesii* - *Quercus muehlenbergii* Forest & Woodland Alliance

Diagnostic Characteristics: Forests in this alliance are dominated by a dense canopy of *Acer grandidentatum*, often occurring with *Quercus* spp. and *Juniperus* spp.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a closed canopy of tall cold-deciduous or broad-leaved evergreen shrubs or short trees 6-8 m in height. Short evergreen shrubs may also be present. The herbaceous understory is typically sparse and composed of annual or perennial graminoids and forbs.

Floristics: These forests are dominated by a dense canopy of *Acer grandidentatum*, often occurring with *Quercus* spp. and *Juniperus* spp. In Rocky Mountain stands, tree and shrub associates include *Amelanchier alnifolia*, *Artemisia tridentata*, *Paxistima myrsinites*, *Physocarpus malvaceus*, *Populus tremuloides*, *Prunus virginiana*, *Quercus gambelii*, and *Symphoricarpos* spp. Shrub and herb strata are relatively sparse. Forests in this alliance grade to slightly less mesic mixed evergreen-deciduous forests, woodlands, or brushfields on adjacent hillsides.

ENVIRONMENT & DYNAMICS

Environmental Description: Vegetation within this alliance occurs in relatively moist lower montane areas of the southern and central Rocky Mountains. These forests occur from 1200-2600 m in elevation. Annual precipitation generally exceeds 40 cm with a large proportion falling during the growing season. The alliance can occur on all aspects but is best developed on north-facing valleys or canyons which have moderate insolation and favorable soil moisture.

Dynamics: In southern stands, these communities are typically associated with protected topographic positions with relatively moist soils and lower fire frequencies than surrounding hillsides.

DISTRIBUTION

Geographic Range: This alliance is known from the Utah-Wyoming Rocky Mountains, Utah High Plateaus, and Colorado Plateau.

Nations: US

States/Provinces: ID, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY**LOWER LEVEL UNITS****Associations:**

- C EGL000559 *Acer grandidentatum* / *Quercus gambelii* Forest
- C EGL000558 *Acer grandidentatum* / *Calamagrostis rubescens* Forest

AUTHORSHIP

Primary Concept Source: D. Sarr, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Diamond 1993, Faber-Langendoen et al. 2017b

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G222. Rocky Mountain Subalpine-Montane Aspen Forest & Woodland

A3367. *Betula papyrifera* Rocky Mountain Forest & Woodland Alliance

Type Concept Sentence: This forest and woodland alliance is found in Alberta, Montana, Washington, and Wyoming and dominated by the successional species *Betula papyrifera*.

OVERVIEW

Scientific Name: *Betula papyrifera* Rocky Mountain Forest & Woodland Alliance

Common Name (Translated Scientific Name): Paper Birch Rocky Mountain Forest & Woodland Alliance

Colloquial Name: Rocky Mountain Paper Birch Forest & Woodland

Type Concept: This forest and woodland alliance is found in Montana, Washington, and Wyoming. It is composed of early-successional forests and woodlands that occur on north-facing slopes and rocky, cut-over areas. This alliance is a provisional type, developed to account for *Betula papyrifera* stands in the Rockies that have not been adequately studied or classified.

Classification Comments: Although in the range of *Populus tremuloides*, this alliance is restricted to stands where *Betula papyrifera* comprises >90% of the deciduous canopy.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Small patch early-successional forests and woodlands of a wide geographic distribution dominated by *Betula papyrifera* with >90% of the total deciduous canopy cover.

VEGETATION

Physiognomy and Structure: This alliance has a cold-deciduous, tree-dominated canopy that is woodland or forest in structure. The dominant tree does not cast dense shade and thus there is usually a prominent subcanopy or shrub layer. The subcanopy, and most other tree reproduction, is composed largely of more shade-tolerant tree species, of a mix of either deciduous or evergreen species.

Floristics: The canopy is open to closed and in some stands the tree density can be high. The dominant tree *Betula papyrifera* does not cast dense shade and thus there is usually a prominent subcanopy or shrub layer.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs on north-facing slopes and rocky, cut-over areas of the northern Rocky Mountains.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found in the Rocky Mountains of Alberta, Montana, Washington, and Wyoming.

NBR alliances

Nations: CA, US

States/Provinces: AB, MT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG005844 *Betula papyrifera* / *Acer glabrum* Woodland
- CEG000520 *Betula papyrifera* Forest

AUTHORSHIP

Primary Concept Source: M.E. Hall, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Faber-Langendoen et al. 2017b

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G222. Rocky Mountain Subalpine-Montane Aspen Forest & Woodland

A2036. *Populus tremuloides* Rocky Mountain Forest & Woodland Alliance

Type Concept Sentence: This alliance is widespread in the southern, central and northern Rocky Mountains, west to the Sierra Nevada and east to the Black Hills and defined by a canopy dominated by *Populus tremuloides*.

OVERVIEW

Scientific Name: *Populus tremuloides* Rocky Mountain Forest & Woodland Alliance

Common Name (Translated Scientific Name): Quaking Aspen Rocky Mountain Forest & Woodland Alliance

Colloquial Name: Rocky Mountain Aspen Forest & Woodland

Type Concept: This alliance is widespread in the montane and subalpine zones Rocky Mountains and adjacent regions, including the Sierra Nevada and Black Hills. Stands are found on a variety of landscape positions, but are consistently in mesic habitats. Stands in this alliance often originate following disturbance. The dominant species of the canopy is *Populus tremuloides*. Scattered conifer trees such as *Pseudotsuga menziesii* and species of *Pinus*, *Picea*, and *Abies* may also be present. Common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia tridentata*, *Juniperus communis*, *Prunus virginiana*, *Rosa woodsii*, *Shepherdia canadensis*, *Symphoricarpos oreophilus*, and the dwarf-shrubs *Mahonia repens* and *Vaccinium myrtillus*. The herbaceous layer may be lush and diverse. Common graminoids may include *Bromus carinatus*, *Calamagrostis rubescens*, *Carex siccata* (= *Carex foenea*), *Carex geyeri*, *Carex rossii*, *Elymus glaucus*, *Elymus trachycaulus*, *Festuca thurberi*, and *Hesperostipa comata* (= *Stipa comata*). Associated forbs may include *Achillea millefolium*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Delphinium x occidentale*, *Geranium viscosissimum*, *Heracleum sphondylium*, *Ligusticum filicinum*, *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pteridium aquilinum*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, *Valeriana occidentalis*, *Wyethia amplexicaulis*, and many others. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Topographic positions are variable, but occurrences tend to occupy cooler, moist aspects.

Classification Comments: This alliance may eventually be split into two or more alliances based on floristics or regional characteristics.

Internal Comments: MEH 1-14: AB, AZ, BC, CA, CO, ID, MT, NM, OR, SD, TX?, UT, WA, WY added & MB, ON, SK removed.

Other Comments:

Similar NVC Types:

- A3209 *Betula papyrifera* - *Populus tremuloides* - *Quercus macrocarpa* Forest Alliance

Diagnostic Characteristics: Highly variable and widely distributed alliance is characterized by stands dominated by the broad-leaved deciduous tree *Populus tremuloides*. Coniferous species may be present but not codominant. Physiognomy varies from open woodlands to dense forests. Understories are dominated by a combination of broad-leaved deciduous shrubs, evergreen shrubs, grasses and occasionally forbs.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderately dense to dense tree canopy dominated by cold-deciduous broad-leaved trees (5-20 m tall). Evergreen needle-leaved trees may be present, but do not codominate the tree canopy. The understory is variable. Sparse to dense, tall- and short-shrub layers may be present and are typically dominated by deciduous broad-leaved species; however, a scale-leaved short shrub dominates the understory of some stands. Sparse to dense tall or short herbaceous layers may also be present and may be dominated by perennial forbs or graminoids.

Floristics: *Populus tremuloides* is typically the sole dominant canopy tree, and stands may have open to closed cover. Other canopy associates may include *Abies lasiocarpa*, *Picea engelmannii*, *Populus angustifolia*, *Populus balsamifera*, and *Pseudotsuga menziesii*. Common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia tridentata*, *Juniperus communis*, *Mahonia repens*, *Prunus virginiana*, *Rosa woodsii*, *Shepherdia canadensis*, *Symphoricarpos oreophilus*, and *Vaccinium myrtillus*. The herbaceous layer may be lush and diverse. Common graminoids may include *Bromus carinatus*, *Calamagrostis rubescens*, *Carex siccata* (= *Carex foenea*), *Carex geyeri*, *Carex rossii*, *Elymus glaucus*, *Elymus trachycaulus*, *Festuca thurberi*, and *Hesperostipa comata* (= *Stipa comata*). Associated forbs may include *Achillea millefolium*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Delphinium x occidentale*, *Geranium viscosissimum*, *Heracleum sphondylium*, *Ligusticum filicinum*, *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pteridium aquilinum*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, *Valeriana occidentalis*, *Wyethia amplexicaulis*, and many others. Exotic grasses, such as the perennial *Poa pratensis* and the annual *Bromus tectorum*, are often common in stands disturbed by grazing.

ENVIRONMENT & DYNAMICS

Environmental Description: Sites include variable topographic positions with slopes ranging from level to steep with variable aspects, with occurrences on warmer aspects at higher elevations and cooler aspects are lower elevations. The soils are typically deep and well-developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loam. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but this vegetation appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Dynamics: Stands in this alliance often originate and are likely maintained by stand-replacing disturbances such as crown fire, disease and windthrow, or cutting by man or beaver. The stems of these thin-barked, clonal trees are easily killed by surface fires, but they can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1993). The stems are relatively short-lived (100-150 years), and the stand will succeed to longer-lived conifer forest if undisturbed. Stands are favored by fire in the conifer zone (Mueggler 1988). With adequate disturbance a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because of the long moist conditions required to establish are rare in the habitats that it occurs in. Superficial soil drying will kill seedlings (Knight 1994).

DISTRIBUTION

Geographic Range: This alliance is more common in the southern and central Rocky Mountains, but occurs in the montane and subalpine zones throughout much of the western U.S., south into northern Mexico and north into Canada. An eastern extension occurs along the Rocky Mountains foothill front, in mountain "islands" in Montana (Big Snowy and Highwood mountains), the Black Hills of South Dakota and also west to the Sierra Nevada.

Nations: CA, US

States/Provinces: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, TX?, UT, WA, WY

TNC Ecoregions [optional]: 11:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Great Basin)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG002816 *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / Mixed Graminoid Forest
- CEG000614 *Populus tremuloides* / *Symphoricarpos oreophilus* / *Festuca thurberi* Forest

NBR alliances

- CEGLO00575 *Populus tremuloides* / *Calamagrostis rubescens* Forest
- CEGLO00611 *Populus tremuloides* / *Symphoricarpos oreophilus* / *Bromus carinatus* Forest
- CEGLO00583 *Populus tremuloides* / *Corylus cornuta* Forest
- CEGLO00619 *Populus tremuloides* / *Thalictrum fendleri* Forest
- CEGLO00620 *Populus tremuloides* / *Vaccinium myrtillus* Forest
- CEGLO00586 *Populus tremuloides* / *Heracleum sphondylium* Forest
- CEGLO00568 *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / Tall Forbs Forest
- CEGLO00585 *Populus tremuloides* / *Festuca thurberi* Forest
- CEGLO00593 *Populus tremuloides* / *Lupinus argenteus* Forest
- CEGLO00603 *Populus tremuloides* / *Rudbeckia occidentalis* Forest
- CEGLO00613 *Populus tremuloides* / *Symphoricarpos oreophilus* / *Carex rossii* Forest
- CEGLO00567 *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest
- CEGLO03146 *Populus tremuloides* / *Artemisia tridentata* / *Monardella odoratissima* - *Kelloggia galioides* Forest
- CEGLO00607 *Populus tremuloides* / *Spiraea betulifolia* Forest
- CEGLO00597 *Populus tremuloides* / *Pteridium aquilinum* Forest
- CEGLO00592 *Populus tremuloides* / *Lonicera involucrata* Forest
- CEGLO00602 *Populus tremuloides* / *Rubus parviflorus* Forest
- CEGLO00588 *Populus tremuloides* / *Juniperus communis* / *Carex geyeri* Forest
- CEGLO00579 *Populus tremuloides* / *Carex geyeri* Forest
- CEGLO00580 *Populus tremuloides* / *Carex rossii* Forest
- CEGLO00578 *Populus tremuloides* / *Carex siccata* Forest
- CEGLO00606 *Populus tremuloides* / *Shepherdia canadensis* Forest
- CEGLO00572 *Populus tremuloides* / *Artemisia tridentata* Forest
- CEGLO00610 *Populus tremuloides* / *Symphoricarpos oreophilus* Forest
- CEGLO00564 *Populus tremuloides* / *Amelanchier alnifolia* Forest
- CEGLO00565 *Populus tremuloides* / *Amelanchier alnifolia* / *Pteridium aquilinum* Forest
- CEGLO00589 *Populus tremuloides* / *Juniperus communis* / *Lupinus argenteus* Forest
- CEGLO005932 *Populus tremuloides* / *Physocarpus monogynus* Forest
- CEGLO00581 *Populus tremuloides* / *Ceanothus velutinus* Forest
- CEGLO00617 *Populus tremuloides* / *Symphoricarpos oreophilus* / *Wyethia amplexicaulis* Forest
- CEGLO005624 *Populus tremuloides* / *Prunus virginiana* Central Rocky Mountain Forest
- CEGLO00587 *Populus tremuloides* / *Juniperus communis* Forest
- CEGLO00563 *Populus tremuloides* / *Acer glabrum* Forest
- CEGLO00598 *Populus tremuloides* / *Quercus gambelii* / *Symphoricarpos oreophilus* Forest
- CEGLO00608 *Populus tremuloides* / *Hesperostipa comata* Forest
- CEGLO00566 *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Bromus carinatus* Forest
- CEGLO00615 *Populus tremuloides* / *Symphoricarpos oreophilus* / Tall Forbs Forest
- CEGLO00618 *Populus tremuloides* / Tall Forbs Forest
- CEGLO00595 *Populus tremuloides* / *Heracleum maximum* Forest
- CEGLO00605 *Populus tremuloides* / *Sambucus racemosa* Forest
- CEGLO00571 *Populus tremuloides* / *Amelanchier alnifolia* / *Thalictrum fendleri* Forest
- CEGLO00945 *Populus tremuloides* / *Physocarpus malvaceus* - *Amelanchier alnifolia* Scree Woodland
- CEGLO00594 *Populus tremuloides* / *Mahonia repens* Forest
- CEGLO00604 *Populus tremuloides* / *Salix scouleriana* Forest
- CEGLO00946 *Populus tremuloides* / *Symphoricarpos albus* / *Elymus glaucus* Woodland
- CEGLO00569 *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Thalictrum fendleri* Forest
- CEGLO00570 *Populus tremuloides* / *Amelanchier alnifolia* / Tall Forbs Forest
- CEGLO00612 *Populus tremuloides* / *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest
- CEGLO00616 *Populus tremuloides* / *Symphoricarpos oreophilus* / *Thalictrum fendleri* Forest
- CEGLO00591 *Populus tremuloides* / *Ligusticum filicinum* Forest
- CEGLO00622 *Populus tremuloides* / *Wyethia amplexicaulis* Forest
- CEGLO00573 *Populus tremuloides* / *Bromus carinatus* Forest
- CEGLO00609 *Populus tremuloides* / *Symphoricarpos albus* Forest
- CEGLO005848 *Populus tremuloides* / *Symphoricarpos occidentalis* Forest
- CEGLO005849 *Populus tremuloides* / *Urtica dioica* Forest
- CEGLO03748 *Populus tremuloides* / Invasive Perennial Grasses Forest
- CEP009589 *Populus tremuloides* / *Ribes* spp. Woodland [Park Special]
- CEGLO03145 *Populus tremuloides* / *Monardella odoratissima* Forest

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Faber-Langendoen et al. 2017b, Knight 1994, Mueggler 1988

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G222. Rocky Mountain Subalpine-Montane Aspen Forest & Woodland

A4078. Populus tremuloides Southern Rocky Mountain Woodland & Scrub Alliance

Type Concept Sentence: This alliance is known only from Grand Canyon National Park and El Malpais National Monument and characterized by open woodland or regenerating stands of *Populus tremuloides*.

OVERVIEW

Scientific Name: *Populus tremuloides* Southern Rocky Mountain Woodland & Scrub Alliance

Common Name (Translated Scientific Name): Quaking Aspen Southern Rocky Mountain Woodland & Scrub Alliance

Colloquial Name: Southern Rocky Mountain Quaking Aspen Woodland & Scrub

Type Concept: Communities of this alliance are characterized by open woodlands or regenerating stands of *Populus tremuloides*. Conifers such as *Pinus ponderosa* and *Pseudotsuga menziesii* from the surrounding mixed conifer stands can be interspersed in the canopy. In the open canopy, shrub cover is often dense and may include *Ceanothus fendleri*, *Holodiscus dumosus*, *Rhus trilobata*, *Ribes leptanthum*, *Robinia neomexicana*, and *Symphoricarpos oreophilus*. The herbaceous layer ranges from sparse to dense and is typically graminoid-dominated. Species include *Carex rossii*, *Carex siccata*, *Piptatheropsis micrantha* (= *Piptatherum micranthum*), and *Poa fendleriana*. This alliance is known only from Grand Canyon National Park and El Malpais National Monument on plateaus and gentle to steep slopes. Elevations range from to 2350-2690 m. Communities occur on all aspects and slopes may be gentle to steep.

Classification Comments: This alliance is provisional and represents stands of *Populus tremuloides* that occupy sites with conditions that prohibit the development of forest vegetation or burned areas.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Open woodland stands dominated by *Populus tremuloides* or post-burn shrubland vegetation where *Populus tremuloides* was the dominant. Shrub vegetation tends to be dense as a result of the open canopy. The herbaceous component is typically graminoid-dominated and may be open to dense. Forbs do not contribute substantial cover.

VEGETATION

Physiognomy and Structure: Communities in this alliance are variable in structure and may be short-statured woodlands with 40-60% cover not exceeding 5 m in height. Other stands are found in post-burn areas where *Populus tremuloides* was the dominant tree. Shrub cover is dense in these open stands and in post-burn areas shrubs form thickets and are the dominant vegetation.

Floristics: Communities of this alliance are characterized by open woodlands or regenerating stands of *Populus tremuloides*. Conifers such as *Pinus ponderosa* and *Pseudotsuga menziesii* from the surrounding mixed conifer stands can be interspersed in the canopy. Trees typically do not exceed 5 m in the height or 60% in cover. In the open canopy, shrub cover is often dense and may include *Ceanothus fendleri*, *Holodiscus dumosus*, *Rhus trilobata*, *Ribes leptanthum*, *Robinia neomexicana*, and *Symphoricarpos oreophilus*. The herbaceous layer ranges from sparse to dense and is typically graminoid-dominated. Species include *Carex rossii*, *Carex siccata*, *Piptatheropsis micrantha* (= *Piptatherum micranthum*), and *Poa fendleriana*. Forbs are typically present but are not dominant. Associates may include *Achillea millefolium*, *Arabis fendleri* (= *Boechera fendleri*), *Arenaria lanuginosa*, *Artemisia campestris*, *Chamerion angustifolium*, *Chenopodium* sp., *Conyza canadensis*, *Erigeron divergens*, *Erigeron formosissimus*, *Fragaria vesca*, *Gayophytum diffusum*, *Lotus utahensis*, *Machaeranthera canescens*, *Packera neomexicana* var. *mutabilis*, *Pseudognaphalium macounii*, *Pseudostellaria jamesiana*, and *Solidago velutina*.

ENVIRONMENT & DYNAMICS

Environmental Description: Positions include plateaus and side slopes. Elevations range from to 2350-2690 m. Communities occur on all aspects, and slopes may be gentle to steep. Some sites include areas that have experienced high-intensity fires. Substrates include silty loams, sandy loams or cinder.

Dynamics:**DISTRIBUTION**

Geographic Range: This alliance is known only from Grand Canyon National Park in Arizona and El Malpais National Monument in New Mexico.

Nations: US

States/Provinces: AZ, NM

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY**LOWER LEVEL UNITS****Associations:**

- CEGLO05503 *Populus tremuloides* / *Robinia neomexicana* Woodland
- CEGLO05034 *Populus tremuloides* / Mixed Shrubs / Cinder Woodland
- CEGLO05504 *Populus tremuloides* - *Ceanothus fendleri* / *Carex* spp. Scrub

AUTHORSHIP

Primary Concept Source: Muldavin et al. (2013c); Kearsley et al. (2013)

Author of Description: M. E. Hall

Acknowledgments:

Version Date: 2014/01/07

REFERENCES

References: Faber-Langendoen et al. 2017b, Kearsley et al. 2015, Muldavin et al. 2013c

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

1.B.2.Nb.5.e. M020 Rocky Mountain Subalpine-High Montane Conifer Forest

G221. Rocky Mountain Subalpine-Montane Limber Pine - Bristlecone Pine Woodland

Type Concept Sentence: This group is composed of open, patchy woodlands dominated by *Pinus flexilis* and/or *Pinus aristata* usually on dry, rocky, wind-blasted, mostly west-facing slopes and exposed ridges near upper treeline and is known from throughout the Rocky Mountains and west into the southern Colorado Plateau.

OVERVIEW

Scientific Name: *Pinus flexilis* - *Pinus aristata* Rocky Mountain Subalpine-Montane Woodland Group

Common Name (Translated Scientific Name): Limber Pine - Bristlecone Pine Rocky Mountain Subalpine-Montane Woodland Group

Colloquial Name: Rocky Mountain Limber Pine Woodland

Type Concept: This group is found throughout the Rocky Mountains and extends west into the southern Colorado Plateau. Stands occur on dry, rocky ridges and slopes near upper treeline above the matrix spruce-fir forest and extend down to the lower montane zone. Sites are harsh, exposed to desiccating winds, with rocky substrates and a short growing season that limit plant growth. Higher elevation occurrences are found well into the subalpine-alpine transition on wind-blasted, mostly west-facing slopes and exposed ridges. Calcareous substrates are important for *Pinus flexilis*-dominated communities in the northern Rocky Mountains and probably elsewhere. The open tree canopy is often patchy and is strongly dominated by *Pinus flexilis* and/or *Pinus aristata* with the latter restricted to southern Colorado, northern New Mexico and the San Francisco Mountains in Arizona. Other trees such as *Juniperus scopulorum*, *Picea engelmannii*, *Pinus contorta*, *Pinus ponderosa*, or *Pseudotsuga menziesii* are occasionally present, but do not dominate. *Arctostaphylos uva-ursi*, *Cercocarpus ledifolius*, *Juniperus communis*, *Mahonia repens*, *Purshia tridentata*, *Ribes montigenum*, or *Vaccinium* spp. may form an open shrub layer in some stands. The herbaceous layer, if present, is generally sparse

and composed of xeric graminoids, such as *Calamagrostis purpurascens*, *Festuca arizonica*, *Festuca idahoensis*, *Festuca thurberi*, or *Pseudoroegneria spicata*, or more alpine plants.

Classification Comments: This montane-subalpine group occurs on higher elevation mountains of the Rocky Mountains. It is distinguished from Rocky Mountain Foothill-Rock Outcrop Limber Pine - Juniper Woodland Group (G209) largely by life zone, which for the most part is restricted to isolated low mountains, hills, and escarpments of the western Great Plains where soil moisture is slightly higher than surrounding grasslands, and lower foothills in northern Colorado, Wyoming and Montana. The foothill stands are typically juniper-dominated and occur below the zone of continuous *Pinus ponderosa* or *Pseudotsuga menziesii* woodlands and forests.

~Rocky Mountain Subalpine-Montane Limber Pine - Bristlecone Pine Woodland Group (G221) is also similar to Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland Group (G224) because *Pinus flexilis* can dominate stands; however, the groups are geographically separate with Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland Group (G224) restricted to the eastern Sierra Nevada and ranges in the northern Mojave Desert and Great Basin extending east to the high plateaus of southwestern and central Utah, roughly following the range of distribution for *Pinus longaeva*.

Stands may occur adjacent to Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland Group (G219) and Southern Rocky Mountain White Fir - Douglas-fir Dry Forest Group (G226), but are distinguished by dominance of *Pinus flexilis* or *Pinus aristata*.

Similar NVC Types:

- G209 Rocky Mountain Foothill-Rock Outcrop Limber Pine - Juniper Woodland
- G224 Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland

Diagnostic Characteristics: *Pinus flexilis* and/or *Pinus aristata* are the dominant and diagnostic species of this woodland group. The understory is variable, but is characterized by xeric shrubs and grasses found in montane and subalpine zones in the Rocky Mountains.

VEGETATION

Physiognomy and Structure: Conifer-dominated woodlands with a typically open tree canopy that is often patchy. Shrub and herbaceous layers, if present, generally have low cover as substrates are characteristically rocky. Higher elevation stands often have cushion plants present.

Floristics: This woodland group is characterized by an open tree canopy that is often patchy and dominated by *Pinus flexilis* and/or *Pinus aristata* with the latter restricted to southern Colorado, northern New Mexico and the San Francisco Mountains in Arizona. Other trees such as *Juniperus scopulorum*, *Picea engelmannii*, *Pinus contorta*, *Pinus ponderosa*, or *Pseudotsuga menziesii* are occasionally present, but do not dominate. *Arctostaphylos uva-ursi*, *Cercocarpus ledifolius*, *Juniperus communis*, *Mahonia repens*, *Purshia tridentata*, *Ribes montigenum*, or *Vaccinium* spp. may form an open shrub layer in some stands. The herbaceous layer, if present, is generally sparse and composed of xeric graminoids, such as *Calamagrostis purpurascens*, *Festuca arizonica*, *Festuca idahoensis*, *Festuca thurberi*, *Leucopoa kingii*, *Muhlenbergia filiculmis*, *Muhlenbergia montana*, *Poa fendleriana*, and *Trisetum spicatum*. Highest elevation stands have a floristic component of typically subalpine and alpine plants, such as *Sedum lanceolatum*, *Trifolium dasyphyllum*, *Carex rupestris*, *Carex elynoides*, or *Phlox pulvinata*. Other scattered forbs may include species of *Achillea*, *Antennaria*, *Artemisia*, *Arenaria*, *Arnica*, *Astragalus*, *Campanula*, *Erigeron*, *Hymenoxys*, *Penstemon*, *Polemonium*, *Senecio*, and *Thalictrum*.

ENVIRONMENT & DYNAMICS

Environmental Description: This woodland group is found throughout the Rocky Mountains and extends west into the southern Colorado Plateau. Stands occur on dry, rocky ridges and slopes near upper treeline above the matrix spruce-fir forest and extends down to the lower montane zone. Sites are harsh, exposed to desiccating winds, with rocky substrates and a short growing season that limit plant growth. Higher elevation occurrences are found well into the subalpine-alpine transition on wind-blasted, mostly west-facing slopes and exposed ridges. Calcareous substrates are important for *Pinus flexilis*-dominated communities in the northern Rocky Mountains and possibly elsewhere.

Climate: Elevations range from 2400-3670 m. Climate is semi-arid, cold temperate with cool summers. Annual precipitation patterns and amounts vary with latitude, but locally the sites are typically xeric on exposed, windswept rocky slopes and ridges. **Soil/substrate/hydrology:** Soils are typically well-drained, shallow, skeletal and coarse-textured such as gravelly, sandy loams or loams. Stands occur most frequently on igneous, metamorphic and volcanic substrates such as andesite, granite, gneiss, breccia, tuff, and conglomerate, but also occur on sedimentary rocks like sandstone. Exposed bedrock is common. Soil pH is 4.5-6.9, acidic to slightly acidic. Calcareous substrates are important for *Pinus flexilis*-dominated communities in the northern Rocky Mountains and possibly elsewhere.

Dynamics: Natural regeneration of *Pinus flexilis* appears to be closely associated with caching of the large wingless seeds, primarily by Clark's nutcracker (*Nucifraga columbiana*) (Lanner and Vander Wall 1980). Germination of cached seeds often results in the multi-stemmed clumps characteristic of these sites, although the species may produce multiple stems from boles damaged near the ground. Germination and rooting will sometimes be restricted to crevices in rock. *Pinus longaeva* has smaller winged seeds and should be wind-disseminated. However, caching by nutcrackers does take place, especially when other *Pinus* species are also available (Dr. R. Lanner pers. comm.). Fires seldom destroy these woodlands due to the sparse nature of the canopy cover of trees and abundant bare ground. Peet (1978, 1981) notes that *Pinus aristata* is dominant at higher elevations in much of the southern Rocky Mountains, where *Pinus flexilis* is restricted to lower elevations. This is attributed to apparent competitive exclusion, because *Pinus flexilis* is dominant at high elevations in northern Colorado, Wyoming and Montana.

DISTRIBUTION

Geographic Range: This group is found throughout the Rocky Mountains, including the Uinta and northern Wasatch mountains, and the Jarbridge Mountains in northeastern Nevada, and extends west into the southern Colorado Plateau. It also occurs farther east, in the Bighorn Range of north-central Wyoming, although it is not common there. Montane limber pine communities probably occur in the mountains of Alberta as well.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, US

States/Provinces: AB, CO, ID, MT, NM, NV, OR, UT, WY

TNC Ecoregions [optional]: 6:C, 7:C, 8:C, 9:C, 10:?, 19:C, 20:C, 21:C, 26:C

USFS Ecoregions (2007): 313B:CC, 331J:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333C:CC, M341B:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- < Bristlecone Pine: 209 (Eyre 1980)
- >< Limber Pine: 219 (Eyre 1980)

LOWER LEVEL UNITS

Alliances:

- A0537 *Pinus aristata* Woodland Alliance
- A0540 *Pinus flexilis* Rocky Mountain Woodland Alliance

AUTHORSHIP

Primary Concept Source: F.H. Eyre (1980)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 03/17/2010

Classif Resp Region: West

Internal Author: KAS 3-10, mod. GK 12-15

REFERENCES

References: Baker 1992, Beasley and Klemmedson 1980, Brunstein and Yamaguchi 1992, Eyre 1980, Faber-Langendoen et al. 2017a, Knight 1994, Krebs 1972, Lanner and Vander Wall 1980, Peet 1978a, Peet 1981, Ranne 1995, Ranne et al. 1997, Steele et al. 1983

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G221. Rocky Mountain Subalpine-Montane Limber Pine - Bristlecone Pine Woodland

G345. Central Rocky Mountain Montane White Spruce Forest

Type Concept Sentence: This group consists of forests where *Picea glauca* is the characteristic conifer often with other trees such as *Betula papyrifera*, *Picea engelmannii* x *glauca* hybrids, *Pinus contorta*, *Pinus ponderosa*, *Populus tremuloides*, and *Pseudotsuga menziesii*. They are found in lower montane regions of western Montana, southwestern Alberta and southeastern British Columbia, with outliers in mountains of the northwestern Great Plains, especially the Black Hills of Wyoming and South Dakota.

OVERVIEW

Scientific Name: *Picea glauca* - *Pseudotsuga menziesii* Central Rocky Mountain Forest Group

Common Name (Translated Scientific Name): White Spruce - Douglas-fir Central Rocky Mountain Forest Group

Colloquial Name: Black Hills White Spruce Forest

Type Concept: This group is found in lower montane regions of western Montana, southwestern Alberta and southeastern British Columbia, with outliers in mountains of the northwestern Great Plains, especially the Black Hills of Wyoming and South Dakota. This forest group is limited to sideslopes and depressions, often adjoining cool, riparian zones, where snow persists well into the growing season. Soils vary widely from deep to quite shallow. *Picea glauca* is the characteristic conifer, but other trees can include *Pinus ponderosa*, *Pinus contorta*, *Picea engelmannii* x *glauca* hybrids, *Pseudotsuga menziesii*, *Populus tremuloides*, and *Betula papyrifera*. Undergrowth shrubs typically include *Arctostaphylos uva-ursi*, *Elaeagnus commutata*, *Juniperus communis*, *Linnaea borealis*, *Shepherdia canadensis*, *Symphoricarpos albus*, and *Vaccinium scoparium*. Common forbs and graminoids include *Fragaria virginiana*, *Oxytropis* spp., *Linnaea borealis*, *Leymus innovatus*, *Lathyrus ochroleucus*, *Hedysarum alpinum*, and Asteraceae spp. Disturbance regimes are not well-documented for this group, but likely include periodic windthrow as well as fire spreading from adjacent, drier forests and woodlands.

Classification Comments: Information on this group needs to be better integrated across Montana, British Columbia and Alberta. Further information on this group in British Columbia is found in Meidinger and Pojar (1991) and in Alberta, in Achuff and Corns (1982), Achuff and Dudynsky (1984), Achuff et al. (2002), and Natural Areas Committee (2006). No sources are currently known for Montana. Its full geographic extent and distinguishing / diagnostic features require further work. As of 2013, the association lists for the Alberta and British Columbia parts have not been integrated.

Similar NVC Types:

Diagnostic Characteristics: Forests and woodlands with *Picea glauca* dominating. Generally in lower montane and foothill settings in the Central Rocky Mountain region, with Rocky Mountain floristic components (as opposed to boreal floristics). Other trees present can include *Pinus ponderosa*, *Pinus contorta*, *Pseudotsuga menziesii*, *Abies lasiocarpa*, and *Populus tremuloides* or *Picea engelmannii* x *glauca* hybrids.

VEGETATION

Physiognomy and Structure: Open to closed canopies of conifers, with some deciduous hardwoods intermingled in some occurrences. Typically there is a well-developed shrub layer also of deciduous species, along with forbs, graminoids and often high cover of mosses. Some occurrences may lack the shrub layer.

Floristics: *Picea glauca* is the characteristic conifer, but other trees can include *Pinus ponderosa*, *Pinus contorta*, *Abies lasiocarpa*, *Picea engelmannii* (and *Picea glauca* x *Picea engelmannii* introgressive hybrids), *Pseudotsuga menziesii*, *Populus tremuloides*, and *Betula papyrifera*. Undergrowth shrubs typically include *Arctostaphylos uva-ursi*, *Elaeagnus commutata*, *Juniperus communis*, *Linnaea borealis*, *Shepherdia canadensis*, *Symphoricarpos albus*, and *Vaccinium scoparium*. Common forbs and graminoids include *Fragaria virginiana*, *Oxytropis* spp., *Linnaea borealis*, *Leymus innovatus*, *Lathyrus ochroleucus*, *Hedysarum alpinum*, and Asteraceae spp.

ENVIRONMENT & DYNAMICS

Environmental Description: In the main part of its range, this forest group is limited to sideslopes and depressions, likely adjoining riparian zones, where snow is well-retained. Soils vary widely from deep to shallow. In the Black Hills, these forests occur as small or large patches at cooler higher elevations, on level or gently sloping areas, from about 1740 to 2135 m (5700-7000 feet) elevation; at lower elevations, they are restricted to north-facing slopes within the ponderosa pine matrix.

Dynamics:**DISTRIBUTION**

Geographic Range: This group is found in lower montane regions of western Montana, southwestern Alberta and southeastern British Columbia, with outliers in higher mountains of the northwestern Great Plains, especially the Black Hills of Wyoming and South Dakota, and possibly the Bighorn Mountains of Wyoming. In Alberta and British Columbia, this group occurs north through Banff National Park to Jasper National Park, and in the British Columbia portion of the Rockies, these occur in the Columbia Trench north to at least Kootenay and Yoho national parks.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, US

States/Provinces: AB, BC, MT, SD, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: PC (Banff, Jasper, Kootenay, Yoho)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- = *Picea glauca* series (Hoffman and Alexander 1987)
- < Montane Natural Subregion (Natural Regions Committee 2006) [The white spruce group is found within the mesic parts of this region, which can contain other types.]
- < Montane Spruce Zone (Meidinger and Pojar 1991) [The white spruce group is found within the mesic parts of this ecological zone, which can contain other types.]

LOWER LEVEL UNITS

Alliances:

- A3623 *Picea glauca* Black Hills Forest Alliance
- A3624 *Picea glauca* - *Pseudotsuga menziesii* Rocky Mountain Forest Alliance

AUTHORSHIP

Primary Concept Source: Hoffman and Alexander (1987); Meidinger and Pojar (1991); Natural Regions Committee (2006)

Author of Description: D. Faber-Langendoen

Acknowledgments: Lorna Allen, Peter Achuff, Del Meidinger

Version Date: 06/06/2013

Classif Resp Region: West

Internal Author: DFL/MSR 2-10, mod. DFL 6-13, mod. GK 12-15

REFERENCES

References: Achuff and Corns 1982, Achuff and Dudynsky 1984a, Achuff et al. 2002, Faber-Langendoen et al. 2017a, Hoffman and Alexander 1987, Meidinger and Pojar 1991, Natural Regions Committee 2006

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G345. Central Rocky Mountain Montane White Spruce Forest

G223. Northern Rocky Mountain Whitebark Pine - Subalpine Larch Woodland

Type Concept Sentence: This group consists of woodlands dominated by *Pinus albicaulis* and *Abies lasiocarpa*, or *Larix lyallii*, that form stunted tree clumps, or open woodlands with herb- or dwarf-shrub-dominated openings with an undergrowth that is usually somewhat depauperate. It is found in the northern Rocky Mountains at high elevations of the treeline/alpine transition zone, an often harsh, windswept environment, where trees maybe flagged from damage by blowing snow and ice crystals.

OVERVIEW

Scientific Name: *Pinus albicaulis* - *Abies lasiocarpa* - *Larix lyallii* Northern Rocky Mountain Woodland Group

Common Name (Translated Scientific Name): Whitebark Pine - Subalpine Fir - Subalpine Larch Northern Rocky Mountain Woodland Group

Colloquial Name: Whitebark Pine Forest & Woodland

Type Concept: This group of the Northern Rockies is typically a high-elevation mosaic of stunted tree clumps, open woodlands, with herb- or dwarf-shrub-dominated openings, occurring above upper subalpine closed forest ecosystems and below alpine communities. The climate is typically very cold and snowy in winter and relatively dry and cool in summer. The upper and lower elevational limits, due to climatic variability and differing topography, vary considerably; in interior British Columbia, this group occurs between 1400 and 2200 m elevation, and in northwestern Montana, it occurs up to 2400 m. Landforms include ridgetops, mountain slopes, glacial trough walls and moraines, talus slopes, landslides and rockslides, cirque headwalls and basins. Some sites have little snow accumulation because of high winds and sublimation. In this harsh, often windswept environment, trees are typically stunted and flagged from damage associated with wind, blowing snow and ice crystals, especially at the upper elevations of the type. The stands or patches often originate when *Pinus albicaulis*, and in some communities *Picea engelmannii*, colonize a sheltered site such as the lee side of a rock. *Abies lasiocarpa* can then colonize in the shelter of either species. These high-elevation coniferous woodlands are dominated by *Pinus albicaulis* and *Abies lasiocarpa*, or *Larix lyallii*. The undergrowth is usually somewhat depauperate, but some stands support a near sward of heath plants, such as *Phyllodoce empetriformis*, *Vaccinium myrtillus*, and *Vaccinium scoparium*, that may be present to codominant. The herbaceous layer is sparse under dense shrub canopies or may be dense where the shrub canopy is open or absent. Common species include *Ligusticum grayi*(?), *Arnica latifolia*, *Xerophyllum tenax*, *Carex rossii*, *Carex geyeri*, and *Luzula glabrata* var. *hitchcockii*. Major disturbances are windthrow and snow avalanches. Fire is

known to occur infrequently in this group, at least where woodlands are present; lightning damage to individual trees is common, but sparse canopies and rocky terrain limit the spread of fire.

Classification Comments: *Pinus albicaulis* and *Larix lyallii* associations are considered distinct enough to be placed in their own group. Alternatively, they could be merged into one of the Rocky Mountain spruce-fir groups, or with the limber pine group, as a "Rocky Mountain dry, cold, subalpine-montane pine" group. *Pinus albicaulis* woodlands in northeastern Oregon are included in this group. In the Sierra Nevada and Oregon Cascades, they are placed into Sierra-Cascade Cold-Dry Subalpine Woodland Group (G243).

Similar NVC Types:

- G218 Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland
- G243 Sierra-Cascade Cold-Dry Subalpine Woodland

Diagnostic Characteristics: These coniferous woodlands are dominated by *Pinus albicaulis* and *Abies lasiocarpa* and locally *Larix lyallii* with occasional *Picea engelmannii*. The undergrowth is often composed of few species, but some stands support a near sward of heath plants, such as *Vaccinium myrtillus* and *Vaccinium scoparium*, that may be present to codominant. The herbaceous layer is sparse under dense shrub canopies or may be dense where the shrub canopy is open or absent. Common species include *Ligusticum grayi*, *Xerophyllum tenax*, *Festuca idahoensis*, *Carex rossii*, *Calamagrostis rubescens*, and *Luzula glabrata* var. *hitchcockii*.

VEGETATION

Physiognomy and Structure: This group is characterized by *Pinus albicaulis* or *Larix lyallii*, sometimes associated with other conifers, which form woodlands and occasionally forests. Trees are often stunted and flagged as a result of harsh cold and wind. The understory is variable depending on substrates ranging from sparse on rockier sites to dense on more mesic sites and typically characterized by heaths and graminoids.

Floristics: These woodlands are mostly dominated by *Pinus albicaulis* or *Larix lyallii* and occasionally codominated by *Abies lasiocarpa*. Understories range from sparse to dense and are occupied by heath species, including *Arctostaphylos uva-ursi*, *Vaccinium membranaceum*, *Vaccinium myrtillus*, *Menziesia ferruginea*, and *Vaccinium scoparium*. The herbaceous layer is sparse under dense shrub canopies or may be dense where the shrub canopy is open or absent. Common species include *Ligusticum grayi*, *Xerophyllum tenax*, *Festuca idahoensis*, *Carex rossii*, *Calamagrostis rubescens*, and *Luzula glabrata* var. *hitchcockii*.

ENVIRONMENT & DYNAMICS

Environmental Description: This subalpine group typically occurs at elevations of 1800-2700 m and occasionally up to 3000 m. Occurrences occupy warmer southern and western aspects on mid to upper slopes, shoulder slopes, ridges, and exposed high-elevation benches. These sites are often subject to desiccating winds, heavy snowpack, and extreme diurnal temperature fluctuations. Substrates include a variety of igneous, metamorphic, and sedimentary geologic formations. Soils are well- to excessively drained and can include coarse sand, silt and clay loams. *Climate:* The climate is typically very cold and snowy in winter and relatively dry in summer. Yearly snow accumulations are often over 3 m in the northern Cascades and 2-3 m in the Rockies. Some sites have little snow accumulation because of high winds and sublimation. In this harsh, often windswept environment, trees are often stunted and flagged from damage associated with wind and blowing snow and ice crystals, especially at the upper elevations of the type. *Soil/substrate/hydrology:* Where *Larix lyallii* is dominant, soils are poorly developed and almost exclusively of fractured granitic or quartzite rocks which have not been previously colonized by other vascular plants. The majority of sites where *Larix lyallii* occurs are in areas which experienced heavy alpine glaciation less than 12,000 years ago.

Dynamics: *Pinus albicaulis* is a slow-growing, long-lived conifer that is common at higher elevations in the upper subalpine zone. It typically occurs in a mosaic of tree islands and meadows where it often colonizes sites and creates habitat for less hardy tree species. In lower subalpine forests, it is a seral species, establishing after a large disturbance such as stand-replacing fire or avalanche, or it is restricted to dry, rocky ridges where it competes well with shade-tolerant tree species. Without disturbance, it will be overtopped in 100-120 years by faster growing, shade-tolerant species such as *Abies lasiocarpa*, *Picea engelmannii*, *Pseudotsuga menziesii*, and *Tsuga mertensiana*. Although crownfires and high-intensity surface fires kill *Pinus albicaulis*, it tolerates low-intensity surface fires that will kill the shade-tolerant understory. Fire intervals range from 30-300 years.

Birds and small mammals often eat and cache the large, wingless pine seeds and are responsible for the dispersal of this species. Most important is the Clark's nutcracker, which can transport the seeds long distances and cache them on exposed windswept and burned-over sites. This results in the regeneration of pines in clumps from forgotten caches (Eyre 1980, Steel et al. 1983, Burns and Honkala 1990a, Schmidt and McDonald 1990).

Pests include the mountain pine beetle (*Dendroctonus ponderosae*), which has killed many mature trees in the past, during epidemics where populations of the beetle build up in lower elevation *Pinus contorta* stands, then move up into the *Pinus albicaulis* (Steel et al. 1983, Burns and Honkala 1990a, Schmidt and McDonald 1990). The exotic pathogen white pine blister rust (*Cronartium ribicola*) is attacking and killing *Pinus albicaulis* trees in many parts of the interior northwestern U.S. It is especially destructive in

more mesic habitats that favor infection of its alternate host *Ribes* spp. *Pinus albicaulis* is very susceptible to this disease, and the only real hope is propagating individuals that have high genetic resistance to blister rust (Steel et al. 1983, Burns and Honkala 1990a, Schmidt and McDonald 1990, Tomback et al. 2001).

Larix lyallii is a very slow-growing, long-lived tree, with individuals attaining up to 1000 years in age (Richards 1981). It is generally intolerant of shade from other trees, but extreme environmental conditions limit competition. Reproduction is typically by seed and is most favorable on moist mineral soil. Seedling growth is initially very slow and accelerates after an extensive root system is established. Major disturbances to stands of this group are windthrow and snow avalanches. Lightning damage to individual trees is common, but sparse canopies and rocky terrain serve to limit the spread of fire.

DISTRIBUTION

Geographic Range: This group occurs in the northern Rocky Mountains, west into the eastern Cascade Range and eastern Washington and Oregon, and east into the mountain "islands" of central Montana. It also occurs in the Canadian Rockies of Alberta and eastern British Columbia.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, US

States/Provinces: AB, BC, CA, ID, MT, NV, OR, WA, WY

TNC Ecoregions [optional]: 3:C, 4:C, 7:C, 8:C, 9:C, 68:C

USFS Ecoregions (2007): 342H:CC, 342I:CP, M242C:CC, M242D:CC, M331A:CC, M331B:CP, M331D:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- >< *Picea engelmannii* - *Abies lasiocarpa* - *Pinus albicaulis* - *Pinus contorta* forest (Achuff 1989)
- >< *Pinus albicaulis*-*Abies lasiocarpa* Woodlands and Parklands (Chappell et al. 1997)
- >< *Pinus albicaulis* Series (Steele et al. 1983)
- >< *Pinus albicaulis* Series (Johnston 1987)
- >< *Pinus albicaulis* Zone (Barrows et al. 1977)
- < FP Engelmann Spruce - Subalpine Fir Parkland (Ecosystems Working Group 1998)
- < WB Whitebark Pine Subalpine (Ecosystems Working Group 1998)
- > Whitebark Pine: 208 (Eyre 1980)

LOWER LEVEL UNITS

Alliances:

- A0631 *Larix lyallii* Woodland Alliance
- A3368 *Pinus albicaulis* Forest & Woodland Alliance

AUTHORSHIP

Primary Concept Source: F.H. Eyre (1980)

Author of Description: M.E. Hall and M.S. Reid

Acknowledgments:

Version Date: 06/10/2013

Classif Resp Region: West

Internal Author: MEH/MSR 2-10, 6-13, mod. GK 12-15

REFERENCES

References: Achuff 1989, Arno and Habeck 1972, Barrows et al. 1977, Burns and Honkala 1990a, Chappell et al. 1997, Cooper et al. 1999, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2017a, Franklin and Dyrness 1973, Johnston 1987, Lillybridge et al. 1995, Meidinger and Pojar 1991, Pfister et al. 1977, Richards 1981, Schmidt and McDonald 1990, Steele et al. 1983, Tomback et al. 2001, Williams and Lillybridge 1983, Williams and Smith 1990

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G223. Northern Rocky Mountain Whitebark Pine - Subalpine Larch Woodland

G224. Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland

Type Concept Sentence: This group consists of open woodlands ranging from krummholz to over 10 m in height with *Pinus flexilis* and/or *Pinus longaeva* as the dominant conifer with an herbaceous layer that is typically sparse. It is commonly found on steep slopes and ridges between 2530 and 3600 m (8300-12,000 feet) elevation, and extends from the Mojave Desert and eastern Sierra Nevada across the central Great Basin to the high plateaus of southwestern and central Utah.

OVERVIEW

Scientific Name: *Pinus flexilis* - *Pinus longaeva* Intermountain Basins Subalpine Woodland Group

Common Name (Translated Scientific Name): Limber Pine - Great Basin Bristlecone Pine Intermountain Basins Subalpine Woodland Group

Colloquial Name: Intermountain Basins Limber Pine Forest & Woodland

Type Concept: This group extends from the Mojave Desert and eastern Sierra Nevada across the central Great Basin to the high plateaus of southwestern and central Utah. These open woodlands are typically found on high-elevation ridges and rocky slopes above subalpine forests and woodlands, sometimes extending down into the montane zone. Site are harsh, exposed to desiccating winds with rocky substrates and a short growing season that limit plant growth. Parent materials include dolomitic, limestone or granitic rocks. Occurrences can be found on all aspects but are more common on southwestern exposures on steep convex slopes and ridges between 2530 and 3600 m (8300-12,000 feet) elevation. Vegetation is characterized by a typically open tree canopy (<25% cover) with heights ranging from 1-2 m (krummholz) to over 10 m. *Pinus flexilis* and/or *Pinus longaeva* dominate the tree canopy, alone or in combination. *Pinus longaeva* stands tend to occur at higher elevation with less mixed canopies. Other trees present to codominant include *Picea engelmannii*, *Pseudotsuga menziesii*, *Populus tremuloides*, or *Abies concolor*. In the Sierra Nevada stands, *Pinus albicaulis*, *Pinus balfouriana*, and/or *Pinus contorta* var. *murrayana* may be present. Understory layers, if present, are sparse to moderately dense and composed of xeric shrubs, graminoids and cushion plants. Characteristic shrubs include *Arctostaphylos patula*, *Artemisia arbuscula*, *Artemisia tridentata* ssp. *vaseyana*, *Ericameria discoidea*, *Juniperus communis*, *Ribes cereum*, and *Ribes montigenum*. *Cercocarpus intricatus*, *Cercocarpus ledifolius*, or *Chrysolepis sempervirens* frequently occur in stands in the Sierra Nevada. The herbaceous layer is typically sparse. Associated herbaceous species are diverse given the wide elevational range, with alpine species occurring near the upper treeline and montane and subalpine species below.

Classification Comments: Rocky Mountain Subalpine-Montane Limber Pine - Bristlecone Pine Woodland Group (G221) is similar to Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland Group (G224) because *Pinus flexilis* can dominate stands; however, the groups are geographically separate. Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland Group (G224) is restricted to the eastern Sierra Nevada and ranges into the northern Mojave Desert and Great Basin, extending east to the high plateaus of southwestern and central Utah, roughly following the range of distribution for *Pinus longaeva*, and Rocky Mountain Subalpine-Montane Limber Pine - Bristlecone Pine Woodland Group (G221) is limited to the Rocky Mountains extending west into the southern Colorado Plateau.

~Rocky Mountain Foothill-Rock Outcrop Limber Pine - Juniper Woodland Group (G209) is also similar to Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland Group (G224) in that stands may be dominated by *Pinus flexilis*, but are geographically separate, occurring mostly in isolated low mountains, hills, and escarpments of the western Great Plains where soil moisture is slightly higher than surrounding grasslands, and lower foothills in northern Colorado, Wyoming and Montana. The foothill stands are typically juniper-dominated and occur below the zone of continuous *Pinus ponderosa* or *Pseudotsuga menziesii* woodlands and forests.

Stands may occur adjacent to Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland Group (G219) and Southern Rocky Mountain White Fir - Douglas-fir Dry Forest Group (G226), but are distinguished by dominance of *Pinus flexilis* or *Pinus aristata*.

Similar NVC Types:

- G209 Rocky Mountain Foothill-Rock Outcrop Limber Pine - Juniper Woodland
- G221 Rocky Mountain Subalpine-Montane Limber Pine - Bristlecone Pine Woodland

Diagnostic Characteristics: *Pinus flexilis* and/or *Pinus longaeva* are the dominant and diagnostic species of this woodland group. The understory is variable, but is characterized by xeric shrubs and grasses found in subalpine zones in the Sierra Nevada and ranges of the Great Basin.

VEGETATION

Physiognomy and Structure: Conifer-dominated woodlands with a typically open tree canopy that is often patchy. Shrub and herbaceous layers, if present, generally have low cover as substrates are characteristically rocky. Higher elevation stands often have cushion plants present.

Floristics: This woodland group is characterized by a typically open tree canopy (<25% cover) with heights ranging from 1-2 m (krummholz) to over 10 m. *Pinus flexilis* and/or *Pinus longaeva* dominate the tree canopy, alone or in combination. *Pinus longaeva* stands tend to occur at higher elevation with less mixed canopies. Other trees present to codominant include *Picea engelmannii*, *Pseudotsuga menziesii*, *Populus tremuloides*, or *Abies concolor*. In the Sierra Nevada stands, *Pinus albicaulis*, *Pinus balfouriana*, and/or *Pinus contorta* var. *murrayana* may be present. Scattered *Pinus monophylla* may also be present in lowest elevation stands. Understory layers, if present, are sparse to moderately dense and composed of xeric shrubs, graminoids and cushion plants. Characteristic shrubs include *Arctostaphylos patula*, *Artemisia arbuscula*, *Arctostaphylos patula*, *Artemisia tridentata* ssp. *vaseyana*, *Ericameria discoidea*, *Juniperus communis*, *Ribes cereum*, and *Ribes montigenum*. *Acer glabrum*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, and *Chrysolepis sempervirens* frequently occur in stands in the Sierra Nevada. The herbaceous layer is typically sparse. Associated herbaceous species are diverse given the wide elevational range, with alpine species occurring near the upper treeline and montane and subalpine species below. Common species may include *Antennaria rosea*, *Aquilegia scopulorum*, *Arabis drummondii*, *Arenaria congesta*, *Arenaria kingii*, *Astragalus kentrophyta*, *Astragalus platytropis*, *Calamagrostis rubescens*, *Carex rossii*, *Cirsium eatonii*, *Cymopterus cinerarius*, *Cymopterus nivalis*, *Elymus elymoides*, *Eriogonum gracilipes*, *Eriogonum holmgrenii*, *Eriogonum ovalifolium*, *Erigeron pygmaeus*, *Erigeron tener*, *Festuca brachyphylla*, *Koeleria macrantha*, *Linanthus pungens* (= *Leptodactylon pungens*), *Packera wernerifolia*, *Penstemon leiophyllus*, *Poa fendleriana*, *Phlox pulvinata*, *Trifolium gymnocarpon*, and *Trisetum spicatum*. *Selaginella watsonii* is common in some high-elevation stands.

ENVIRONMENT & DYNAMICS

Environmental Description: The bristlecone pine-limber pine woodland group denotes some of the driest and windiest sites capable of supporting trees other than *Juniperus*. Sites are typically xeric on exposed, windswept rocky slopes and ridges. It can be found on all aspects but is more common on southwestern exposures on steep convex slopes and ridges between 2530 and 3600 m (8300-12,000 feet) elevation. It commonly represents a topographic or edaphic climax within the *Abies lasiocarpa* and upper *Pseudotsuga menziesii* zones.

This group occurs on a variety of substrates but is best represented on colluvium derived from limestone and dolomite or Tertiary and Cretaceous sandstone. A characteristic feature is the predominance of bare soil; almost all sites have between 25 and 50% bare ground. Consequently, litter accumulations are slight and intermittent. Most sites are droughty, with gravel in the shallow subsurface horizons. Surface textures vary depending upon parent material. Steep slopes, high-intensity summer convection storms, and only partial ground cover for interception often result in severe sheet erosion of fine particles. This usually leads to the development of gravel pavements. Additional erosion can be expected from wind action. High insolation and wind during the winter usually result in reduced snowpack accumulations. However, soils can be expected to freeze.

The sparsity of shrubs, forbs, grasses, and litter in addition to the widely spaced trees usually means that fire does not carry easily. Individual trees may be ignited from lightning, but seldom is an entire occurrence burned.

Dynamics: Both *Pinus longaeva* and *Pinus flexilis* are slow-growing, long-lived trees that are intolerant of shade. *Pinus longaeva* may attain nearly 4900 years in age and 12 m in height, whereas *Pinus flexilis* may live 1000 years and attain 18 m in height. Bristlecone pine branches retain needles for as long as 30 years, whereas limber pine needles are lost after several years. Bristlecone pine trees produce dense, resinous wood that is resistant to rot and disease. Mature trees have massive, contorted trunks with mostly dead and gnarled wood. (Sawyer et al. 2009).

Natural regeneration of both species appears to be closely associated with caching of the large wingless seeds, primarily by Clark's nutcracker (*Nucifraga columbiana*) (Lanner and Vander Wall 1980). Germination of cached seeds often results in the multi-stemmed clumps characteristic of these sites, although the species may produce multiple stems from boles damaged near the ground. Germination and rooting will sometimes be restricted to crevices in rock. *Pinus longaeva* has smaller winged seeds and should be wind-disseminated. However, caching by nutcrackers does take place, especially when other *Pinus* species are also available (Dr. R. Lanner pers. comm.). The longevity of individuals enables stands to persist for centuries between times of favorable seedling establishment (Keeley and Zedler 1998). Fires seldom destroy this group due to the sparse nature of the canopy cover of trees and abundant bare ground.

DISTRIBUTION

Geographic Range: This woodland group extends from mountains ranges in the Mojave Desert and Sierra Nevada across the Great Basin to the high plateaus of southwestern Utah, central Wasatch and extreme western Uinta Mountains.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, US

States/Provinces: CA, NV, UT

TNC Ecoregions [optional]: 9:?, 11:C, 12:C, 18:C, 19:C

USFS Ecoregions (2007): 322A:CC, 341A:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342J:C?, M261E:CC, M261G:C?, M331D:PP, M341A:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL**USNVC Confidence Level with Comments:** Moderate.**SYNONYMY**

- > Bristlecone Pine Forest (#86400) (Holland 1986b)
- > Bristlecone Pine Series (Sawyer and Keeler-Wolf 1995)
- < Bristlecone Pine: 209 (Eyre 1980)
- > Limber Pine Forest (#86700) (Holland 1986b)
- > Limber Pine Series (Sawyer and Keeler-Wolf 1995)
- >< Limber Pine: 219 (Eyre 1980)

LOWER LEVEL UNITS**Alliances:**

- A0518 *Pinus longaeva* Forest & Woodland Alliance
- A2035 *Pinus flexilis* Intermountain Basins Forest & Woodland Alliance

AUTHORSHIP**Primary Concept Source:** R.F. Holland (1986b)**Author of Description:** K.A. Schulz**Acknowledgments:****Version Date:** 03/17/2010**Classif Resp Region:** West**Internal Author:** KAS 3-10, mod. GK 12-15**REFERENCES**

References: Eyre 1980, Faber-Langendoen et al. 2017a, Graybosch and Buchanan 1983, Holland 1986b, Holland and Keil 1995, Keeley and Zedler 1998a, LaMarche and Mooney 1972, Lanner and Vander Wall 1980, Lanner pers. comm., Nachlinger and Reese 1996, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G224. Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland

A2035. *Pinus flexilis* Intermountain Basins Forest & Woodland Alliance

Type Concept Sentence: Forests and woodlands of the central Great Basin, Columbia Plateau, middle and southern Rocky Mountains and Wyoming Basins solely dominated or codominated by the evergreen needle-leaved tree *Pinus flexilis*.

OVERVIEW**Scientific Name:** *Pinus flexilis* Intermountain Basins Forest & Woodland Alliance**Common Name (Translated Scientific Name):** Limber Pine Intermountain Basins Forest & Woodland Alliance**Colloquial Name:** Intermountain Basins Limber Pine Forest & Woodland

Type Concept: These forests and woodlands occur from the central Great Basin, east and north to the Columbia Plateau, middle and southern Rocky Mountains and Wyoming Basins. Canopies are solely dominated or codominated by the evergreen needle-leaved tree *Pinus flexilis*. Other trees present to codominant include *Abies concolor*, *Picea engelmannii*, *Populus tremuloides*, and *Pseudotsuga menziesii*. The understory is sparse to moderately dense and composed of xeric shrubs, graminoids and cushion plants. The most common dominant shrubs include *Arctostaphylos patula*, *Cercocarpus ledifolius*, and *Symphoricarpos oreophilus*. Herbaceous layers are sparse but, given the broad geographic range of these forests and woodlands, are highly variable. The most common species are graminoids such as *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua gracilis*, *Calamagrostis purpurascens*, *Carex rossii*, *Festuca campestris*, *Festuca idahoensis*, *Koeleria macrantha*, *Leucopoa kingii* (= *Festuca kingii*), and *Pseudoroegneria spicata*. Scattered forbs may include species of *Achillea*, *Antennaria*, *Arenaria*, *Arnica*, *Astragalus*, *Erigeron*, *Eriogonum*, *Hymenopappus*, *Hymenoxys*, *Liatris*, *Sedum*, *Solidago*, and *Thermopsis*. Sites include high-elevation ridges and rocky slopes above subalpine forests and woodlands, sometimes extending down into the montane zone. They are harsh, exposed to desiccating winds with rocky substrates and a short growing season that limit plant growth. Parent materials include dolomitic, limestone or granitic rocks. Occurrences can be found on all aspects but are more common on southwestern exposures on steep convex slopes and ridges between 2530 and 3600 m (8300-12,000 feet) elevation.

Classification Comments: It may be difficult to determine which tree species are dominant in a mixed, montane or subalpine forest stand, especially when *Pinus flexilis* is seral on *Pseudotsuga menziesii* habitat type sites. Some stands included in this alliance are too sparse to be classified as woodlands, especially those growing on lava (Eggler 1941).

Internal Comments:**Other Comments:**

Similar NVC Types: This alliance is similar to *Pinus flexilis* Rocky Mountain Woodland Alliance (A0540), but distinguished by having distributions in the intermountain basins and ranges of the West rather than the Rocky Mountains.

- A0540 *Pinus flexilis* Rocky Mountain Woodland Alliance: of the Rocky Mountains.

Diagnostic Characteristics: *Pinus flexilis* is the dominant and diagnostic species of this woodland group. The understory is variable, but is characterized by xeric shrubs and grasses found in subalpine zones in the intermountain basins and ranges of the West.

VEGETATION

Physiognomy and Structure: The structure of vegetation included in this alliance is variable and has a tree canopy that ranges from very open to dense with heights from to 3-20 m tall. The canopy is dominated by evergreen needle-leaved trees although broad-leaved deciduous species may codominate on some sites. Sparse to moderately sparse tall- and short-shrub layers may be present (1-3 m and <1 m tall, respectively). If present, both shrub layers may be dominated by broad-leaved or microphyllous deciduous shrubs. A sparse to moderately dense herbaceous layer dominated by perennial graminoids is present. Perennial forbs have sparse cover. Annual forbs and grasses may be seasonally present.

Floristics: Vegetation of this alliance has an open to moderately dense canopy 3-20 m tall. The stands are solely dominated or codominated by the evergreen needle-leaved tree *Pinus flexilis*. Other trees species that may be present to codominant vary by geography and elevation zones throughout the woodland's range. Other trees present to codominant include *Abies concolor*, *Picea engelmannii*, *Populus tremuloides*, and *Pseudotsuga menziesii*. The understory is sparse to moderately dense and composed of xeric shrubs, graminoids and cushion plants. The most common dominant shrubs include *Arctostaphylos patula*, *Cercocarpus ledifolius*, and *Symphoricarpos oreophilus*. Other characteristic shrubs may include *Arctostaphylos uva-ursi*, *Artemisia arbuscula*, *Artemisia nova*, *Artemisia tridentata*, *Jamesia americana*, *Juniperus communis*, *Mahonia repens*, *Purshia tridentata*, *Rhus trilobata*, *Shepherdia canadensis*, and *Yucca glauca*. Herbaceous layers are sparse but, given the broad geographic range of these forests and woodlands, are highly variable. The most common species are graminoids such as *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua gracilis*, *Calamagrostis purpurascens*, *Carex rossii*, *Festuca campestris*, *Festuca idahoensis*, *Koeleria macrantha*, *Leucopoa kingii* (= *Festuca kingii*), and *Pseudoroegneria spicata*. Scattered forbs may include species of *Achillea*, *Antennaria*, *Arenaria*, *Arnica*, *Astragalus*, *Erigeron*, *Eriogonum*, *Hymenopappus*, *Hymenoxys*, *Liatris*, *Sedum*, *Solidago*, and *Thermopsis*.

ENVIRONMENT & DYNAMICS

Environmental Description: These forests and woodlands occur throughout a great portion of the Intermountain West between 2530 and 3600 m elevation. Sites are xeric, harsh and exposed to desiccating winds with rocky substrates and a short growing season that limit plant growth. Parent materials include dolomitic, limestone or granitic rocks. Occurrences can be found on all aspects but are more common on southwestern exposures on steep convex slopes and ridges. A characteristic of these forests and woodlands is the prominence of bare ground and, therefore, litter accumulation is low. Steep slopes and often low ground cover often result in high rates of surface erosion.

Dynamics: Although some of the conifers that are typically codominant in *Pinus flexilis* stands are late-successional species, they are not likely to displace *Pinus flexilis*. This is because most of these stands occur on harsh sites where *Pinus flexilis* is more competitive than most other conifer species. These stands are generally considered to be topographic or edaphic "climax" stands (Cooper 1975, Eyre 1980). Birds and small mammals often eat and cache the large, wingless pine seeds. Most important is the Clark's nutcracker, which can transport the seeds long distances and cache them on exposed windswept sites (Lanner and Vander Wall 1980). This results in the regeneration of pines in clumps from forgotten caches (Eyre 1980, Steele et al. 1983).

DISTRIBUTION

Geographic Range: Stands included in this forest and woodland alliance occur intermittently throughout the intermountain regions of the central Great Basin, Columbia Plateau, middle and southern Rocky Mountains and Wyoming Basins.

Nations: US

States/Provinces: CA, ID, MT, NV, UT, WY

TNC Ecoregions [optional]: 11:C, 12:C, 16:C

USFS Ecoregions (2007): 341D:CC, 341Ff:CCC, M261E:CC, M262B:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Pinus flexilis* / *Agropyron spicatum* Habitat Type (Girard et al. 1989)
- = *Pinus flexilis* (Limber pine woodland) Alliance (Sawyer et al. 2009) [87.160.00]
- ? *Pinus flexilis* Habitat Type (USFS 1992)
- ? *Pinus flexilis* Habitat Type (Steele et al. 1983)
- ? *Pinus flexilis* Series (Girard et al. 1989)
- ? *Pinus flexilis* Series (Johnston 1987)
- = *Pinus flexilis* Woodland Alliance (Evens et al. 2014)
- = *Pinus flexilis* Woodland Alliance (CNPS 2017) [87.160.00]
- >< Limber Pine Forest (#86700) (Holland 1986b)
- ? Limber Pine Woodland (Barrows et al. 1977) [included in Desert Montane and Forests and Woodlands]
- >< Limber Pine: 219 (Eyre 1980)
- = Limber pine series (Sawyer and Keeler-Wolf 1995)
- >< Southern California Subalpine Forest (#86500) (Holland 1986b)

LOWER LEVEL UNITS**Associations:**

- CEG005434 *Pinus flexilis* - (*Populus tremuloides*) / *Arctostaphylos patula* Forest
- CEPP009588 *Pinus flexilis* / *Artemisia tridentata* Woodland
- CEG005321 *Pinus flexilis* / *Symphoricarpos oreophilus* Woodland
- CEG000804 *Pinus flexilis* / *Cercocarpus ledifolius* Woodland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Barney 1980, Barrows et al. 1977, CNPS 2017, Cheng 2004, Cooper 1975, Egger 1941, Evens et al. 2014, Eyre 1980, Faber-Langendoen et al. 2017b, Girard et al. 1989, Griffin and Critchfield 1972, Hanes 1976, Holland 1986b, Johnson 2001, Johnston 1987, Keeler-Wolf et al. 2003a, Klein and Evens 2006, Lanner and Vander Wall 1980, Paysen et al. 1980, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Steele 1990, Steele et al. 1983, Taylor 1979, Thomas et al. 2004, Thorne 1977, Thorne 1982, Thorne et al. 2007, USFS 1992, Vasek and Thorne 1977

1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Forest & Woodland

G224. Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland

A0518. *Pinus longaeva* Forest & Woodland Alliance

Type Concept Sentence: This widely scattered subalpine forest and woodland alliance occurs on mountain slopes throughout the Great Basin and is solely dominated by *Pinus longaeva*, although some stands may be codominated by *Abies concolor* and *Pinus ponderosa*.

OVERVIEW

Scientific Name: *Pinus longaeva* Forest & Woodland Alliance

Common Name (Translated Scientific Name): Great Basin Bristlecone Pine Forest & Woodland Alliance

Colloquial Name: Great Basin Bristlecone Pine Forest & Woodland

Type Concept: This widely scattered subalpine forest and woodland alliance occurs on mountain slopes throughout the Great Basin. Canopies are typically solely dominated by *Pinus longaeva*, although some stands may be codominated by *Abies concolor* (= *var. concolor*) and *Pinus ponderosa*. Other canopy associates occurring at low cover may include *Juniperus osteosperma*, *Juniperus scopulorum*, *Picea engelmannii*, *Pinus edulis*, *Pinus flexilis*, *Populus tremuloides*, and *Pseudotsuga menziesii*. Shrubs are infrequent to conspicuous. Characteristic shrubs may include *Amelanchier utahensis*, *Arctostaphylos patula*, *Cercocarpus intricatus*, *Ericameria discoidea*, *Ericameria nauseosa*, *Eriogonum corymbosum*, *Purshia tridentata*, and *Ribes montigenum*. The herbaceous is very sparse to open (5-35% cover) and may be dominated by graminoids or forbs. The most common graminoids are *Carex rossii*, *Leymus salinus*, and *Poa fendleriana*. A variety of forbs may be present and may include *Aquilegia scopulorum*, *Arabis drummondii*, *Astragalus platytropis*, *Castilleja nana*, *Cymopterus nivalis*, *Erigeron jonesii*, *Oxytropis oreophila*, *Penstemon leiophyllus var. franciscipennellii*, *Tetraneris acaulis*, *Trifolium gymnocarpon*, and *Trisetum spicatum*. These forests and woodlands grow on all slopes, especially ridges and upper slopes below timberline. They grow on dolomitic, limestone- or granite-derived soils. This woodland may

occur under the driest conditions of the California subalpine woodlands. The growing season is limited by drought in the summer and cold in the winter. Precipitation, mostly as snow, falls in the winter. Stands are found between 2600 and 3600 m elevation.

Classification Comments:

Internal Comments: MEH 9-13: CA added.

Other Comments: *Pinus longaeva* is perhaps the longest living species on the planet. Individuals have been found that are more than 4000 years old. Usually, the oldest trees are found on the poorest sites. Plot data exist for California and Nevada stands.

Similar NVC Types:

Diagnostic Characteristics: The alliance is distinguished by an open canopy, typically 10-15 m tall of *Pinus longaeva* trees that range in cover from 15 to 60%. These forests and woodlands are small patch in size and occur near treeline on exposed, windswept positions of the Great Basin.

VEGETATION

Physiognomy and Structure: This rounded-crowned, temperate or subpolar, needle-leaved evergreen forest and woodland forms an open tree canopy less than 18 m in height. Shrubs are infrequent to conspicuous. The herbaceous layer is sparse.

Floristics: Canopies are typically solely dominated by *Pinus longaeva*, although some stands may be codominated by *Abies concolor* (= var. *concolor*) and *Pinus ponderosa*. Canopy cover ranges from 15-60%. Other canopy associates occurring at low cover may include *Juniperus osteosperma*, *Juniperus scopulorum*, *Picea engelmannii*, *Pinus edulis*, *Pinus flexilis*, *Populus tremuloides*, and *Pseudotsuga menziesii*. Shrubs are infrequent to conspicuous. Characteristic shrubs may include *Amelanchier utahensis*, *Arctostaphylos patula*, *Cercocarpus intricatus*, *Ericameria discoidea*, *Ericameria nauseosa*, *Eriogonum corymbosum*, *Juniperus communis*, *Purshia tridentata*, *Ribes cereum*, *Ribes montigenum*, *Rubus idaeus*, and *Symphoricarpos oreophilus*. The herbaceous layer is very sparse to open (5-35% cover) and may be dominated by graminoids or forbs. The most common graminoids are *Carex rossii*, *Leymus salinus*, and *Poa fendleriana*. A variety of forbs may be present and may include *Aquilegia scopulorum*, *Arabis drummondii*, *Astragalus platytropis*, *Castilleja nana*, *Cymopterus nivalis*, *Erigeron jonesii*, *Oxytropis oreophila*, *Penstemon leiophyllus* var. *francisci-pennellii*, *Tetraneuris acaulis*, *Trifolium gymnocarpon*, and *Trisetum spicatum*.

ENVIRONMENT & DYNAMICS

Environmental Description: This widely scattered subalpine forest and woodland alliance grows on all slopes, especially ridges and upper slopes below timberline. It grows on dolomitic, limestone- or granite-derived soils. Soils are rapidly drained with low to moderate cover of rocks and gravel. This woodland may occur under the driest conditions of the California subalpine woodlands. The growing season is limited by drought in the summer and cold in the winter. Precipitation, mostly as snow, falls in the winter. Stands are found between 2600 and 3600 m elevation.

Dynamics: This alliance is subject to long, intense droughts. Tree-ring data over the last 4000 years indicate that droughts of 200 years or more have occurred.

DISTRIBUTION

Geographic Range: Scattered stands of this subalpine woodland occur in California and Nevada's White Mountains, in the Desert Range, and in isolated pockets throughout the Intermountain West.

Nations: US

States/Provinces: CA, NV, UT

TNC Ecoregions [optional]: 11:C, 17:C, 18:C, 19:C

USFS Ecoregions (2007): 341B:CC, 341D:CC, 341Fb:CCC, 341Ff:CCC, M341A:CC, M341C:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Bryce Canyon, Capitol Reef, Cedar Breaks, Death Valley, Great Basin); USFS (Dixie, Inyo)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Pinus longaeva* (Bristlecone pine woodland) Alliance (Sawyer et al. 2009) [87.140.00]
- = *Pinus longaeva* Woodland Alliance (Evens et al. 2014)
- = *Pinus longaeva* Woodland Alliance (CNPS 2017) [87.140.00]
- = Bristlecone Pine Forest (#86400) (Holland 1986b)
- = Bristlecone pine series (Sawyer and Keeler-Wolf 1995)
- >< Western Needleleaf Forests: 5: Mixed Conifer Forest (*Abies-Pinus-Pseudotsuga*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEGLO03073 *Pinus longaeva* - *Pinus flexilis* Woodland [Placeholder]
- CEGLO02736 *Abies concolor* - *Pinus ponderosa* - *Pinus longaeva* Forest
- CEGLO02380 *Pinus longaeva* Woodland
- CEGLO05447 *Pinus longaeva* / (*Ericameria discoidea*, *Ribes montigenum*) Woodland
- CEPS009592 *Pinus longaeva* / *Artemisia tridentata* ssp. *vaseyana* Woodland [Park Special]
- CEPS009593 *Pinus longaeva* / *Symphoricarpos oreophilus* Woodland [Park Special]
- CEPS009591 *Pinus longaeva* / *Arctostaphylos patula* Woodland [Park Special]

AUTHORSHIP

Primary Concept Source: M. Schindel, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Beasley and Klemmedson 1980, Billings and Thompson 1957, Brown et al. 1980, CNPS 2017, Cheng 2004, Evens et al. 2014, Faber-Langendoen et al. 2017b, Griffin and Critchfield 1972, Hawksworth and Bailey 1980, Holland 1986b, Howard 2004c, K uchler 1964, Lloyd and Mitchell 1973, Mooney 1973, Mooney et al. 1962, Paysen et al. 1980, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Schulz and Hall 2011, Taylor 1979, Thorne 1976, Thorne et al. 2007, Vasek and Thorne 1977, Wright and Mooney 1965

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

These pinyon pine- and juniper-dominated woodlands, scrub, and savannas generally occur just above semi-desert shrublands and grasslands or shortgrass prairies and below montane forest vegetation throughout the semi-arid Intermountain West and western Great Plains of North America.

M026. Intermountain Singleleaf Pinyon - Juniper Woodland

This broadly defined pinyon and juniper woodland, savanna and scrub macrogroup occurs in dry foothills in the interior western U.S. and is characterized by an open to closed tree canopy composed of *Juniperus occidentalis*, *Juniperus osteosperma*, *Pinus edulis*, *Pinus monophylla*, and/or *Cercocarpus ledifolius*.

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

1.B.2.Nc.1.a. M026 Intermountain Singleleaf Pinyon - Juniper Woodland

G246. Colorado Plateau-Great Basin Juniper Open Woodland

Type Concept Sentence: This widespread juniper woodland and savanna group occurs in the Colorado Plateau and Great Basin and is characterized by dominance of *Juniperus osteosperma* trees in an open tree canopy with high cover of perennial bunchgrasses and forbs (savannas) or an open to closed canopy often with a shrub understory (woodlands) and the lack of pinyon trees *Pinus edulis* and *Pinus monophylla*, which occur outside the ecological or geographic range of this type.

OVERVIEW

Scientific Name: *Juniperus osteosperma* Open Woodland Group

Common Name (Translated Scientific Name): Utah Juniper Open Woodland Group

Colloquial Name: Utah Juniper / Herb Open Woodland

Type Concept: This widespread juniper woodland and savanna group occupies dry foothills and sandsheets of the Colorado Plateau and eastern Great Basin from the western Colorado to Nevada and southern Idaho, and south to northwestern New Mexico and northern Arizona. The vegetation ranges from savanna, often with inclusions of denser patches of juniper, to open to dense woodland. The savanna stands are characterized by an open tree canopy of *Juniperus osteosperma* trees with high cover of perennial bunchgrasses and forbs, with *Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, *Leymus salinus*, and *Pleuraphis jamesii* being most common. Woodland stands are generally open, but range from an open to closed canopy often with shrubs between trees depending on size of gaps. Characteristic shrubs include *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Coleogyne ramosissima*, and *Ephedra* spp. Pinyon trees are typically not present because sites are outside the ecological or geographic range of *Pinus edulis* and *Pinus monophylla*. These juniper woodlands and wooded grasslands are generally found at lower elevations and on more xeric sites than Great Basin Pinyon - Juniper Woodland Group (G247) or Colorado Plateau Pinyon -

Juniper Woodland Group (G250). Elevation ranges from 1500-2300 m. Stands occur on lower mountain slopes, hills, plateaus, basins and more recently on flats where juniper is expanding into semi-desert grasslands and steppe.

Classification Comments: *Juniperus californica* savannas in the Central Valley of California and around the fringes of the Mojave Desert are not part of this group. In many cases, they are the result of some disturbance removing an oak component from one of the several oak woodland and savanna systems of California. This group does not extend north into the Columbia Plateau where *Juniperus occidentalis* dominates the Columbia Plateau Western Juniper Open Woodland Group (G248). This Utah juniper savanna and woodland group does not include sparse juniper stands on rock outcrops or woodlands. It corresponds to both the *Juniperus osteosperma*-dominated portion of the *pinyon-juniper savanna* type (low to moderate cover of trees, well-developed graminoid understory, generally a minor shrub component, growing on deeper soils) and well as the *Juniperus osteosperma*-dominated portion of the *persistent pinyon-juniper woodland* type (occurs on rocky uplands with shallow, coarse-textured, and often skeletal soils that support relatively sparse herbaceous cover and rarely burn) described in Romme et al. (2009).

Similar NVC Types:

- G250 Colorado Plateau Pinyon - Juniper Woodland
- G247 Great Basin Pinyon - Juniper Woodland

Diagnostic Characteristics: These woodlands and savannas are characterized by the dominance of *Juniperus osteosperma* in the tree layer and absence of *Pinus monophylla* and *Pinus edulis*. If stand is a savanna, then there is a lush perennial grass layer with scattered *Juniperus osteosperma* trees. Characteristic grasses include *Achnatherum hymenoides*, *Hesperostipa comata*, *Leymus salinus*, and *Pleuraphis jamesii*. *Juniperus occidentalis* is absent (or accidental) as it is restricted to Columbia Plateau Western Juniper Woodland & Savanna Group (G248).

VEGETATION

Physiognomy and Structure: This group includes both open to closed woodlands dominated by the evergreen sclerophyllous tree *Juniperus osteosperma*, as well as savannas characterized by a lush perennial grass layer (20-90% cover) with tree layer dominated by *Juniperus osteosperma*. Woodland stands may have shrubs present to dense forming a layer.

Floristics: The vegetation is typically open savanna, although there may be inclusions of denser patches of juniper. This savanna is typically dominated by *Juniperus osteosperma* trees with high cover of perennial bunchgrasses and forbs, with *Bouteloua gracilis*, *Hesperostipa comata*, *Leymus salinus*, *Pleuraphis jamesii*, *Pleuraphis mutica*, and *Pseudoroegneria spicata* being most common. Pinyon trees are typically not present because sites are outside the ecological or geographic range of *Pinus edulis* and *Pinus monophylla*. Scattered shrubs may be present with low cover relative to the perennial herbaceous layer. Characteristic shrubs include *Artemisia arbuscula*, *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Ephedra viridis*, *Mahonia fremontii*, *Purshia tridentata*, and *Symphoricarpos oreophilus*. *Juniperus scopulorum* may codominate or replace *Juniperus osteosperma* in upper elevation stands, near washes, and in the cooler northern extent.

ENVIRONMENT & DYNAMICS

Environmental Description: This widespread juniper woodland and savanna group occupies dry foothills and sandsheets of the Colorado Plateau and eastern Great Basin. These wooded grasslands are generally found at lower elevations and on more xeric sites than Great Basin Pinyon - Juniper Woodland Group (G247) or Colorado Plateau Pinyon - Juniper Woodland Group (G250). Elevation ranges from 1500-2300 m. Stands occur on lower mountain slopes, hills, plateaus, basins and more recently on flats where juniper is expanding into semi-desert grasslands and steppe. Soils are generally calcareous and alkaline, and often shallow and rocky, but may be acidic.

Dynamics: Some researchers believe that at one time the juniper savanna was more common than juniper woodlands (West and Young 2000). These savanna communities depend on periodic fire (once every 10-30 years) to maintain the juniper savanna structure by thinning trees that invade the interspaces between larger fire-resistant trees and create woodlands (Wright et al. 1979, West and Young 2000). Juniper trees less than 1.2 m (4 feet) tall are readily killed by fires (Wright et al. 1979). Heavy grazing by livestock reduces the fine fuel layer (grasses), which decreases the fire frequency resulting in increased juniper density (Wright et al. 1979, West and Young 2000). Over the last century, a reduction in fire frequency has caused a conversion of some juniper savanna to juniper woodland as well as invasion of juniper trees from areas of naturally low fire frequency, e.g., rocky ridges into adjacent communities, especially sagebrush steppe (Wright et al. 1979, West and Young 2000).

DISTRIBUTION

Geographic Range: This *Juniperus osteosperma* woodland and savanna group occupies dry foothills and sandsheets of the Colorado Plateau and Great Basin from western Colorado to Nevada and southern Idaho, and south to northwestern New Mexico and northern Arizona. Where it occurs in California, it is found only in the far eastern edges of the state within or adjacent to the Great Basin.

Spatial Scale & Pattern [optional]: Large patch

Nations: US

States/Provinces: AZ, CA, CO, ID, NM, NV, UT

TNC Ecoregions [optional]: 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315H:CC, 321A:CC, 322A:CC, 341A:C?, 341D:C?, 341E:C?, 341F:C?, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CP, 342G:CC, 342J:CC, M313A:CC, M331D:CC, M331E:C?, M331G:CP, M331H:CC, M331I:CP, M331J:CP, M332E:CC, M341A:CC, M341D:CP

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = Juniper steppe woodland (*Juniperus - Artemisia - Agropyron*) (Küchler 1964)
- = Utah Juniper Series (Dick-Peddie 1993)

LOWER LEVEL UNITS

Alliances:

- A3497 *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance
- A3496 *Juniperus osteosperma* / Shrub Understory Woodland Alliance

AUTHORSHIP

Primary Concept Source: A.W. Kuchler (1964)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: KAS 1-10, 6-23, 11-15

REFERENCES

References: Bassett et al. 1987, Blackburn and Tueller 1970, Brown 1982a, Brown et al. 1979, Dick-Peddie 1993, Eyre 1980, Faber-Langendoen et al. 2017a, Fitzhugh et al. 1987, Francis 1986, Küchler 1964, Larson and Moir 1986, Larson and Moir 1987, Romme et al. 2009, Sawyer et al. 2009, Shiflet 1994, Tuhy et al. 2002, West 1999a, West 1999b, West and Young 2000, West et al. 1998, Wright et al. 1979

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

G246. Colorado Plateau-Great Basin Juniper Open Woodland

A3497. *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance

Type Concept Sentence: This juniper woodland and savanna alliance is characterized by an open to moderately dense, short (<15 m) tree canopy strongly dominated by *Juniperus osteosperma* or *Juniperus scopulorum* (at higher elevations) with an understory dominated by an open to dense layer of perennial grasses and lacking significant cover of shrubs. It occurs in the Colorado Plateau, but it extends out into adjacent ecoregions primarily west into the Great Basin and north and east into the foothills of the central and southern Rocky Mountains.

OVERVIEW

Scientific Name: *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance

Common Name (Translated Scientific Name): Utah Juniper / Herbaceous Understory Open Woodland Alliance

Colloquial Name: Utah Juniper / Herb Open Woodland

Type Concept: Stands have a typically open to moderately dense tree canopy with an understory characterized by herbaceous vegetation. Tree canopy is dominated by *Juniperus osteosperma* with *Juniperus scopulorum* becoming important at higher elevations and along drainages. *Pinus* species are absent or accidental. Perennial grasses typically dominate the herbaceous layer although forbs are present and can be diverse. Characteristic species include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, *Hesperostipa neomexicana*, *Leymus salinus*, *Pleuraphis jamesii*, *Pleuraphis mutica*, and *Pseudoroegneria spicata*. The non-native, invasive annual grass *Bromus tectorum* may be abundant in disturbed stands and dominate the herbaceous layer of highly disturbed stands. The core distribution of this juniper alliance is the Colorado Plateau, but it extends out into adjacent ecoregions primarily west into the Great Basin and north and east into the foothills of the central and southern Rocky Mountains. Stands occur on level to moderately steep alluvial fans and terraces, colluvial slopes, benches, hills, and badlands. Elevation of most stands ranges

from 1423 to 1880 m (4670-6165 feet) but may occur as high as 2200 m (7215 feet) on warmer southwest-facing slopes. Sites may be oriented to any aspect. Stands have been observed on north-facing steep slopes along bluffs of the Snake River in southeastern Idaho. Soils are well-drained sands, sandy clays, or clay loams derived from shales, sandstones, or a mix of the two. Less frequently substrates are derived from eolian sands.

Classification Comments: This alliance may include stands with *Juniperus monosperma* present to codominant in northeastern Arizona. There is a transition zone between the ranges of the two species of *Juniperus* in the southern Colorado Plateau.

Internal Comments: mjr 12-14: CA added for MOJN. KAS-1-14: *Juniperus osteosperma* / *Pleuraphis mutica* Woodland (CEGL000736) is included in this alliance because it is reported in the Southern Colorado Plateau north of the Mogollon Rim, but needs further review as it has presence of warm desert indicator species.

Other Comments:

Similar NVC Types: This alliance has similarities to other pinyon-juniper and juniper woodland and savanna alliances in several other groups, such as G200, G247, G248, G250, G252, G253, and G487.

- A3134 *Juniperus coahuilensis* - *Juniperus deppeana* - *Juniperus monosperma* / Grass Understory Open Woodland Alliance: is similar in that it is a juniper savanna, but Madrean and warm desert floristic species overlap very little with Intermountain West floristics.
- A3426 *Juniperus osteosperma* - *Juniperus scopulorum* / Shrub Understory Central Rocky Mountain Woodland Alliance
- A3572 *Pinus edulis* - *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance: is similar except overstory is characterized by *Pinus edulis* with 5% or more cover.
- A3575 *Juniperus monosperma* / Herbaceous Understory Open Woodland Alliance: is similar except overstory is dominated by *Juniperus monosperma*.
- A3500 *Juniperus occidentalis* / Herbaceous Understory Open Woodland Alliance: is similar except overstory is dominated by *Juniperus occidentalis*.
- A3496 *Juniperus osteosperma* / Shrub Understory Woodland Alliance: is similar but understory has a shrub layer (>10% cover) or, if less, shrub cover exceeds herbaceous cover.
- A2109 *Pinus monophylla* - *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance: is similar except overstory is characterized by *Pinus monophylla* with 5% or more cover.

Diagnostic Characteristics: Stands have an open to moderately dense tree canopy dominated by *Juniperus osteosperma* with *Juniperus scopulorum* present to dominant at higher elevations. Understory is characterized by dominant and diagnostic perennial grass species *Bouteloua gracilis*, *Hesperostipa comata*, *Hesperostipa neomexicana*, *Leymus ambiguus*, *Leymus salinus*, *Pleuraphis jamesii*, *Pleuraphis mutica*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Shrub cover is sparse and does not form a layer. Forbs are present generally with low cover. This alliance also includes disturbed stands with the understory dominated by introduced annual grass *Bromus tectorum*.

VEGETATION

Physiognomy and Structure: These are sparsely to moderate dense (5-30% cover) wooded communities dominated by scale-leaved evergreen trees of low stature (<15 m). Evergreen or cold-deciduous shrubs occupy the interstices between trees, interspersed with caespitose graminoids. In total, the herbaceous layer is usually of moderate cover (25-50%), but may also be low (5% cover) when it exceeds shrub cover. Occasionally shrubs may be present, but do not form a layer (<10% cover).

Floristics: Stands have a short (<15 m tall), typically open to moderately dense tree canopy with an understory characterized by herbaceous vegetation. Tree canopy is dominated by *Juniperus osteosperma* with *Juniperus scopulorum* becoming important at higher elevations and along drainages. *Pinus* species, such as *Pinus monophylla*, *Pinus edulis*, *Pinus flexilis*, *Pinus ponderosa*, or *Pseudotsuga menziesii* are absent or accidental. The open to dense herbaceous layer is typically dominated by perennial grasses. Characteristic species include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, *Hesperostipa neomexicana*, *Leymus ambiguus*, *Leymus salinus*, *Pleuraphis jamesii*, *Pleuraphis mutica*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Forbs are present in the herbaceous layer and can be diverse but contribute little cover, including *Arenaria hookeri*, *Arenaria fendleri*, *Calochortus gunnisonii*, *Chaetopappa ericoides*, *Cymopterus bulbosus*, *Cymopterus purpureus*, *Eriogonum umbellatum*, *Hymenoxys richardsonii*, *Linanthus pungens* (= *Leptodactylon pungens*), *Lepidium montanum*, *Machaeranthera grindelioides*, *Mirabilis multiflora*, *Oenothera pallida*, *Petradoria pumila*, *Phlox austromontana*, *Phlox hoodii*, *Sphaeralcea coccinea*, *Streptanthella longirostris*, *Stenotus acaulis*, *Tetraneuris acaulis* (= *Hymenoxys acaulis*), and *Xylorhiza venusta*. The non-native, invasive annual grass *Bromus tectorum* may be abundant in disturbed stands and dominate the herbaceous layer of highly disturbed stands. Scattered shrubs such as *Artemisia tridentata*, *Artemisia nova*, *Atriplex* spp., *Chrysothamnus* spp., *Cercocarpus* spp. (on thin soils near rock outcrops), *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, and *Opuntia* spp. may be present but do not form a layer or exceed the herbaceous cover.

ENVIRONMENT & DYNAMICS

Environmental Description: This savanna and open woodland alliance is distributed across the Intermountain West from the foothills of the eastern Sierra Nevada to the foothills of the central and southern Rocky Mountains. Climate is temperate with freezing temperatures during winter. Distribution of the alliance is often correlated with "thermal belts" which occur above the areas of cold-air drainage in high intermountain basins. Average annual precipitation is between 25 and 50 cm; however, seasonal distribution is variable across the range of the alliance. Stands occur on alluvial fans and terraces, colluvial slopes, benches, hills, and badlands. Sites are on level to moderately steep (3-46% slope) terrain that may be oriented to any aspect. Elevation of most stands ranges from 1423 to 1880 m (4670-6165 feet) but may occur as high as 2200 m (7215 feet). Sites tend to occur on cooler north and east aspects at lower elevations and warmer/drier south and west aspects at higher elevations. Soils are well-drained sands, sandy clays, or clay loams derived from shales, sandstones, or a mix of the two. Less frequently substrates are derived from eolian sands. Parent materials include Mesozoic marine shales of the Morrison Formation, Chinle Formation or Mancos shale, Kayenta Formation and Cedar Mesa sandstone. Colluvium from sandstone cliffs or outcrops upslope is common on the ground surface.

Dynamics: Within the distribution of *Pinus edulis*, this alliance typically occurs at lower elevation and on more xeric sites than *Pinus edulis* - (*Juniperus* spp.) woodlands. There is elevational overlap between this alliance and *Pinus monophylla* woodlands as this pinyon can occur on more xeric sites than *Pinus edulis*. *Juniperus osteosperma* also occurs on sites outside the ranges of *Pinus edulis* and *Pinus monophylla*. There has been significant expansion of this alliance over the last century into sagebrush-dominated shrublands. An altered fire regime (such as fire suppression, thus longer return intervals) is considered a primary cause of this expansion.

DISTRIBUTION

Geographic Range: The core distribution of this juniper alliance is the Colorado Plateau, but it extends out into adjacent ecoregions primarily west into the Great Basin and north and east into the foothills of the central and southern Rocky Mountains.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Juniperus osteosperma* (Utah juniper woodland) Alliance (Sawyer et al. 2009) [89.300.00]
- >< Utah Juniper Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEG002815 *Juniperus osteosperma* / *Hesperostipa comata* Open Woodland
- CEG002817 *Juniperus osteosperma* / *Bromus tectorum* Ruderal Woodland
- CEG000740 *Juniperus osteosperma* / *Hesperostipa neomexicana* Open Woodland
- CEG000736 *Juniperus osteosperma* / *Pleuraphis mutica* Open Woodland
- CEG000738 *Juniperus osteosperma* / *Pseudoroegneria spicata* Open Woodland
- CEG005618 *Juniperus osteosperma* / *Festuca idahoensis* Open Woodland
- CEG001488 *Juniperus osteosperma* / *Leymus salinus* ssp. *salmonis* Wooded Grassland
- CEG002361 *Juniperus osteosperma* / *Bouteloua gracilis* Open Woodland
- CEG003109 *Juniperus osteosperma* / *Leymus salinus* Open Woodland
- CEG002362 *Juniperus osteosperma* / *Pleuraphis jamesii* Open Woodland
- CEG001489 *Juniperus osteosperma* / *Hesperostipa comata* Wooded Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Jennings, M.S. Reid, and D. Sarr.

Version Date: 2014/03/14

REFERENCES

References: Baker 1983b, Baker 1984a, Baker and Kennedy 1985, Barney and Frischknecht 1974, Blackburn 1967, Blackburn et al. 1968a, Blackburn et al. 1968c, Blackburn et al. 1969a, Blackburn et al. 1969e, Blackburn et al. 1971, Brotherson and Evenson 1983, Bunting 1987, Caicco and Wellner 1983c, Dastrup 1963, Despain 1973a, Donart et al. 1978b, Everett 1986, Faber-Langendoen et al. 2017b, Isaacson 1967, Jameson et al. 1962, Johnsen 1962, Johnston 1987, Jones 1989b, Kline 1973, Knight et al. 1987, Komarkova et al. 1988b, Koniak 1985, Larson and Moir 1986, Larson and Moir 1987, Lesica and DeVelice 1992, Marriott and Jones 1989, Moir and Carleton 1987, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, USFS 1983a, USFS 1985c, West et al. 1978, Wight 1965, Wight and Fisser 1968, Wright et al. 1979

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

G246. Colorado Plateau-Great Basin Juniper Open Woodland

A3496. Juniperus osteosperma / Shrub Understory Woodland Alliance

Type Concept Sentence: This juniper woodland alliance is characterized by an open to moderately dense, short (<15 m) tree canopy that is strongly dominated by *Juniperus osteosperma* or *Juniperus scopulorum* (at higher elevations) with an understory characterized by an open dense layer of shrubs (<10% cover). If understory is sparse then shrubs exceed herbaceous cover. It occurs in the Colorado Plateau, but it extends out into adjacent ecoregions primarily west into the Great Basin and north and east into the foothills of the central and southern Rocky Mountains.

OVERVIEW

Scientific Name: *Juniperus osteosperma* / Shrub Understory Woodland Alliance

Common Name (Translated Scientific Name): Utah Juniper / Shrub Understory Woodland Alliance

Colloquial Name: Utah Juniper / Shrub Woodland

Type Concept: Stands have a short, typically open to moderately dense tree canopy with an understory characterized by shrubs. Tree canopy is dominated by *Juniperus osteosperma* with *Juniperus scopulorum* becoming important and sometimes dominant at higher elevations and on relatively mesic sites such as along drainages. *Pinus* species are absent or accidental with very low cover. Shrubs typically dominate the understory and form an open to moderately dense layer. Scattered shrubs frequently characterize the sparse and rocky understory. Characteristic shrubs are many, including *Artemisia arbuscula*, *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Mahonia fremontii*, *Quercus gambelii*, and *Symphoricarpos oreophilus*. The herbaceous layer is sparse to moderate and composed of grasses and often diverse forbs. Common species may include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, *Hesperostipa neomexicana*, *Leymus salinus*, *Pleuraphis jamesii*, and *Pseudoroegneria spicata*. The non-native, invasive annual grass *Bromus tectorum* may be abundant and dominate the herbaceous layer of highly disturbed stands. This alliance also includes sparse understory stands often with scattered shrubs and grasses. The core distribution of this juniper alliance is semi-arid canyons, foothills, plateaus and low mountains in the Colorado Plateau, but it extends out into adjacent ecoregions primarily west into the Great Basin and north and east into the foothills of the central and southern Rocky Mountains. Stands have been observed on north-facing steep slopes along bluffs of the Snake River in southeastern Idaho. Stands occur on a variety of sites, including alluvial fans and stream terraces, colluvial slopes, benches, ledges, hills, ridges, mesas, and badlands. Sites range from level to steep terrain that may be oriented to any aspect. Elevation of most stands ranges from 1220 to 2260 m (4000-7400 feet). Soils are often calcareous, shallow, poorly developed, rapidly to well-drained sands, sandy clays, or clay loams derived from shales, sandstones, or a mix of the two.

Classification Comments: This alliance may include stands with *Juniperus monosperma* present to codominant in northeastern Arizona. There is a transition zone between the ranges of the two species of *Juniperus* in the southern Colorado Plateau. Scattered shrubs frequently characterize the sparse and rocky understory of stands and so are included in this alliance.

Internal Comments:

Other Comments:

Similar NVC Types: This alliance has similarities to other pinyon-juniper and juniper woodland and savanna alliances in several other groups, such as G200, G247, G248, G250, G252, G253, and G487.

- A3133 *Juniperus coahuilensis* - *Juniperus deppeana* - *Juniperus monosperma* / Shrub Understory Open Woodland Alliance: is similar in that it is a juniper woodland, but Madrean and warm desert floristic species overlap very little with southern Rocky Mountain and western Great Plains floristics.
- A3427 *Juniperus osteosperma* - *Juniperus scopulorum* / Grass Understory Central Rocky Mountain Woodland Alliance
- A2109 *Pinus monophylla* - *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance
- A2108 *Pinus monophylla* - *Juniperus osteosperma* / Shrub Understory Woodland Alliance: is similar except overstory is characterized by *Pinus monophylla* with 5% or more cover.

- A3497 *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance: is similar but understory lacks a shrub layer and is dominated by an herbaceous layer (>10% cover) or, if less, grass cover exceeds shrub cover.
- A3571 *Pinus edulis* - *Juniperus osteosperma* / Shrub Understory Foothill & Lower Montane Dry-Mesic Woodland Alliance: is similar except overstory is characterized by *Pinus edulis* with 5% or more cover.

Diagnostic Characteristics: Stands have an open to moderately dense tree canopy dominated by *Juniperus osteosperma* with *Juniperus scopulorum* present to dominant at higher elevations. Understory is characterized by dominant and diagnostic shrub species such as *Artemisia arbuscula*, *Artemisia bigelovii*, *Artemisia nova*, *Artemisia tridentata*, *Atriplex confertifolia*, *Atriplex confertifolia*, *Cercocarpus intricatus*, *Cercocarpus montanus*, *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria teretifolia*, *Eriogonum fasciculatum*, *Fendlera rupicola*, *Fraxinus anomala*, *Grayia spinosa*, *Gutierrezia sarothrae*, *Mahonia fremontii*, *Purshia glandulosa*, *Purshia tridentata*, *Quercus gambelii*, *Rhus trilobata*, *Salvia dorrii*, *Symphoricarpos oreophilus*, *Tetradymia axillaris*, and *Yucca* spp.

VEGETATION

Physiognomy and Structure: These are sparsely to densely (5-80% cover) wooded communities dominated by scale-leaved evergreen trees of low stature (<15 m). Evergreen or cold-deciduous shrubs occupy the interstices between trees, interspersed with caespitose graminoids. In total, the shrub layer is usually open to moderate (10-50% cover), but may also be sparse (<10% cover) or when shrubs exceeds herbaceous cover.

Floristics: Stands have a short (<15 m tall), open to moderately dense tree canopy with an understory characterized by shrubs. Tree canopy is dominated by *Juniperus osteosperma* with *Juniperus scopulorum* becoming important and sometimes dominant at higher elevations and on relatively mesic sites such as along drainages. *Pinus* species, such as *Pinus monophylla*, *Pinus edulis*, *Pinus flexilis*, *Pinus ponderosa*, or *Pseudotsuga menziesii* are absent or accidental. Shrubs typically dominate the understory and form an open to moderately dense layer. Characteristic shrubs are many, including *Artemisia arbuscula*, *Artemisia bigelovii*, *Artemisia nova*, *Artemisia tridentata*, *Atriplex confertifolia*, *Atriplex confertifolia*, *Cercocarpus intricatus*, *Cercocarpus montanus*, *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria teretifolia*, *Eriogonum fasciculatum*, *Fendlera rupicola*, *Fraxinus anomala*, *Grayia spinosa*, *Gutierrezia sarothrae*, *Mahonia fremontii*, *Purshia glandulosa*, *Purshia tridentata*, *Quercus gambelii*, *Rhus trilobata*, *Salvia dorrii*, *Symphoricarpos oreophilus*, *Tetradymia axillaris*, and *Yucca* spp. The herbaceous layer is typically sparse to low in terms of cover but high in species diversity. Common graminoids provide sparse to moderate cover and include *Achnatherum hymenoides*, *Aristida purpurea*, *Bouteloua gracilis*, *Bouteloua curtipendula*, *Bromus tectorum*, *Elymus elymoides*, *Hesperostipa comata*, *Hesperostipa neomexicana*, *Leymus salinus*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Associated forbs may include *Chamaesyce fendleri*, *Cryptantha* spp., *Eriogonum inflatum*, *Eriogonum alatum*, *Gayophytum racemosum*, *Hymenoxys richardsonii*, *Hymenopappus filifolius*, *Lepidium montanum*, *Linanthus pungens* (= *Leptodactylon pungens*), *Machaeranthera canescens*, *Mirabilis multiflora*, *Packera multilobata* (= *Senecio multilobatus*), *Phlox hoodii*, *Plantago patagonica*, *Stenotus acaulis* (= *Haplopappus acaulis*), and *Tetraneuris acaulis* (= *Hymenoxys acaulis*). The non-native, invasive annual grass *Bromus tectorum* may be abundant and dominate the herbaceous layer of highly disturbed stands. This alliance also includes sparse understory stands often with scattered shrubs and grasses. The lack of understory can be caused by harsh substrate (rockland, shale badland) or dense tree canopy resulting from lack of fire that shades out understory.

ENVIRONMENT & DYNAMICS

Environmental Description: This open to dense woodland alliance occurs in semi-arid canyons, foothills, plateaus and low mountains across the Intermountain West from the eastern Sierra Nevada to the central and southern Rocky Mountains. Climate is temperate with freezing temperatures during winter. Distribution of the alliance is often correlated with "thermal belts" which occur above the areas of cold-air drainage in high intermountain basins. Average annual precipitation is between 25 and 50 cm; however, seasonal distribution is variable across the range of the alliance. Stands occur on a variety of sites, including alluvial fans and stream terraces, colluvial slopes, benches, ledges, hills, ridges, mesas, and badlands. Sites range from level to steep terrain that may be oriented to any aspect, and most sites are on cooler north and east aspects at lower elevations and warmer/drier south and west aspects at higher elevations. Elevation of most stands ranges from 1220 to 2260 m (4000-7400 feet). Soils are often calcareous, shallow, poorly developed, rapidly to well-drained sands, sandy clays, or clay loams derived from shales, sandstones, or a mix of the two. Less frequently substrates are derived sandy loams from eolian sands. Parent materials are sandstones, shale, and Precambrian gneiss. The unvegetated ground surface often has a high percentage of rock, exposed bedrock or bare ground, but in undisturbed stands, the cover of cryptobiotic crusts may be high.

Dynamics: Within the distribution of *Pinus edulis*, this alliance typically occurs at lower elevation and on more xeric sites than *Pinus edulis* - (*Juniperus* spp.) woodlands. There is elevational overlap between this alliance and *Pinus monophylla* woodlands as this pinyon can occur on more xeric sites than *Pinus edulis*. *Juniperus osteosperma* also occurs on sites outside the ranges of *Pinus edulis* and *Pinus monophylla*. There has been significant expansion of this alliance over the last century into sagebrush-dominated shrublands. An altered fire regime (such as fire suppression, thus longer return intervals) is considered a primary cause of this expansion.

Fires in this alliance are thought to be infrequent because *Juniperus osteosperma* and many shrubs such as *Artemisia tridentata* are easily killed by burns and do not resprout (Barney and Frischknecht 1974, Everett 1986). In addition, many stands have an open canopy with insufficient understory to carry fire. Shrubs will often re-establish relatively quickly (about 10-20 years) if a seed source is nearby (Barney and Frischknecht 1974, Bunting 1987). However, *Juniperus osteosperma* is relatively slow to recover following fire, and shrubs such as sagebrush may dominate the sites for decades (Jameson et al. 1962). Fire, drought and competition with grasses are thought to have kept *Juniperus* spp. communities restricted to rocky areas that do not burn frequently (Wright et al. 1979).

DISTRIBUTION

Geographic Range: The core distribution of this juniper alliance is the Colorado Plateau, but it extends out into adjacent ecoregions primarily west into the Great Basin and north and east into the foothills of the central and southern Rocky Mountains. Stands have been observed on north-facing steep slopes along bluffs of the Snake River in southeastern Idaho.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, UT, WY

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007): 322Aj:CCC, 322Al:CCC, 341Ff:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Mojave); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Juniperus osteosperma* (Utah juniper woodland) Alliance (Sawyer et al. 2009) [89.300.00]
- = *Juniperus osteosperma* Woodland Alliance (Evens et al. 2014)

LOWER LEVEL UNITS

Associations:

- CEGLO00735 *Juniperus osteosperma* / *Cercocarpus montanus* Woodland
- CEGLO05754 *Juniperus osteosperma* / *Eriogonum fasciculatum* - *Yucca baccata* Woodland
- CEGLO02967 *Juniperus scopulorum* - *Quercus gambelii* Woodland
- CEGLO05616 *Juniperus osteosperma* / *Artemisia tridentata* ssp. *tridentata* / *Pseudoroegneria spicata* Woodland
- CEGLO02964 *Juniperus osteosperma* Wooded Shrubland [Placeholder]
- CEGLO00741 *Juniperus osteosperma* / *Symphoricarpos oreophilus* Woodland
- CEGLO00733 *Juniperus osteosperma* / *Cercocarpus intricatus* Woodland
- CEGLO00729 *Juniperus osteosperma* / *Artemisia nova* / Rock Woodland
- CEGLO05598 *Juniperus (osteosperma, scopulorum)* / *Artemisia tridentata* ssp. *wyomingensis* - *Chamaebatiaria millefolium* Woodland
- CEGLO05599 *Juniperus (scopulorum, osteosperma)* / *Ericameria nana* Wooded Grassland
- CEGLO00728 *Juniperus osteosperma* / *Artemisia nova* Woodland
- CEGLO00730 *Juniperus osteosperma* / *Artemisia tridentata* Woodland
- CEGLO00737 *Juniperus osteosperma* - *Juniperus monosperma* / Sparse Understory Woodland
- CEGLO00731 *Juniperus osteosperma* / *Artemisia tridentata* / *Achnatherum hymenoides* Woodland
- CEGLO05617 *Juniperus osteosperma* / *Artemisia tridentata* ssp. *wyomingensis* Woodland
- CEGLO05619 *Juniperus osteosperma* / *Purshia tridentata* / *Poa secunda* Woodland
- CEGLO02909 *Juniperus osteosperma* / *Coleogyne ramosissima* Woodland
- CEGLO00732 *Juniperus osteosperma* / Sparse Understory Woodland
- CEGLO00727 *Juniperus osteosperma* Woodland
- CEGLO02266 *Juniperus osteosperma* / Mixed Shrubs Talus Woodland
- CEGLO02360 *Juniperus osteosperma* / *Artemisia tridentata* ssp. *tridentata* Woodland
- CEGLO03965 *Juniperus osteosperma* / *Mahonia fremontii* Woodland
- CEGLO03774 *Juniperus osteosperma* - (*Pinus edulis*) / *Coleogyne ramosissima* - *Purshia stansburiana* - *Quercus havardii* var. *tuckeri* Wooded Shrubland
- CEGLO05600 *Juniperus osteosperma* / *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Wooded Shrubland
- CEPP005694 *Juniperus osteosperma* / *Quercus havardii* - *Artemisia filifolia* - *Ephedra cutleri* Sandsheet Scrub
- CEPP005696 *Juniperus osteosperma* / *Quercus gambelii* Woodland
- CEPP006716 *Juniperus osteosperma* / *Gutierrezia microcephala* Woodland
- CEGLO02757 *Juniperus osteosperma* / *Artemisia arbuscula* Woodland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Jennings and M.S. Reid.

Version Date: 2016/09/29

REFERENCES

References: Evens et al. 2014, Faber-Langendoen et al. 2017b, Keeler-Wolf and Thomas 2000, Sawyer et al. 2009

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

1.B.2.Nc.1.b. M026 Intermountain Singleleaf Pinyon - Juniper Woodland

G248. Columbia Plateau Western Juniper Open Woodland

Type Concept Sentence: This woodland and savanna group is centered on the Columbia Plateau and extends from the eastern foothills of the Cascades and the Modoc Plateau across the northern margin of the Great Basin and is characterized by an open to closed canopy of *Juniperus occidentalis* that is sometime codominated by *Cercocarpus ledifolius* and typically has a shrubby understory dominated by *Artemisia tridentata*.

OVERVIEW

Scientific Name: *Juniperus occidentalis* Open Woodland Group

Common Name (Translated Scientific Name): Western Juniper Open Woodland Group

Colloquial Name: Western Juniper / Herb Open Woodland

Type Concept: This woodland group is found on the Columbia Plateau and extends to the northern and western margins of the Great Basin, from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern California. *Juniperus occidentalis* is typically the only tree species with *Pinus monophylla* absent. *Pinus ponderosa* or *Pinus jeffreyi* may be present in higher elevation stands. The tree form of *Cercocarpus ledifolius* may occasionally codominate. In the understory, *Artemisia tridentata* is the most common shrub; others are *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Purshia tridentata*, *Ribes cereum*, and *Tetradymia* spp. Graminoids commonly include *Carex filifolia*, *Festuca idahoensis*, *Poa secunda*, and *Pseudoroegneria spicata*. This group occurs over a wide elevation range from under 200 m along the Columbia River in central Washington to over 1500 m in the Blue Mountains. In the middle of its distribution in central Oregon, stands occur on all aspects and slope positions. Older woodlands are generally found in rocky areas where fire frequency is low. Generally soils are medium-textured, with abundant coarse fragments, and derived from volcanic parent materials. Throughout much of its range, fire exclusion and removal of fine fuels by grazing livestock have reduced fire frequency and allowed *Juniperus occidentalis* seedlings to colonize adjacent alluvial soils and expand into the shrub-steppe and grasslands. *Juniperus occidentalis* savanna may occur on the drier edges of woodlands where trees are intermingling with or invading the surrounding grasslands and where local edaphic or climatic conditions favor grasslands over shrublands. Where this group grades into relatively mesic forest or grassland habitats, these woodlands become restricted to rock outcrops or escarpments with excessively drained soils.

Classification Comments: This woodland group includes two very different ecological types. There are old-growth *Juniperus occidentalis* woodlands with trees and stands often over 1000 years old, with large, fairly well-spaced trees with rounded crowns. There are also large areas where juniper has expanded into sagebrush steppe and bunchgrass-dominated areas, with young, pointed-crowned trees growing closely together. Currently, these two very different types are about equally distributed across the landscape, with *Juniperus occidentalis* continuing to expand, either from the combination of fire exclusion, past grazing or climate change. *Juniperus occidentalis* has also expanded into *Pinus ponderosa* and *Pinus ponderosa* - *Pinus contorta* stands in central Oregon. These two types correspond to the *Juniperus occidentalis*-dominated portion of the *persistent pinyon-juniper woodlands* (open to denser of tree canopy occurring on shallow rocky soils) and *wooded shrublands* (open tree canopy with well-developed shrub stratum and variable grass-forb cover) described by Romme et al. (2009).

Woodland stands dominated by *Juniperus grandis* (= *Juniperus occidentalis* var. *australis*) occur in the subalpine Sierra Nevada and forested uplands of the northern Coast Ranges of California, southward to San Bernardino, San Gabriel and various desert mountain ranges and westward into Nevada are included in Sierra-Cascade Cold-Dry Subalpine Woodland Group (G243).

Similar NVC Types:

- G243 Sierra-Cascade Cold-Dry Subalpine Woodland

Diagnostic Characteristics: *Juniperus occidentalis* is the diagnostic and typically dominant species of this woodland and savanna group. This juniper species is largely restricted to the Columbia Plateau ecoregion. *Cercocarpus ledifolius* may codominate some stands. *Pinus monophylla* is not present in this region. The understory of stands included in this group is variable and ranges from

perennial grass-dominated tree savannas and open woodlands to open and moderately dense woodlands with a shrub-dominated understory to wooded shrublands with a sparse *Juniperus occidentalis* tree layer (5-10% cover).

VEGETATION

Physiognomy and Structure: This woodland and savanna group has an open to dense canopy that includes two very different tree canopy structures: (1) an old-growth *Juniperus occidentalis* woodland with large, fairly well-spaced trees with rounded crowns, and (2) relatively young, often dense junipers trees with pointed crowns. The structure of the understory ranges from perennial grass-dominated tree savannas and open woodlands to shrublands with a very open tree canopy (wooded shrublands) and open to moderately dense woodlands with a shrub-dominated understory. Cover of understory species sharply declines when tree canopy cover exceeds 40% (Young et al. 1982). Many of the tree savannas have a sparse shrub layer present.

Floristics: Stands have a typically open tree canopy that is dominated by *Juniperus occidentalis* trees, although *Pinus ponderosa* or *Pinus jeffreyi* may be present in some stands. *Pinus monophylla* is not present in this region. The tree form of *Cercocarpus ledifolius* may occasionally codominate. In the understory, *Artemisia tridentata* is the most common shrub; others are *Purshia tridentata*, *Ericameria nauseosa*, *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Ribes cereum*, and *Tetradymia* spp. Graminoids commonly include *Carex filifolia*, *Festuca idahoensis*, *Poa secunda*, and *Pseudoroegneria spicata*.

ENVIRONMENT & DYNAMICS

Environmental Description: This woodland group is found on the Columbia Plateau and extends to the northern and western margins of the Great Basin. Elevations range from under 200 m along the Columbia River in central Washington to over 1500 m. In central Oregon, the center of distribution, all aspects and slope positions occur. Old-growth stands are largely restricted to rocky outcrops, upper slopes and ridges, and rims of mesa and canyon that are fire-safe. Younger seral stands have invaded adjacent shrublands and grasslands and now occur on lower slopes, valleys and plains. Soils are generally medium-textured, with abundant coarse fragments, and derived from volcanic parent materials. Where this group grades into relatively mesic forest or grassland habitats, these woodlands become restricted to dry sites such as rock outcrops or escarpments with excessively drained soils. **Soil/substrate/hydrology:** Soils are generally medium-textured, with abundant coarse fragments, and derived from volcanic parent materials. In central Oregon, the center of distribution, all aspects and slope positions occur. Where this group grades into relatively mesic forest or grassland habitats, these woodlands become restricted to dry sites such as rock outcrops or escarpments with excessively drained soils.

Dynamics: *Juniperus occidentalis* is a long-lived tree that can exceed 3000 years in age in rocky, fire-protected areas such as along rimrock (Waigchler et al. 2001, Thorne et al. 2007). These fire-sensitive trees do not sprout following fire and are typically killed by moderate to severe fires (Tirmenstein 1999h, Sawyer et al. 2009). Young junipers have thin bark and are readily killed by surface fires (Martin et al. 1978), whereas mature trees with thicker bark are described as "moderately resistant" (Fowells 1965). Reproductive age begins at about 20 years, peaks after 50 years and continues for many years (Miller and Rose 1995, Tirmenstein 1999h). Following stand-replacing fire, recovery time is relatively slow and depends on stand maturity, the size and season of burn, fire severity and juniper mortality, the persistence of the seeds in the seed bank, location of seed source, the presence of animal dispersers such as Clark's nutcrackers, competition from herbaceous species and shrubs, and the amount of post-fire precipitation (Burkhardt and Tisdale 1976, Tirmenstein 1999h). Large burns and long distances from seed sources slow recovery rates because seed dispersal is dependent on water and animals (Tirmenstein 1999h).

DISTRIBUTION

Geographic Range: This woodland and savanna group is found along the northern and western margins of the Great Basin, from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern California. It also occurs in scattered localities of northern Nevada and south-central Washington.

Spatial Scale & Pattern [optional]: Large patch

Nations: US

States/Provinces: CA, ID, NV, OR, WA

TNC Ecoregions [optional]: 4:C, 6:C, 8:C

USFS Ecoregions (2007): 341G:CC, 342B:CC, 342C:CC, 342D:CP, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M261A:C?, M261D:CC, M261E:CP, M261G:CC, M332G:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Juniperus occidentalis* Zone (Franklin and Dyrness 1973)

NBR alliances

- = Northern Juniper Woodlands (Holland and Keil 1995)
- = Western Juniper: 238 (Eyre 1980)

LOWER LEVEL UNITS

Alliances:

- A3500 *Juniperus occidentalis* / Herbaceous Understory Open Woodland Alliance
- A3499 *Juniperus occidentalis* / Shrub Understory Woodland Alliance

AUTHORSHIP

Primary Concept Source: J.F. Franklin and C.T. Dyrness (1973)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: KAS 1-10, 5-13, 11-15

REFERENCES

References: Barbour and Major 1988, Burkhardt and Tisdale 1976, Eyre 1980, Faber-Langendoen et al. 2017a, Fowells 1965, Franklin and Dyrness 1973, Holland and Keil 1995, Johnson and Clausnitzer 1992, Martin et al. 1978, Miller and Rose 1995, Romme et al. 2009, Sawyer et al. 2009, Shiflet 1994, Thorne et al. 2007, Tirmenstein 1999h, Volland 1976, Waigchler et al. 2001, Young et al. 1982

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

G248. Columbia Plateau Western Juniper Open Woodland

A3500. *Juniperus occidentalis* / Herbaceous Understory Open Woodland Alliance

Type Concept Sentence: This open woodland and savanna alliance is characterized by diagnostic tree species *Juniperus occidentalis* that forms an open to moderately dense tree layer with an understory dominated by a moderately dense to dense layer of perennial grasses and lacking significant cover of shrubs (1-20% cover). It occurs on the Columbia Plateau extending from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern California.

OVERVIEW

Scientific Name: *Juniperus occidentalis* / Herbaceous Understory Open Woodland Alliance

Common Name (Translated Scientific Name): Western Juniper / Herbaceous Understory Open Woodland Alliance

Colloquial Name: Western Juniper / Herb Open Woodland

Type Concept: Vegetation within this woodland and savanna alliance is characterized by a sparse to open canopy of *Juniperus occidentalis* and a moderately dense to dense herbaceous layer. *Juniperus occidentalis* is typically the sole tree species; however, the tree form of *Cercocarpus ledifolius* may occasionally be present to codominant. Additionally, a sparse to open shrub layer (1-20% cover) may be present. The most common shrub is *Artemisia tridentata*, but others include *Artemisia arbuscula*, *Artemisia rigida*, *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Purshia tridentata*, *Ribes cereum*, and *Symphoricarpos oreophilus*. The herbaceous layer is typically dominated by graminoids such as *Achnatherum occidentale*, *Achnatherum thurberianum*, *Carex geyeri*, *Carex filifolia*, *Festuca idahoensis*, *Koeleria macrantha*, *Leymus cinereus*, *Poa secunda*, and *Pseudoroegneria spicata*. Common forbs include *Achillea millefolium*, *Balsamorhiza* spp., and *Trifolium macrocephalum*. This woodland and savanna alliance is found on the Columbia Plateau and extends to the northern and western margins of the Great Basin, from southwestern Idaho to the eastern foothills of the Cascades, and south to the Modoc Plateau of northeastern California. Stands range in elevation from under 200 m along the Columbia River in central Washington to over 1800 m in southwestern Idaho. Generally soils are medium-textured, with abundant coarse fragments derived from volcanic parent materials. In central Oregon, the center of distribution, all aspects and slope positions occur. Where this type grades into relatively mesic forest or grassland habitats, the vegetation becomes restricted to rock outcrops or escarpments with excessively drained soils.

Classification Comments: This alliance is composed of wooded herbaceous vegetation associations that have an open tree canopy of about 5-15% cover. Additionally, sometimes there is enough shrub cover (1-20%) to form a shrub layer. Some stands with near 20% shrub cover might be confused with *Juniperus occidentalis* / Shrub Understory Woodland Alliance (A3499); however, it is the strong herbaceous layer that characterizes this alliance.

Internal Comments: KAS-1-14: Associations in this alliance need further review to ensure that their understory is dominated by graminoids when stands have shrub layer.

Other Comments:

Similar NVC Types: This alliance has similarities to other pinyon-juniper woodland and juniper woodland alliances in several other groups, such as G200, G246, G247, G250, G252, G253, and G487.

- A3499 *Juniperus occidentalis* / Shrub Understory Woodland Alliance: is similar except understory has a shrub layer (>20% cover) or, if less, shrub cover exceeds herbaceous cover.
- A3575 *Juniperus monosperma* / Herbaceous Understory Open Woodland Alliance
- A3497 *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance

Diagnostic Characteristics: This woodland and savanna alliance is characterized by a sparse to open canopy of *Juniperus occidentalis* and a moderately dense to dense herbaceous layer. *Juniperus occidentalis* is diagnostic and typically the sole tree species; however, the tree form of *Cercocarpus ledifolius* may occasionally be present to codominant. The herbaceous layer may be composed of several different characteristic graminoid species such as *Achnatherum occidentale*, *Achnatherum thurberianum*, *Carex geyeri*, *Carex filifolia*, *Festuca idahoensis*, *Koeleria macrantha*, *Leymus cinereus*, *Poa secunda*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: Stands of this alliance are characterized by a sparse to open canopy (5-30% cover) of evergreen scale-leaved trees which vary widely in density due to edaphic patterns. A patchy layer of evergreen and winter-deciduous shrubs is often present, interspersed in a well-developed layer of cespitose perennial bunch grasses and forbs.

Floristics: This woodland and savanna alliance is characterized by a sparse to open canopy of *Juniperus occidentalis* and a moderately dense to dense herbaceous layer. *Juniperus occidentalis* is typically the sole tree species; however, the tree form of *Cercocarpus ledifolius* may occasionally be present to codominant. Additionally, a sparse to open shrub layer (1-20% cover) may be present. The most common shrub is *Artemisia tridentata*, but others include *Artemisia arbuscula*, *Artemisia rigida*, *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Purshia tridentata*, *Ribes cereum*, and *Symphoricarpos oreophilus*. The herbaceous layer is typically dominated by graminoids such as *Achnatherum occidentale*, *Achnatherum thurberianum*, *Carex geyeri*, *Carex filifolia*, *Festuca idahoensis*, *Koeleria macrantha*, *Leymus cinereus*, *Poa secunda*, and *Pseudoroegneria spicata*. Annual forbs (*Blepharipappus scaber*, *Cleome platycarpa*, *Collinsia parviflora*, *Crocidium multicaule*, *Eriogonum vimineum*, *Mimulus nanus*) and perennial forbs (*Achillea millefolium*, *Astragalus filipes*, *Astragalus purshii*, *Balsamorhiza sagittata*, *Calochortus macrocarpus*, *Castilleja* spp., *Erigeron filifolius*, *Eriogonum umbellatum*, *Lomatium hendersonii*, *Trifolium macrocephalum*) occur and make the association species-rich, but provide very little cover. At the mesic edge of the woodland's range, occasional emergent *Pinus ponderosa*, *Pseudotsuga menziesii*, or other trees become increasingly common. At higher elevations, this alliance becomes surrounded by forests and occurs only on xeric microhabitats within the forest matrix.

ENVIRONMENT & DYNAMICS

Environmental Description: This woodland and savanna alliance is found on the Columbia Plateau and extends to the northern and western margins of the Great Basin, from southwestern Idaho to the eastern foothills of the Cascades, and south to the Modoc Plateau of northeastern California. Throughout the range the climate is semi-arid, with 23-36 cm of precipitation annually, and a maximum in winter. The temperature regime is cool summer-continental, with a wide range in diurnal temperatures and night frosts through most of the year. Summer lightning storms and associated fire are common in the environments where this type occurs and are presumably important in structuring the vegetation. Elevations range from under 200 m along the Columbia River in central Washington to over 1800 m in southwestern Idaho. Generally soils are medium-textured, with abundant coarse fragments derived from volcanic parent materials or eolian deposits such as pumice over well-cracked Columbia basalt bedrock. In central Oregon, the center of distribution, all aspects and slope positions occur. Where this type grades into relatively mesic forest or grassland habitats, the vegetation becomes restricted to rock outcrops or escarpments with excessively drained soils.

Dynamics: *Juniperus occidentalis* has been documented to germinate and grow preferentially under the canopy of *Artemisia* and other shrubs (Everett 1986), and is currently expanding its range into surrounding steppe vegetation types. Burkhardt and Tisdale (1969) noted that larger, older trees are often associated with rock outcrops, while younger trees are prevalent on adjacent alluvial soils. This pattern has also been observed in northeastern California (Barbour and Major 1977). This pattern has been interpreted to mean that *Juniperus occidentalis* colonizes from rocky refuges which offer shelter from fire, and that the recent expansion of *Juniperus occidentalis* woodlands can be linked to fire suppression.

DISTRIBUTION

Geographic Range: This woodland alliance is found largely in the Columbia Plateau and occurs along the northern and western edges of the Great Basin from southern California north to central Washington and east to southwestern Idaho. The areas of broadest distribution are central Oregon and the Modoc Plateau of northeastern California. Both areas lie just east of the Cascade Range and have extensive moderate-elevation terrain with gentle topography. This alliance is found west of the Cascade-Sierra axis in the upper Klamath Basin, where it occurs in the rainshadow of the Klamath Mountains.

Nations: US

States/Provinces: CA, ID, NV?, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omerik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Juniperus occidentalis* - *Agropyron* - *Festuca* (Hall 1973)
- > *Juniperus occidentalis* / *Agropyron spicatum* (Driscoll 1964a)
- > *Juniperus occidentalis* / *Festuca idahoensis* - *Agropyron spicatum* (Johnson and Simon 1987)

LOWER LEVEL UNITS

Associations:

- CEG001721 *Juniperus occidentalis* / *Artemisia tridentata* / *Pseudoroegneria spicata* Wooded Grassland
- CEG001716 *Juniperus occidentalis* / *Artemisia arbuscula* / *Festuca idahoensis* Wooded Grassland
- CEG001728 *Juniperus occidentalis* / *Pseudoroegneria spicata* Wooded Grassland
- CEG001723 *Juniperus occidentalis* / *Cercocarpus ledifolius* / *Leymus cinereus* Wooded Grassland
- CEG001727 *Juniperus occidentalis* / *Poa secunda* - *Achnatherum occidentale* Wooded Grassland
- CEG002622 *Juniperus occidentalis* / *Purshia tridentata* / *Festuca idahoensis* - *Pseudoroegneria spicata* Wooded Grassland
- CEG001717 *Juniperus occidentalis* / *Artemisia arbuscula* / *Pseudoroegneria spicata* Wooded Grassland
- CEG001722 *Juniperus occidentalis* / *Artemisia tridentata* - *Purshia tridentata* Wooded Grassland
- CEG001724 *Juniperus occidentalis* / *Festuca idahoensis* Wooded Grassland
- CEG001715 *Juniperus occidentalis* / *Artemisia arbuscula* / *Poa secunda* Wooded Grassland
- CEG001718 *Juniperus occidentalis* / *Artemisia rigida* / *Poa secunda* Wooded Grassland
- CEG000724 *Juniperus occidentalis* / *Cercocarpus ledifolius* / *Carex geyeri* Wooded Grassland
- CEG001719 *Juniperus occidentalis* / *Artemisia tridentata* / *Carex filifolia* Wooded Grassland
- CEG001720 *Juniperus occidentalis* / *Artemisia tridentata* / *Festuca idahoensis* Wooded Grassland
- CEG002635 *Juniperus occidentalis* / *Achnatherum thurberianum* Open Woodland

AUTHORSHIP

Primary Concept Source: R.S. Driscoll (1964a)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Jennings and D. Sarr.

Version Date: 2014/03/14

REFERENCES

References: Baker 1980b, Barbour and Major 1977, Barrows et al. 1977, Burkhardt and Tisdale 1969, Burkhardt and Tisdale 1976, Burns and Honkala 1990a, Copeland 1980b, Dealy 1975, Dealy 1978, Dealy et al. 1978, Driscoll 1964a, Driscoll 1964b, Eckert 1957, Everett 1986, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1969, Franklin et al. 1972, Hall 1973, Hall 1978, Hopkins 1979a, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Kagan 1988, Moir et al. 1973b, ORNHP unpubl. data, Segura-Bustamante 1970, Volland 1976, Winward and Youtie 1976, Youtie and Winward 1977

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

G248. Columbia Plateau Western Juniper Open Woodland

A3499. *Juniperus occidentalis* / Shrub Understory Woodland Alliance

Type Concept Sentence: This woodland and savanna alliance is characterized by diagnostic tree species *Juniperus occidentalis* that forms an open to moderately dense tree layer with an understory dominated by an open to dense shrub layer (commonly *Artemisia tridentata*). It occurs on the Columbia Plateau extending from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern California.

OVERVIEW

Scientific Name: *Juniperus occidentalis* / Shrub Understory Woodland Alliance

Common Name (Translated Scientific Name): Western Juniper / Shrub Understory Woodland Alliance

Colloquial Name: Western Juniper / Shrub Woodland

Type Concept: Vegetation of this woodland alliance is characterized by an open to moderately dense canopy of *Juniperus occidentalis* with a moderately dense to dense shrub layer. *Juniperus occidentalis* is typically the only tree species, although *Pinus ponderosa* may be present in some stands. *Pinus jeffreyi* may occasionally occur in stands of this alliance in extreme northeastern

California. The tree form of *Cercocarpus ledifolius* may occasionally codominate. The shrub layer is dominated by *Artemisia tridentata* as the most common shrub; others are *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Purshia tridentata*, *Ribes cereum*, and *Symphoricarpos oreophilus*. A sparse to moderately dense herbaceous layer may be present that is typically dominated by graminoids such as *Carex filifolia*, *Festuca idahoensis*, *Poa secunda*, and *Pseudoroegneria spicata*. This woodland alliance is found on the Columbia Plateau and extends to the northern and western margins of the Great Basin, from southwestern Idaho to the eastern foothills of the Cascades, and south to the Modoc Plateau of northeastern California. Stands range in elevation from under 200 m along the Columbia River in central Washington to over 1800 m in southwestern Idaho. Generally soils are medium-textured, with abundant coarse fragments, and derived from volcanic parent materials. In central Oregon, the center of distribution, all aspects and slope positions occur. Where this alliance grades into relatively mesic forest or grassland habitats, these woodlands become restricted to rock outcrops and escarpments having xeric soils.

Classification Comments: This alliance is composed of wooded herbaceous vegetation associations that have an open tree canopy of about 5-15% cover. Additionally, sometimes there is enough shrub cover (1-20%) to form a shrub layer. Some stands with near 20% shrub cover might be confused with *Juniperus occidentalis* / Shrub Understory Woodland Alliance (A3499); however, it is the strong herbaceous layer that characterizes this alliance.

Internal Comments: KAS-1-14: Associations in this alliance need further review to ensure that their understory is dominated by graminoids when stands have shrub layer.

Other Comments:

Similar NVC Types: This alliance has similarities to other pinyon-juniper woodland and juniper woodland alliances in several other groups, such as G200, G246, G247, G250, G252, G253, and G487.

- A3500 *Juniperus occidentalis* / Herbaceous Understory Open Woodland Alliance: is similar but understory lacks a shrub layer and is dominated by an herbaceous layer (>10% cover) or, if less, grass cover exceeds shrub cover.

Diagnostic Characteristics: This woodland alliance has an open to dense tree canopy dominated by *Juniperus occidentalis*. The understory is characterized by an open to dense shrub layer dominated by characteristic species *Artemisia tridentata*, *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Purshia tridentata*, *Ribes cereum*, and *Symphoricarpos oreophilus*. A sparse to moderately dense herbaceous layer may be present that is typically dominated by graminoids such as *Carex filifolia*, *Festuca idahoensis*, *Poa secunda*, and *Pseudoroegneria spicata*. Shrub cover is generally greater than 20% or exceeds herbaceous cover.

VEGETATION

Physiognomy and Structure: Stands in this alliance are characterized by an open canopy (10-60% cover) of evergreen scale-leaved trees which vary widely in density due to edaphic conditions. A patchy to continuous layer of evergreen and winter-deciduous shrubs is often present, mixed with scattered perennial bunch grasses, forming a grassland/shrubland mosaic.

Floristics: Vegetation included in this alliance is characterized by a short (<20 m tall), open to moderately dense canopy of *Juniperus occidentalis* with a moderately dense to dense shrub layer. *Juniperus occidentalis* is typically the only tree species, although *Pinus ponderosa* may be present in some stands. *Pinus jeffreyi* may occasionally occur in stands of this alliance in extreme northeastern California. The tree form of *Cercocarpus ledifolius* or *Quercus garryana* may occasionally be present to codominate. The shrub layer is dominated by *Artemisia tridentata* as the most common shrub; other shrubs may include *Amelanchier alnifolia*, *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Prunus emarginata*, *Prunus virginiana*, *Purshia tridentata*, *Ribes cereum*, *Ribes velutinum*, *Symphoricarpos oreophilus*, and *Tetradymia* spp. A sparse to moderately dense herbaceous layer may be present that is typically dominated by graminoids such as *Bromus carinatus*, *Carex filifolia*, *Carex rossii*, *Festuca idahoensis*, *Hesperostipa* spp., *Koeleria macrantha*, *Poa secunda*, and *Pseudoroegneria spicata*. No forbs dominate, although species such as *Achillea millefolium*, *Arabis holboellii*, *Collinsia parviflora*, *Eriophyllum lanatum*, *Gayophytum diffusum*, *Geum triflorum*, *Phacelia heterophylla*, and *Senecio integerrimus* may be present.

ENVIRONMENT & DYNAMICS

Environmental Description: This woodland alliance is found on the Columbia Plateau and extends to the northern and western margins of the Great Basin, from southwestern Idaho to the eastern foothills of the Cascades, and south to the Modoc Plateau of northeastern California. Throughout the range the climate is semi-arid, with 23-36 cm of precipitation annually, and a maximum in winter. The temperature regime is cool summer-continental, with a wide range in diurnal temperatures and night frosts through most of the year. Summer lightning storms and associated fire are common in the environments where this type occurs and are presumably important in structuring the vegetation. Stands often occur on moderate slopes (25-30%) on southern to southwestern aspects, but can occur on all aspects and gentle to steep slopes. Elevations range from under 200 m along the Columbia River in central Washington to over 1800 m in southwestern Idaho. Substrates are generally well-drained and moderately deep, medium-

textured soils with abundant coarse fragments, and derived from volcanic parent materials. Where this type grades into relatively mesic forest or grassland habitats, the vegetation becomes restricted to rock outcrops or escarpments with excessively drained soils.

Dynamics: Throughout much of the range of this alliance, *Juniperus occidentalis* populations are expanding into contiguous *Artemisia* shrub-steppe. The reasons for this are not entirely clear, but *Juniperus occidentalis* has been documented to germinate and grow preferentially under the canopy of *Artemisia* and other shrubs (Everett 1986). Burkhardt and Tisdale (1969) noted that larger, older trees are often associated with rock outcrops, while younger trees are prevalent on adjacent alluvial soils. This pattern has also been observed in northeastern California (Barbour and Major 1977). This pattern has been interpreted to mean that *Juniperus occidentalis* is colonizing out from rocky refuges which offer shelter from fire, and that the recent expansion of *Juniperus occidentalis* woodlands can be linked to fire suppression.

DISTRIBUTION

Geographic Range: This woodland alliance is found largely in the Columbia Plateau and occurs along the northern and western edges of the Great Basin from southern California north to central Washington and east to southwestern Idaho. The areas of broadest distribution are central Oregon and the Modoc Plateau of northeastern California. Both areas lie just east of the Cascade Range and have extensive moderate-elevation terrain with gentle topography. This alliance is found west of the Cascade-Sierra axis in the upper Klamath Basin, where it occurs in the rainshadow of the Klamath Mountains.

Nations: US

States/Provinces: CA, ID, NV?, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Juniperus occidentalis* / *Cercocarpus ledifolius* / *Festuca idahoensis* - *Agropyron spicatum* Plant Association (Johnson and Clausnitzer 1992)

LOWER LEVEL UNITS

Associations:

- CEGL000726 *Juniperus occidentalis* / *Cercocarpus ledifolius* - *Symphoricarpos oreophilus* Woodland
- CEGL000723 *Juniperus occidentalis* / *Artemisia tridentata* ssp. *vaseyana* Woodland
- CEGL000725 *Juniperus occidentalis* / *Cercocarpus ledifolius* / *Pseudoroegneria spicata* Woodland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Jennings and D. Sarr.

Version Date: 2014/03/14

REFERENCES

References: Barbour and Major 1977, Barrows et al. 1977, Burkhardt and Tisdale 1969, Burkhardt and Tisdale 1976, Dealy 1975, Driscoll 1964a, Everett 1986, Faber-Langendoen et al. 2017b, Johnson and Clausnitzer 1992, ORNHP unpubl. data, Youtie and Winward 1977

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

1.B.2.Nc.1.c. M026 Intermountain Singleleaf Pinyon - Juniper Woodland

G247. Great Basin Pinyon - Juniper Woodland

Type Concept Sentence: This woodland group occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada and is characterized by an open to moderately dense tree canopy typically composed of a mix of *Pinus monophylla* and *Juniperus osteosperma*, but either tree species may dominate as long as there is significant presence of *Pinus monophylla* (not accidental) to characterize the stand as a pinyon-juniper stand and not the more xeric, typically lower-elevation *Juniperus osteosperma* woodland and savanna.

OVERVIEW

Scientific Name: *Pinus monophylla* - *Juniperus osteosperma* Woodland Group

Common Name (Translated Scientific Name): Singleleaf Pinyon - Utah Juniper Woodland Group

Colloquial Name: Great Basin Singleleaf Pinyon - Utah Juniper / Herb Open Woodland

Type Concept: This woodland group occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada, and south in scattered locations throughout southern California. The vegetation is characterized by an open to moderately dense tree canopy typically composed of a mix of *Pinus monophylla* and *Juniperus osteosperma*, but either tree species may dominate as long as there is significant presence of *Pinus monophylla* (not accidental) to characterize the stand as a pinyon-juniper stand and not the more xeric, typically lower-elevation *Juniperus osteosperma* woodland and savanna. In some regions of southern California, *Juniperus osteosperma* is replaced by *Juniperus californica*. *Cercocarpus ledifolius* is a common associate and may occur in tree or shrub form. On the east slope of the Sierra Nevada in California, *Pinus jeffreyi* and *Juniperus grandis* (= *Juniperus occidentalis* var. *australis*) may be minor components of higher elevation stands in these woodlands. The understory layers are variable, but shrubs such as *Artemisia tridentata* frequently form a moderately dense short-shrub layer. Other associated shrubs include *Arctostaphylos patula*, *Artemisia arbuscula*, *Artemisia nova*, *Cercocarpus ledifolius*, *Cercocarpus intricatus*, *Coleogyne ramosissima*, *Juniperus californica*, *Quercus chrysolepis*, *Quercus gambelii*, *Quercus john-tuckeri*, *Quercus turbinella*, and *Yucca brevifolia*. Bunchgrasses such as *Bouteloua gracilis*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus* (= *Elymus cinereus*), *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata* are commonly present and may form an herbaceous layer. These woodlands are typically found at lower elevations, but range from 1500-2600 m. Stands occur on warm, dry sites on mountain slopes, mesas, plateaus and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. These woodlands occur at lower elevation than Colorado Plateau Pinyon - Juniper Woodland Group (G250) where sympatric.

Classification Comments: This group corresponds to the *Pinus monophylla*-dominated portion of the *persistent pinyon-juniper woodland* type from Romme et al. (2009) that occurs on rocky uplands with shallow, coarse-textured, and often skeletal soils that support relatively sparse herbaceous cover and rarely burn.

Similar NVC Types:

- G250 Colorado Plateau Pinyon - Juniper Woodland
- G246 Colorado Plateau-Great Basin Juniper Open Woodland

Diagnostic Characteristics: These woodlands are characterized by diagnostic tree species *Pinus monophylla* that forms an open to dense tree layer often with the wider ranging *Juniperus osteosperma* or, less frequently, *Juniperus californica* in southern California. *Juniperus osteosperma* also may dominate woodland stands within the range of *Pinus monophylla* as long as there is significant presence of *Pinus monophylla* (not accidental) to characterize the stand as a pinyon-juniper stand and not the more xeric, typically lower-elevation *Juniperus osteosperma* woodland and savanna. Understory diagnostic species are characteristic of the Great Basin, such as *Arctostaphylos patula*, *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, *Coleogyne ramosissima*, *Purshia stansburiana*, *Purshia tridentata*, *Pleuraphis jamesii*, *Pseudoroegneria spicata*, *Poa secunda*, or *Poa fendleriana*.

VEGETATION

Physiognomy and Structure: This vegetation group is characterized by an open to moderately dense, short (2-10 m tall) evergreen needle-leaved or scale-leaved tree canopy. Open to dense shrub and herbaceous layers may be present or absent. Herbaceous layers are usually sparse.

Floristics: These woodlands are characterized by an open to moderately dense tree canopy typically composed of a mix of *Pinus monophylla* and *Juniperus osteosperma*, but either tree species may dominate as long as there is significant presence of *Pinus monophylla* (not accidental) to characterize the stand as a pinyon-juniper stand and not the more xeric, typically lower-elevation *Juniperus osteosperma* woodland and savanna. In some regions of southern California, *Juniperus osteosperma* is replaced by *Juniperus californica*. *Cercocarpus ledifolius* is a common associate and may occur in tree or shrub form. On the east slope of the Sierra Nevada in California, *Pinus jeffreyi* and *Juniperus grandis* (= *Juniperus occidentalis* var. *australis*) may be minor components of these woodlands. Understory layers are variable, but shrubs such as *Artemisia tridentata* frequently form a moderately dense short-shrub layer. Other associated shrubs include *Amelanchier utahensis*, *Arctostaphylos patula*, *Arctostaphylos pungens*, *Artemisia arbuscula*, *Artemisia nova*, *Ceanothus greggii*, *Cercocarpus intricatus*, *Coleogyne ramosissima*, *Glossopetalon spinescens*, *Peraphyllum ramosissimum*, *Prunus virginiana*, *Purshia stansburiana*, *Purshia tridentata*, *Quercus chrysolepis*, *Quercus gambelii*, *Quercus john-tuckeri*, *Quercus turbinella*, *Shepherdia rotundifolia*, and *Yucca brevifolia*. Bunchgrasses such as *Bouteloua gracilis*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus* (= *Elymus cinereus*), *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata* are commonly present and may form an herbaceous layer.

ENVIRONMENT & DYNAMICS

Environmental Description: This woodland group occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada, and south in scattered locations throughout southern California. It is typically found at lower elevations but ranges from 1500-2600 m. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus and ridges. Substrates are variable but are often rocky with shallow soil. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides.

Dynamics: *Pinus monophylla*, *Juniperus osteosperma*, and *Juniperus scopulorum* are slow-growing, long-lived trees (about 650 years for *Juniperus osteosperma*, 300 years for *Juniperus scopulorum*, and 800 years for *Pinus monophylla* although older individuals are known) (Burns and Honkala 1990a, Zlatnik 1999e, Zouhar 2001b, Scher 2002, Sawyer et al. 2009). These trees are killed by severe fire because of thin bark and lack of self-pruning; however, mature trees can survive low-intensity fires (Zouhar 2001b, Sawyer et al. 2009). Although there is variation in fire frequency because of the diversity of site characteristics, stand-replacing fire was uncommon in this ecological system historically, with an average fire-return interval (FRI) of 100-1000 years occurring primarily during extreme fire behavior conditions and during long droughts (Zouhar 2001b) (Landfire 2007a, BpS model 1210190). Mixed-severity fire (average FRI of 100-500 years) was characterized as a mosaic of replacement and surface fires distributed through stands in patches at a fine scale (<0.1 acre) (LF BpS model 1210190).

DISTRIBUTION

Geographic Range: This woodland group occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada. It extends southwest in California to the northern Transverse Ranges (Ventura County) and San Jacinto Mountains (Riverside County). Stands do not occur in Mexico.

Spatial Scale & Pattern [optional]: Matrix

Nations: US

States/Provinces: CA, ID, NV, UT

TNC Ecoregions [optional]: 6:C, 11:C, 12:C, 18:C

USFS Ecoregions (2007): 313A:CC, 322A:CC, 322B:CC, 341A:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342J:CC, M242C:??, M261D:C?, M261E:CC, M261G:CC, M331D:CC, M341A:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = PIMO Series (West et al. 1998)

LOWER LEVEL UNITS

Alliances:

- A2109 *Pinus monophylla* - *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance
- A2108 *Pinus monophylla* - *Juniperus osteosperma* / Shrub Understory Woodland Alliance

AUTHORSHIP

Primary Concept Source: N.E. West, R.J. Tausch, and P.T. Tueller (1998)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: KAS 1-10, 5-13, 11-15

REFERENCES

References: Barbour and Major 1977, Brown 1982a, Brown et al. 1979, Burns and Honkala 1990a, Eyre 1980, Faber-Langendoen et al. 2017a, Holland and Keil 1995, Küchler 1964, Landfire 2007a, Romme et al. 2009, Sawyer et al. 2009, Scher 2002, Shiflet 1994, Thorne et al. 2007, West 1999a, West et al. 1998, Zlatnik 1999e, Zouhar 2001b

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

G247. Great Basin Pinyon - Juniper Woodland

A2109. *Pinus monophylla* - *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance

Type Concept Sentence: This open woodland and savanna alliance is characterized by diagnostic tree species *Pinus monophylla* that forms an open to moderately dense tree layer often with *Juniperus osteosperma* or, less frequently, *Juniperus californica* in southern California, with an understory dominated by an open to dense layer of perennial grasses and lacking significant cover of shrubs. It occurs on dry mountain slopes, foothills, plateaus and ridges in the Great Basin region and eastern foothills of the Sierra Nevada, and south in scattered locations throughout southern California, including desert mountain ranges.

OVERVIEW

Scientific Name: *Pinus monophylla* - *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance

Common Name (Translated Scientific Name): Singleleaf Pinyon - Utah Juniper / Herbaceous Open Woodland Alliance

Colloquial Name: Great Basin Singleleaf Pinyon - Utah Juniper / Herb Open Woodland

Type Concept: These open woodlands and tree savannas are characterized by diagnostic tree species *Pinus monophylla* which forms an open to moderately dense tree layer often with *Juniperus osteosperma* or, less frequently, *Juniperus californica* in southern California. *Juniperus osteosperma* may also dominate stands as long as there is significant presence of *Pinus monophylla* that characterizes the stand as a pinyon-juniper stand and not the more xeric, typically lower elevation *Juniperus osteosperma* / Shrub Understory Woodland Alliance (A3496). At higher elevations and on relatively mesic sites, such as along drainages, *Juniperus scopulorum* may be present and sometimes dominant. Other conifers are absent or accidental with very low cover. The understory is characterized by an open to dense herbaceous layer. Scattered shrubs may be present but do not form a layer and do not exceed cover of herbaceous layer. Perennial grasses typically dominate the herbaceous layer, although forbs species are present and can be diverse. Characteristic species include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus elymoides*, *Hesperostipa comata*, *Leymus cinereus*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. The non-native, invasive annual grass *Bromus tectorum* may become abundant and dominate the understory of highly disturbed stands. This open woodland and savanna alliance occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada, and south in scattered locations throughout southern California, including desert mountain ranges. Stands occur on warm, dry sites on mountain slopes, foothills, plateaus and ridges in ranges of the Great Basin and southern California, usually on erosional terrain or upper alluvial slopes. Elevations range from 1000 to 2800 m. The climate is semi-arid, with approximately 20-45 cm of precipitation annually. Substrates are variable but often rocky with shallow soil.

Classification Comments: This alliance currently contains *Pinus monophylla* - *Juniperus osteosperma* / *Leymus cinereus* Wooded Grassland (CEGL000835) which was described qualitatively from a single location in southern Idaho. Vegetation similar in composition has been described from southern California (Barbour and Major 1977) and Nevada (Blackburn 1967, Blackburn et al. 1969). The low-elevation woody vegetation of the Great Basin has been traditionally lumped into *Pinus monophylla* (singleleaf pinyon) or pinyon-juniper woodlands, and further classification work is needed to differentiate true woodlands from the savanna-like stands in this alliance. It is likely that these savannas are much more widely distributed than presently documented.

Internal Comments:

Other Comments:

Similar NVC Types: This alliance has similarities to other pinyon-juniper and juniper woodland and savanna alliances in several other groups, such as G200, G246, G248, G250, G252, G253, and G487.

- A3497 *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance: is similar except overstory lacks *Pinus monophylla* or has low cover <5%.
- A3496 *Juniperus osteosperma* / Shrub Understory Woodland Alliance
- A2108 *Pinus monophylla* - *Juniperus osteosperma* / Shrub Understory Woodland Alliance: is similar but understory has a shrub layer (>10% cover) or, if less, shrub cover exceeds herbaceous cover.

Diagnostic Characteristics: This alliance is characterized by the diagnostic tree species *Pinus monophylla* which forms an open to moderately dense tree layer often with *Juniperus osteosperma* or, less frequently, *Juniperus californica* in southern California. *Juniperus osteosperma* may also dominate stands as long as there is significant presence of *Pinus monophylla* with which to characterize the stand as pinyon-juniper. Characteristic species include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus elymoides*, *Hesperostipa comata*, *Poa fendleriana*, *Poa secunda*, *Pleuraphis jamesii*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: These are sparse savannas and open woodland (5-30% cover) characterized by needle-leaved evergreen trees of low stature (<20 m). Scale-leaved evergreen trees are often present and may be codominant in the tree layer. The herbaceous layer is usually of low to moderate cover (20-40%) and dominated by tall perennial bunch grasses (0.5-1.5 m tall).

Floristics: These open woodlands and tree savannas are characterized by diagnostic tree species *Pinus monophylla* which forms an open to moderately dense tree layer often with *Juniperus osteosperma* or, less frequently, *Juniperus californica* in southern California. *Juniperus osteosperma* may also dominate stands as long as there is significant presence of *Pinus monophylla* that characterizes the stand as a pinyon-juniper stand and not the more xeric, typically lower elevation *Juniperus osteosperma* / Shrub Understory Woodland Alliance (A3496). At higher elevations and on relatively mesic sites, such as along drainages, *Juniperus scopulorum* may be present and sometimes dominant. Other conifers such as *Abies concolor*, *Pinus aristata*, *Pinus flexilis*, and *Pinus ponderosa* are absent or accidental with very low cover. The understory is characterized by an open to dense herbaceous layer. Scattered shrubs and dwarf-shrubs, such as *Cercocarpus ledifolius*, *Gutierrezia sarothrae*, and *Opuntia* sp., may be present but do not form a layer and do not exceed cover of herbaceous layer. Perennial grasses typically dominate the herbaceous layer, although forbs species are present and can be diverse. Characteristic species include *Achnatherum hymenoides*, *Aristida purpurea*, *Bouteloua gracilis*, *Elymus elymoides*, *Hesperostipa comata*, *Leymus cinereus*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Common forbs include *Penstemon linarioides*, *Eriogonum umbellatum*, and *Hymenoxys richardsonii*. The non-native, invasive annual grass *Bromus tectorum* may become abundant in disturbed stands and dominate the understory of highly disturbed stands.

ENVIRONMENT & DYNAMICS

Environmental Description: These woodlands occur on warm, dry sites on mountain slopes, foothills, plateaus and ridges in ranges of the Great Basin and southern California, usually on erosional terrain or upper alluvial slopes. Elevations range from 1000 to 2800 m. The climate of the region is characterized as semi-arid, with warm summers and cold winters. Average annual precipitation is 27 cm (20-45 cm), and shows a peak during April through June, when more than 30% of the annual total is received. Summers are typically dry and there is usually extreme variation in yearly totals. In the Great Basin, these woodlands occur on intermediate slopes above pools of cold-air drainage. Upper elevation limits are determined by local climate and/or the presence of competing tree species. Soils are variable, but generally coarse-textured and well-drained and derived from gneiss, schist, quartzite, and amphibolite. Soil pH is usually nearly neutral or alkaline.

Dynamics: *Pinus monophylla* is a slow-growing, long-lived tree and stands appear somewhat static over time compared to more productive forests. Regeneration occurs primarily under nurse shrubs or adult trees, where canopy shading minimizes drought stress for seedlings (Koniak 1985). These woodlands are expanding into adjacent steppe grasslands in many areas, reportedly in connection with livestock grazing and altered fire regimes. Many of these woodlands have been intensively altered to enhance livestock forage.

DISTRIBUTION

Geographic Range: The core distribution of this woodland alliance is the Great Basin, but it extends out into adjacent ecoregions primarily west into the foothills of the Sierra Nevada, south on scattered mountain ranges of the Mojave Desert and east into the transition zone with the Colorado Plateau. A second substantial range occurs along interior slopes in the Transverse and Peninsular ranges of southern California.

Nations: US

States/Provinces: AZ, CA, ID, NV, UT

TNC Ecoregions [optional]: 11:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Great Basin)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Pinus monophylla* (Singleleaf pinyon woodlands) Alliance (Sawyer et al. 2009) [87.040.00]
- >< Singleleaf Pinyon Series (Sawyer and Keeler-Wolf 1995)
- >< Singleleaf Pinyon-Utah Juniper Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEGLO00835 *Pinus monophylla* - *Juniperus osteosperma* / *Leymus cinereus* Wooded Grassland
- CEGLO03154 *Pinus monophylla* / *Artemisia tridentata* / *Elymus elymoides* Open Woodland
- CEGLO02969 *Pinus monophylla* - *Juniperus osteosperma* / *Hesperostipa comata* Open Woodland
- CEGLO05440 *Pinus monophylla* - *Juniperus osteosperma* / *Poa (fendleriana, secunda)* Open Woodland
- CEGLO05396 *Pinus monophylla* - *Juniperus osteosperma* / *Bouteloua gracilis* Open Woodland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Jennings and D. Sarr.

Version Date: 2014/03/14

REFERENCES

References: Armstrong 1969, Barrows et al. 1977, Beatley 1976, Blackburn 1967, Blackburn et al. 1968a, Blackburn et al. 1968c, Blackburn et al. 1969a, Blackburn et al. 1969c, Blackburn et al. 1969d, Blackburn et al. 1969e, Caicco and Wellner 1983a, Everett 1986, Faber-Langendoen et al. 2017b, Heinze et al. 1962, Koniak 1985, Kurzius 1981, Peterson 1984a, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shaw et al. 1995, West et al. 1998

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

G247. Great Basin Pinyon - Juniper Woodland

A2108. *Pinus monophylla* - *Juniperus osteosperma* / Shrub Understory Woodland Alliance

Type Concept Sentence: This woodland alliance is characterized by diagnostic tree species *Pinus monophylla* that forms an open to dense tree layer often with *Juniperus osteosperma* or, less frequently, *Juniperus californica* in southern California, with an understory that is characterized by shrubs that typically form an open to moderately dense layer. It is found on dry mountain slopes, foothills, plateaus and ridges of the Great Basin region and eastern foothills of the Sierra Nevada, and south in scattered locations throughout southern California, including desert mountain ranges.

OVERVIEW

Scientific Name: *Pinus monophylla* - *Juniperus osteosperma* / Shrub Understory Woodland Alliance

Common Name (Translated Scientific Name): Singleleaf Pinyon - Utah Juniper / Shrub Understory Woodland Alliance

Colloquial Name: Great Basin Singleleaf Pinyon - Utah Juniper / Shrub Woodland

Type Concept: This woodland alliance is found on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada, and south in scattered locations throughout southern California, including desert mountain ranges. *Pinus monophylla* forms an open to dense tree layer often with *Juniperus osteosperma* or, less frequently, *Juniperus californica* in southern California. *Juniperus osteosperma* may also dominate stands as long as there is significant presence of *Pinus monophylla* that characterizes the stand as a pinyon-juniper stand and not the more xeric, typically lower elevation *Juniperus osteosperma* / Shrub Understory Woodland Alliance (A3496). At higher elevations and on relatively mesic sites, such as along drainages, *Juniperus scopulorum* may be present and sometimes dominant. Other conifers are absent or accidental. The understory is characterized by shrubs that typically form an open to moderately dense layer. Similar scattered shrubs frequently characterize sparse and rocky understory woodlands and so those types are included in this alliance. Characteristic shrubs are many, including *Amelanchier utahensis*, *Arctostaphylos patula*, *Arctostaphylos pungens*, *Artemisia arbuscula*, *Artemisia nova*, *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *vaseyana*, *Ceanothus greggii*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, *Coleogyne ramosissima*, *Ephedra* spp., *Ericameria* spp., *Glossopetalon spinescens*, *Gutierrezia sarothrae*, *Peraphyllum ramosissimum*, *Prunus virginiana*, *Purshia stansburiana*, *Quercus gambelii*, *Quercus turbinella*, *Ribes velutinum*, *Shepherdia rotundifolia*, and *Symphoricarpos oreophilus*. The herbaceous layer is sparse to moderate and composed of grasses and often diverse forbs. Common species may include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, *Poa fendleriana*, *Poa secunda*, *Pleuraphis jamesii*, and *Pseudoroegneria spicata*. The non-native, invasive annual grass *Bromus tectorum* may become abundant in disturbed stands and dominate the herbaceous layer of highly disturbed stands. This alliance also includes sparse understory stands often with scattered shrubs and grasses. Stands occur on warm, dry sites on mountain slopes, foothills, plateaus and ridges in ranges of the Great Basin and southern California, usually on erosional terrain or upper alluvial slopes. Elevations range from 1000 to 2800 m. The climate is semi-arid, with approximately 20-45 cm of precipitation annually. Substrates are variable but often rocky with shallow soil.

Classification Comments: Scattered shrubs frequently characterize sparse and rock understory stands and so are included in this alliance.

Internal Comments:

Other Comments:

Similar NVC Types: This alliance has similarities to other pinyon-juniper and juniper woodland and savanna alliances in several other groups, such as G200, G246, G248, G250, G252, G253, and G487.

- A2109 *Pinus monophylla* - *Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance: is similar but understory lacks a shrub layer and is dominated by an herbaceous layer (>10% cover) or, if less, grass cover exceeds shrub cover.
- A3574 *Juniperus monosperma* / Shrub Understory Woodland Alliance
- A3496 *Juniperus osteosperma* / Shrub Understory Woodland Alliance: is similar except overstory lacks *Pinus monophylla* or has low cover <5%.

Diagnostic Characteristics: This alliance is characterized by diagnostic tree species *Pinus monophylla* that forms an open to dense tree layer often with *Juniperus osteosperma* or, less frequently, *Juniperus californica* in southern California. *Juniperus osteosperma* may also dominate stands as long as there is significant presence of *Pinus monophylla* with which to characterize the stand as a pinyon-juniper stand and not the more xeric, typically lower elevation *Juniperus osteosperma* / Shrub Understory Woodland Alliance (A3496). Understory diagnostic species include *Amelanchier utahensis*, *Arctostaphylos patula*, *Arctostaphylos patula*, *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, *Coleogyne ramosissima*, *Purshia stansburiana*, *Purshia tridentata*, *Quercus gambelii*, *Quercus turbinella*, *Shepherdia rotundifolia*, and *Symphoricarpos oreophilus*. This alliance also includes sparse understory stands often with scattered shrubs and grasses. The lack of understory can be caused by harsh substrate (rockland, shale badland) or dense tree canopy resulting from lack of fire that shades out understory.

VEGETATION

Physiognomy and Structure: These are open to dense woodlands (10-70% cover), dominated by needle-leaved evergreen trees of low stature (<20 m). Scale-leaved evergreen trees or tall shrubs (2-10 m tall) are often present and may be codominant. Generally, evergreen or cold-deciduous shrubs occupy the interstices between trees, interspersed with caespitose graminoids. In total, the ground layer is usually of low to moderate cover (20-40%). This alliance also includes sparse understory stands often with scattered shrubs and grasses.

Floristics: *Pinus monophylla* forms an open to dense tree layer often with *Juniperus osteosperma* or, less frequently, *Juniperus californica* in southern California. *Juniperus osteosperma* may also dominate stands as long as there is significant presence of *Pinus monophylla* that characterizes the stand as a pinyon-juniper stand and not the more xeric, typically lower elevation *Juniperus osteosperma* / Shrub Understory Woodland Alliance (A3496). At higher elevations and on relatively mesic sites, such as along drainages, *Juniperus scopulorum* may be present and sometimes dominant. Other conifers such as *Abies concolor*, *Pinus aristata*, *Pinus flexilis*, *Pinus jeffreyi*, and *Pinus ponderosa* are absent or accidental with very low cover. The understory is characterized by shrubs that typically form an open to moderately dense layer. Similar scattered shrubs frequently characterize sparse and rocky understory woodlands and so those types are included in this alliance. Characteristic shrubs are many, including *Amelanchier utahensis*, *Arctostaphylos patula*, *Arctostaphylos pungens*, *Artemisia arbuscula*, *Artemisia nova*, *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *vaseyana*, *Ceanothus greggii*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, *Coleogyne ramosissima*, *Ephedra* spp., *Ericameria* spp., *Glossopetalon spinescens*, *Gutierrezia sarothrae*, *Peraphyllum ramosissimum*, *Prunus virginiana*, *Purshia stansburiana*, *Quercus gambelii*, *Quercus turbinella*, *Ribes velutinum*, *Shepherdia rotundifolia*, and *Symphoricarpos oreophilus*. Along the eastern slopes of the Sierra Nevada or Transverse Ranges of southern California, *Arctostaphylos glauca*, *Ceanothus cuneatus*, *Eriogonum fasciculatum*, *Quercus chrysolepis*, and *Yucca schidigera* may also occur. The herbaceous layer is sparse to moderate and composed of grasses and often diverse forbs. Common species may include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, *Poa fendleriana*, *Poa secunda*, *Pleuraphis jamesii*, and *Pseudoroegneria spicata*. Although forb cover is generally sparse, it may be very diverse. Common forbs include *Astragalus* spp., *Cryptantha cinerea* var. *jamesii* (= *Cryptantha jamesii*), *Eriogonum caespitosum*, *Eriogonum umbellatum*, *Gayophytum ramosissimum*, *Gilia ochroleuca*, *Hymenoxys richardsonii*, *Lomatium foeniculaceum* ssp. *macdougallii* (= *Lomatium macdougallii*), *Machaeranthera canescens*, *Penstemon linarioides*, *Phlox* spp., and *Sphaeralcea coccinea*. Disturbed stands may have high cover of the introduced annual grass *Bromus tectorum* or *Halogeton glomeratus*, an introduced forb. This alliance also includes sparse understory stands often with scattered shrubs and grasses. The lack of understory can be caused by harsh substrate (rockland, shale badland) or dense tree canopy that shades out the understory.

ENVIRONMENT & DYNAMICS

Environmental Description: These woodlands occur on warm, dry sites on mountain slopes, foothills, plateaus and ridges in ranges of the Great Basin and southern California, usually on erosional terrain or upper alluvial slopes. Elevations range from 1000 to 2800 m. The climate of the region is characterized as semi-arid, with warm summers and cold winters. Average annual precipitation is 27 cm (20-45 cm), and shows a peak during April through June, when more than 30% of the annual total is received. Summers are typically dry and there is usually extreme variation in yearly totals. In the Great Basin, these woodlands occur on intermediate slopes above pools of cold-air drainage. Upper elevation limits are determined by local climate and/or the presence of competing tree species. Soils are variable, but generally coarse-textured and well-drained and derived from gneiss, schist, quartzite, and amphibolite. Soil pH is usually nearly neutral or alkaline.

Dynamics: *Pinus monophylla* is a slow-growing, long-lived tree and stands appear somewhat static over time compared to more productive forests. Regeneration occurs primarily under nurse shrubs or adult trees, where canopy shading minimizes drought stress for seedlings (Koniak 1985). These woodlands are expanding into adjacent steppe grasslands in many areas, reportedly in connection with livestock grazing and altered fire regimes. Many of these woodlands have been intensively altered to enhance livestock forage.

DISTRIBUTION

Geographic Range: The core distribution of this woodland alliance is the Great Basin, but it extends out into adjacent ecoregions primarily west into the foothills of the Sierra Nevada, south on scattered mountain ranges of the Mojave Desert and east into the

transition zone with the Colorado Plateau. A second substantial range occurs along interior slopes in the Transverse and Peninsular ranges of southern California.

Nations: US

States/Provinces: AZ, CA, ID, NV, UT

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Lake Mead, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Pinus monophylla* (Singleleaf pinyon woodlands) Alliance (Sawyer et al. 2009) [87.040.00]
- = *Pinus monophylla*-(*Juniperus osteosperma*) Woodland Alliance (Evens et al. 2014)
- >< Singleleaf Pinyon Series (Sawyer and Keeler-Wolf 1995)
- >< Singleleaf Pinyon-Utah Juniper Series (Sawyer and Keeler-Wolf 1995)
- >< Utah Juniper Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEGLO00838 *Pinus monophylla* - *Quercus gambelii* / *Artemisia tridentata* Woodland
- CEPP006732 *Pinus monophylla* / *Eriogonum fasciculatum* Woodland
- CEGLO00828 *Pinus monophylla* - *Juniperus osteosperma* / *Cercocarpus ledifolius* Woodland
- CEGLO02941 *Pinus monophylla* - *Juniperus osteosperma* / *Quercus turbinella* Woodland
- CEGLO00827 *Pinus monophylla* / *Artemisia tridentata* Woodland
- CEGLO00829 *Pinus monophylla* - *Juniperus osteosperma* / Sparse Understory Woodland
- CEGLO03153 *Pinus monophylla* / *Ribes velutinum* Woodland
- CEGLO00831 *Pinus monophylla* - *Juniperus osteosperma* / *Artemisia nova* Woodland
- CEGLO00837 *Pinus monophylla* - *Juniperus osteosperma* - *Quercus gambelii* / *Artemisia tridentata* Woodland
- CEGLO02968 *Pinus monophylla* - *Juniperus osteosperma* / *Quercus gambelii* Woodland
- CEGLO00832 *Pinus monophylla* - *Juniperus osteosperma* / *Artemisia tridentata* Woodland
- CEGLO00834 *Pinus monophylla* - *Juniperus osteosperma* / *Cercocarpus ledifolius* / *Pseudoroegneria spicata* Woodland
- CEGLO00825 *Pinus monophylla* Woodland
- CEGLO00826 *Pinus monophylla* / *Amelanchier alnifolia* / *Arctostaphylos patula* Woodland
- CEGLO02971 *Pinus monophylla* - *Juniperus osteosperma* / *Coleogyne ramosissima* Woodland
- CEGLO00839 *Pinus monophylla* / *Symphoricarpos oreophilus* - *Artemisia tridentata* Woodland
- CEGLO02970 *Pinus monophylla* - *Juniperus osteosperma* / *Gutierrezia sarothrae* / *Pleuraphis jamesii* Woodland
- CEGLO00836 *Pinus monophylla* - *Juniperus osteosperma* / *Prunus virginiana* Woodland
- CEGLO02942 *Pinus monophylla* - *Juniperus osteosperma* / (*Shepherdia rotundifolia*, *Amelanchier utahensis*) Woodland
- CEGLO05437 *Pinus monophylla* - (*Juniperus osteosperma*) / *Cercocarpus intricatus* Woodland
- CEGLO05300 *Juniperus osteosperma* - (*Pinus monophylla*) / *Ceanothus greggii* Woodland
- CEGLO05438 *Pinus monophylla* - *Juniperus osteosperma* / *Glossopetalon spinescens* - *Artemisia tridentata* - *Purshia stansburiana* Woodland
- CEGLO05397 *Pinus monophylla* - *Juniperus osteosperma* / *Purshia stansburiana* Woodland
- CEGLO05299 *Juniperus osteosperma* - (*Pinus monophylla*) / *Arctostaphylos pungens* Woodland
- CEGLO05436 *Pinus monophylla* - *Juniperus osteosperma* / *Artemisia tridentata* ssp. *vaseyana* - Mixed Shrub Woodland
- CEGLO05439 *Pinus monophylla* - *Juniperus osteosperma* / *Peraphyllum ramosissimum* Woodland
- CEPS009608 *Pinus monophylla* - *Juniperus osteosperma* / *Purshia tridentata* Woodland [Park Special]
- CEGLO00830 *Pinus monophylla* - *Juniperus osteosperma* / *Artemisia arbuscula* Woodland
- CEGLO00833 *Pinus monophylla* - *Juniperus osteosperma* / *Artemisia tridentata* ssp. *vaseyana* / *Pseudoroegneria spicata* Woodland
- CEGLO05772 *Pinus monophylla* / *Prunus fasciculata* - *Rhus trilobata* Woodland
- CEGLO05771 *Pinus monophylla* / *Garrya flavescens* Woodland
- CEGLO03152 *Pinus monophylla* / *Cercocarpus ledifolius* / *Artemisia tridentata* - *Purshia tridentata* Woodland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Jennings and D. Sarr.

Version Date: 2014/03/14

REFERENCES

References: Armstrong 1969, Baker 1983b, Baker 1984a, Baker and Kennedy 1985, Beatley 1976, Blackburn 1967, Blackburn et al. 1968a, Blackburn et al. 1968c, Blackburn et al. 1969a, Blackburn et al. 1969c, Blackburn et al. 1969d, Blackburn et al. 1969e, Blackburn et al. 1971, Bradley 1964, Brotherson and Evenson 1983, Caicco and Wellner 1983a, Caicco and Wellner 1983b, Caicco and Wellner 1983c, Clary et al. 1974, Dalen and Snyder 1987, Dastrup 1963, Despain 1973a, Donart et al. 1978b, Eddleman and Jaindl 1994, Evens et al. 2014, Everett 1986, Faber-Langendoen et al. 2017b, Heinze et al. 1962, Isaacson 1967, Jameson et al. 1962, Johnsen 1962, Johnson and Pfister 1982, Johnston 1987, Jones 1989b, Kline 1973, Knight et al. 1987, Komarkova et al. 1988a, Komarkova et al. 1988b, Koniak 1985, Kurzius 1981, Larson and Moir 1986, Larson and Moir 1987, Lesica and DeVelice 1992, Marriott and Jones 1989, Milton and Purdy 1983, Moir and Carleton 1987, Peterson 1984a, Rust 1999, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shaw et al. 1995, USFS 1983a, USFS 1985c, USFS 1985e, Warren n.d., West et al. 1978, West et al. 1998, Wight 1965, Wight and Fisser 1968

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

1.B.2.Nc.1.d. M026 Intermountain Singleleaf Pinyon - Juniper Woodland

G249. Intermountain Basins Curl-leaf Mountain-mahogany Woodland & Scrub

Type Concept Sentence: This *Cercocarpus ledifolius*-dominated woodland and shrubland group occurs in hills and mountain ranges of the intermountain western U.S. from the eastern foothills of the Sierra Nevada northeast to the foothills of the Bighorn Mountains and includes both tree and shrub forms of *Cercocarpus ledifolius* with *Artemisia tridentata ssp. vaseyana*, *Purshia tridentata*, and species of *Arctostaphylos*, *Ribes*, or *Symphoricarpos* often present to codominant in the shrub layer.

OVERVIEW

Scientific Name: *Cercocarpus ledifolius* Woodland & Scrub Group

Common Name (Translated Scientific Name): Curl-leaf Mountain-mahogany Woodland & Scrub Group

Colloquial Name: Curl-leaf Mountain-mahogany / Herb Woodland

Type Concept: This woodland and shrubland group includes stands dominated by either the tree or shrub form of *Cercocarpus ledifolius*. Scattered junipers or pines may also occur. *Artemisia tridentata ssp. vaseyana*, *Purshia tridentata*, along with species of *Arctostaphylos*, *Ribes*, or *Symphoricarpos* are often present to codominate in the shrub layer. Herbaceous undergrowth is often sparse and dominated by bunchgrasses, usually *Pseudoroegneria spicata* and *Festuca idahoensis*. Stands occur in hills and mountain ranges of the Intermountain West basins from the eastern foothills of the Sierra Nevada northeast to the foothills of the Bighorn Mountains. It typically occurs from 600 m to over 2650 m in elevation on rocky outcrops or escarpments and forms small- to large-patch stands in forested areas. Most stands occur as shrublands on ridges and steep rimrock slopes, but they may be composed of small trees in steppe areas. The tree form of *Cercocarpus ledifolius* is more common in the western range extent. *Cercocarpus ledifolius* is a slow-growing, drought-tolerant species that generally does not resprout after burning and needs the protection from fire that rocky sites provide.

Classification Comments: Within this group, the *Cercocarpus ledifolius* woodland and shrubland alliances are poorly distinguished in the literature, as most authors describe the species as having either a tall-shrub or small-tree growth form within a single association. Some associations may have shrub-dominated stands in one area and also have a woodland physiognomy in another. The woodland physiognomy appears to be more typical, based on available literature. Near the northern edge of its range in Montana and Idaho, *Cercocarpus ledifolius* is described as occurring primarily in the shrub form (Mueggler and Stewart 1980, Tisdale 1986). These northern variants are the only described stands which appear to be clearly distinct from the woodland alliance. The woodland alliance may have a different subspecies (or variety) as a dominant than the shrubland. Woodland stands tend to occur in the more western portion of the species range and are largely attributed to *Cercocarpus ledifolius var. intercedens* (= *Cercocarpus ledifolius var. intermontanus*), whereas *Cercocarpus ledifolius var. ledifolius* is found in the eastern and northern portions of the range and typically occurs as a shrubland.

Similar NVC Types:

Diagnostic Characteristics: *Cercocarpus ledifolius* is the diagnostic and dominant species of this woodland and shrubland group. Scattered pinyon or juniper trees may be present with low cover in woodland stands. If pinyon and juniper trees are codominant, then the stand is pinyon-juniper woodland. In shrubland stands, other shrubs, especially *Artemisia tridentata ssp. vaseyana*, *Purshia tridentata*, or *Symphoricarpos* spp., may be present to codominant.

VEGETATION

Physiognomy and Structure: Structure in this group is variable as *Cercocarpus ledifolius* stands may form an open to dense short-tree canopy (3-5 m tall), a tall-shrub layer (3-4 m tall), or a short-shrub layer (1-2 m tall). Herbaceous layers are variable depending on density of woody canopy and type of substrate.

Floristics: This group includes both woodlands and shrublands dominated by *Cercocarpus ledifolius*. *Artemisia tridentata* ssp. *vaseyana*, *Purshia tridentata*, along with *Arctostaphylos patula*, *Holodiscus dumosus*, *Mahonia repens*, and species of *Ribes* or *Symphoricarpos* are often present. Undergrowth is often sparse and dominated by bunchgrasses, usually *Pseudoroegneria spicata* with *Calamagrostis rubescens*, *Festuca idahoensis*, *Leymus salinus*, or *Poa secunda*. Scattered junipers or pines may also occur.

ENVIRONMENT & DYNAMICS

Environmental Description: This woodland and shrubland group occurs in hills and mountain ranges of the Intermountain West basins from the eastern foothills of the Sierra Nevada northeast to the foothills of the Bighorn Mountains. It typically occurs from 600 m to over 2650 m in elevation on rocky outcrops or escarpments and forms small- to large-patch stands in forested areas. Most stands occur as shrublands on ridges and steep rimrock slopes, but they may be composed of small trees in steppe areas.

Dynamics: *Cercocarpus ledifolius* is a slow-growing, drought-tolerant species that can inhabit very poor sites, such as cliffs and outcrops. Stands are often small and clumped near ridgetops. These sites may also afford the species some protection from fire. The species is highly susceptible to fire damage and generally does not resprout. *Cercocarpus ledifolius* is highly favored by native ungulates for winter range, and many individual shrubs show evidence of highlining by deer or elk.

DISTRIBUTION

Geographic Range: This woodland and shrubland group occurs in hills and mountain ranges of the Intermountain West basins from the eastern foothills of the Sierra Nevada northeast to the foothills of the Bighorn Mountains.

Spatial Scale & Pattern [optional]: Large patch

Nations: US

States/Provinces: CA, CO, ID, MT, NV, OR, UT, WY

TNC Ecoregions [optional]: 6:P, 9:C, 10:P, 11:C, 12:C

USFS Ecoregions (2007): 313A:CC, 331A:CC, 331G:CC, 341A:CC, 341B:CP, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CP, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242C:CC, M261E:CC, M261G:CC, M331A:C?, M331B:CC, M331D:CC, M331E:CC, M331J:C?, M332A:CC, M332B:C?, M332D:C?, M332E:CC, M332F:CC, M332G:CC, M333D:PP, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > Curlleaf Mountain-Mahogany (415) (Shiflet 1994)
- > Curlleaf Mountain-Mahogany - Bluebunch Wheatgrass (322) (Shiflet 1994)

LOWER LEVEL UNITS

Alliances:

- A3570 *Cercocarpus ledifolius* / Herbaceous Understory Woodland Alliance
- A0586 *Cercocarpus ledifolius* / Shrub Understory Woodland Alliance
- A0828 *Cercocarpus ledifolius* Scrub Alliance

AUTHORSHIP

Primary Concept Source: T.N. Shiflet (1994)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: KAS 1-10, 11-15

REFERENCES

References: Dealy 1975, Dealy 1978, Eyre 1980, Faber-Langendoen et al. 2017a, Holland and Keil 1995, Knight 1994, Knight et al. 1987, Lewis 1975b, Mueggler and Stewart 1980, Sawyer et al. 2009, Shiflet 1994

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

G249. Intermountain Basins Curl-leaf Mountain-mahogany Woodland & Scrub

A3570. *Cercocarpus ledifolius* / Herbaceous Understory Woodland Alliance

Type Concept Sentence: This woodland alliance is characterized by an open tree canopy of *Cercocarpus ledifolius* with the understory characterized by an open to moderate herbaceous layer typically dominated by bunchgrasses. It occurs in semi-arid steppe and temperate mountainous habitats of the interior western United States.

OVERVIEW

Scientific Name: *Cercocarpus ledifolius* / Herbaceous Understory Woodland Alliance

Common Name (Translated Scientific Name): Curl-leaf Mountain-mahogany / Herbaceous Understory Woodland Alliance

Colloquial Name: Curl-leaf Mountain-mahogany / Herb Woodland

Type Concept: The vegetation in this alliance is characterized by an open canopy of *Cercocarpus ledifolius*. Steppe woodlands typically have only *Cercocarpus ledifolius* in the overstory canopy, but *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus edulis*, or *Pinus monophylla* occur in local areas. The understory is characterized by an open to moderate herbaceous layer typically dominated by bunchgrasses. Characteristic species include *Achnatherum* spp., *Calamagrostis rubescens*, *Elymus elymoides*, *Festuca idahoensis*, *Leymus ambiguus*, *Leymus salinus*, and *Pseudoroegneria spicata*. Diverse forbs may be present, usually with low cover. Scattered short shrubs may be present, but they do not form a layer (<10% cover) and have less total cover than the herbaceous layer. Plant associations in this alliance occur in semi-arid steppe and cool temperate mountainous habitats of the interior western United States. These woodlands often form small patchy stands in forested areas or may form the only tree cover in steppe regions. Elevation ranges from 1730-2745 m (5675-9000 feet). Lower elevation stands in steppe regions have rolling topography, whereas mountain stands occur on moderate to very steep slopes and ridges. Aspect is variable depending on elevation. Annual precipitation is variable in amount (18-56 cm) and season depending on location with mostly snow in mountains and spring convective showers in steppe region. Soils are moderately shallow, rocky, well-drained gravelly loams over cracked bedrock or colluvium.

Classification Comments: The *Cercocarpus ledifolius* woodland and shrubland alliances are poorly distinguished in the literature, as most authors describe the species as having either a tall-shrub or small-tree growth form within a single association. Some associations may have shrub-dominated stands in one area and also have a woodland physiognomy in another. The woodland physiognomy appears to be more typical, based on available literature. Near the northern edge of its range in Montana and Idaho, *Cercocarpus ledifolius* is described as occurring primarily in the shrub-form (Mueggler and Stewart 1980, Tisdale 1986). These northern variants are the only described stands which appear to be clearly distinct from the woodland alliance.

The woodland stands may have a different subspecies (or variety) as a dominant than the shrubland. In Wyoming, the heritage program is proposing to recognize two *Cercocarpus ledifolius* alliances, based upon varieties of *Cercocarpus ledifolius*. The most widespread proposed alliance there is dominated by *Cercocarpus ledifolius* var. *ledifolius*, which grows up to about 1.5 m tall. The other proposed alliance, dominated by *Cercocarpus ledifolius* var. *intercedens*, is found only along the western border of the state, and the growth form is as small trees 4-5 m tall. The two taxa are obviously different in Wyoming, in stature and leaf characteristics, and are easily separated. Further review of the two current *Cercocarpus ledifolius* alliances may warrant treatment as proposed for Wyoming.

Internal Comments:

Other Comments:

Similar NVC Types: This alliance has similarities to several montane conifer woodland alliances that have *Cercocarpus ledifolius* codominant in the subcanopy in several other groups, such as G209, G213, G215, G224, G226, G243, and G344.

- A0828 *Cercocarpus ledifolius* Scrub Alliance: is similar except overstory is composed of shrub-form rather than tree-form *Cercocarpus ledifolius*.
- A0586 *Cercocarpus ledifolius* / Shrub Understory Woodland Alliance: is similar but understory has a shrub layer (>10% cover) or, if less, shrub cover exceeds herbaceous cover.

Diagnostic Characteristics: The vegetation in this woodland alliance is characterized by an open tree canopy dominated by *Cercocarpus ledifolius*, sometimes with low cover of *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus edulis*, or *Pinus monophylla*. The understory is characterized by an open to dense herbaceous layer. Diagnostic species include *Achnatherum* spp., *Calamagrostis rubescens*, *Elymus elymoides*, *Festuca idahoensis*, *Leymus ambiguus*, *Leymus salinus*, and *Pseudoroegneria spicata*. If shrubs are present, then cover is low (<10%) and the herbaceous layer significantly exceeds shrub cover forming a layer.

VEGETATION

Physiognomy and Structure: Plant associations in this alliance are woodlands dominated by a spreading broad-leaved evergreen small tree (5-15 m tall) of open cover (10-30%). Scattered evergreen or cold-deciduous shrubs may be present with low cover (<10%). A ground layer of cespitose or rhizomatous perennial graminoids is present and characterizes the understory.

Floristics: The vegetation in this alliance is characterized by an open canopy of *Cercocarpus ledifolius*. Steppe woodlands typically have only *Cercocarpus ledifolius* in the overstory canopy, but *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus edulis*, or *Pinus monophylla* occur in local areas. The understory is characterized by an open to moderate herbaceous layer typically dominated by bunchgrasses. Characteristic species include *Achnatherum* spp., *Calamagrostis rubescens*, *Elymus elymoides*, *Festuca idahoensis*, *Leymus ambiguus*, *Leymus salinus*, and *Pseudoroegneria spicata*. Diverse forbs may be present, usually with low cover, and include such perennials as *Geum triflorum*, *Hieracium cynoglossoides*, *Senecio integerrimus*, and *Viola nuttallii*; the annual *Agoseris heterophylla* is often present. Other abundant and constant species include *Achnatherum lemmonii*, *Hesperostipa comata*, *Poa fendleriana*, and *Poa secunda*, and the perennial sedge *Carex rossii*. Scattered short shrubs may be present, including *Amelanchier alnifolia*, *Artemisia tridentata* ssp. *vaseyana*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Holodiscus dumosus*, *Purshia tridentata*, *Prunus virginiana*, *Ribes* spp., and *Symphoricarpos* spp., but they do not form a layer (<10% cover) and have less total cover than the herbaceous layer.

ENVIRONMENT & DYNAMICS

Environmental Description: Plant associations in this woodland alliance occur in semi-arid steppe and foothills, and cool temperate mountainous habitats of the interior western United States. These woodlands often form small patchy stands in forested areas or may form the only tree cover in steppe regions. Elevations range from 1730 m to over 2745 m (5675-9000 feet). Climate ranges from semi-arid at lower elevations in southern Idaho to cool temperate in mountains of Montana. Precipitation is variable in amount and season depending on locations, with annual precipitation ranging from 18-56 cm with much of the precipitation falling during the winter months as snow in mountains or as convective showers in May and June in steppe and foothills. Lower elevation sites in steppe regions have rolling topography with low relief. Stands found in foothills and mountains occur on moderate to very steep slopes and ridges. Aspect is variable depending on elevation, with cooler east to north slopes more typical of lower elevation sites. Soils are moderately shallow (30-48 cm deep), rocky, well-drained gravelly loams over cracked bedrock or colluvium. Stones make up 30-60% of the soil volume. *Cercocarpus* roots extend into cracks within the bedrock. Parent materials include andesite, granite, rhyolite, tuffs and metamorphic (schist).

Dynamics: *Cercocarpus ledifolius* is a slow-growing, drought-tolerant species that can inhabit very poor sites, such as cliffs and outcrops. Stands are often small and clumped near ridgetops. These sites may also afford the species some protection from fire. The species is highly susceptible to fire damage and generally does not resprout. *Cercocarpus ledifolius* is highly favored by native ungulates for winter range, and many individual shrubs show evidence of highlining by deer or elk.

DISTRIBUTION

Geographic Range: This alliance occurs in the Great Basin extending west into the foothills of the Sierra Nevada and north into the Columbia Plateau, from northeastern California north across Nevada, into southeastern Oregon, southern Idaho, western Utah and western Montana.

Nations: US

States/Provinces: CA, ID, MT, NV, OR, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Cercocarpus ledifolius* (Curl leaf mountain mahogany scrub) Alliance (Sawyer et al. 2009) [76.200.00]

LOWER LEVEL UNITS

Associations:

- CEG000961 *Cercocarpus ledifolius* / *Calamagrostis rubescens* Woodland
- CEG000962 *Cercocarpus ledifolius* / *Festuca idahoensis* Woodland
- CEG000964 *Cercocarpus ledifolius* / *Leymus salinus* ssp. *salmonis* Woodland
- CEG000968 *Cercocarpus ledifolius* / *Pseudoroegneria spicata* - *Festuca idahoensis* Woodland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M.S. Reid and D. Sarr.

Version Date: 2014/03/14

REFERENCES

References: Beatley 1976, Blackburn et al. 1969d, Cooper et al. 1995, DeVelice 1992, Dealy 1975, Faber-Langendoen et al. 2017b, Gruell et al. 1985, Hall 1973, Heinze et al. 1962, Moseley 1987b, Mozingo 1987, Mueggler and Stewart 1980, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Tisdale 1986

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

G249. Intermountain Basins Curl-leaf Mountain-mahogany Woodland & Scrub

A0586. Cercocarpus ledifolius / Shrub Understory Woodland Alliance

Type Concept Sentence: This woodland is characterized by an open to moderately dense tree canopy of *Cercocarpus ledifolius* with the understory characterized by an open to moderate shrub layer (>10% cover) or, if less, then shrub cover exceeds herbaceous cover. It occurs in semi-arid steppe and temperate mountainous habitats of the interior western United States.

OVERVIEW

Scientific Name: *Cercocarpus ledifolius* / Shrub Understory Woodland Alliance

Common Name (Translated Scientific Name): Curl-leaf Mountain-mahogany / Shrub Understory Woodland Alliance

Colloquial Name: Curl-leaf Mountain-mahogany / Shrub Woodland

Type Concept: The vegetation in this alliance is characterized by an open to moderately dense canopy of *Cercocarpus ledifolius*. These woodlands may occur as scattered communities in arid steppe or on rocky outcrops or steep escarpments within forests. Steppe woodlands typically have only *Cercocarpus ledifolius* in the overstory canopy, but *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus edulis*, or *Pinus monophylla* occur locally. The understory is characterized by an open to dense short-shrub layer. Shrub cover is over 10% or, if less, exceeds herbaceous cover. Characteristic shrub species include *Amelanchier alnifolia*, *Arctostaphylos patula*, *Artemisia tridentata*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Holodiscus dumosus*, *Prunus virginiana*, *Purshia tridentata*, *Quercus gambelii*, *Ribes* spp., *Symphoricarpos oreophilus*, and *Symphoricarpos rotundifolius*. Stands with sparse understories are included in this alliance because these stands usually have similar scattered shrubs present. A sparse to moderately dense herbaceous layer may be present and is typically dominated by bunchgrasses, including *Achnatherum* spp., *Calamagrostis rubescens*, *Elymus elymoides*, *Festuca idahoensis*, *Leymus ambiguus*, and *Pseudoroegneria spicata*. Diverse forbs may be present but usually with low cover. Plant associations in this alliance occur in semi-arid steppe and cool temperate mountainous habitats of the interior western United States. These woodlands often form small patchy stands on rocky outcrops or escarpments in forested areas, or may form the only tree cover in steppe regions. Elevations range from 1600 to 2835 m (5250-9300 feet). Annual precipitation averages 25-45 cm, with a significant proportion falling as winter snow. Soils are typically rocky and immature, and of coarser texture than soils of adjacent coniferous woodlands or forests.

Classification Comments: The *Cercocarpus ledifolius* woodland and shrubland alliances are poorly distinguished in the literature, as most authors describe the species as having either a tall-shrub or small-tree growth form within a single association. Some associations may have shrub-dominated stands in one area and also have a woodland physiognomy in another. The woodland physiognomy appears to be more typical, based on available literature. Near the northern edge of its range in Montana and Idaho, *Cercocarpus ledifolius* is described as occurring primarily in the shrub-form (Mueggler and Stewart 1980, Tisdale 1986). These northern variants are the only described stands which appear to be clearly distinct from the woodland alliance.

The woodland stands may have a different subspecies (or variety) as a dominant than the shrubland. In Wyoming, the heritage program is proposing to recognize two *Cercocarpus ledifolius* alliances, based upon varieties of *Cercocarpus ledifolius*. The most widespread proposed alliance there is dominated by *Cercocarpus ledifolius* var. *ledifolius*, which grows up to about 1.5 m tall. The other proposed alliance, dominated by *Cercocarpus ledifolius* var. *intercedens*, is found only along the western border of the state, and the growth form is as small trees 4-5 m tall. The two taxa are obviously different in Wyoming, in stature and leaf characteristics, and are easily separated. Further review of the two current *Cercocarpus ledifolius* alliances may warrant treatment as proposed for Wyoming.

Internal Comments:

Other Comments:

Similar NVC Types: This alliance has similarities to several montane conifer woodland alliances have *Cercocarpus ledifolius* codominant in subcanopy in several other groups, such as G209, G213, G215, G224, G226, G243, and G344.

- A0828 *Cercocarpus ledifolius* Scrub Alliance: is similar except overstory is composed of shrub-form rather than tree-form *Cercocarpus ledifolius*.
- A3570 *Cercocarpus ledifolius* / Herbaceous Understory Woodland Alliance: is similar but understory lacks a shrub layer and is dominated by an herbaceous layer (>10% cover) or, if less, grass cover exceeds shrub cover.

Diagnostic Characteristics: The vegetation in this woodland alliance is characterized by a tree canopy dominated by *Cercocarpus ledifolius*, sometimes with low cover of *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus edulis*, or *Pinus monophylla*. The understory is characterized by an open to dense shrub layer dominated by species such as *Amelanchier alnifolia*, *Arctostaphylos patula*, *Artemisia tridentata*, *Ericameria nauseosa*, *Holodiscus dumosus*, *Quercus gambelii*, *Prunus virginiana*, *Purshia tridentata*, *Ribes* spp., *Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*. An herbaceous layer may be present and is typically dominated by bunchgrasses sometimes with low cover of diverse forbs. If shrub cover is low (<10%), then it exceeds herbaceous cover.

VEGETATION

Physiognomy and Structure: Plant associations in this alliance are woodlands dominated by a spreading broad-leaved evergreen small tree (5-15 m tall) with open to moderate cover (10-60%). Smaller evergreen or cold-deciduous shrubs may be present and are typically of low to medium cover. A ground layer of cespitose or rhizomatous graminoids is usually present, but cover is highly variable.

Floristics: The vegetation in this alliance is characterized by an open to moderately dense canopy of *Cercocarpus ledifolius*. Steppe woodlands typically have only *Cercocarpus ledifolius* in the overstory canopy, but *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus edulis*, or *Pinus monophylla* occur locally. Montane stands may have scattered emergent conifer trees present, including *Pinus jeffreyi*, *Pinus ponderosa*, and *Pseudotsuga menziesii*. The understory is characterized by an open to dense short-shrub layer. Shrub cover is over 10% or, if less, exceeds herbaceous cover. Characteristic shrub species include *Amelanchier alnifolia*, *Arctostaphylos patula*, *Artemisia tridentata*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Holodiscus dumosus*, *Prunus virginiana*, *Purshia tridentata*, *Quercus gambelii*, *Ribes* spp., *Symphoricarpos oreophilus*, *Symphoricarpos rotundifolius*, and *Tetradymia canescens*. Stands with sparse understories are included in this alliance because these stands usually have similar scattered shrubs present. A sparse to moderately dense herbaceous layer may be present and is typically dominated by bunchgrasses, including *Achnatherum* spp., *Calamagrostis rubescens*, *Elymus elymoides*, *Festuca idahoensis*, *Leymus ambiguus*, and *Pseudoroegneria spicata*. Diverse forbs may be present but usually with low cover. Common forbs include *Arenaria* spp., *Balsamorhiza sagittata*, *Chaetopappa ericoides*, *Comandra umbellata*, *Hackelia patens*, *Lappula occidentalis*, *Packera multilobata* (= *Senecio multilobatus*), and *Senecio integerrimus*.

ENVIRONMENT & DYNAMICS

Environmental Description: Plant associations in this woodland alliance occur in semi-arid steppe and foothills, and cool temperate mountainous habitats of the interior western United States. These woodlands often form small patchy stands in arid steppe or on rocky outcrops or steep escarpments in forested areas or may form the only tree cover in steppe regions. Elevations range from 1600 to 2835 m (5250-9300 feet). Climate ranges from semi-arid at lower elevations in the Colorado Plateau, Columbia Plateau, and Owyhee Uplands to cool temperate in foothills and mountains of the western Sierra Nevada, northern Great Basin, and western slope of the Rocky Mountains. Precipitation is variable in amount and season depending on locations, with annual precipitation ranging from 25-45 cm with much of the precipitation falling during the winter months as snow in mountains or as convective showers in May and June in steppe and foothills. Lower elevation sites in steppe regions have rolling topography with low relief. Stands found in foothills and mountains occur on moderate to very steep slopes and ridges. Aspect is variable depending on elevation with cooler east to north slopes more typical of lower elevation sites. Soils are mostly shallow, rocky, well-drained sandy or gravelly loams derived from colluvium, bedrock, or less frequently alluvium. Parent materials are variable and include andesite, basalt, granite, rhyolite, tuff and metamorphic (schist) rocks, and sandstones. Stones make up 30-60% of the soil volume. *Cercocarpus* roots extend into cracks within the bedrock.

Dynamics: *Cercocarpus ledifolius* is a slow-growing, drought-tolerant species that can inhabit very poor sites, such as cliffs and outcrops. Stands are often small and clumped near ridgetops. These sites may also afford the species some protection from fire. The species is highly susceptible to fire damage and generally does not resprout. *Cercocarpus ledifolius* is highly favored by native ungulates for winter range, and many individual shrubs show evidence of highlining by deer or elk.

DISTRIBUTION

Geographic Range: This alliance occurs in the Great Basin extending west into the foothills of the Sierra Nevada and north into the Columbia Plateau, from northeastern California north across Nevada, into southeastern Oregon, southern Idaho, western Utah and southwestern Montana.

Nations: US

States/Provinces: CA, CO?, ID, MT, NV, OR, UT, WY?

TNC Ecoregions [optional]: 4:C, 6:C, 8:C, 9:C, 11:C, 12:C, 17:C, 18:C, 19:C

USFS Ecoregions (2007): 341Fb:CCC, 341Ff:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Bryce Canyon, Capitol Reef, Cedar Breaks, Death Valley, Dinosaur, Grand Canyon, Great Basin, John Day Fossil Beds, Yosemite)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Cercocarpus ledifolius* (Curl leaf mountain mahogany scrub) Alliance (Sawyer et al. 2009) [76.200.00]
- = *Cercocarpus ledifolius* Shrubland Alliance (Evens et al. 2014)

LOWER LEVEL UNITS

Associations:

- CEG000960 *Cercocarpus ledifolius* / *Artemisia tridentata* Woodland
- CEG001022 *Cercocarpus ledifolius* / *Artemisia tridentata* ssp. *vaseyana* Woodland
- CEG000963 *Cercocarpus ledifolius* / *Holodiscus dumosus* Woodland
- CEG005359 *Cercocarpus ledifolius* / *Quercus gambelii* Woodland
- CEG008637 *Cercocarpus ledifolius* / *Symphoricarpos rotundifolius* Woodland
- CEG005355 *Cercocarpus ledifolius* / *Arctostaphylos patula* Woodland
- CEG000970 *Cercocarpus ledifolius* / *Symphoricarpos oreophilus* Woodland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M.S. Reid and D. Sarr.

Version Date: 2014/03/14

REFERENCES

References: Blackburn et al. 1969d, Cooper et al. 1995, DeVelice 1992, Dealy 1975, Evens et al. 2014, Faber-Langendoen et al. 2017b, Gruell et al. 1985, Hall 1973, Keeler-Wolf and Thomas 2000, Moseley 1987b, Mozingo 1987, Mueggler and Stewart 1980, Reid et al. 1999, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Tisdale 1986, VegCAMP and AIS 2013

1. Forest & Woodland

1.B.2.Nc. Western North American Pinyon - Juniper Woodland & Scrub

G249. Intermountain Basins Curl-leaf Mountain-mahogany Woodland & Scrub

A0828. *Cercocarpus ledifolius* Scrub Alliance

Type Concept Sentence: This shrubland is characterized by an open to moderately dense shrub layer dominated or codominated by *Cercocarpus ledifolius* with a sparse to moderately dense herbaceous layer. It occurs in semi-arid, mountainous habitats of the interior western United States.

OVERVIEW

Scientific Name: *Cercocarpus ledifolius* Scrub Alliance

Common Name (Translated Scientific Name): Curl-leaf Mountain-mahogany Scrub Alliance

Colloquial Name: Curl-leaf Mountain-mahogany Scrub

Type Concept: The vegetation in this alliance is characterized by an open shrub canopy of *Cercocarpus ledifolius*. The vegetation may occur as scattered small- and large-patch communities in arid steppe or on rocky outcrops or steep escarpments within forests. Other shrubs often occur in the stands and include *Amelanchier alnifolia*, *Artemisia arbuscula*, *Artemisia frigida*, *Artemisia nova*, *Artemisia tridentata*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Mahonia repens*, *Prunus virginiana*, *Ribes* spp., and *Symphoricarpos* spp. The herbaceous layer is usually composed of xeric graminoids, including *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Achnatherum occidentale* (= *Stipa occidentalis*), *Calamagrostis rubescens*, *Elymus glaucus*, *Festuca idahoensis*, *Hesperostipa comata*, *Koeleria macrantha*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Diverse forbs may be present, usually with low cover. Outcrop communities usually include many of the species above, but may also include occasional forest trees, such as *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus flexilis*, *Pinus jeffreyi*, *Pinus ponderosa*, or *Pseudotsuga menziesii*. The plant associations in this alliance occur in semi-arid, mountainous habitats of the interior western United States. These shrublands are often located on rocky outcrops or escarpments in forested areas. Most stands occur on steep rimrock slopes, usually in areas of shallow soils or protected slopes. Soils are typically rocky and immature, and are always rockier than found in surrounding sites. In Wyoming, stands of this alliance primarily grow on carbonate sediments (limestone or dolomite) or on sandstones rich in calcium carbonate. Other rock types include quartz, gneiss, and basalt.

Classification Comments: The *Cercocarpus ledifolius* woodland and shrubland alliances are poorly distinguished in the literature, as most authors describe the species as having either a tall-shrub or small-tree growth form within a single association. Some associations may have shrub-dominated stands in one area and also have a woodland physiognomy in another. The woodland physiognomy appears to be more typical, based on available literature. Near the northern edge of its range in Montana and Idaho, *Cercocarpus ledifolius* is described as occurring primarily in the shrub-form (Mueggler and Stewart 1980, Tisdale 1986). These northern variants are the only described stands which appear to be clearly distinct from the woodland alliance. The woodland alliance may have a different subspecies (or variety) as a dominant than the shrubland. In Wyoming, the heritage program is proposing to recognize two *Cercocarpus ledifolius* alliances, based upon varieties of *Cercocarpus ledifolius*. The most widespread proposed alliance there is dominated by *Cercocarpus ledifolius* var. *ledifolius*, which grows up to ca. 1.5 m tall. The other proposed alliance, dominated by *Cercocarpus ledifolius* var. *intercedens*, is found only along the western border of the state, and the growth form is small trees 4-5 m tall. The two taxa are obviously different in Wyoming, in stature and leaf characteristics, and are easily separated. Further review of the two current *Cercocarpus ledifolius* alliances may warrant treatment as proposed for Wyoming.

Internal Comments:

Other Comments:

Similar NVC Types: This alliance has similarities to several montane conifer woodland alliances have *Cercocarpus ledifolius* codominant in subcanopy in several other groups, such as G209, G213, G215, G224, G226, G243, and G344.

- A0586 *Cercocarpus ledifolius* / Shrub Understory Woodland Alliance: is similar except overstory is composed of tree-form rather than shrub-form *Cercocarpus ledifolius* and has a short-shrub layer.
- A3570 *Cercocarpus ledifolius* / Herbaceous Understory Woodland Alliance: is similar except overstory is composed of tree-form rather than shrub-form *Cercocarpus ledifolius* and has an herbaceous layer.

Diagnostic Characteristics: This alliance is composed of shrub-form *Cercocarpus ledifolius* dominating or codominating the shrub layer with other shrubs and dwarf-shrubs such as *Amelanchier alnifolia*, *Artemisia arbuscula*, *Artemisia frigida*, *Artemisia nova*, *Artemisia tridentata*, *Ericameria nauseosa*, *Mahonia repens*, *Prunus virginiana*, *Ribes* spp., and *Symphoricarpos* spp. An open to moderately dense herbaceous layer is usually present and composed of xeric graminoids, including *Achnatherum hymenoides*, *Achnatherum occidentale*, *Calamagrostis rubescens*, *Elymus glaucus*, *Festuca idahoensis*, *Hesperostipa comata*, *Koeleria macrantha*, *Poa secunda*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: The vegetation in this alliance is dominated by a spreading broad-leaved evergreen shrub layer of open to moderate cover. If present, the herbaceous layer is composed of open to moderate cover of perennial bunch grasses.

Floristics: The vegetation in this alliance is characterized by an open shrub canopy of *Cercocarpus ledifolius*. The vegetation may occur as scattered small- and large-patch communities in arid steppe or on rocky outcrops or steep escarpments within forests. Other shrubs often occur in the stands and include *Amelanchier alnifolia*, *Artemisia arbuscula*, *Artemisia frigida*, *Artemisia nova*, *Artemisia tridentata*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Mahonia repens*, *Prunus virginiana*, *Ribes* spp., and *Symphoricarpos* spp. The herbaceous layer is usually composed of xeric graminoids, including *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Achnatherum occidentale* (= *Stipa occidentalis*), *Calamagrostis rubescens*, *Elymus glaucus*, *Festuca idahoensis*, *Hesperostipa comata*, *Koeleria macrantha*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Diverse forbs may be present, usually with low cover. Outcrop communities usually include many of the species above, but may also include occasional forest trees, such as *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus flexilis*, *Pinus jeffreyi*, *Pinus ponderosa*, or *Pseudotsuga menziesii*. These shrublands are often located on rocky outcrops or escarpments in forested areas.

ENVIRONMENT & DYNAMICS

Environmental Description: The plant associations in this alliance occur in semi-arid, mountainous habitats of the interior west. Annual precipitation averages 25-45 cm, with a significant proportion falling as winter snow. These shrublands are often located on rocky outcrops or escarpments in forested areas. Most stands occur on steep rimrock slopes, usually in areas of shallow soils or protected slopes. In Wyoming, stands of this alliance primarily grow on carbonate sediments (limestone or dolomite) or on sandstones rich in calcium carbonate. Other rock types include quartz, gneiss, and basalt. Soils are typically rocky and immature, and are always rockier than found in surrounding sites. Adjacent vegetation is usually *Pinus ponderosa* or *Pseudotsuga menziesii* forests or woodlands, pinyon and/or juniper woodlands, or *Artemisia* shrubland.

Dynamics: *Cercocarpus ledifolius* is a slow-growing, drought-tolerant species which can inhabit very poor sites, such as cliffs, stony slopes, and outcrops. Stands are often small and clumped near ridgetops. These sites may also afford the species some protection from fire. The species is highly susceptible to fire damage and generally does not resprout. *Cercocarpus ledifolius* is highly favored by native ungulates for winter range and many individual shrubs show evidence of highlining by deer and elk.

DISTRIBUTION

Geographic Range: This alliance occurs in mountain ranges throughout the Great Basin and into the northern Mojave Desert, from eastern California and Oregon to Colorado and north to Wyoming and western Montana.

Nations: US

States/Provinces: CA, CO, MT, NM, NV, OR, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Cercocarpus ledifolius* (Curl leaf mountain mahogany scrub) Alliance (Sawyer et al. 2009) [76.200.00]
- = *Cercocarpus ledifolius* Shrubland Alliance (Bourgeron and Engelking 1994)
- >< Curlleaf Mountain-Mahogany Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS**Associations:**

- CEG000967 *Cercocarpus ledifolius* / *Pseudoroegneria spicata* Scrub
- CEG005589 *Cercocarpus ledifolius* - *Purshia tridentata* / *Poa secunda* Scrub
- CEG000965 *Cercocarpus ledifolius* / *Mahonia repens* Scrub
- CEG001487 *Artemisia arbuscula* - *Cercocarpus ledifolius* / *Pseudoroegneria spicata* - *Poa secunda* Scrub
- CEG000969 *Cercocarpus ledifolius* / *Symphoricarpos longiflorus* Scrub
- CEG000966 *Cercocarpus ledifolius* / *Prunus virginiana* Scrub

AUTHORSHIP

Primary Concept Source: P.S. Bourgeron and L.D. Engelking (1994)

Author of Description: K.A. Schulz and D. Sarr

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Baker 1983c, Baker and Kennedy 1985, Bourgeron and Engelking 1994, Cooper et al. 1995, Dealy 1975, Faber-Langendoen et al. 2017b, Heinze et al. 1962, Johnson and Simon 1985, Knight et al. 1987, Lewis 1975a, Miller 1964, Mueggler and Stewart 1980, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Schlatterer 1972, Tisdale 1986

1.B.2.Nd. Vancouverian Forest & Woodland

This division includes forests and woodlands of the lowland, montane and subalpine zones of cool maritime temperate climates of western North America characterized by the conifers *Abies amabilis*, *Abies grandis*, *Abies lowiana*, *Abies magnifica*, *Abies procera*, *Calocedrus decurrens*, *Callitropsis nootkatensis*, *Callitropsis lawsoniana*, *Picea sitchensis*, *Pinus contorta* var. *contorta*, *Pinus jeffreyi*, *Pinus lambertiana*, *Pinus ponderosa* var. *benthamiana*, *Pseudotsuga menziesii* var. *menziesii*, *Sequoia sempervirens*, *Sequoiadendron giganteum*, *Thuja plicata*, *Tsuga heterophylla*, and *Tsuga mertensiana*, the broadleaf evergreen trees *Arbutus menziesii*, *Notholithocarpus densiflorus*, and *Quercus chrysolepis*, and the broadleaf deciduous species *Acer macrophyllum*, *Alnus rubra*, and *Quercus kelloggii*.

M886. Southern Vancouverian Dry Foothill Forest & Woodland

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

1.B.2.Nd.1.a. M886 Southern Vancouverian Dry Foothill Forest & Woodland

G800. Southern Vancouverian Dry Douglas-fir - Madrone Woodland

Type Concept Sentence: This group consists of dry, mixed broadleaf-conifer forests dominated by *Arbutus menziesii* and *Pseudotsuga menziesii* with an understory that is usually species-rich and well-developed. It is found in lowland areas of the Puget Sound, including the San Juan Islands in Washington and the Gulf Islands in British Columbia, and as far south as the Klamath Mountains in northern California.

OVERVIEW

Scientific Name: Southern Vancouverian Dry Douglas-fir - Madrone Woodland Group

Common Name (Translated Scientific Name): Southern Vancouverian Dry Douglas-fir - Madrone Woodland Group

Colloquial Name: Douglas-fir - Grand Fir - Pacific Madrone Forest & Woodland

Type Concept: This dry, mixed broadleaf-conifer forest group is dominated by the evergreen broadleaf *Arbutus menziesii* and the evergreen conifer *Pseudotsuga menziesii*. Some stands may have only *Pseudotsuga menziesii*. The short-lived conifer *Pinus contorta*, the broad-leaved deciduous *Acer macrophyllum*, and the shade-tolerant conifer *Abies grandis* can be locally dominant or codominant species. *Calocedrus decurrens* is absent. The broad-leaved deciduous tree *Quercus garryana* may also be present in the upper tree stratum or as a subcanopy. The forest understory is usually species-rich and well-developed. This group is found in lowland areas of the Puget Sound, including the San Juan Islands in Washington and the Gulf Islands in British Columbia, and as far south as the Klamath Mountains. It occurs along low-elevation (0-1000 m) mountain slopes and valley margins, usually on southern exposures with ample sun and seasonal drought. Sites usually have bedrock or sandy soils which drain quickly.

Classification Comments:

Similar NVC Types:

- G344 Californian Montane Conifer Forest & Woodland

Diagnostic Characteristics: Dry stands dominated by *Arbutus menziesii* and *Pseudotsuga menziesii*.

VEGETATION

Physiognomy and Structure: Tall woodlands and forests up to 18 m in height.

Floristics: Stands are dominated by *Arbutus menziesii* and *Pseudotsuga menziesii*. *Pinus contorta*, *Acer macrophyllum*, and *Abies grandis* can be locally dominant or codominant species. *Calocedrus decurrens* is absent. Other conifers, such as *Taxus brevifolia* and *Juniperus scopulorum*, may be present in the tree layer, depending upon location and stand history. The broad-leaved deciduous tree *Quercus garryana* may also be present in the upper tree stratum or as a subcanopy. The forest understory is usually species-rich and well-developed. Common shrub species include *Corylus cornuta* var. *californica*, *Gaultheria shallon*, *Holodiscus discolor*, *Lonicera hispidula*, *Symphoricarpos albus*, and *Vaccinium ovatum*. The herbaceous layer is usually well-developed and dominated by xerophytic grasses and forbs. *Festuca occidentalis*, *Elymus glaucus*, and *Bromus vulgaris* are typical grass species. *Vicia americana*, *Lathyrus nevadensis*, and *Sanicula crassicaulis* are common forbs. Ferns include *Polystichum munitum* and *Pteridium aquilinum*.

ENVIRONMENT & DYNAMICS

Environmental Description: This group occurs along low-elevation (0-1000 m) mountain slopes and valley margins, usually on southern exposures with ample sun and seasonal drought, often adjacent to saltwater shorelines. Primarily, this group occurs in areas with a pronounced rainshadow effect from the Olympics and other coastal ranges. Sites usually have bedrock or sandy soils which drain quickly.

Dynamics: *Arbutus menziesii* stump sprouts following fire, and these communities were probably subject to a moderate-severity fire regime in presettlement times. These sites are too dry and warm or have been too frequently and extensively burned for more than small amounts of *Tsuga heterophylla* or *Thuja plicata* to be present as regeneration. On sites where it occurs, *Arbutus menziesii* dominance is favored by high-severity fires; *Pseudotsuga menziesii* can be locally eliminated by logging and hot fire or repeated high-severity fires.

DISTRIBUTION

Geographic Range: This group is found in lowland areas of the Puget Sound, including the San Juan Islands in Washington and the Gulf Islands in British Columbia, and as far south as the Klamath Mountains of northern California. It is less common around the margins of the Willamette Valley, Oregon, and on the lower foothills of the Cascades in Washington and Oregon.

Spatial Scale & Pattern [optional]:

Nations: CA, US

States/Provinces: BC, CA, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL**USNVC Confidence Level with Comments:** Moderate.**SYNONYMY****LOWER LEVEL UNITS****Alliances:**

- A3716 *Pseudotsuga menziesii* - *Abies grandis* - *Arbutus menziesii* Forest & Woodland Alliance

AUTHORSHIP**Primary Concept Source:** C. Chappell, in Faber-Langendoen et al. (2015)**Author of Description:** G. Kittel and C. Chappell**Acknowledgments:****Version Date:** 05/14/2015**Classif Resp Region:** West**Internal Author:** MSR 11-14; GK 5-15, 12-15**REFERENCES****References:** Faber-Langendoen et al. 2017a

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G800. Southern Vancouverian Dry Douglas-fir - Madrone Woodland

G206. Cascadian Oregon White Oak - Conifer Forest & Woodland

Type Concept Sentence: This narrowly restricted group appears at or near lower treeline in foothills of the eastern Cascades in Washington and Oregon, within 65 km (40 miles) of the Columbia River Gorge and in the adjacent Columbia Plateau ecoregion and is characterized by a mix of *Quercus garryana* and *Pinus ponderosa* or *Pseudotsuga menziesii*.

OVERVIEW**Scientific Name:** *Quercus garryana* - *Pinus ponderosa* - *Pseudotsuga menziesii* Forest & Woodland Group**Common Name (Translated Scientific Name):** Oregon White Oak - Ponderosa Pine - Douglas-fir Forest & Woodland Group**Colloquial Name:** East Cascadian Oregon White Oak - Pine Woodland

Type Concept: This narrowly restricted group appears at or near lower treeline in foothills of the eastern Cascades in Washington and Oregon, within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion. Most occurrences of this group are dominated by a mix of *Quercus garryana* and *Pinus ponderosa* or *Pseudotsuga menziesii*. Isolated, taller *Pinus ponderosa* or *Pseudotsuga menziesii* over *Quercus garryana* trees characterize parts of this group. Clonal *Quercus garryana* can create dense patches across a grassy landscape or can dominate open woodlands or even savannas. The understory may include dense stands of shrubs or, more often, be dominated by grasses, sedges or forbs. Shrub-steppe shrubs may be prominent in some stands and create a distinct tree / shrub / sparse grassland habitat, including *Artemisia nova* (in Oregon only), *Artemisia tridentata*, *Chrysothamnus viscidiflorus*, and *Purshia tridentata*. Mesic sites have an open to closed sodgrass understory dominated by *Calamagrostis rubescens*, *Carex geyeri*, *Carex inops*, *Carex rossii*, or *Elymus glaucus*. Drier savanna and woodland understories typically contain bunchgrass steppe species such as *Festuca idahoensis* or *Pseudoroegneria spicata*. Common exotic grasses that often appear in high abundance are *Bromus tectorum* and *Poa bulbosa*. Disjunct occurrences in the Klamath Mountains and southernmost Cascades typically have high cover of sagebrush and bitterbrush in the understory, along with other shrubs. In the Columbia River Gorge, this group appears as small to large patches in transitional areas in the Little White Salmon and White Salmon river drainages in Washington and Hood River, Rock Creek, Moiser Creek, Mill Creek, Threemile Creek, Fifteen Mile Creek, and White River drainages in Oregon. *Quercus garryana* can create dense patches often associated with grassland or shrubland balds within a closed *Pseudotsuga menziesii* forest landscape. Commonly the understory is shrubby and composed of *Ceanothus integerrimus*, *Holodiscus discolor*, *Symphoricarpos albus*, and *Toxicodendron diversilobum*. These woodlands occur at the lower treeline/ecotone between *Artemisia* spp. or *Purshia tridentata* steppe or shrubland and *Pinus ponderosa* and/or *Pseudotsuga menziesii* forest or woodland. Elevations range from 460 to 1920 m. Sites are typically warm with southern exposures with seasonal soil drought or desiccating winds. Substrates usually have bedrock, sand, or pumice soils which are excessively well-drained. Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii* in the gorge and other oak patches on xeric sites in the east Cascade foothills. In the past, most of the habitat experienced frequent low-severity fires that maintained woodland or savanna conditions. The mean fire-return interval is 20 years, although variable. Soil drought plays a role, maintaining an open tree canopy in part of this dry woodland habitat.

Westside: This group also occurs on the west side of the mountain ranges from the Cascades to the North Coast Ranges in California. It is limited to the southern portions of the North Pacific region where it occurs in southwestern British Columbia, in the

Puget Trough and Willamette Valley south into the Klamath Mountains and into northern California, southward through the lower southern Cascades and western Modoc Plateau and the middle and inner North Coast Ranges into Mendocino County. The vegetation ranges from savanna and woodland to forest dominated by deciduous broadleaf trees, mostly *Quercus garryana*. Codominance by the evergreen conifer *Pseudotsuga menziesii* is common, and *Pinus ponderosa* is important in some stands. In the south, common associates also include *Quercus kelloggii* and *Arbutus menziesii*. The predominant oaks with the higher frequency fires include *Quercus kelloggii* and *Quercus garryana*, with *Quercus garryana* var. *garryana* codominant in the central and northern Coast Ranges, Klamath Mountains and Modoc Plateau. However, *Quercus garryana* var. *fruticosa* (= var. *breweri*) often codominates in the northwestern Coast Ranges. More isolated patches of shrubby, clonal *Quercus garryana* var. *semota* (similar to but apparently distinct from var. *fruticosa*) occur farther south into the Sierra Nevada southward to the Paiute and Tehachapi mountains (southern branches of the Sierra Nevada), but these are without *Pinus ponderosa* or *Pseudotsuga menziesii* and appear to behave more as montane chaparral stands. The perennial bunchgrass component includes *Danthonia californica* (close to the coast), *Elymus glaucus*, *Festuca californica*, and *Festuca idahoensis*. A variety of native forbs also occur. Other characteristic species include *Ceanothus cuneatus*, *Juniperus occidentalis*, and *Toxicodendron diversilobum*. Succession in the absence of fire tends to favor increased shrub dominance in the understory, increased tree density, and increased importance of conifers, with the end result being conversion to a conifer forest. This group merges into Californian Broadleaf Forest & Woodland Group (G195). This group occurs as both small patch and large patch in its dynamics. This west side version of this group is associated with dry, predominantly low-elevation sites and/or sites that experienced frequent presettlement fires. Elevations range from 600-1600 m (1800-4850 feet) on steep, rocky slopes where snow and cold temperatures occur. In the Willamette Valley, soils are mesic yet well-drained, and the stands are mostly large patch. In the Puget Lowland and Georgia Basin, this group is primarily found on dry sites, typically either shallow bedrock soils or deep gravelly glacial outwash soils. It occurs on various soils in the interior valleys of the Klamath Mountains, and on shallow soils of "bald hill" toward the coast. Even where more environmentally limited, the group is strongly associated with a historic low-severity fire regime. With frequent annual burning (at lower elevations and on warmer sites), this group is an open to dense woodland of large oaks with well-developed grassy understories of native perennial bunchgrass. Succession in the absence of fire tends to favor increased shrub dominance in the understory, increased tree density, and increased importance of conifers, with the end result being conversion to a conifer forest. This group merges into Californian Broadleaf Forest & Woodland Group (G195). This group occurs as both small patch and large patch in its dynamics.

Classification Comments: This group is a matrix type with stands of either pure *Pinus ponderosa*, pure *Quercus garryana*, or mixed *Pinus ponderosa* - (*Pseudotsuga menziesii*) - *Quercus garryana*. The description of *Pinus ponderosa* - *Quercus garryana* / *Arctostaphylos viscida* / *Festuca californica* Woodland (CEGL000880) indicates that it is a transitional type or a clustering of plots from the interbasins (*Festuca idahoensis* and *Pseudoroegneria spicata*) and California (*Festuca californica*, *Toxicodendron diversilobum*).

Quercus garryana var. *fruticosa* (and other shrub-form varieties) are not included in this group; in California, they are considered part of montane deciduous scrub, occurring at higher elevations than the tree-form *Quercus garryana* var. *garryana*.

Similar NVC Types:

- G344 Californian Montane Conifer Forest & Woodland

Diagnostic Characteristics: Forests and woodlands dominated by a mix of *Quercus garryana* and *Pinus ponderosa* or *Pseudotsuga menziesii*. Shrubs and herbaceous species are Intermountain Basin species, diagnostic of the Columbia Plateau and Great Basin or Rocky Mountains species. Bakker and Colasurdo (2010) concluded that *Quercus garryana* tree densities in all size classes were higher in eastern Washington than on western sites. Westside: Dry low-elevation stands dominated by *Quercus garryana* which can have some *Arbutus menziesii*, *Quercus chrysolepis*, or *Quercus kelloggii*. *Pseudotsuga menziesii* is common, and *Pinus ponderosa* occurs occasionally but is not diagnostic. Other characteristic species include *Ceanothus cuneatus*, *Juniperus occidentalis*, *Symphoricarpos albus*, and *Toxicodendron diversilobum*.

VEGETATION

Physiognomy and Structure: Medium-tall woodlands and forests often with emergent taller conifer trees. Undergrowth of medium-height shrubs and an open layer of grasses and or forbs is typical. Also medium-height open-canopy deciduous broadleaf woodlands with grassy understory.

Floristics: Most occurrences of this group are dominated by *Quercus garryana* with and without *Pinus ponderosa* or *Pseudotsuga menziesii*. Isolated, taller *Pinus ponderosa* or *Pseudotsuga menziesii* over *Quercus garryana* trees characterize part of this group. Clonal *Quercus garryana* can create dense tree or tall-shrub patches across a grassy landscape or can dominate open woodlands or even savannas. The understory may include dense stands of shrubs or, more often, be dominated by grasses, sedges or forbs. Shrub-steppe shrubs may be prominent in some stands and create a distinct tree / shrub / sparse grassland habitat, including *Purshia tridentata*, *Artemisia tridentata*, *Artemisia nova*, and *Chrysothamnus viscidiflorus*. Understories are generally dominated by herbaceous species, especially graminoids. Mesic sites have an open to closed sodgrass understory dominated by *Calamagrostis*

rubescens, *Carex geyeri*, *Carex rossii*, *Carex inops*, or *Elymus glaucus*. Drier savanna and woodland understories typically contain bunchgrass steppe species such as *Festuca idahoensis* or *Pseudoroegneria spicata*. Common exotic grasses that often appear in high abundance are *Bromus tectorum* and *Poa bulbosa*. These woodlands occur at the lower treeline/ecotone between *Artemisia* spp. or *Purshia tridentata* steppe or shrubland and *Pinus ponderosa* and/or *Pseudotsuga menziesii* forests or woodlands. In the Columbia River Gorge, this group appears as small to large patches in transitional areas in the Little White Salmon and White Salmon river drainages in Washington and Hood River, Rock Creek, Moiser Creek, Mill Creek, Threemile Creek, Fifteen Mile Creek, and White River drainages in Oregon. *Quercus garryana* can create dense patches often associated with grassland or shrubland balds within a closed *Pseudotsuga menziesii* forest landscape. Commonly the understory is shrubby and composed of *Ceanothus integerrimus*, *Holodiscus discolor*, *Symphoricarpos albus*, and *Toxicodendron diversilobum*. Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii* in the gorge and other oak patches on xeric sites in the east Cascade foothills.

Westside floristics: With frequent annual burning (at lower elevations and on warmer sites), this group is an open to dense woodland of large oaks with well-developed grassy understories of native perennial bunchgrass. The perennial bunchgrass component includes *Danthonia californica* (close to the coast), *Elymus glaucus*, *Festuca californica*, and *Festuca idahoensis*. A variety of native forbs also occur. Other characteristic species include *Ceanothus cuneatus*, *Juniperus occidentalis*, and *Toxicodendron diversilobum*. The predominant oaks with the higher frequency fires include *Quercus kelloggii* and *Quercus garryana*, with *Quercus garryana* var. *garryana* codominant in the central and northern Coast Ranges. Succession in the absence of fire tends to favor increased shrub dominance in the understory, increased tree density, and increased importance of conifers, with the end result being conversion to a conifer forest. The vegetation ranges from savanna and woodland to forest dominated by deciduous broadleaf trees, mostly *Quercus garryana*. Codominance by the evergreen conifer *Pseudotsuga menziesii* is common, and *Pinus ponderosa* is important in some stands. In the south, common associates also include *Arbutus menziesii* and *Quercus kelloggii*.

ENVIRONMENT & DYNAMICS

Environmental Description: This narrowly restricted group appears at or near lower treeline in foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion associated with low-elevation slopes and valley margins. This area receives 50-80 cm of annual precipitation, falling mostly as winter rain and snow. Elevation ranges from 460 to 1920 m. Stands often occur on warm sites with southern exposures with seasonal soil drought or desiccating winds. Substrates usually have bedrock, sand, or pumice soils which drain quickly (Reid et al.1999).

Westside environment: This group is limited to southwestern British Columbia, in the Puget Trough and Willamette Valley south into the Klamath Mountains and into northern California, where it is found throughout the Sierra Nevada and Coast Ranges foothills and lower montane elevations from 600-1600 m (1800-4850 feet) on steep, rocky slopes where snow and cold temperatures occur. This group is associated with dry, predominantly low-elevation sites and/or sites that experienced frequent presettlement fires. In the Willamette Valley, soils are mesic yet well-drained, and the stands are mostly large patch. In the Puget Lowland and Georgia Basin, this group is primarily found on dry sites, typically either shallow bedrock soils or deep gravelly glacial outwash soils. It occurs on various soils in the interior valleys of the Klamath Mountains, and on shallow soils of "bald hills" toward the coast.

Dynamics: Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii* in the gorge and other oak patches on xeric sites in the east Cascade foothills. Most of the habitat experienced frequent low-severity fires that maintained woodland or savanna conditions. The mean fire-return interval is 20 years, although variable. Landfire VDDT models: #R OAP1 Oregon White Oak-Ponderosa Pine model describes general successional pathways treating drier pine succession separate from more mesic Douglas-fir pathways. Frequent annual burning (at lower elevations and on warmer sites) is required to maintain the open to dense woodland of large oaks with well-developed grassy understories of native perennial bunchgrass. Landfire VDDT models: #R OWOA Oregon White Oak applies to southern occurrences.

DISTRIBUTION

Geographic Range: This narrowly restricted group appears at or near lower treeline in the foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion. Disjunct occurrences in the Klamath Mountains and southernmost Cascades may have big sagebrush and bitterbrush in the understory, along with other shrubs.

Westside range: This group occurs primarily in the Puget Trough and Willamette Valley and extends southward at low elevations in the Klamath Mountains on both sides of the Oregon/California stateline, and continues south throughout the Sierra Nevada and Coast Ranges foothills and lower montane of California and Oregon at elevations from 600-1600 m (1800-4850 feet).

Spatial Scale & Pattern [optional]: Matrix, Large patch

Nations: CA, US

States/Provinces: BC, CA, OR, WA

TNC Ecoregions [optional]: 4:C, 6:C

USFS Ecoregions (2007): 342H:CC, 342I:CC, M242B:C?, M242C:CC, M242D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. M.S. Reid 2-13: G204 was merged into this group. Text was quickly added from that group to this one, but further editing to clean up the concept is required. Below comments are from reviewers prior to this merge, and are part of the reason for the merging of these 2 groups.

I think the distinction between this and Californian-Vancouverian Deciduous Oak Woodland Group (G204) is very uncertain. We need to review floristics of both, and consider merging them into one type. Rather than clumping groups that have only the overstory differential species in common I'd look at the associations and maybe alliances in G204 and move them into the east Cascades group G206 based on floristics, i.e., Idaho fescue to G206 Roemer's fescue into California G204. G206 is mostly Intermountain Basin or Rocky Mountains flora i.e., *Pseudoroegneria*, *Carex geyeri*, *Calamagrostis*, *Purshia tridentata*, *Artemisia tridentata*, *Artemisia nova*, and *Chrysothamnus viscidiflorus* except for oak. Maybe moving the central Gorge and Klamath associations with *Ceanothus integerrimus*, *Toxicodendron diversilobum*, *Festuca californica* to the California group would clarify these groups.

This type concept works for stands in the east Klamath Mountains and Cascades in CA. The problem in CA is what to do with the shrub vars. of *Quercus garryana*. Should they be in G204? They are considered by people in CA as the low limits of the montane chaparral, but maybe in this group as a southern extension along the westside if the Sierra Nevada and the interior North Coast Ranges makes sense. See *Quercus garryana* shrubland alliance in MVC2. This group, even with *Quercus garryana* also defining G204, is sufficiently different from this group in CA. Here the distinction suggested for *Festuca idahoensis/roemeri* is blurred.

G204 was merged into this group. Text was quickly added from that group to this one, but further editing to clean up the concept is required. *Quercus garryana* var. *breweri* (and other shrub-form varieties) is not included in this group; in California it is considered part of montane deciduous scrub, occurring at higher elevations than the tree-form *Quercus garryana* var. *garryana*.

SYNONYMY

- < Interior Ponderosa Pine: 237 (Eyre 1980)
- < Oregon White Oak: 233 (Eyre 1980)

LOWER LEVEL UNITS

Alliances:

- A3327 *Quercus garryana* - *Pinus ponderosa* / *Carex geyeri* Woodland Alliance
- A3328 *Quercus garryana* - *Pseudotsuga menziesii* / *Toxicodendron diversilobum* Forest & Woodland Alliance

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2011)

Author of Description: G. Kittel, C. Chappell, M.S. Reid, R. Crawford, K.A. Schulz

Acknowledgments: R. Crawford, R.J. Cole, T. Keeler-Wolf, J. Evens

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: GK/CC/MSR 1-10, mod. GK/RC 12-11, mod. RC/MSR 4-13, mod. DFL/TKW/JE/MSR 10-13, mod. KAS 11-15

REFERENCES

References: Bakker and Colasurdo 2010, Barbour et al. 2007a, Eyre 1980, Faber-Langendoen et al. 2017a, John and Tart 1986, Lillybridge et al. 1995, Reid et al. 1999, Sawyer et al. 2009, Simpson 2007, Topik et al. 1988

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G206. Cascadian Oregon White Oak - Conifer Forest & Woodland

A3327. *Quercus garryana* - *Pinus ponderosa* / *Carex geyeri* Woodland Alliance

Type Concept Sentence: This alliance covers stands that are dominated by *Quercus garryana* mixed with *Pinus ponderosa* and/or *Pseudotsuga menziesii*. The understory may include dense shrubs or just herbaceous species. This alliance is geographically concentrated on the eastside of the Cascade Range of Oregon and Washington with disjunct stands in southern central Oregon and northern California.

OVERVIEW

Scientific Name: *Quercus garryana* - *Pinus ponderosa* / *Carex geyeri* Woodland Alliance

Common Name (Translated Scientific Name): Oregon White Oak - Ponderosa Pine / Geyer's Sedge Woodland Alliance

Colloquial Name: East Cascadian Oregon White Oak - Pine Woodland

Type Concept: This alliance consists of stands dominated by *Quercus garryana* mixed with *Pinus ponderosa* and/or *Pseudotsuga menziesii*. Isolated, taller *Pinus ponderosa* or *Pseudotsuga menziesii* over *Quercus garryana* trees sometimes characterize this alliance. Clonal *Quercus garryana* stands can create dense patches across a grassy landscape creating open woodlands or savannas. The understory may be dense shrubs or be dominated by grasses, sedges or forbs. Shrubs prominent in some stands include *Artemisia nova*, *Artemisia tridentata*, *Chrysothamnus viscidiflorus*, and *Purshia tridentata*. Understories are generally dominated by herbaceous species, especially graminoids. Mesic sites have an open to closed sodgrass understory dominated by *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Carex inops*, or *Elymus glaucus*. Drier savanna and woodland understories typically contain bunchgrass steppe species such as *Festuca idahoensis* or *Pseudoroegneria spicata*. Common exotic grasses that often appear in high abundance are *Bromus tectorum* and *Poa bulbosa*. This alliance occurs in the foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge, further east into the Columbia Plateau ecoregion, and there are disjunct occurrences in Klamath County, south-central Oregon and Siskiyou County, north-central California. These woodlands occur at the lower treeline/ecotone between *Artemisia* spp. or *Purshia tridentata* steppe or shrubland and *Pinus ponderosa* and/or *Pseudotsuga menziesii* forests or woodlands. Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii*. Soil, fire and drought play roles in maintaining an open tree canopy in part of this dry woodland habitat. It is drier and colder than more maritime stands of *Quercus garryana* - *Pseudotsuga menziesii* / *Toxicodendron diversilobum* Forest & Woodland Alliance (A3328).

Classification Comments: This alliance concept parallels that of ecological system East Cascades Oak-Ponderosa Pine Forest and Woodland (CES204.085), where associations have floristic components of the Intermountain Basins or Rocky Mountains. There is some floristic overlap with west-side white oak associations. The two alliances in this group are distinguished by the differing floristics in the shrub and herb layers between "eastside" and "westside." There is certainly some overlap, and geographically east versus west of the mountains is not a sharp line. We could consider finding a stronger eastside diagnostic species for the name of this alliance.

Internal Comments: MSR 1-16: *Q. garryana* occurs in BC in the Georgia Trough region, this type could occur in BC.

Other Comments:

Similar NVC Types:

- A3328 *Quercus garryana* - *Pseudotsuga menziesii* / *Toxicodendron diversilobum* Forest & Woodland Alliance

Diagnostic Characteristics: Forests and woodlands dominated by a mix of *Quercus garryana* and *Pinus ponderosa* or *Pseudotsuga menziesii*.

VEGETATION

Physiognomy and Structure: Vegetation within this alliance is characterized by a sparse and irregular layer of cold-deciduous trees, 8-25 m in height. A sparse cold-deciduous or evergreen shrub layer may be present. Drought-tolerant graminoids and herbs usually form a continuous ground cover less than 1 m in height.

Floristics: This alliance consists of stands dominated by *Quercus garryana* mixed with *Pinus ponderosa* and/or *Pseudotsuga menziesii*. Isolated, taller *Pinus ponderosa* or *Pseudotsuga menziesii* over *Quercus garryana* trees sometimes characterize this alliance. Clonal *Quercus garryana* stands can create dense patches across a grassy landscape creating open woodlands or savannas. The understory may be dense shrubs or be dominated by grasses, sedges or forbs. Shrubs prominent in some stands include *Artemisia nova*, *Artemisia tridentata*, *Chrysothamnus viscidiflorus*, and *Purshia tridentata*. Understories are generally dominated by herbaceous species, especially graminoids. Mesic sites have an open to closed sodgrass understory dominated by *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Carex inops*, or *Elymus glaucus*. Drier savanna and woodland understories typically contain bunchgrass steppe species such as *Festuca idahoensis* or *Pseudoroegneria spicata*. Common exotic grasses that often appear in high abundance are *Bromus tectorum* and *Poa bulbosa*.

ENVIRONMENT & DYNAMICS

Environmental Description: Vegetation within this alliance is found in low-elevation (120-900 m) valleys and slopes of the Pacific Northwest. Precipitation ranges from 40-150 cm annually, with a protracted warm, dry period in midsummer. Dry-season fire is common and serves to maintain the open canopy of these savannas. These are among the most drought-tolerant communities of the maritime Pacific Northwest, and occur east of the Cascade Range where river canyons allow adequate penetration of Pacific moisture. This alliance represents the most xeric expression of the *Quercus garryana* alliances, where soil drought prohibits continuous canopy cover. Stands of the alliance are found at the lowermost boundary of woodland and forest vegetation, on hot, dry sites, particularly in the Columbia River Gorge, on southerly aspects. Soils are moderately deep, rocky silt loams to loams, derived from mixed colluvium of basaltic materials with a minor component of loess. Adjacent vegetation often includes *Quercus garryana* woodlands, *Quercus garryana*, *Pseudotsuga menziesii*, *Pinus ponderosa*, or *Abies grandis* forest communities at the upper elevation, and valley grasslands or *Artemisia* steppe at lower, drier sites.

Dynamics: In the past, most of the habitat experienced frequent low-severity fires that maintained woodland or savanna conditions. The mean fire-return interval is 20 years, although variable. Dry season fire historically controlled the abundance of invading conifers and maintained the savanna structure of these communities (Thilenius 1968). Fire suppression and grazing can lead to cloning of *Quercus garryana* and the development of more closed-canopy stands. *Quercus garryana* is shade-intolerant and is eventually killed when overtopped by coniferous forest. Although many *Quercus garryana* communities are seral to conifer forest, the extreme seasonal drought where this alliance occurs allows the *Quercus garryana* to maintain dominance.

DISTRIBUTION

Geographic Range: This alliance occurs at or near lower treeline in foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion. Disjunct occurrences are found in Klamath County in south-central Oregon and Siskiyou County in north-central California where more sagebrush and bitterbrush occurs in the understory, along with other shrubs.

Nations: CA?, US

States/Provinces: BC?, CA, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Quercus garryana* (Oregon white oak woodland) Alliance (Sawyer et al. 2009) [71.030.00]
- >< Oregon White Oak Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEG000551 *Quercus garryana* / *Festuca idahoensis* Woodland
- CEG001714 *Quercus garryana* / *Festuca (idahoensis ssp. roemerii, rubra)* Wooded Grassland
- CEG000882 *Pinus ponderosa* - *Quercus garryana* / *Carex geyeri* Woodland
- CEG000884 *Pinus ponderosa* - *Quercus garryana* / *Symphoricarpos albus* Woodland
- CEG000549 *Quercus garryana* / *Carex geyeri* Woodland
- CEG000550 *Quercus garryana* / *Elymus glaucus* Woodland
- CEG000552 *Quercus garryana* / *Pseudoroegneria spicata* Woodland
- CEG000553 *Quercus garryana* / *Symphoricarpos albus* Woodland
- CEG000881 *Pinus ponderosa* - *Quercus garryana* / *Balsamorhiza sagittata* Woodland
- CEG000883 *Pinus ponderosa* - *Quercus garryana* / *Purshia tridentata* Woodland

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Chappell et al. 1997, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Thilenius 1968

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G206. Cascadian Oregon White Oak - Conifer Forest & Woodland

A3328. *Quercus garryana* - *Pseudotsuga menziesii* / *Toxicodendron diversilobum* Forest & Woodland Alliance

Type Concept Sentence: This alliance covers savanna, woodland and forest dominated by *Quercus garryana*. Codominance by the evergreen conifer *Pseudotsuga menziesii* is common, and *Pinus ponderosa* can be important in some stands. This alliance occurs from southwestern British Columbia to northern California at lower montane on steep, rocky slopes where snow and cold temperatures occur.

OVERVIEW

Scientific Name: *Quercus garryana* - *Pseudotsuga menziesii* / *Toxicodendron diversilobum* Forest & Woodland Alliance

Common Name (Translated Scientific Name): Oregon White Oak - Douglas-fir / Pacific Poison-oak Forest & Woodland Alliance

Colloquial Name: West Cascadian Dry White Oak - Douglas-fir Forest & Woodland

Type Concept: This alliance consists of savanna, woodland and forest dominated by *Quercus garryana*. Codominance by the evergreen conifer *Pseudotsuga menziesii* is common, and *Pinus ponderosa* is important in some stands with mesic indicator species in the undergrowth. In the south, common associates also include *Quercus kelloggii* and *Arbutus menziesii*. The predominant oaks in areas of higher fire frequency include *Quercus kelloggii* and *Quercus garryana*, with *Quercus garryana* var. *garryana* codominant in the central and northern Coast Ranges. The perennial bunchgrass component includes *Festuca idahoensis*, *Festuca californica*, *Elymus glaucus*, and *Danthonia californica* (close to the coast). A variety of native forbs also occur. Other characteristic species include *Toxicodendron diversilobum*, *Juniperus occidentalis*, and *Ceanothus cuneatus*. This alliance occurs in southwestern British Columbia, in the Puget Trough and Willamette Valley south into the Klamath Mountains and into northern California, where it is found in the northern portions of the Sierra Nevada and Coast Ranges foothills at lower montane elevations from 600-1600 m (1800-4850 feet) on steep, rocky slopes where snow and cold temperatures occur. This alliance is associated with dry, predominantly low-elevation sites and/or sites that experienced frequent presettlement fires.

Classification Comments: This alliance concept parallels that of the ecological system North Pacific Oak Woodland (CES204.852), where associations have floristic components of the west side of the Cascade Range and northern California. There is some floristic overlap with eastside white oak associations. *Quercus garryana* var. *fruticosa* (= var. *breweri*) associations are not included in this group or alliance. Several associations identified in California (Sawyer et al. 2009) are not included in those listed for this alliance, as they are not in the USNVC yet.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3327 *Quercus garryana* - *Pinus ponderosa* / *Carex geyeri* Woodland Alliance

Diagnostic Characteristics: Dry low-elevation stands dominated by *Quercus garryana* which can have some *Arbutus menziesii*, *Quercus chrysolepis*, or *Quercus kelloggii*. *Pseudotsuga menziesii* is common, and *Pinus ponderosa* occurs occasionally but is not diagnostic. Other characteristic species include *Toxicodendron diversilobum*, *Symphoricarpos albus*, *Juniperus occidentalis*, and *Ceanothus cuneatus*.

VEGETATION

Physiognomy and Structure: Broad-leaved deciduous trees ranging in density from very open savanna-like canopy to dense forest. Trees are from 15-30 m tall. Understory is usually herbaceous perennial graminoids; some stands have dense shrub cover.

Floristics: Vegetation within this alliance is characterized by a closed canopy of *Quercus garryana*, a winter deciduous tree, occasionally with scattered emergent individuals of *Pseudotsuga menziesii* or, less often, *Pinus ponderosa*. *Acer macrophyllum* is often an associated tree. There is often a tall-shrub stratum of *Corylus cornuta* var. *californica*, *Amelanchier alnifolia*, and/or *Toxicodendron diversilobum*. Many forb species can be found in these forests; some of the more common or important include *Achillea millefolium*, *Apocynum androsaemifolium* (= *Apocynum pumilum*), *Brodiaea elegans*, *Camassia quamash*, *Fragaria vesca*, *Fragaria virginiana*, *Galium triflorum*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Perideridia bolanderi*, and *Vicia americana*.

ENVIRONMENT & DYNAMICS

Environmental Description: Vegetation within this alliance is found in low-elevation (15-610 m) valleys and slopes of the Pacific Northwest, usually on the leeward side of the coastal ranges. This alliance is associated with dry, predominantly low-elevation sites and/or sites that experienced frequent presettlement fires. In the Willamette Valley, soils are mesic yet well-drained, and the stands are mostly large patch. In the Puget Lowland and Georgia Basin, it is found primarily on dry sites, typically either with shallow bedrock soils or deep gravelly glacial outwash soils. It occurs on various soils in the interior valleys of the Klamath Mountains, and on shallow soils of "bald hill" toward the coast. Even where more environmentally limited, it is strongly associated with a historic low-severity fire regime. With frequent annual burning (at lower elevations and on warmer sites), this is an open to dense woodland of large oaks with well-developed grassy understories of native perennial bunchgrass.

Precipitation ranges from 50-200 cm annually, with a decidedly warm, dry period in midsummer. Environmental factors that limit the invasion and increase of conifers play an important role in maintenance and functioning of these communities; foremost in importance are soil drought and fire. These communities are associated with excessively drained soils, or sometimes riparian areas

and wetland transitions in prairie landscapes. Best stand development occurs on well-drained alluvial soils and mild slopes. This is one of the most drought-tolerant communities of the maritime Pacific Northwest.

Dynamics: Succession in the absence of fire tends to favor increased shrub dominance in the understory, increased tree density, and increased importance of conifers, with the end result being conversion to a conifer forest. Dry-season fire was historically common and controlled the abundance of invading conifers (Thilenius 1968). *Quercus garryana* is shade-intolerant and is eventually killed when overtopped by coniferous forest. Stands of this type often are seral to *Pseudotsuga menziesii* in the absence of fire (Chappell et al. 1997). Animal dissemination of acorns is important in dispersal of oaks and thus the presence of oak-dominated stands.

DISTRIBUTION

Geographic Range: This alliance occurs in southwestern British Columbia, in the Puget Trough and Willamette Valley and extends southward at low elevations in the Klamath Mountains on both sides of the Oregon/California stateline, and continues south in the northern portions of the Sierra Nevada and Coast Ranges foothills and lower montane of California and Oregon.

Nations: CA, US

States/Provinces: BC, CA, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Quercus garryana* (Oregon white oak woodland) Alliance (Sawyer et al. 2009) [71.030.00]
- >< Oregon White Oak: 233 (Eyre 1980)
- >< Western Broadleaf Forests: 26: Oregon Oakwoods (*Quercus*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEG000932 *Quercus garryana* / *Toxicodendron diversilobum* / *Elymus glaucus* Woodland
- CEG000931 *Quercus garryana* - *Quercus kelloggii* / *Toxicodendron diversilobum* Woodland
- CEG000929 *Pseudotsuga menziesii* - *Quercus garryana* / *Symphoricarpos albus* Woodland
- CEG003299 *Quercus garryana* - (*Fraxinus latifolia*) / *Symphoricarpos albus* Forest
- CEG003355 *Pseudotsuga menziesii* - *Quercus garryana* / *Melica subulata* Forest
- CEG000930 *Quercus garryana* / *Ceanothus cuneatus* / *Festuca idahoensis* Woodland
- CEG003348 *Pinus ponderosa* / *Carex inops* - *Festuca idahoensis* ssp. *roemeri* Woodland
- CEG000928 *Pseudotsuga menziesii* - *Quercus garryana* / *Toxicodendron diversilobum* Woodland
- CEG000547 *Quercus garryana* Forest [Placeholder]
- CEG003358 *Quercus garryana* / *Symphoricarpos albus* / *Carex inops* Woodland
- CEG000458 *Pseudotsuga menziesii* / *Symphoricarpos albus* / *Hieracium cynoglossoides* Forest
- CEG000880 *Pinus ponderosa* - *Quercus garryana* / *Arctostaphylos viscida* / *Festuca californica* Woodland
- CEG000548 *Quercus garryana* / *Carex inops* - *Camassia quamash* Woodland
- CEG003354 *Quercus garryana* / *Viburnum ellipticum* - *Toxicodendron diversilobum* Woodland
- CEG003353 *Quercus garryana* / *Symphoricarpos albus* / *Polystichum munitum* Forest

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Chappell et al. 1997, Evans 1989a, Eyre 1980, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Küchler 1964, Sawyer et al. 2009, Thilenius 1968

M023. Southern Vancouverian Montane-Foothill Forest

This macrogroup includes Jeffery pine - ponderosa pine woodlands; mixed conifer woodlands with *Abies concolor*, *Calocedrus decurrens*, *Pinus jeffreyi*, *Pinus lambertiana*, *Pinus ponderosa* var. *benthamiana*, *Pinus ponderosa* var. *washoensis*, *Pseudotsuga menziesii* var. *menziesii*, or *Sequoiadendron giganteum*; and *Pinus monticola* and *Abies lowiana* forests that occur in dry habitats

found in the foothills and montane elevations of the southern Cascade Range, Klamath Mountains, Modoc Plateau, Sierra Nevada, and Peninsula and Transverse ranges. Additionally, some stands of *Abies bracteata*, *Pinus lambertiana*, and *Pinus ponderosa* occur close to the coast, such as in the Santa Lucia Range of the Central Coast, which is the highest coastal range in the U.S.

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

1.B.2.Nd.2.a. M023 Southern Vancouverian Montane-Foothill Forest

G344. Californian Montane Conifer Forest & Woodland

Type Concept Sentence: This large group consists of montane forests dominated by a single species or a mix of conifers such as *Abies concolor*, *Calocedrus decurrens*, *Pinus jeffreyi*, *Pinus lambertiana*, *Pinus ponderosa*, *Pseudotsuga menziesii*, *Quercus chrysolepis*, *Quercus kelloggii*, and *Pinus monticola*. Additional species included in this group that have a more limited range are *Abies bracteata*, *Abies magnifica* var. *magnifica*, *Abies magnifica* var. *shastensis*, *Pinus ponderosa* var. *washoensis*, *Pseudotsuga macrocarpa*, and *Sequoiadendron giganteum*. Understories are variable. These forests occur from southern Oregon into Baja California, Mexico. This group includes forests dominated by conifer trees on serpentine (ultramafic) soils.

OVERVIEW

Scientific Name: *Calocedrus decurrens* - *Pinus lambertiana* - *Abies concolor* Forest & Woodland Group

Common Name (Translated Scientific Name): Incense-cedar - Sugar Pine - White Fir Forest & Woodland Group

Colloquial Name: Bristlecone Fir Forest

Type Concept: This group comprises low- to mid-montane elevation forests and woodlands dominated by conifer trees, either with one dominant species or as mixed-conifer forests. They occur on all aspects in lower montane zones from southern Oregon (600-2200 m [1800-6700 feet] elevation) down to 425 m (1400 feet) in elevation along Klamath River, south through the Sierra Nevada (1200-2150 m) in southern California, throughout the Transverse Ranges of California, and into northern Baja California, Mexico (1200-2740 m [4000-8300 feet]). They also occur in the higher North Coast Ranges, Klamath Mountains, the southern Cascades, on the Modoc Plateau as well as at lower to middle elevations of the Sierra Nevada on both the east and west sides. This group occurs in a variety of topo-edaphic positions, such as upper slopes at higher elevations, canyon sideslopes, ridgetops, and south- and west-facing slopes which burn relatively frequently. It also occurs in cool ravines and north-facing slopes. Several conifer species co-occur in individual stands and the wide variation of possible combinations is difficult to capture in a few summary sentences. The following list of species are those that cover the range of the group and that occur as pure stands or mixed with two or more species as dominants with others as sub-dominants: *Abies concolor*, *Calocedrus decurrens*, *Pinus jeffreyi*, *Pinus lambertiana*, *Pinus ponderosa*, *Pseudotsuga menziesii*, *Quercus chrysolepis*, *Quercus kelloggii*, and *Pinus monticola*. Additional species included in this group that have limited ranges include *Pseudotsuga macrocarpa* stands of the Transverse Ranges of southern California; *Abies bracteata* stands of the central coast region; in the central and southern Sierra Nevada, *Sequoiadendron giganteum* dominates, usually with *Abies concolor*; at the highest elevations stands may mix with *Abies magnifica* var. *magnifica* and *Abies magnifica* var. *shastensis* (= *Abies x shastensis*); *Chrysolepis chrysophylla* occurs in the western Klamath Mountains; *Pinus ponderosa* var. *washoensis* (= *Pinus washoensis*) may replace *Pinus jeffreyi* further north in the Carson Range and Warner Mountains. Understories are variable. This group also includes forests dominated by conifer trees on serpentine (ultramafic) soils. Many of the characteristic conifer alliances of this group have associations that are specific to serpentine soils.

Classification Comments: These are montane and relative cool temperate stands of generally mixed conifers (although single-species stands are included) that are not at low elevations near the coast. This group includes former Sierran-Intermontane Desert Western White Pine - White Fir Woodland Group (G234). This group does not include coastal mixed evergreen forests [see Californian Moist Coastal Mixed Evergreen Forest Group (G208)], mixed conifer stands near the coast [see Californian Conifer Forest & Woodland Group (G198)], stands of ponderosa pine on the east side of the Cascades [see Cascadian Oregon White Oak - Conifer Forest & Woodland Group (G206)], or Central Rocky Mountain Ponderosa Pine Open Woodland Group (G213) north of the Warm Springs Reservation of central Oregon.

Similar NVC Types:

- G198 Californian Conifer Forest & Woodland: are closed-cone conifer forests of coastal and interior foothill, lower elevation, generally not mixed, drier, harsher climates.
- G208 Californian Moist Coastal Mixed Evergreen Forest: are coastal forests characterized by *Pseudotsuga menziesii* - *Notholithocarpus densiflorus*, at generally lower elevations.
- G213 Central Rocky Mountain Ponderosa Pine Open Woodland: are ponderosa pine forests.
- G800 Southern Vancouverian Dry Douglas-fir - Madrone Woodland: occurs further north, where *Calocedrus decurrens* and *Pinus ponderosa* drop out.

- G206 Cascadian Oregon White Oak - Conifer Forest & Woodland: are ponderosa pine and Douglas-fir forests with Oregon white oak in the Cascades.
- G749 Sierra-Cascade Red Fir - Mountain Hemlock Forest

Diagnostic Characteristics: This group comprises low- to mid-montane elevation (not foothill nor upper montane-subalpine) forests and woodlands dominated by conifer trees, either with one dominant species or as mixed-conifer forests. They occur on all aspects in lower montane zones. Dominant species include *Pseudotsuga menziesii*, *Abies concolor*, *Pinus ponderosa*, *Pinus jeffreyi*, *Calocedrus decurrens*, *Pinus lambertiana*, and *Sequoiadendron giganteum* (and others).

VEGETATION

Physiognomy and Structure: This group is characterized by open to closed tree canopies, 15-60 m in height, and evergreen needle-leaved conifer growth form.

Floristics: Stands may have single or several conifer species co-occurring in individual stands; the wide variation of possible combinations is difficult to capture in a few sentences. The following list of species are those that cover the range of the group and that occur as pure stands or mixed with two or more species as dominants with others as sub-dominants: *Abies concolor*, *Calocedrus decurrens*, *Pinus jeffreyi*, *Pinus lambertiana*, *Pinus ponderosa*, *Pseudotsuga menziesii*, *Quercus chrysolepis*, *Quercus kelloggii*, and *Pinus monticola*. Additional species included in this group that have limited ranges include *Pseudotsuga macrocarpa* stands of the Transverse Ranges of southern California; *Abies bracteata* stands of the central coast region; *Picea breweriana* in the Klamath Mountains; in the central and southern Sierra Nevada, *Sequoiadendron giganteum* dominates, usually with *Abies concolor*; at the highest elevations stands may mix with *Abies magnifica* var. *magnifica* and *Abies magnifica* var. *shastensis* (= *Abies x shastensis*); *Chrysolepis chrysophylla* occurs in the western Klamath Mountains; *Pinus ponderosa* var. *washoensis* (= *Pinus washoensis*) may replace *Pinus jeffreyi* further north in the Carson Range and Warner Mountains. Understories are variable. In the Sierra Nevada, some stands can have dense understory mats of *Chamaebatia foliolosa* (and other low, spreading shrubs) which foster relatively high-frequency, low-intensity surface fires. Other common understory shrubs are *Corylus cornuta*, *Cornus nuttallii*, and at higher elevations *Chrysolepis sempervirens*. In Oregon, shrubs such as *Holodiscus discolor*, *Toxicodendron diversilobum*, *Mahonia nervosa*, *Mahonia aquifolium*, and *Symphoricarpos mollis* are common in addition to graminoids such as *Festuca californica*, *Elymus glaucus*, and *Danthonia californica*.

In areas of recent fire or other disturbance, *Arctostaphylos patula*, *Ceanothus integerrimus*, *Ceanothus cordulatus*, and *Ribes* spp. are more common. On the east side of the Sierra Nevada, there can be well-developed shrub understories with strong Great Basin affinities; species can include *Artemisia tridentata*, *Purshia tridentata*, *Symphoricarpos rotundifolius* var. *parishii* (= *Symphoricarpos parishii*), *Arctostaphylos patula*, *Ceanothus cordulatus*, *Ceanothus prostratus*, *Ceanothus integerrimus*, *Chrysolepis sempervirens*, *Eriogonum wrightii*, *Quercus vacciniifolia*, and *Lupinus elatus*. Fire of highly variable patch size and return interval maintains the structure of these forests and woodlands.

ENVIRONMENT & DYNAMICS

Environmental Description: This group occurs on all aspects in lower montane zones from southern Oregon (600-2200 m [1800-6700 feet] elevation) down to 425 m (1400 feet) in elevation along Klamath River, south through the Sierra Nevada (1200-2150 m) in southern California, throughout the Transverse Ranges of California, and into northern Baja California, Mexico (1200-2740 m [4000-8300 feet]). They occur in the Klamath Mountains, the southern Cascades, on the Modoc Plateau as well as at lower and middle elevations of the Sierra Nevada on both the east and west sides. High elevations of the Coast Ranges also contain pockets of this forest type. This group occurs in a variety of topo-edaphic positions, such as upper slopes at higher elevations, canyon sideslopes, ridgetops, and south- and west-facing slopes which burn relatively frequently. It also occurs in cool ravines and north-facing slopes. This group also includes forests dominated by conifer trees on serpentine (ultramafic) soils. *Climate:* This group occurs in lower montane regions in a montane (oro-) Mediterranean climate.

Dynamics: Historically, frequent and low-intensity fires maintained these forests and woodlands. Due to fire suppression, the majority of these forests now have closed canopies, whereas in the past, a moderately high fire frequency (every 15-30 years) formerly maintained a more open forest of many conifers and correspondently diverse understory.

DISTRIBUTION

Geographic Range: This group occurs in lower and mid-montane zones from southern Oregon south through the Sierra Nevada, in the Klamath-Siskiyou Mountains of southern Oregon/northern California, throughout the Transverse Ranges of California and into northern Baja California, Mexico.

Spatial Scale & Pattern [optional]: Large patch, Matrix

Nations: MX, US

States/Provinces: CA, MXBC, NV, OR

TNC Ecoregions [optional]: 5:C, 12:C, 14:C, 15:C, 16:C

USFS Ecoregions (2007): 263A:CC, 322A:CP, 332:P, 341D:CC, 342B:CC, M242A:CC, M242B:CC, M242C:CC, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. This group is defined broadly and is very diverse. Upon review, it might be split. Take the part of this type concept and that of G208 for the southernmost Sierra, the Transverse Ranges, and Peninsular Ranges and make a new group south of the range of Douglas-fir both in the Sierra and Coast Ranges. You highlight *Pinus coulteri* and *Pseudotsuga macrocarpa* in this type concept and that of G208. Replace incense-cedar with Douglas-fir in this group name. 3-29-13: It was decided that *Pseudotsuga macrocarpa* stands can be handled at the alliance level within this group. Douglas-fir is too much of a generalist, and an important component of other groups, that it would not be representative of this group as a nominal. *Pinus coulteri* stands are not included in this group.

SYNONYMY

- >< Interior Ponderosa Pine: 237 (Eyre 1980) [This group includes Ponderosa pine in the Sierra Nevada of California.]
- < Jeffrey Pine: 247 (Eyre 1980)
- >< Pacific Douglas-fir: 229 (Eyre 1980)
- >< Pacific Ponderosa Pine - Douglas-fir: 244 (Eyre 1980)
- >< Pacific Ponderosa Pine: 245 (Eyre 1980) [Ponderosa pine stands in the Sierras and Klamaths are included in this group.]
- >< Port Orford-Cedar: 231 (Eyre 1980)
- >< Sierra Nevada Mixed Conifer: 243 (Eyre 1980)
- >< White Fir: 211 (Eyre 1980) [White fir (*Abies lowiana*) is a major component of this group.]

LOWER LEVEL UNITS

Alliances:

- A3675 *Pseudotsuga macrocarpa* - *Quercus chrysolepis* Forest Alliance
- A0147 *Abies bracteata* Forest Alliance
- A3674 *Abies concolor* - *Pseudotsuga menziesii* Coastal, Cascadian & Sierran Forest Alliance
- A3677 *Abies concolor* - *Pinus ponderosa* Eastern Sierran Forest & Woodland Alliance
- A4150 *Sequoiadendron giganteum* Forest Alliance
- A3676 *Pinus jeffreyi* - *Pinus ponderosa* var. *washoensis* Mixed Conifer Woodland Alliance
- A0156 *Picea breweriana* - *Abies concolor* Forest Alliance
- A3673 *Pinus ponderosa* - *Calocedrus decurrens* - *Pseudotsuga menziesii* Forest Alliance
- A3678 *Abies concolor* - *Abies magnifica* var. *magnifica* - *Abies magnifica* var. *shastensis* Forest Alliance
- A3672 *Abies concolor* - *Pinus lambertiana* Forest Alliance

AUTHORSHIP

Primary Concept Source: M.G. Barbour and J. Major (1988)

Author of Description: G. Kittel

Acknowledgments: M. Creasy, P. Moore, R.J. Cole

Version Date: 06/06/2013

Classif Resp Region: West

Internal Author: GK 1-10, 6-13, 12-15

REFERENCES

References: Barbour and Major 1988, Comer et al. 2003, Eyre 1980, Faber-Langendoen et al. 2017a, Holland and Keil 1995, Jimerson 1993, Jimerson 1994, Jimerson and Daniel 1999, Jimerson et al. 1995, Kruckeberg 1984, Sawyer and Keeler-Wolf 1995, Shiflet 1994

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G344. Californian Montane Conifer Forest & Woodland

A0147. *Abies bracteata* Forest Alliance [Low - Poorly Documented]

Type Concept Sentence: This alliance consists of stands dominated by *Abies bracteata* usually with other tree species such as *Quercus chrysolepis*. It occurs in steep fire-protected draws, canyons and ravines along the immediate coast and upper slopes of the Santa Lucia Range in central coastal California.

OVERVIEW

Scientific Name: *Abies bracteata* Forest Alliance

Common Name (Translated Scientific Name): Bristlecone Fir Forest Alliance

Colloquial Name: Bristlecone Fir Forest

Type Concept: This alliance consists of stands dominated by *Abies bracteata* usually with other trees such as *Alnus rhombifolia*, *Arbutus menziesii*, *Notholithocarpus densiflorus* (= *Lithocarpus densiflorus*), *Pinus coulteri*, *Pinus lambertiana*, *Pinus ponderosa*, and/or *Quercus chrysolepis*. It is limited to fire-protected draws, steep mesic slopes, rocky slopes, ridges, canyon bottoms and ravines; slope aspects are typically northerly or easterly. Known stands are smaller than 5 ha, and it is found only on the immediate coast and upper slopes of the Santa Lucia Range in central coastal California.

Classification Comments: This description is verbatim from Sawyer et al. (2009).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Canopy dominated by >30% relative cover of *Abies bracteata* when codominant with *Quercus chrysolepis*.

VEGETATION

Physiognomy and Structure: This alliance has a continuous canopy with trees less than 50 m in height. The canopy may be two-tiered. Shrubs are infrequent. The herbaceous layer is sparse.

Floristics: This forest alliance has *Abies bracteata* as the sole dominant or codominant species in the canopy. The broad-leaved evergreen tree *Quercus chrysolepis* is important or codominant in most stands. Several other conifers such as *Pinus coulteri*, *Pinus ponderosa*, or *Pinus lambertiana* may be present. Broad-leaved evergreens such as *Arbutus menziesii* and *Notholithocarpus densiflorus* (= *Lithocarpus densiflorus*) are often present. The deciduous tree *Alnus rhombifolia* may also be important. Shrubs are infrequent, and the herbaceous layer is sparse.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands are found between 250 and 1400 m elevation in the central California Coast Ranges, most commonly near the crest of the range. Annual precipitation increases with elevation and totals approximately 80 cm, with a distinct summer dry season. This alliance occurs above the zone of summer fogs, and temperatures show more fluctuation than those at lower elevations. Stands are concentrated on steep, rough terrain that does not carry intense fire. Sites include rocky slopes, ridges, and canyons or ravines; slope aspects are typically northerly or easterly. Stands in ravines are found on stream benches or terraces, usually with concave topography and seasonally saturated soils. Soils in ravines are skeletal to deep, with loamy textures. On steep slopes and ridges, the parent materials are sandstones and shales with overlying skeletal soils of various textures. These soils are well-drained and rocky.

Dynamics: Stands of *Abies bracteata* are best developed in sites protected from severe fire. These sites include rocky slopes, ridges, and canyons or ravines. Stands in ravines are normally found on stream terraces, usually with concave topography and seasonally saturated soils. These ravine stands could be considered palustrine. Some stands have probably been impacted by changes in patterns of fire frequency and intensity. Fire suppression has increased fuel loads so that when fires do occur they tend to be larger and more intense. Some stands of this alliance have burned in recent years, possibly because more intense fires are spreading into sites where smaller fires would not have carried. Stands with mature *Abies bracteata* tend to occur on steep, rocky slopes that are unlikely to carry fire because of topographic constraints. During favorable years, stands expand into adjacent mixed hardwood forests with deeper soils and gentler topography. These trees seldom attain maturity within the mixed hardwood forest because fire removes the fire-sensitive fir from the stand.

DISTRIBUTION

Geographic Range: This alliance is found along the central California coast and Coast Ranges.

Nations: US

States/Provinces: CA

TNC Ecoregions [optional]: 15:C, 16:C

USFS Ecoregions (2007): 261Aj:CCC, 261Ak:CCC, M262Ae:CCC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

- = *Abies bracteata* (Santa Lucia fir groves) Alliance (Sawyer et al. 2009) [88.300.00]
- = *Abies bracteata* Forest Alliance (CNPS 2017) [88.300.00]
- ? G7411112 BABBROO (Barrows 1989)
- ? Santa Lucia Fir Forest (Cheatham and Haller 1975)
- = Santa Lucia Fir Forest (#84120) (Holland 1986b)
- ? Santa Lucia Series (Paysen et al. 1980)
- = Santa Lucia fir series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS**Associations:**

- CEGL003000 *Abies bracteata* Forest

AUTHORSHIP

Primary Concept Source: J.O. Sawyer et al. (2009)

Author of Description: G. Kittel and M. Schindel

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Axelrod 1976, Barbour 1988, Barbour and Major 1988, Barrows 1989, Borchert 1987, CNPS 2017, Cheatham and Haller 1975, Cheng 2004, Davis and Borchert 2006, Faber-Langendoen et al. 2017b, Griffin 1976a, Griffin and Critchfield 1972, Holland 1986b, Paysen et al. 1980, Sawyer and Keeler-Wolf 1995, Sawyer et al. 1988, Sawyer et al. 2009, Sullivan 1993b, Talley 1974

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G344. Californian Montane Conifer Forest & Woodland

A3678. *Abies concolor* - *Abies magnifica* var. *magnifica* - *Abies magnifica* var. *shastensis* Forest Alliance

Type Concept Sentence: This alliance consists of mixed forests with at least two of these three conifers: *Abies concolor*, *Abies magnifica* var. *shastensis*, and *Abies magnifica* var. *magnifica*, along with several other conifers that may also be present in the tree canopy. This alliance occurs on the eastern and western slopes of the Oregon Cascades south to Lassen Peak, California, and is also widespread at high cool elevations in the Klamath-Siskiyou Mountains and the central and southern Sierra Nevada.

OVERVIEW

Scientific Name: *Abies concolor* - *Abies magnifica* var. *magnifica* - *Abies magnifica* var. *shastensis* Forest Alliance

Common Name (Translated Scientific Name): White Fir - California Red Fir - Shasta Red Fir Forest Alliance

Colloquial Name: White Fir - California Red Fir - Shasta Red Fir Forest

Type Concept: Associations are usually mixed forests with at least two of these conifers: *Abies concolor*, *Abies magnifica* var. *shastensis* (= *Abies x shastensis*), *Abies magnifica* var. *magnifica*, or *Abies procera*; however, several other conifers may also be present in the tree canopy. Canopy density is influenced by variable-severity burns or by edaphic conditions (granitic sands in the Siskiyou Mountains and volcanic ash in the Cascades). This alliance occurs from the western slope of the Oregon Cascades near the Rogue-Umpqua divide, south through the Klamath-Siskiyou mountain region to Lassen Peak, California, on the east side of the Cascades in extreme southern Oregon, and is also widespread at high cool elevations in central and southern Sierra Nevada (1983-2440 m [6500-8000 feet]). In the southern Cascade and Siskiyou Mountains it is found at elevations of 1500-2000 m. The climate is cool and wet with annual precipitation totals of 100-300 cm, and moderate (1-3 m) snow accumulations. Summers are usually dry, and soil moisture is dependent upon winter snowpacks, which may be heavy but of shorter duration than in the subalpine zone. Precipitation decreases eastward, especially east of the crest of the Siskiyou Mountains. Soils are usually deep and composed of deep fractured granitics or volcanic ash deposits with surface organic layers. In both cases the parent materials have weathered to sandy-textured soils. These forests occupy steep slopes in deeply dissected topography.

Classification Comments: This alliance combines two previous alliances: *Abies magnifica* - *Abies concolor* Forest Alliance (A.2561) and *Abies concolor* - *Abies x shastensis* Forest Alliance (A.151), and encompasses the *Abies magnifica* - *Abies concolor* Forest Alliance of Sawyer et al. (2009).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Codominance of *Abies concolor* with *Abies magnifica* var. *shastensis*, *Abies magnifica* var. *magnifica*, and/or *Abies procera* in the forest canopy (30-60% in the tree layer).

VEGETATION

Physiognomy and Structure: Forests within this alliance are characterized by a tall canopy of needle-leaved evergreen trees which approach 50 m in height, ranging from 40-100% cover. A layer of broad-leaved evergreen or cold-deciduous shrubs is often well-developed, particularly in wet Siskiyou Mountain stands, or stands which have experienced recent disturbance. The herbaceous stratum is composed of shade-tolerant forbs or graminoids, and foliar cover ranges widely in response to site moisture.

Floristics: These forests occupy a zone of overlap between forests of *Abies concolor* at slightly lower elevations, and *Abies magnifica* var. *shastensis* (= *Abies x shastensis*), *Abies magnifica* var. *magnifica*, or *Abies procera* forests which become more common at higher elevations. In lower elevation stands, *Pseudotsuga menziesii* becomes an important component of these forests. Depending upon elevation, moisture, geographic location, and site history, *Abies procera*, *Abies amabilis*, *Abies lasiocarpa*, *Pinus contorta*, *Pinus albicaulis*, *Pinus monticola*, *Pinus jeffreyi*, *Pinus lambertiana*, *Pinus ponderosa*, *Tsuga mertensiana*, *Picea breweriana*, or *Picea engelmannii* may be present. In high-elevation Cascade and Sierran stands, the understory is often very sparse, but may be well-developed in western and northern stands at somewhat lower elevations. Species assemblages are a highly variable mix of shrubs, graminoids and forbs. When present, the shrub layer is usually composed of ericaceous or, less commonly, cold-deciduous species, including *Quercus sadleriana*, *Mahonia nervosa*, *Acer circinatum*, *Ceanothus prostratus*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Arctostaphylos patula*, *Arctostaphylos nevadensis*, *Paxistima myrsinites*, *Vaccinium scoparium*, *Vaccinium membranaceum*, *Ribes viscosissimum*, *Ribes cereum*, *Rosa gymnocarpa*, *Rubus lasiococcus*, *Symphoricarpos mollis*, or *Symphoricarpos albus*. The herbaceous layer is generally dominated by shade-tolerant forbs, and graminoids, including *Linnaea borealis*, *Orthilia secunda*, *Chimaphila umbellata*, *Cornus canadensis*, and *Clintonia uniflora*. Other common herbaceous species include *Xerophyllum tenax*, *Bromus carinatus*, *Carex pensylvanica*, *Pyrola picta*, *Tiarella trifoliata* var. *laciniata*, *Achillea millefolium*, *Actaea rubra*, *Galium oregonum*, *Galium triflorum*, *Goodyera oblongifolia*, *Hieracium albiflorum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Polemonium pulcherrimum*, and *Vicia americana*. Forests in this alliance are typically late-seral.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs in the middle to upper montane zone of the southern Cascade Range and Siskiyou Mountains at elevations of 1500-2000 m. The climate is cool and wet with annual precipitation totals of 100-300 cm, and moderate (1-3 m) snow accumulations. Summers are usually dry, and soil moisture is dependent upon winter snowpacks, which may be heavy but of shorter duration than in the subalpine zone. Precipitation decreases eastward, especially east of the crest of the Siskiyou Mountains. Soils are usually deep and composed of deep fractured granitics or volcanic ash deposits with surface organic layers. In both cases the parent materials have weathered to sandy-textured soils. These forests occupy steep slopes in deeply dissected topography.

Dynamics: The natural fire frequency averages about 40-60 years. Following fire or other disturbance, *Pseudotsuga menziesii* or *Pinus* spp. can become established in these communities and can grow to reach the canopy, possibly persisting for centuries.

DISTRIBUTION

Geographic Range: This alliance is found in southern Oregon and northern California mountains. In Oregon, it occurs along the western slope of the Cascades, the Klamath-Siskiyou mountain region, and on the east side of the Cascades in extreme southern Oregon. In California, it occurs in the western Klamath Mountains, northern California Coast Ranges, southern Cascades, and Sierra Nevada.

Nations: US

States/Provinces: CA, OR

TNC Ecoregions [optional]: 4:C, 5:C, 12:C, 14:C

USFS Ecoregions (2007): M261A:CC, M261Ba:CCC, M261D:CC, M261E:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Abies magnifica* - *Abies concolor* (Red fir - white fir forest) Alliance (Sawyer et al. 2009) [88.520.00]
- = *Abies magnifica*-*Abies concolor* Forest Alliance (CNPS 2017) [88.520.00]
- < Red Fir Forest (#85310) (Holland 1986b)
- >< Red Fir: 207 (Eyre 1980)
- < Red fir series (Sawyer and Keeler-Wolf 1995)
- >< Shasta Red Fir Series (Atzet et al. 1996)

- >< Western Needleleaf Forests: 4: Fir-Hemlock Forest (*Abies-Tsuga*) (Küchler 1964)
- >< Western Needleleaf Forests: 5: Mixed Conifer Forest (*Abies-Pinus-Pseudotsuga*) (Küchler 1964)
- >< White Fir Series (Atzet et al. 1996)

LOWER LEVEL UNITS

Associations:

- CEGLO08682 *Abies magnifica* - *Abies concolor* - *Pinus jeffreyi* Sierran Montane Chaparral Forest
- CEGLO00030 *Abies concolor* - *Abies magnifica* var. *shastensis* / *Chimaphila umbellata* Forest
- CEGLO00032 *Abies concolor* - *Abies magnifica* var. *shastensis* / *Rosa gymnocarpa* Forest
- CEGLO00031 *Abies concolor* - *Abies magnifica* var. *shastensis* / *Ribes* spp. Forest
- CEGLO08683 *Abies magnifica* - *Abies concolor* - *Pinus lambertiana* / Sparse Understory Forest
- CEGLO08681 *Abies magnifica* - *Abies concolor* / Sparse Understory Forest
- CEGLO00033 (*Abies concolor*) - *Abies magnifica* var. *shastensis* / *Symphoricarpos mollis* Forest

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments: We have incorporated significant descriptive information previously compiled by J. Evens.

Version Date: 2014/12/18

REFERENCES

References: Atzet and McCrimmon 1990, Atzet and Wheeler 1984, Atzet et al. 1996, Barbour 1988, Burns and Honkala 1990a, CNPS 2017, Chappell et al. 1997, Cope 1993a, Eyre 1980, Faber-Langendoen et al. 2017b, Fites-Kaufman et al. 2007, Franklin 1988, Franklin and Dyrness 1973, Gordon 1980, Hendrickson and Prigge 1975, Holland 1986b, Hopkins 1979b, Jimerson 1993, Keeler-Wolf et al. 2003a, Küchler 1964, Laacke 1990a, Laacke 1990b, Laacke and Fiske 1983, Minnich 1987, Paysen et al. 1980, Potter 1998, Rundel et al. 1977, Sawyer 2006, Sawyer and Keeler-Wolf 1995, Sawyer and Keeler-Wolf 2007, Sawyer and Thornburgh 1977, Sawyer et al. 2009, Sugihara et al. 2006, Vasek 1985, Zouhar 2001a

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G344. Californian Montane Conifer Forest & Woodland

A3672. *Abies concolor* - *Pinus lambertiana* Forest Alliance

Type Concept Sentence: This alliance is characterized by one or more conifer species mixtures, where *Abies concolor*, *Calocedrus decurrens*, and/or *Pinus lambertiana* comprise the predominant canopy. Other conifer species that may present include *Pinus jeffreyi*, *Pinus ponderosa*, or *Pseudotsuga menziesii*. These mixed mesic conifer forests occur in the cooler, upper elevations of the Klamath-Siskiyou Mountains and Sierra Nevada.

OVERVIEW

Scientific Name: *Abies concolor* - *Pinus lambertiana* Forest Alliance

Common Name (Translated Scientific Name): White Fir - Sugar Pine Forest Alliance

Colloquial Name: White Fir - Sugar Pine Forest

Type Concept: This alliance is characterized by one or more conifer species mixtures, where *Abies concolor*, *Calocedrus decurrens*, and/or *Pinus lambertiana* comprise the predominant canopy. Other conifer species that may present include *Pinus jeffreyi*, *Pinus ponderosa*, or *Pseudotsuga menziesii*. These mixed mesic conifer forests occur in the cooler, upper elevations of the Klamath-Siskiyou Mountains and Sierra Nevada. They occurs on raised stream benches, terraces, slopes, and ridges at 1000-3000 m in elevation.

Classification Comments: This concept is based on Sawyer et al. (2009) *Abies concolor* - *Pinus lambertiana* Forest Alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: *Abies concolor* is typically in combination with *Pinus lambertiana* and/or *Calocedrus decurrens*.

VEGETATION

Physiognomy and Structure: These are closed, medium-statured to tall (20-50 m in height), multi-storied forests of needle-leaved evergreen trees.

Floristics: These forests are mixed conifer forests of middle elevations. At least two of three predominant conifers are dominant with *Abies concolor*, *Calocedrus decurrens*, and/or *Pinus lambertiana*. Stands often have other conifers present such as *Pinus ponderosa*, *Pinus jeffreyi*, *Pinus monophylla*, *Pinus contorta*, and *Pseudotsuga menziesii*. Common hardwood associates include *Cornus nuttallii* and *Quercus kelloggii*. Ericaceous or cold-deciduous shrubs include *Arctostaphylos patula*, *Arctostaphylos nevadensis*, *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), *Ceanothus prostratus*, *Ceanothus integerrimus*, *Rubus parviflorus*, *Prunus emarginata*, and *Salix scouleriana*. The herbaceous layer is composed largely of forbs, including *Asarum hartwegii*, *Clintonia uniflora*, *Lupinus latifolius*, *Adenocaulon bicolor*, *Sarcodes sanguinea*, and *Osmorhiza berteroi* (= *Osmorhiza chilensis*).

ENVIRONMENT & DYNAMICS

Environmental Description: They occurs on raised stream benches, terraces, slopes, and ridges at 1000-3000 m in elevation.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found throughout mid-elevations of California in the Klamath-Siskiyou Mountains, Modoc Plateau, southern Cascades, Sierra Nevada, Transverse Ranges and southern California mountains, and north into southern Oregon in the Cascades and Klamath-Siskiyou Mountains.

Nations: US

States/Provinces: CA, OR

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Abies concolor* - *Pinus lambertiana* (White fir - sugar pine forest) Alliance (Sawyer et al. 2009) [88.510.00]
- = *Abies concolor*-*Pinus lambertiana* Forest Alliance (CNPS 2017) [88.510.00]
- ? Big Tree Forest (#84250) (Holland 1986b) [This synonym was used by Robert Holland and is widely quoted in literature.]
- ? Giant Sequoia Series (Sawyer and Keeler-Wolf 1995) [This name is a synonym for the Alliance used by the California Heritage Division.]
- >> Interior Douglas-fir: 210 (Eyre 1980)
- ? Sierra Nevada Mixed Conifer type-SAF (Burns and Honkala 1990a) [Giant sequoia groves lie entirely within this Society of American Foresters cover type 243.]
- >> Sierra Nevada Mixed Conifer: 243 (Eyre 1980)
- >> Western Needleleaf Forests: 20: Spruce-Fir-Douglas fir Forest (*Picea-Abies-Pseudotsuga*) (Küchler 1964)
- >> Western Needleleaf Forests: 5: Mixed Conifer Forest (*Abies-Pinus-Pseudotsuga*) (Küchler 1964)
- >> White Fir: 211 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEGLO08675 *Abies concolor* - *Calocedrus decurrens* - *Pinus lambertiana* / *Chrysolepis sempervirens* / *Carex multicaulis* Forest
- CEGLO03155 *Abies concolor* - *Pinus lambertiana* - *Pinus jeffreyi* / Sparse Understory Forest
- CEGLO08677 *Abies concolor* - *Calocedrus decurrens* - *Pinus lambertiana* / *Cornus nuttallii* / *Corylus cornuta* var. *californica* Forest
- CEGLO08676 *Abies concolor* - *Pinus lambertiana* - *Calocedrus decurrens* / *Symphoricarpos mollis* / *Kelloggia galioides* Forest
- CEGLO08678 *Abies concolor* - *Calocedrus decurrens* - *Pinus lambertiana* / *Adenocaulon bicolor* Forest
- CEGLO08679 *Abies concolor* - *Pinus lambertiana* Forest
- CEGLO08680 *Abies concolor* - *Pinus lambertiana* / *Maianthemum racemosum* - *Prosartes hookeri* Forest
- CEGLO00016 *Abies concolor* - *Pinus lambertiana* - *Pinus ponderosa* / *Arctostaphylos patula* Forest

AUTHORSHIP

Primary Concept Source: G. Kittel after Sawyer et al. (2009)

Author of Description: G. Kittel and J. Evens

Acknowledgments: We have incorporated significant descriptive information previously compiled by J. Evens.

Version Date: 2014/12/18

REFERENCES

References: Atzet and McCrimmon 1990, Atzet and Wheeler 1984, Atzet et al. 1996, Aune 1994, Barbour 1988, Burns and Honkala 1990a, CNPS 2017, Chappell et al. 1997, Conard and Radosevich 1982, Evens and San 2006, Eyre 1980, Faber-Langendoen et al. 2017b, Fites 1993, Fites-Kaufman et al. 2007, Franklin 1988, Franklin and Dyrness 1973, Gordon 1980, Griffin and Critchfield 1976, Habeck 1992b, Hendrickson and Prigge 1975, Holland 1986b, Hopkins 1979a, Hopkins 1979b, Johnston 1984, Johnston 1987, Keeler-Wolf et al. 2003a, Klein and Evens 2006, Küchler 1964, Laacke 1990a, Laacke and Fiske 1983, Lee 2004, Sawyer 2006, Sawyer 2007, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Volland 1976, Zouhar 2001a

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G344. Californian Montane Conifer Forest & Woodland

A3677. *Abies concolor* - *Pinus ponderosa* Eastern Sierran Forest & Woodland Alliance

Type Concept Sentence: This alliance is distinguished by the dominance of *Abies concolor*, *Pinus monticola*, and *Pinus ponderosa*. *Pseudotsuga menziesii* is usually absent. This alliance also includes stands of *Pinus ponderosa* var. *washoensis* (limited to the east side of the Sierra Nevada). Stands occur on the Modoc Plateau and Warner Mountains of California, north along the east slope of the southern Cascades in Oregon.

OVERVIEW

Scientific Name: *Abies concolor* - *Pinus ponderosa* Eastern Sierran Forest & Woodland Alliance

Common Name (Translated Scientific Name): White Fir - Ponderosa Pine Eastern Sierran Forest & Woodland Alliance

Colloquial Name: Eastern Sierran White Fir - Ponderosa Pine Forest & Woodland

Type Concept: This alliance consists of mixed conifer stands dominated by *Abies concolor*, *Pinus monticola*, and *Pinus ponderosa* with varying amounts of *Calocedrus decurrens* and *Pinus contorta* in the tree layer. *Pseudotsuga menziesii* is usually absent. Other conifers present include *Calocedrus decurrens*, *Pinus contorta*, and *Pinus monticola* in the tree layer. This alliance includes stands of *Pinus ponderosa* var. *washoensis* also limited to the east side of the Sierra Nevada. Understories are typically open, with moderately low shrub cover and diversity that includes *Arctostaphylos patula*, *Arctostaphylos nevadensis*, *Chrysolepis sempervirens*, *Ceanothus* sp., and *Ribes viscosissimum*. Common herbaceous taxa include *Arnica cordifolia*, *Festuca* sp., *Poa nervosa*, *Carex inops*, *Pyrola picta*, and *Hieracium albiflorum*. In openings, *Wyethia mollis* can be abundant. Stands occur on the Modoc Plateau and Warner Mountains of California, north along the east slope of the southern Cascades in Oregon. These forests and woodlands range from just above the zone of ponderosa pine in the montane zone, to the upper montane zone at elevations of 1370 to over 2135 m (4500-7000 feet). Occurrences are found on all slopes and aspects, although more frequently on drier areas, including northwest- and southeast-facing slopes, but also on northerly slopes and ridges.

Classification Comments: Associations within Southern Rocky Mountain Lower Montane Forest Macrogroup (M022) are highly related (e.g., Southern Rocky Mountain Ponderosa Pine Forest & Woodland Group (G228) and Southern Rocky Mountain White Fir - Douglas-fir Dry Forest Group (G226)). Further study is needed to determine whether the alliance in this group (G344) should be separate (at the division level) from these other groups. Treatment of *Pinus ponderosa* varieties has been recently revised (cf. Haller and Vivrette 2011).

Internal Comments: J. Evens 10-13: This type occurs regularly in Oregon so the name should be further changed from Eastern Sierran. Potentially consider *Pinus ponderosa* var. *washoensis* in this alliance. mjr 10-13: Haller and Vivrette 2011 [need full citation]

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Mixed dominance of *Abies concolor* and *Pinus ponderosa*.

VEGETATION

Physiognomy and Structure: This alliance tends to be more woodland than forest in character, with conifer trees (15-20 m tall), and the undergrowth is more open and drier, with little shrub or herbaceous cover.

Floristics: This alliance consists of mixed conifer stands dominated *Abies concolor*, *Pinus monticola*, and *Pinus ponderosa* with varying amounts of *Calocedrus decurrens* and *Pinus contorta* in the tree layer. *Pseudotsuga menziesii* is usually absent. Understories are typically open, with moderately low shrub cover and diversity that includes *Arctostaphylos patula*, *Arctostaphylos nevadensis*, *Chrysolepis sempervirens*, *Ceanothus* sp., and *Ribes viscosissimum*. Common herbaceous taxa include *Arnica cordifolia*, *Festuca* sp., *Poa nervosa*, *Carex inops*, *Pyrola picta*, and *Hieracium albiflorum*. In openings, *Wyethia mollis* can be abundant.

ENVIRONMENT & DYNAMICS

Environmental Description: These forests and woodlands range from just above the zone of ponderosa pine in the montane zone, to the upper montane zone. Elevations range from 1370 m to over 2135 m (4500-7000 feet). Occurrences are found on all slopes and aspects, although more frequently on drier areas, including northwest- and southeast-facing slopes, but also occurs on northerly slopes and ridges. This alliance generally occurs on basalts, andesite, glacial till, basaltic rubble, colluvium, or volcanic ash-derived soils, and sometimes on granitics (Carson Range). These soils have characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. Climatically, this alliance occurs somewhat in the rainshadow of the Sierras and Cascades and has a more continental regime, similar to the northern Great Basin. This alliance tends to be more woodland than forest in character, and the undergrowth is more open and drier, with little shrub or herbaceous cover. Tree regeneration is less prolific than in other mixed-montane conifer alliances of the Cascades, Sierra Nevada and California Coast Ranges. In the Warner Mountains, the *Abies lowiana* stands range from 1675 to 2135 m (5500-7000 feet) in elevation, and the mixed *Pinus monticola* - *Abies concolor* is usually above 2135 m (7000 feet).

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found in south-central Oregon and central to northeastern California.

Nations: US

States/Provinces: CA, OR

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Abies concolor* Series (Johnston 1987)
- >< Interior Douglas-fir: 210 (Eyre 1980) [southwestern stands]
- >< Sierra Nevada Mixed Conifer: 243 (Eyre 1980)
- >< Western Needleleaf Forests: 20: Spruce-Fir-Douglas fir Forest (*Picea-Abies-Pseudotsuga*) (Küchler 1964)
- >< Western Needleleaf Forests: 5: Mixed Conifer Forest (*Abies-Pinus-Pseudotsuga*) (Küchler 1964)
- >< White Fir: 211 (Eyre 1980) [Pacific coastal stands]

LOWER LEVEL UNITS

Associations:

- CEGLO00014 *Abies concolor* - *Pinus ponderosa* / *Amelanchier alnifolia* Forest
- CEGLO00256 *Abies concolor* - *Pinus contorta* / *Carex pensylvanica* - *Achnatherum occidentale* Forest
- CEGLO00257 *Abies concolor* - *Pinus ponderosa* / *Carex inops* ssp. *inops* Forest
- CEGLO00258 *Abies concolor* - *Pinus ponderosa* / *Ceanothus velutinus* Forest
- CEGLO00017 *Abies concolor* - *Pinus ponderosa* / *Arctostaphylos patula* - *Mahonia* spp. Forest
- CEGLO00259 *Abies concolor* - *Pinus ponderosa* / *Purshia tridentata* Woodland
- CEGLO00018 *Abies concolor* - *Pinus ponderosa* / *Symphoricarpos* spp. Forest
- CEGLO00260 *Abies concolor* - *Pinus monticola* / *Ribes viscosissimum* Forest

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel and J. Evens

Acknowledgments: We have incorporated significant descriptive information previously compiled by J. Evens.

Version Date: 2014/12/18

REFERENCES

References: Atzet and McCrimmon 1990, Atzet and Wheeler 1984, Atzet et al. 1996, Chappell et al. 1997, Conard and Radosevich 1982, Dealy 1971, Eyre 1980, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Haller and Vivrette 2011, Hopkins 1979a, Hopkins 1979b, Johnston 1984, Johnston 1987, Küchler 1964, Sawyer and Keeler-Wolf 1995, Volland 1976

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G344. Californian Montane Conifer Forest & Woodland

A3674. *Abies concolor* - *Pseudotsuga menziesii* Coastal, Cascadian & Sierran Forest Alliance

Type Concept Sentence: This alliance consists of stands where the upper tree canopy has a mixed codominance of *Abies concolor* and *Pseudotsuga menziesii*. Other tree species present may include *Calocedrus decurrens*, *Chrysolepis chrysophylla*, *Cornus nuttallii*, *Pinus ponderosa*, *Quercus chrysolepis*, and/or *Quercus kelloggii*. This alliance occurs in Oregon and California mountains.

OVERVIEW

Scientific Name: *Abies concolor* - *Pseudotsuga menziesii* Coastal, Cascadian & Sierran Forest Alliance

Common Name (Translated Scientific Name): White Fir - Douglas-fir Coastal, Cascadian & Sierran Forest Alliance

Colloquial Name: Coastal, Cascadian & Sierran White Fir - Douglas-fir Forest

Type Concept: This is a forest alliance where the upper tree canopy is a mixed codominance of *Abies concolor* and *Pseudotsuga menziesii*. Other tree species often present include *Calocedrus decurrens*, *Chrysolepis chrysophylla*, *Cornus nuttallii*, *Pinus lambertiana*, *Pinus ponderosa*, *Quercus chrysolepis*, and *Quercus kelloggii*. *Pinus lambertiana* has less than 5% absolute cover, and less than 2% relative cover. Stands can have well-developed shrub layers or no shrub layer, and stands can have greater diversity of mixed trees in the upper canopy. Understory species are characteristic of the Vancouverian flora which differentiates this alliance from its Rocky Mountain counterpart. Characteristic understory and undergrowth species include *Anemone deltoidea*, *Ceanothus cordulatus*, *Chrysolepis chrysophylla*, *Corylus cornuta*, *Holodiscus discolor*, *Notholithocarpus densiflorus* (= *Lithocarpus densiflorus*), *Mahonia aquifolium*, *Quercus sadleriana*, *Quercus vaccinifolia*, *Rubus nivalis*, *Taxus brevifolia*, *Toxicodendron diversilobum*, and *Whipplea modesta*. The alliance occurs throughout the Oregon Coast Ranges, southern Cascades and Klamath Mountains south into the California northern Coast Ranges, California Cascades and Sierra Nevada.

Classification Comments: This alliance is based on the *Abies concolor* - *Pseudotsuga menziesii* Forest Alliance described by Sawyer et al. (2009), where the two conifers share codominance in the tree canopy (both 30-60% relative cover). These are stands of *Abies concolor* that are generally lower in elevation than *Abies concolor* mixed with *Pinus lambertiana*, so is considered drier with a higher fire frequency. Associations in this alliance are closely related to types within Southern Rocky Mountain White Fir - Douglas-fir Dry Forest Group (G226) and Rocky Mountain Douglas-fir - White Fir - Blue Spruce Mesic Forest Group (G225); further study is needed to determine whether the alliance in this group (G344) should be separate (at the division level) from these other groups.

Internal Comments: J. Evens 10-13: If this alliance is kept separate from those in the related Southern Rocky Mountain groups, then you need to expand on the shrub understory and other characteristics that would make this alliance different.

Other Comments:

Similar NVC Types:

- A3420 *Abies concolor* Dry Forest & Woodland Alliance: occurs in the Rocky Mountains with Rocky Mountain characteristic understory species such as *Quercus gambelii*, *Carex siccata*, *Festuca thurberi*, and *Danthonia parryi*; codominant tree

Diagnostic Characteristics: Upper canopy codominance of *Abies concolor* with *Pseudotsuga menziesii* (both present with 30-60% relative cover).

VEGETATION

Physiognomy and Structure: Forests within this alliance are characterized by evergreen needle-leaved trees 20-50+ m in height.

Floristics: Upper tree canopy is a mixed codominance of *Abies concolor* and *Pseudotsuga menziesii*. Other tree species often present include *Calocedrus decurrens*, *Chrysolepis chrysophylla*, *Cornus nuttallii*, *Pinus lambertiana*, *Pinus ponderosa*, *Quercus chrysolepis*, and *Quercus kelloggii*. *Pinus lambertiana* has less than 5% absolute cover, and less than 2% relative cover. Stands can have well-developed shrub layers or no shrub layer, and stands can have greater diversity of mixed trees in the upper canopy. Understory species are characteristic of the Vancouverian flora which differentiates this alliance from its Rocky Mountain counterpart. Characteristic understory and undergrowth species include *Anemone deltoidea*, *Ceanothus cordulatus*, *Chrysolepis chrysophylla*, *Corylus cornuta*, *Holodiscus discolor*, *Notholithocarpus densiflorus* (= *Lithocarpus densiflorus*), *Mahonia aquifolium*, *Quercus sadleriana*, *Quercus vaccinifolia*, *Rubus nivalis*, *Taxus brevifolia*, *Toxicodendron diversilobum*, and *Whipplea modesta*.

These are mixed conifer forests in which *Abies concolor* is always present either in the canopy or in the tree-regeneration layer. Other conifers, such as *Calocedrus decurrens*, *Pinus lambertiana*, *Pinus ponderosa*, *Pseudotsuga menziesii*, are usually present in the canopy or understory. *Notholithocarpus densiflorus* may occur in small stands or as scattered individuals throughout these forests. A distinctive group of cold-deciduous or sclerophyllous broad-leaved trees are sometimes common in these stands, including *Arbutus menziesii*, *Quercus kelloggii*, *Quercus chrysolepis*, *Quercus sadleriana*, and *Chrysolepis chrysophylla* (= *Castanopsis chrysophylla*). Ericaceous or cold-deciduous shrubs are common, particularly in young or somewhat open stands. Recurrent species include *Amelanchier alnifolia*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Ceanothus velutinus*, *Gaultheria shallon*, *Holodiscus discolor*, *Mahonia nervosa*, *Mahonia aquifolium* (= *Mahonia piperiana*), *Symphoricarpos mollis*, *Symphoricarpos albus*, *Quercus vaccinifolia*, *Toxicodendron diversilobum*, *Rubus ursinus*, and *Vaccinium* spp. The herb layer is typically dominated by shade-tolerant

forbs or ferns, including *Pyrola picta*, *Orthilia secunda*, *Chimaphila umbellata*, *Achlys triphylla*, *Polystichum munitum*, *Pteridium aquilinum*, and *Maianthemum stellatum*. Graminoids include *Bromus vulgaris*, *Elymus glaucus*, and *Festuca californica*.

In the Sierra Nevada and southern California ranges, these forests form an upper elevation phase of the mixed conifer forests of middle elevations. *Abies concolor* is typically dominant, but other conifers commonly present include *Pinus ponderosa*, *Pinus jeffreyi*, *Pinus lambertiana*, *Pinus monophylla*, *Pinus contorta*, *Calocedrus decurrens*, *Pseudotsuga menziesii*, *Abies magnifica* var. *magnifica*, and *Abies magnifica* var. *shastensis* (= *Abies x shastensis*). Common hardwood associates include *Cornus nuttallii* and *Quercus kelloggii*. Ericaceous or cold-deciduous shrubs include *Arctostaphylos patula*, *Arctostaphylos nevadensis*, *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), *Ceanothus prostratus*, *Ceanothus integerrimus*, *Rubus parviflorus*, *Prunus emarginata*, and *Salix scouleriana*. On the eastern slope of the Sierra Nevada, *Purshia tridentata* and *Artemisia tridentata* may be common. The herbaceous layer is composed largely of forbs, including *Asarum hartwegii*, *Clintonia uniflora*, *Lupinus latifolius*, *Adenocaulon bicolor*, *Sarcodes sanguinea*, and *Osmorhiza berteroi* (= *Osmorhiza chilensis*).

ENVIRONMENT & DYNAMICS

Environmental Description: Stands occur at elevations of 1000-1800 m in the Oregon Coast Ranges. The climate is cool and wet with annual precipitation totals 90-150 cm, and moderate to deep (1-3 m) snow accumulations. Summers are usually dry, and soil moisture is dependent upon winter snowpacks. Precipitation decreases southward, with the relative importance of spring and fall rainfall decreasing. These forests are generally associated with somewhat moist, topographically protected microhabitats which are less fire-prone than surrounding areas. The majority of these are now closed-canopy forests in which a moderately high fire frequency (20-30 years) formerly maintained an open forest of many conifers. At higher elevations, the stands are naturally more closed and burn less frequently. Soils are usually deep and composed of deep ash deposits and organic layers in the Cascades, and fractured granitics in the south.

In Pacific coast stands, these forests occur at relatively low elevations (370-1500 m) with most of the precipitation occurring as winter rain or snow. Annual precipitation ranges from over 200 cm in the northern Sierra Nevada and Siskiyou Mountains. The Sierra Nevada has dry summers. Stands occupy a variety of topo-edaphic positions, such as lower and middle slopes of ravines, upper slopes at higher elevations, canyon sideslopes, along stream terraces, ridgetops, and north- and east-facing slopes that burn somewhat infrequently. Parent materials and soils are highly variable and nondefinitive for these forests. Temperature and moisture regimes appear to be the key factors in their distribution.

Dynamics: These forests are late-seral, ancient forest communities which can persist for very long periods under the present climate. Following low-intensity fire or other disturbance, *Pseudotsuga menziesii*, or *Pinus* spp. commonly become established in these communities and can grow to reach the canopy, persisting for centuries. Usually, however these stands occur on sites where fires or other disturbances are rare. In Oregon, the majority of these forests now have closed canopies, where in the past a moderately high fire frequency (20-30 years) formerly maintained an open forest of many conifers. With fire suppression, *Abies concolor* tends to replace many of the important conifers at lower elevation sites (Chappell et al. 1997). At higher elevations, the stands are naturally more closed and burn less frequently. Forb, shrub, and wildlife diversity varies greatly with the substrate (Chappell et al. 1997). In California, frequent surface fires restricted these forests to rather moist or less fire-prone areas. With fire suppression, *Abies concolor* has vigorously colonized many sites which were formerly occupied by open *Pinus ponderosa* woodlands. These invasions have dramatically changed the fuel load and potential behavior of fire in these forests. In particular, the potential for high-intensity crown fires has increased. In some areas of the Pacific ranges, hot, stand-replacing fires lead to establishment of dense chaparral thickets which germinate from buried seed. Such stands are highly competitive with coniferous forest species and may slow forest reestablishment.

DISTRIBUTION

Geographic Range: This alliance is found in the Oregon Coast Ranges, Klamath Mountains and southern Cascades, and California northern Coast Ranges, Klamath Mountains, Sierra Nevada, and southern Cascades.

Nations: US

States/Provinces: CA, OR

TNC Ecoregions [optional]: 4:C, 5:C, 12:C, 14:C

USFS Ecoregions (2007): M261A:CC, M261B:CC, M261D:CC, M261E:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Abies concolor* - *Pseudotsuga menziesii* (White fir - Douglas fir forest) Alliance (Sawyer et al. 2009) [88.530.00]
- = *Abies concolor*-*Pseudotsuga menziesii* Forest Alliance (CNPS 2017) [88.530.00]
- >< Interior Douglas-fir: 210 (Eyre 1980)

- >> Sierra Nevada Mixed Conifer: 243 (Eyre 1980)
- >> Sierran Mixed Coniferous Forest (#84230) (Holland 1986b)
- >> Sierran White Fir Forest (#84240) (Holland 1986b)
- >> Western Needleleaf Forests: 20: Spruce-Fir-Douglas fir Forest (*Picea-Abies-Pseudotsuga*) (Küchler 1964)
- >> Western Needleleaf Forests: 5: Mixed Conifer Forest (*Abies-Pinus-Pseudotsuga*) (Küchler 1964)
- >> Western White Pine Series (Sawyer and Keeler-Wolf 1995)
- >> White Fir: 211 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEGLO00028 *Abies concolor* / *Taxus brevifolia* Forest
- CEGLO07345 *Pseudotsuga menziesii* - (*Pinus contorta*) / *Arctostaphylos uva-ursi* / *Racomitrium canescens* Woodland
- CEGLO00021 *Abies concolor* - *Pseudotsuga menziesii* / *Holodiscus discolor* Forest
- CEGLO00013 *Pseudotsuga menziesii* - *Abies concolor* / *Gaultheria shallon* Forest
- CEGLO00019 *Abies concolor* - *Pseudotsuga menziesii* / *Mahonia nervosa* Forest
- CEGLO00020 *Abies concolor* - *Pseudotsuga menziesii* / *Mahonia aquifolium* Forest
- CEGLO00245 *Abies concolor* / *Chrysolepis chrysophylla* Forest
- CEGLO08608 *Abies concolor* / *Ceanothus cordulatus* Forest
- CEGLO00023 *Abies concolor* / *Quercus sadleriana* Forest
- CEGLO00024 *Abies concolor* / *Rubus nivalis* Forest
- CEGLO00010 *Abies concolor* / *Amelanchier alnifolia* / *Anemone deltoidea* Forest
- CEGLO00012 *Abies concolor* / *Mahonia nervosa* Forest
- CEGLO00246 *Abies concolor* / *Ceanothus velutinus* Forest
- CEGLO00264 *Abies concolor* / *Vaccinium membranaceum* Forest
- CEGLO00015 *Abies concolor* / *Chimaphila umbellata* Forest
- CEGLO00022 *Abies concolor* - *Pseudotsuga menziesii* / *Whipplea modesta* Forest
- CEGLO00025 *Abies concolor* / *Maianthemum stellatum* Forest
- CEGLO00262 *Abies concolor* / *Toxicodendron diversilobum* Forest
- CEGLO00026 *Abies concolor* / *Symphoricarpos albus* Forest
- CEGLO03449 *Pinus monticola* - *Pseudotsuga menziesii* / *Quercus vacciniifolia* - *Notholithocarpus densiflorus* Woodland
- CEGLO00027 *Abies concolor* / *Symphoricarpos mollis* Forest
- CEGLO05629 *Pseudotsuga menziesii* - *Abies concolor* / *Polystichum munitum* Forest
- CEGLO05630 *Pseudotsuga menziesii* - *Abies concolor* - *Umbellularia californica* / *Polystichum munitum* Forest
- CEGLO05631 *Pseudotsuga menziesii* - *Abies grandis* / *Acer circinatum* / *Polystichum munitum* Forest
- CEGLO00011 *Abies concolor* / *Amelanchier alnifolia* - *Corylus cornuta* Forest

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel and D. Sarr

Acknowledgments: We have incorporated significant descriptive information previously compiled by J. Evens.

Version Date: 2014/12/18

REFERENCES

References: Atzet and McCrimmon 1990, Atzet and Wheeler 1984, Atzet et al. 1996, Barbour 1988, CNPS 2017, Chappell et al. 1997, Cheng 2004, Conard and Radosevich 1982, Eyre 1980, Faber-Langendoen et al. 2017b, Fites 1993, Fites-Kaufman et al. 2007, Franklin 1988, Franklin and Dyrness 1973, Gordon 1980, Griffin and Critchfield 1972, Hendrickson and Prigge 1975, Hermann and Lavender 1990, Holland 1986b, Hopkins 1979a, Hopkins 1979b, Jimerson 1993, Johnston 1984, Keeler-Wolf et al. 2003a, Küchler 1964, Laacke 1990a, Laacke and Fiske 1983, Laidlaw-Holmes 1981, Sawyer 2006, Sawyer 2007, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Stuart et al. 1992, Sugihara et al. 2006, Taylor and Teare 1979a, Uchytel 1991b, Volland 1976, Zouhar 2001a

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G344. Californian Montane Conifer Forest & Woodland

A0156. *Picea breweriana* - *Abies concolor* Forest Alliance

Type Concept Sentence: This alliance is dominated by several conifer trees: *Abies* spp., *Picea breweriana*, and *Pseudotsuga menziesii* with *Chamaecyparis lawsoniana* or *Pinus lambertiana* codominating in some stands. *Picea breweriana* is the diagnostic species as it has the most limited geographic range, without which stands belong to a different alliance. These forests occur at high elevations of the Klamath Mountains in southwestern Oregon and northern California.

OVERVIEW

Scientific Name: *Picea breweriana* - *Abies concolor* Forest Alliance

Common Name (Translated Scientific Name): Brewer Spruce - White Fir Forest Alliance

Colloquial Name: Northwestern Brewer Spruce - White Fir Forest

Type Concept: This is a mixed conifer alliance dominated by *Abies* spp., *Picea breweriana*, and *Pseudotsuga menziesii* with *Chamaecyparis lawsoniana* or *Pinus lambertiana* codominating in some stands. *Picea breweriana* is diagnostic of these stands, because it has the most limited geographic range, without which stands belong to a different alliance. Broad-leaved trees may also be present and include *Quercus sadleriana*, *Quercus vaccinifolia*, *Quercus kelloggii*, *Chrysolepis chrysophylla* (= *Castanopsis chrysophylla*), and *Notholithocarpus densiflorus* (= *Lithocarpus densiflorus*). Shrub layers include *Arctostaphylos nevadensis*, *Chimaphila umbellata*, *Holodiscus discolor*, *Mahonia nervosa*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Vaccinium membranaceum*, or *Vaccinium parvifolium*. The herbaceous layer is typically sparse with 12-25% cover. Forests are found at relatively high (subalpine) elevations (1170-1560 m) within the rainshadow of the Coast Ranges. Stands occur on steep rugged mountain slopes and benches but not in valleys. Slopes are moderate to steep, and aspects range from southwesterly to northern. Parent materials are primarily granitics, gabbro, diorite, granodiorite and andesite with some metamorphics. These forests occur in the Klamath Mountains of southwestern Oregon and northern California.

Classification Comments: *Abies concolor* is typically the codominant, but *Abies procera* or *Abies magnifica* var. *shastensis* may replace *Abies concolor* in some stands (J. Evens pers. comm. 2014). *Picea breweriana* is the most famous relict of the Klamath Mountains (Sawyer 2006). It grows on high-elevation, cool sites in the montane and subalpine belts as local, isolated groves of varying size, as single individuals invading forests and montane chaparral, and as scattered individuals in dense, mixed conifer forests (Cope 1992c). Ecologists in Oregon have recognized the alliance (Kagan et al. 2004); ecologists in California have focused on the species (Cheng 2004), or they have considered the tree to be a secondary species of other forest types (Jimerson et al. 1996).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure: Tall evergreen forests (>50 m) with a subcanopy of conifers and broad-leaved trees and tall shrubs. It is structurally diverse, typically closed-canopy coniferous forest, with a continuous vertical structure difficult to categorize as layers.

Floristics: This is a mixed conifer alliance dominated by *Abies concolor*, *Abies procera*, *Abies magnifica* var. *shastensis*, *Picea breweriana*, and *Pseudotsuga menziesii* with *Chamaecyparis lawsoniana* or *Pinus lambertiana* codominating in some stands. *Picea breweriana* is diagnostic of these stands and forms a moderately dense (40-60% cover) subcanopy less than 25 m in height, under the other conifers, which average over 50 m in height. Other species that may be present to codominate in the subcanopy include the broad-leaved trees *Quercus sadleriana*, *Quercus vaccinifolia*, *Quercus kelloggii*, *Chrysolepis chrysophylla* (= *Castanopsis chrysophylla*), and *Notholithocarpus densiflorus* (= *Lithocarpus densiflorus*). These forests are diverse with as many as 7 other tree species occurring in some stands, most often with <10% cover. Total tree cover averages 75%. Both tall- and short-shrub layers are usually present. The tall layer is dominated by conifer regeneration, especially of *Picea breweriana* and *Abies concolor*, with the broad-leaved evergreen small tree/tall shrubs *Quercus sadleriana* or *Quercus vaccinifolia* often codominant. The short-shrub layer is dominated by a mix of broad-leaved deciduous and evergreen species such as *Arctostaphylos nevadensis*, *Chimaphila umbellata*, *Holodiscus discolor*, *Mahonia nervosa*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Vaccinium membranaceum*, or *Vaccinium parvifolium*. Although diverse in species, average shrub cover ranges from relatively sparse to moderately dense (22-46% cover) depending on the community. The herbaceous layer is typically sparse with 12-25% cover. Common species include *Arnica cordifolia*, *Galium ambiguum*, *Goodyera oblongifolia*, and *Pyrola picta*. Nonvascular ground cover, of mostly mosses, varies from 2% to over 70% depending on site conditions.

ENVIRONMENT & DYNAMICS

Environmental Description: These forests occur at high elevations (subalpine 1170-1560 m) on rugged, deeply dissected terrain. The climate of the region is maritime, with wet, mild winters, and cool, relatively dry summers at higher elevations. Precipitation is less than 75 cm annually on the eastern slope, where a rainshadow effect is pronounced and summers are very dry. Stands occur on mountain slopes and benches but not in valleys. Slopes are moderate to steep, and aspects range from warm, being southwesterly to westerly, to northern aspects which are cooler and result in cool soil temperatures and slow warming during the growing season. Local topographic effects result in increased fog and humidities, as well as orographically produced summer precipitation. Most sites with *Chamaecyparis lawsoniana* have abundant soil moisture or high atmospheric moisture as a result of fog. Parent materials are

primarily granitics, gabbro, diorite, granodiorite and andesite with some metamorphics. Soils derived from the granitics are very infertile and are low in most essential elements. Soils derived from the metamorphics are shallow and rocky.

Dynamics: Low-intensity surface fires kill *Picea breweriana* because it has thin bark, drooping branches, and a shallow root system. Recovery from fire takes several decades or centuries if seed sources exist. Seedlings establish in shaded conditions with reduced moisture stress (Sawyer and Thornburgh 1977, Thornburgh 1990). The most developed stands tend to occur on very steep, rocky, fire-protected sites.

DISTRIBUTION

Geographic Range: Forests in this alliance have been described from southwestern Oregon and the adjacent region of northern California.

Nations: US

States/Provinces: CA, OR

TNC Ecoregions [optional]: 5:C

USFS Ecoregions (2007): M261A:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Picea breweriana* (Brewer spruce forest) Alliance (Sawyer et al. 2009) [83.300.00]
- = *Picea breweriana* Forest Alliance (CNPS 2017) [83.300.00]
- ? Enriched stands in the Klamath Mountains (Sawyer and Keeler-Wolf 1995)
- >< Salmon-Scott Enriched Coniferous Forest (#85420) (Holland 1986b)
- >< Siskiyou Enriched Coniferous Forest (#85410) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEGLO00049 *Abies concolor* - *Chamaecyparis lawsoniana* - *Picea breweriana* / *Quercus vaccinifolia* Forest
- CEGLO00050 *Abies concolor* - *Picea breweriana* / *Chimaphila umbellata* Forest
- CEGLO00041 *Abies concolor* - *Chamaecyparis lawsoniana* - *Pseudotsuga menziesii* / (*Mahonia nervosa*) / *Achlys triphylla* Forest
- CEGLO00052 *Abies concolor* - *Picea breweriana* / *Vaccinium membranaceum* / *Goodyera oblongifolia* Forest
- CEGLO00051 *Abies concolor* - *Picea breweriana* / *Gaultheria ovatifolia* / *Orthilia secunda* Forest

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel and K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Atzet and Wheeler 1982, Atzet and Wheeler 1984, Atzet et al. 1996, CNPS 2017, Cheng 2004, Cope 1992c, Eckert and Eckert 2007, Faber-Langendoen et al. 2017b, Hawk 1977, Holland 1986b, Jimerson et al. 1996, Reid et al. 1994, Sawyer 2006, Sawyer 2007, Sawyer and Keeler-Wolf 1995, Sawyer and Thornburgh 1977, Sawyer et al. 2009, Thornburgh 1990

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G344. Californian Montane Conifer Forest & Woodland

A3676. *Pinus jeffreyi* - *Pinus ponderosa* var. *washoensis* Mixed Conifer Woodland Alliance

Type Concept Sentence: The alliance is dominated by *Pinus jeffreyi* or *Pinus ponderosa* var. *washoensis* with a dense to open canopy ranging from forests to woodlands to wooded herbaceous stands. Other trees that can be codominant include *Pinus ponderosa*, *Calocedrus decurrens*, *Chrysolepis chrysophylla*, *Pseudotsuga menziesii*, *Pinus monticola*, *Pinus monophylla*, *Abies magnifica*, and *Abies concolor*. This alliance occurs on well-drained, productive or infertile soils regardless of parent material throughout much of California, including the east side of the Sierra Nevada and Modoc Plateau area, the Klamath Mountains and northern Coast Ranges.

OVERVIEW

Scientific Name: *Pinus jeffreyi* - *Pinus ponderosa* var. *washoensis* Mixed Conifer Woodland Alliance

Common Name (Translated Scientific Name): Jeffrey Pine - Washoe Pine Mixed Conifer Woodland Alliance

Colloquial Name: Jeffrey Pine - Washoe Pine Mixed Conifer Woodland

Type Concept: The alliance is dominated by *Pinus jeffreyi* or *Pinus ponderosa* var. *washoensis* (= *Pinus washoensis*) with a dense to open canopy ranging from forests to woodlands to wooded herbaceous stands. Other codominant trees include *Pinus ponderosa*, *Calocedrus decurrens*, *Chrysolepis chrysophylla*, *Pseudotsuga menziesii*, *Pinus monticola*, *Pinus monophylla*, *Abies magnifica*, and *Abies concolor*. Additional trees that may be present include *Arbutus menziesii*, *Quercus kelloggii*, *Quercus chrysolepis*, *Quercus wislizeni*, *Pinus ponderosa*, and *Chamaecyparis lawsoniana*. Shrubs present may include *Artemisia tridentata* ssp. *vaseyana*, *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Arctostaphylos canescens*, *Ceanothus pumilus* (= *Ceanothus prostratus* ssp. *pumilus*), *Ceanothus cuneatus*, *Ceanothus cordulatus*, *Ceanothus velutinus*, *Cercocarpus ledifolius*, *Chrysolepis sempervirens*, *Ericameria ophitidis*, *Purshia tridentata*, *Quercus vacciniifolia*, *Rhus trilobata*, and/or *Symphoricarpos longiflorus*. This alliance is found throughout much of California, including the east side of the Sierra Nevada and Modoc Plateau area, the Klamath Mountains and northern Coast Ranges. Stands occur on well-drained, productive or infertile soils regardless of parent material. Some self-replicating stands are found on strongly serpentinized peridotite. Most commonly, stands are found on ultramafic-derived soils.

Classification Comments: This includes stands where *Pinus jeffreyi* or *Pinus ponderosa* var. *washoensis* is the sole tree present, as well as mixed stands. The hybridization between *Pinus ponderosa* var. *ponderosa*, *Pinus jeffreyi*, and *Pinus ponderosa* var. *washoensis* may cause some confusion.

Internal Comments: MSR 1-16: MX? removed. J. Evens 10-13: See comments in AE review about removing this *Pinus washoensis* from the description. *Pinus washoensis* is more widespread than the more restricted stands in California. Do not mix these here. GMK and MSR don't agree as they overlap in similar habitats in the northern part of Pije range.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: *Pinus jeffreyi* or *Pinus ponderosa* var. *washoensis* with >50% relative cover or similar cover to that of other conifer tree species present.

VEGETATION

Physiognomy and Structure: This rounded-crown, needle-leaved evergreen woodland forms an open or intermittent canopy less than 25 m in height. The shrub layer is sparse and the herbaceous layer is grassy.

Floristics: The alliance is dominated by *Pinus jeffreyi* or *Pinus ponderosa* var. *washoensis* (= *Pinus washoensis*) with a dense to open canopy ranging from forests to woodlands to wooded herbaceous stands. Other codominant trees include *Pinus ponderosa*, *Calocedrus decurrens*, *Chrysolepis chrysophylla*, *Pseudotsuga menziesii*, *Pinus monticola*, *Pinus monophylla*, *Abies magnifica*, and *Abies concolor*. Additional trees that may be present include *Arbutus menziesii*, *Quercus kelloggii*, *Quercus chrysolepis*, *Quercus wislizeni*, *Pinus attenuata*, *Pinus contorta* var. *murrayana*, *Pinus ponderosa*, and *Chamaecyparis lawsoniana*. Shrubs present may include *Ceanothus pumilus* (= *Ceanothus prostratus* ssp. *pumilus*), *Ceanothus cuneatus*, *Ceanothus velutinus*, *Arctostaphylos patula*, *Arctostaphylos canescens*, *Purshia tridentata*, *Rhus trilobata*, *Cercocarpus ledifolius*, *Symphoricarpos longiflorus*, *Quercus vacciniifolia*, *Artemisia tridentata* ssp. *vaseyana*, *Ceanothus cordulatus*, *Arctostaphylos nevadensis*, *Ericameria ophitidis*, *Pseudostellaria jamesiana* and *Chrysolepis sempervirens*. Graminoid undergrowth species include *Achnatherum occidentale* (= *Stipa occidentalis*), *Calamagrostis koelerioides*, *Elymus glaucus*, *Elymus elymoides*, *Festuca californica*, *Festuca idahoensis*, *Koeleria macrantha*, *Poa secunda*, and *Poa wheeleri*. Forb species include *Achillea millefolium*, *Allium falcifolium*, *Castilleja applegatei*, *Eriogonum umbellatum*, *Eriophyllum lanatum*, *Iris innominata*, *Lupinus caudatus*, *Phlox divaricata*, *Wyethia mollis*, and *Xerophyllum tenax*. *Pinus contorta* var. *murrayana*, *Pinus jeffreyi*, *Pinus ponderosa*, *Abies magnifica*, *Pinus monticola*, and *Abies concolor* may also be present.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands occur from 60 to 2900 m in elevation. The climate throughout most of this alliance's range is Mediterranean, with warm, dry summers and moist winters. Precipitation ranges from 60-150 cm per year, mostly as rain. The bulk of the rain falls between November and May. Stands occur on rolling topography with moderately steep to steep slopes (12-60%). It occurs on all aspects, but north. Soils are well-drained, gravelly clays and clay loams with 0-25% cobbles. Average bare ground and rock cover is less than 20% each. Most commonly stands are found on serpentine, mixed-ultramafic with metavolcanics and peridotite-derived soils. Some self-replicating stands are found on strongly serpentinized peridotite. Most commonly, stands are found on ultramafic-derived soils.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found throughout much of California, including the east side of the Sierra Nevada and Modoc Plateau area, the Klamath Mountains and northern Coast Ranges. *Pinus ponderosa* var. *washoensis* is limited to the northern portion of this range (northern Sierra Nevada, southern Cascades, and Modoc Plateau).

Nations: US

States/Provinces: CA, NV, OR

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Pinus jeffreyi* / *Arctostaphylos canescens* - *Festuca idahoensis* Plant Association (Atzet et al. 1996)
- ? *Pinus jeffreyi* / *Festuca idahoensis* Plant Association (Atzet et al. 1996)
- > *Pinus jeffreyi* (Jeffrey pine forest) Alliance (Sawyer et al. 2009) [87.020.00]
- < *Pinus ponderosa* (Ponderosa pine forest) Alliance (Sawyer et al. 2009) [87.010.00]
- > *Pinus washoensis* (Washoe pine woodland) Alliance (Sawyer et al. 2009) [87.120.00]
- ? Jeffrey Pine Forest (#85100) (Holland 1986b)
- >< Jeffrey Pine Series (Sawyer and Keeler-Wolf 1995)
- ? Jeffrey Pine: 247 (Eyre 1980)
- ? Northern Ultramafic Jeffrey Pine Forest (#84171) (Holland 1986b)
- ? Southern Ultramafic Jeffrey Pine Forest (#84172) (Holland 1986b)
- >< Washoe Pine-Fir Forest (#85220) (Holland 1986b)

LOWER LEVEL UNITS**Associations:**

- CEGLO08631 *Pinus jeffreyi* - *Abies concolor* / *Symphoricarpos rotundifolius* / *Elymus elymoides* Woodland
- CEGLO00818 *Pinus jeffreyi* - *Pinus monticola* / *Arctostaphylos nevadensis* Woodland
- CEGLO08629 *Pinus jeffreyi* - *Pinus monophylla* Woodland
- CEGLO08624 *Pinus jeffreyi* / *Purshia tridentata* Woodland
- CEGLO03447 *Pinus jeffreyi* / *Quercus vacciniifolia* - *Garrya buxifolia* Woodland
- CEGLO03156 *Pinus jeffreyi* - *Quercus chrysolepis* / *Arctostaphylos viscida* Woodland
- CEGLO08632 *Pinus jeffreyi* - *Abies magnifica* Woodland
- CEGLO03078 *Pinus ponderosa* var. *washoensis* Woodland
- CEGLO00819 *Pinus jeffreyi* - *Pseudotsuga menziesii* / *Arctostaphylos viscida* Woodland
- CEGLO00820 *Pinus jeffreyi* - *Calocedrus decurrens* / *Quercus vacciniifolia* Woodland
- CEGLO03448 *Pinus jeffreyi* / *Quercus vacciniifolia* - *Arctostaphylos nevadensis* Woodland
- CEGLO08626 *Pinus jeffreyi* / *Cercocarpus ledifolius* Woodland
- CEGLO00817 *Pinus jeffreyi* / *Festuca idahoensis* ssp. *roemeri* Wooded Grassland
- CEGLO08625 *Pinus jeffreyi* / *Chrysolepis sempervirens* Woodland
- CEGLO08627 *Pinus jeffreyi* / *Arctostaphylos patula* Woodland
- CEGLO08628 *Pinus jeffreyi* / *Ceanothus cordulatus* Woodland
- CEGLO00816 *Pinus jeffreyi* / *Ceanothus pumilus* Wooded Grassland
- CEGLO08714 *Pinus jeffreyi* / *Quercus vacciniifolia* Sierra Nevada Woodland
- CEGLO08630 *Pinus jeffreyi* - *Abies concolor* Woodland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel and J. Evens

Acknowledgments: We have incorporated significant descriptive information previously compiled by J. Evens.

Version Date: 2014/12/18

REFERENCES

References: Atzet and Wheeler 1984, Atzet et al. 1996, Eyre 1980, Faber-Langendoen et al. 2017b, Holland 1986b, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G344. Californian Montane Conifer Forest & Woodland

A3673. *Pinus ponderosa* - *Calocedrus decurrens* - *Pseudotsuga menziesii* Forest Alliance

Type Concept Sentence: This forest alliance is codominated by *Pseudotsuga menziesii*, *Pinus ponderosa*, and *Calocedrus decurrens*. A variety of other conifers usually co-occur, including *Pinus lambertiana*, *Pinus jeffreyi*, and/or *Pinus attenuata*. This alliance occurs along the western slope of the southern Oregon Cascades and throughout the Klamath Mountains in Oregon and California, south into the California Coast Ranges. It occurs at low to middle elevations (600-1200 m) with high winter rainfall (75-250 cm), warm to hot, dry summers, and extremely variable geology.

OVERVIEW

Scientific Name: *Pinus ponderosa* - *Calocedrus decurrens* - *Pseudotsuga menziesii* Forest Alliance

Common Name (Translated Scientific Name): Ponderosa Pine - Incense-cedar - Douglas-fir Forest Alliance

Colloquial Name: Ponderosa Pine - Incense-cedar - Douglas-fir Forest

Type Concept: These forests are typically codominated by *Pseudotsuga menziesii*, *Pinus ponderosa* var. *benthamiana* (= *Pinus ponderosa* var. *pacifica*), and *Calocedrus decurrens*. A variety of other conifers co-occur, including *Pinus lambertiana*, *Pinus jeffreyi*, and/or *Pinus attenuata*. A diverse broad-leaved deciduous or evergreen tree layer may be present and may include *Quercus garryana*, *Arbutus menziesii*, *Notholithocarpus densiflorus* (= *Lithocarpus densiflorus*), *Umbellularia californica*, *Acer macrophyllum*, and others. *Quercus kelloggii* and *Quercus chrysolepis* may also codominant in the Sierra Nevada. A shrub layer may or may not be present and is generally best developed in comparatively moist northern or high-elevation stands. Common species in such mesic stands include *Acer circinatum*, *Mahonia nervosa*, *Gaultheria shallon*, and *Cornus nuttallii*, which can occasionally be a small tree. In southern or lower elevation stands, drought-tolerant species such as *Holodiscus discolor*, *Toxicodendron diversilobum*, *Symphoricarpos mollis*, *Ceanothus* spp., and *Arctostaphylos* spp. become prevalent. The herbaceous understory can be similarly variable, depending upon site moisture, canopy closure, and location. This alliance occurs along the western slope of the southern Oregon Cascades and throughout the Klamath Mountains in Oregon and California. From the Klamath region, the range extends south into the California Coast Ranges as far as the Yolla-Bolly region, and in the Sierra Nevada as far south as Yosemite National Park. These communities are usually associated with sunny aspects and droughty or infertile soils of lower mountain slopes. They occur at low to middle elevations (600-1200 m) with high winter rainfall (75-250 cm), warm to hot, dry summers, and extremely variable geology.

Classification Comments: This alliance includes *Pinus ponderosa* var. *benthamiana*; other races of *Pinus ponderosa* are in other USNVC groups. This alliance lacks *Abies concolor* in the upper canopy or, if present, has less than 10% relative cover, or may be present only in subcanopy regenerating layers.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Upper canopy mixed dominance by two of the three nominal species.

VEGETATION

Physiognomy and Structure: Vegetation within this alliance is typified by a closed or nearly closed canopy of needle-leaved evergreen trees approaching 50 m in height. A subcanopy of broad-leaved cold-deciduous or evergreen trees is common. The shrub layer is often structurally diverse, sometimes with several strata of cold-deciduous and evergreen species. The herbaceous layer is variable, from sparse graminoid cover in xeric stands to dense forb, graminoid, and fern cover in moist habitats.

Floristics: These forests are typically codominated by *Pseudotsuga menziesii*, *Pinus ponderosa* var. *benthamiana* (= *Pinus ponderosa* var. *pacifica*), and *Calocedrus decurrens*. A variety of other conifers co-occur, including *Pinus lambertiana*, *Pinus jeffreyi*, and *Pinus attenuata*. A diverse broad-leaved deciduous or evergreen tree layer may be present and may include *Quercus garryana*, *Arbutus menziesii*, *Notholithocarpus densiflorus* (= *Lithocarpus densiflorus*), *Umbellularia californica*, *Acer macrophyllum*, and others. *Quercus kelloggii* and *Quercus chrysolepis* are reported to share a codominance with these mixed conifers in Yosemite and other areas in the Sierra Nevada. A shrub layer may or may not be present and is generally best developed in comparatively moist northern or high-elevation stands. Common species in such mesic stands include *Acer circinatum*, *Mahonia nervosa*, *Gaultheria shallon*, and *Cornus nuttallii*, which can occasionally be a small tree. In southern or lower elevation stands, drought-tolerant species such as *Holodiscus discolor*, *Toxicodendron diversilobum*, *Symphoricarpos mollis*, *Ceanothus* spp., and *Arctostaphylos* spp. become prevalent. The herbaceous understory can be similarly variable, depending upon site moisture, canopy closure, and location.

ENVIRONMENT & DYNAMICS

Environmental Description: The associations in this alliance occur in low to middle elevations (600-1200 m) with high winter rainfall (75-250 cm), warm to hot, dry summers, and extremely variable geology. These communities are usually associated with sunny aspects and droughty or infertile soils of lower mountain slopes.

Dynamics: These communities are usually associated with seasonal drought and historically high fire frequencies when high frequency of late summer lightning storms, at a time of low fuel moisture, created short fire-return intervals (20-30 years). With fire suppression stands have become more closed and unnaturally dense. Many of these communities are believed to be seral to *Abies concolor* forests in the absence of fire or other disturbance.

DISTRIBUTION

Geographic Range: This alliance is found along the western slope of the southern Oregon Cascades, throughout the Klamath Mountains, south into the California Coast Ranges as far as the Yolla-Bolly region, and in the Sierra Nevada as far south as Yosemite National Park.

Nations: US

States/Provinces: CA, OR

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Pinus ponderosa* - *Calocedrus decurrens* (Mixed conifer forest) Alliance (Sawyer et al. 2009) [87.015.00]
- = *Pinus ponderosa* - *Calocedrus decurrens* Forest Alliance (Keeler-Wolf et al. 2012)

LOWER LEVEL UNITS**Associations:**

- CEGLO00208 *Pinus ponderosa* - *Pseudotsuga menziesii* / *Arctostaphylos nevadensis* Woodland
- CEGLO05813 *Pseudotsuga menziesii* - *Abies concolor* - *Calocedrus decurrens* Forest
- CEGLO08674 *Pinus ponderosa* - *Calocedrus decurrens* - *Quercus chrysolepis* / *Chamaebatia foliolosa* Forest
- CEGLO03122 *Calocedrus decurrens* Forest [Placeholder]
- CEGLO00066 *Calocedrus decurrens* - *Pseudotsuga menziesii* / *Arctostaphylos nevadensis* Forest
- CEGLO08673 *Pinus ponderosa* - *Calocedrus decurrens* - *Quercus kelloggii* Forest
- CEGLO08684 *Pseudotsuga menziesii* - *Pinus ponderosa* - *Calocedrus decurrens* Forest
- CEGLO00209 *Pinus ponderosa* - *Pseudotsuga menziesii* / *Arctostaphylos patula* Woodland
- CEGLO08672 *Pinus ponderosa* - *Calocedrus decurrens* / *Chamaebatia foliolosa* Forest
- CEGLO05814 *Pseudotsuga menziesii* - *Quercus chrysolepis* Forest
- CEGLO00061 *Pinus ponderosa* / *Arctostaphylos patula* - *Arctostaphylos viscida* Forest
- CEGLO00065 *Pinus lambertiana* - *Pinus ponderosa* - *Pseudotsuga menziesii* / *Festuca californica* Forest

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments: We have incorporated significant descriptive information previously compiled by J. Evens.

Version Date: 2014/12/18

REFERENCES

References: Atzet and McCrimmon 1990, Atzet and Wheeler 1984, Atzet et al. 1996, Chappell et al. 1997, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Keeler-Wolf et al. 2012, ORNHP unpubl. data, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G344. Californian Montane Conifer Forest & Woodland

A3675. *Pseudotsuga macrocarpa* - *Quercus chrysolepis* Forest Alliance

Type Concept Sentence: This alliance consists of forests dominated by *Pseudotsuga macrocarpa*, with or without other tree species, where *Quercus chrysolepis* can be a codominant in the upper canopy. It is a montane forest that grows on steep to moderate slopes, between 275 and 2400 m in elevation on all aspects, in southern Coast, Peninsular and Transverse ranges of California.

OVERVIEW

Scientific Name: *Pseudotsuga macrocarpa* - *Quercus chrysolepis* Forest Alliance

Common Name (Translated Scientific Name): Bigcone Douglas-fir - Canyon Live Oak Forest Alliance

Colloquial Name: Bigcone Douglas-fir - Canyon Live Oak Forest

Type Concept: This is an alliance of forests with *Pseudotsuga macrocarpa* as the sole dominant or codominant with other trees, including *Quercus chrysolepis*. Other trees present may include *Quercus agrifolia*, *Quercus kelloggii*, *Pinus coulteri*, *Pinus attenuata*, *Pinus sabiniana*, *Pinus monophylla*, *Umbellularia californica*, and *Juglans californica*. The shrub and herbaceous layers are sparse. This alliance is restricted to southern California Coast, Peninsular and Transverse ranges (and just barely into the central Coast Ranges). Stands occur at montane elevations, between 275 and 2400 m, on steep to moderate slopes at all aspects. Annual precipitation varies with elevation, and ranges from 70-100 cm, with a distinct summer dry season. Precipitation is episodic, and droughts of several years duration are not uncommon. Soils that support this alliance are skeletal, rocky, and well-drained.

Classification Comments: Some reviewers suggested placing these into their own "southern mixed conifer group," but not enough information was available and it is assumed not enough diversity to warrant a new group. Pure stands of *Pseudotsuga macrocarpa* are included in this alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: *Pseudotsuga macrocarpa* completely replaces *Pseudotsuga menziesii* in these mixed conifer stands in southern California.

VEGETATION

Physiognomy and Structure: This conical-crowned, temperate or subpolar, needle-leaved evergreen forest forms a continuous canopy less than 30 m in height. In older stands the canopy is two-tiered. Shrubs are infrequent, and the herbaceous layer is sparse.

Floristics: Stands are dominated by *Pseudotsuga macrocarpa*, with or without *Quercus chrysolepis*, which is often codominant, merely present or entirely absent. Other trees present may include *Quercus kelloggii*, *Pinus coulteri*, *Pinus attenuata*, *Pinus sabiniana*, *Pinus monophylla*, *Umbellularia californica*, and *Juglans californica*. In older stands the canopy tends to be two-tiered, with *Quercus chrysolepis* forming the subcanopy beneath the conifers. The shrub and herbaceous layers are sparse.

ENVIRONMENT & DYNAMICS

Environmental Description: This montane forest alliance of central and southern California occurs on moderate to steep slopes of all aspects. Stands are found between 275 and 2400 m elevation. Annual precipitation varies with elevation, and ranges from 70 to 100 cm, with a distinct summer dry season. Precipitation is episodic, and droughts of several years duration are not uncommon. Soils that support this alliance are skeletal, rocky, and well-drained.

Dynamics: *Pseudotsuga macrocarpa* has the unusual ability to trunk sprout following a fire. The tree also has a thick bark, capable of withstanding most fires. This alliance seems to be well-adapted to low-intensity fire, and the natural fire frequency is probably high. Seedling densities on burned areas can be quite high.

DISTRIBUTION

Geographic Range: This montane forest alliance occurs in California's southern Coast Ranges, and Transverse and Peninsular ranges. It does appear in the southernmost sections of the central California Coast Ranges as well.

Nations: US

States/Provinces: CA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Pseudotsuga macrocarpa* (Bigcone Douglas fir forest) Alliance (Sawyer et al. 2009) [82.100.00]
- >< Bigcone Spruce-Cañon Oak Forest (#84150) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEG003084 *Pseudotsuga macrocarpa* Forest
- CEG003083 *Pseudotsuga macrocarpa* - *Quercus chrysolepis* Forest [Placeholder]

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel and M. Schindel

Acknowledgments: We have incorporated significant descriptive information previously compiled by J. Evens.

Version Date: 2014/12/18

REFERENCES

References: Faber-Langendoen et al. 2017b, Holland 1986b, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009

1. Forest & Woodland

1.B.2.Nd. Vancouverian Forest & Woodland

G344. Californian Montane Conifer Forest & Woodland

A4150. *Sequoiadendron giganteum* Forest Alliance

Type Concept Sentence: This alliance consists of mixed conifer forests where *Sequoiadendron giganteum* is the dominant or at least characteristic tree, usually with other trees such as *Abies concolor*, *Calocedrus decurrens*, *Quercus kelloggii*, *Pseudotsuga menziesii*, *Pinus jeffreyi*, *Pinus ponderosa*, and/or *Pinus lambertiana*. This forest alliance occurs along the western slope of California's Sierra Nevada.

OVERVIEW

Scientific Name: *Sequoiadendron giganteum* Forest Alliance

Common Name (Translated Scientific Name): Giant Sequoia Forest Alliance

Colloquial Name: Giant Sequoia Forest

Type Concept: This alliance consists of mixed conifer forest where *Sequoiadendron giganteum* is the dominant or at least characteristic tree within the stand. Other trees present in the canopy include *Abies concolor*, *Calocedrus decurrens* (= *Libocedrus decurrens*), *Abies magnifica*, *Quercus kelloggii*, *Pseudotsuga menziesii*, *Pinus jeffreyi*, *Pinus contorta* var. *murrayana*, *Pinus ponderosa*, and/or *Pinus lambertiana*. Shrubs may be infrequent to common and include *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), *Chamaebatia foliolosa*, *Ceanothus* spp., *Arctostaphylos patula*, *Rhododendron occidentale*, *Ribes* spp., *Rosa* spp., and *Rubus* spp. Stand structure and composition vary considerably with elevation, latitude, exposure, soil moisture, and time since most recent fire or disturbance. This forest alliance occurs along the western slope of California's Sierra Nevada.

Classification Comments: This alliance is based on Sawyer et al. (2009) *Sequoiadendron giganteum* Forest Alliance where *Sequoiadendron giganteum* is dispersed throughout the stand or is an emergent with >10% absolute canopy cover.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of this forest alliance is the presence of large *Sequoiadendron giganteum* in the upper tree canopy.

VEGETATION

Physiognomy and Structure: Tall conifer trees (>70 m tall) dominate the canopy. Mixed conifers are often interspersed within groves forming a subcanopy. Shrubs are infrequent to common; the herbaceous layer is sparse to abundant.

Floristics: This forest alliance is characterized by the presence of *Sequoiadendron giganteum*. Other dominant trees include *Quercus kelloggii*, *Pseudotsuga menziesii*, *Calocedrus decurrens* (= *Libocedrus decurrens*), *Pinus jeffreyi*, *Pinus contorta* var. *murrayana*, *Pinus ponderosa*, *Abies magnifica*, *Pinus lambertiana*, and *Abies concolor*. Groves can have a canopy of *Abies concolor* with emergent individuals of *Sequoiadendron giganteum*. At lower elevations *Calocedrus decurrens* may dominate and at higher elevations *Abies magnifica* may dominate. Shrubs may be infrequent to common, and may include *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), *Chamaebatia foliolosa*, *Ceanothus cordulatus*, *Ceanothus parvifolius*, *Ceanothus integerrimus*, *Ceanothus velutinus*, *Arctostaphylos patula*, *Rhododendron occidentale*, *Ribes* spp., *Rosa* spp., and *Rubus* spp. Stand structure varies considerably with elevation, latitude, exposure, soil moisture, and time since most recent fire or disturbance.

ENVIRONMENT & DYNAMICS

Environmental Description: *Sequoiadendron giganteum* is limited by temperature in the upper elevations, and by deficient soil moisture at lower elevations. Elevations typically range from 825-2700 m. Groves in the northern portion of the range tend to occur on southern aspects; those in the southern portion tend to occur on northern aspects. Most groves occur on granitic-based residual soils, alluvium or glacial outwash. Sequoias grow best in deep, well-drained, sandy loams with perennial soil moisture. Vigorous individuals can thrive in shallow, rocky soils if underground water is available. Soil moisture seems to be the limiting factor in the extent of a grove or stand of sequoias. Most groves occur on granitic-based residual soils, alluviums, or glacial outwash.

Dynamics: Fire is the most important agent in the maintenance of this forest alliance. As a species, sequoias are very shade-intolerant and require openings within the forest canopy to establish. The species' optimal habitat is mesic sites with good soils, and disturbance is required to open up areas with such favorable conditions. Fire reduces light competition, and increases the friability and the wetability of the exposed surface mineral soils. These are exactly the conditions most conducive to germination and establishment of sequoia seedlings. The survival rate for sequoia seedlings has been found to be 27% following a hot fire. No seedlings survived in adjacent, undisturbed areas. Fires within established groves are the single largest agent of seed drop. Heat from the fire convects into the canopy, drying and opening the mature seed cones. This allows up to 8,000,000 seeds/acre to drop. This seed drop corresponds to the favorable seed bed conditions created by the fire. Sequoia seeds are very light (91,000/lb) and winged. The updrafts caused by fire or the winds typical of the Sierra Nevada can disperse seeds more than a 1/2 mile. Once established, sequoias maintain dominance by rapid growth. Young sequoias are very susceptible to injury or death by fire, but because they usually germinate in areas recently burned, they often are large enough to withstand a light fire by the time the fuel loads would allow one to occur. Large sequoias are very fire-resistant due to their thick, non-resinous bark and elevated crowns. Few mature sequoias are killed directly by fire. Repeated fires can eventually sear through the bark near the tree base, kill underlying cambium, and produce an ever-enlarging scar. These scars provide entry points for insects and fungi, which weaken the tree. Most sequoias are killed by toppling, with a significant percentage of trees failing at the point of greatest insect and/or fungi damage and falling to the fire-scarred side. Fire suppression during the 20th century has caused a massive failure in sequoia regeneration. The reduced fire frequency also allows greater litter accumulation, increasing the severity of fires when they do occur.

DISTRIBUTION

Geographic Range: Groves of giant sequoia are scattered in a belt about 24 km wide and 420 km long on the west slope of California's Sierra Nevada.

Nations: US

States/Provinces: CA

TNC Ecoregions [optional]: 12:C

USFS Ecoregions (2007): M261E:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Sequoiadendron giganteum* (Giant sequoia forest) Alliance (Sawyer et al. 2009) [86.200.00]
- = *Sequoiadendron giganteum* Forest Alliance (CNPS 2017) [86.200.00]
- = Big Tree Forest (#84250) (Holland 1986b) [This synonym was used by Robert Holland and is widely quoted in literature.]
- = Giant Sequoia Series (Sawyer and Keeler-Wolf 1995) [This name is a synonym for the alliance used by the California Heritage Division.]
- ? Sierra Nevada Mixed Conifer type-SAF (Burns and Honkala 1990a) [Giant sequoia groves lie entirely within this Society of American Foresters cover type 243.]

LOWER LEVEL UNITS

Associations:

- CEG003108 *Sequoiadendron giganteum* Forest
- CEG008607 *Sequoiadendron giganteum* - *Pinus lambertiana* / *Cornus nuttallii* Forest

AUTHORSHIP

Primary Concept Source: G. Kittel after Sawyer et al. (2009)

Author of Description: G. Kittel, M. Schindel, J. Evens

Acknowledgments: We have incorporated significant descriptive information previously compiled by J. Evens.

Version Date: 2014/12/18

REFERENCES

References: Aune 1994, Barbour 1988, Barbour et al. 1981, Biswell et al. 1966, Burns and Honkala 1990a, CNPS 2017, Conard and Radosevich 1982, Eyre 1980, Faber-Langendoen et al. 2017b, Fites-Kaufman et al. 2007, Griffin and Critchfield 1976, Habeck 1992c, Holland 1986b, Johnston 1984, Keeler-Wolf et al. 2003a, Kilgore and Taylor 1979, Kuchler 1964, Nichols 1989, Rundel 1971, Rundel 1972a, Rundel 1972b, Rundel et al. 1977, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Weatherspoon 1990, Willard 2000, van Wagtenonk et al. 2006

1.B.3. Temperate Flooded & Swamp Forest

Temperate Flooded & Swamp Forest is a tree-dominated wetland influenced by minerotrophic groundwater, either on mineral or organic (peat) soil, found in mid-latitudes of the globe.

1.B.3.Nc. Rocky Mountain-Great Basin Montane Flooded & Swamp Forest

Forested riparian and depressional wetlands dominated by broad-leaved deciduous trees or conifers (or both) that occur at mid to high elevations of the Rocky Mountains, ranges of the Intermountain West and the Colorado Plateau, and in the Sierra Nevada and eastern Cascades.

M034. Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

This macrogroup consists of montane riparian and swamp forests and woodlands dominated by cottonwood trees, conifer trees, or a mix with such species as *Acer negundo*, *Alnus rhombifolia*, *Picea engelmannii*, *Picea pungens*, *Pinus contorta*, *Pinus ponderosa*, *Populus angustifolia*, and *Populus balsamifera*. It occurs throughout the Great Basin and Rocky Mountains.

1. Forest & Woodland

1.B.3.Nc. Rocky Mountain-Great Basin Montane Flooded & Swamp Forest

1.B.3.Nc.1.a. M034 Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

G506. Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

Type Concept Sentence: This riparian forest group includes seasonally flooded conifer-dominated forests found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, and west into the Intermountain West region and the Colorado Plateau. *Picea engelmannii*, *Picea pungens*, and/or *Populus angustifolia* dominate, and the understory is often dominated by forbs or graminoids with only a few shrubs. Soils are mineral and very well-oxygenated.

OVERVIEW

Scientific Name: *Picea engelmannii* - *Picea pungens* - *Populus angustifolia* Riparian & Swamp Forest Group

Common Name (Translated Scientific Name): Engelmann Spruce - Blue Spruce - Narrowleaf Cottonwood Riparian & Swamp Forest Group

Colloquial Name: Rocky Mountain Grand Fir Riparian Forest

Type Concept: This group contains woodlands dominated by cottonwood, conifer and aspen that line montane streams. Dominant tree species usually include *Abies lasiocarpa*, *Picea engelmannii*, *Pinus ponderosa*, *Juniperus scopulorum*, and/or *Populus angustifolia*; other important species include *Pseudotsuga menziesii*, *Picea pungens*, *Picea engelmannii* x *glauca*, and *Populus tremuloides*. Other trees possibly present but not usually dominant include *Alnus incana*, *Abies concolor*, *Abies grandis*, *Pinus contorta*, and *Juniperus osteosperma*. Shrub cover tends to be limited but may include *Alnus incana*, *Betula occidentalis*, *Cornus sericea*, *Crataegus rivularis*, *Forestiera pubescens* var. *pubescens*, *Ribes* spp., *Rosa woodsii*, *Salix* spp., and others. The herbaceous undergrowth can be lush to depauperate. Herbaceous species include *Calamagrostis canadensis*, *Carex aquatilis* var. *aquatilis*, *Carex obnupta*, *Carex pellita*, *Equisetum arvense*, *Heracleum maximum*, *Ranunculus alismifolius*, *Senecio bigelovii* var. *bigelovii*, *Streptopus amplexifolius*, and *Veratrum californicum*. This riparian group includes seasonally flooded forests found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, and west into the Intermountain West region and the Colorado Plateau. It occurs throughout the interior of British Columbia and the eastern slopes of the Cascade Range. These are communities tolerant of periodic flooding and high water tables. Snowmelt moisture may create shallow water tables or seeps for a portion of the growing season. Stands typically occur at elevations between 1500 and 3300 m (4920-10,830 feet); farther north, elevation ranges between 900 and 2000 m. This is confined to specific riparian environments occurring on floodplains or terraces of rivers and streams, in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, occurrences are found in moderately wide valley bottoms on large floodplains along broad, meandering rivers, and on pond or lake margins.

Classification Comments: This group is restricted to montane riparian areas and avalanche chutes between lower and upper treeline.

Similar NVC Types:

- G505 Rocky Mountain-Great Basin Swamp Forest: occurs on saturated, extremely poorly drained soil.
- G507 North Pacific Montane Riparian Woodland

Diagnostic Characteristics: This group contains the conifer and aspen woodlands that line montane streams. These are communities tolerant of periodic flooding and high water tables.

VEGETATION

Physiognomy and Structure: Open to closed woodlands of tall conifer or deciduous trees with or without an understory of deciduous shrubs, generally forming linear bands following streams. These can blend into the surrounding upland forest, and often only the understory herbaceous species indicate the wet nature of the soils.

Floristics: Dominant tree species usually include *Abies lasiocarpa*, *Abies grandis*, *Picea engelmannii*, *Picea pungens*, *Populus angustifolia*, *Pinus ponderosa*, *Pinus contorta*, and/or *Juniperus scopulorum*; other important species include *Pseudotsuga menziesii*, *Picea engelmannii* x *glauca*, and *Populus tremuloides*. Other trees possibly present and dominant or codominant include *Abies concolor*, *Abies grandis*, *Pinus contorta*, and *Juniperus osteosperma*. Shrub cover tends to be limited but may include *Alnus incana*, *Betula occidentalis*, *Cornus sericea*, *Crataegus rivularis*, *Forestiera pubescens* var. *pubescens*, *Ribes* spp., *Rosa woodsii*, *Salix* spp., and others. The herbaceous undergrowth can be lush to depauperate. Herbaceous species include *Calamagrostis canadensis*, *Carex aquatilis* var. *aquatilis*, *Carex obnupta*, *Carex pellita*, *Equisetum arvense*, *Heracleum maximum*, *Ranunculus alismifolius*, *Senecio bigelovii* var. *bigelovii*, *Streptopus amplexifolius*, and *Veratrum californicum*. Floristic information is compiled from several sources for eastern Washington and Oregon (Kovalchik 1987, 1993, Crowe and Clausnitzer 1997), Nevada (Manning and Padgett 1995), Colorado (Kittel et al. 1999b), Montana (Butler 1979, 1985, Malanson and Butler 1984, Hansen et al. 1989), British Columbia (MacKenzie and Moran 2004), Utah (Padgett et al. 1989, Tuhy et al. 2002), New Mexico and Arizona (Szaro 1989, Muldavin et al. 2000a), and Wyoming (Walford 1996, Walford et al. 2001).

ENVIRONMENT & DYNAMICS

Environmental Description: *Climate:* Temperate cold. *Soil/substrate/hydrology:* Stands typically occur at elevations between 1500 and 3300 m (4920-10,830 feet); farther north, elevation ranges between 900 and 2000 m. This group is confined to specific riparian environments occurring on floodplains or terraces of rivers and streams, in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, occurrences are found in moderately wide valley bottoms on large floodplains along broad, meandering rivers, on pond or lake margins, and seeps on gentle slopes. Environmental information is compiled from several sources: for eastern Washington and Oregon (Kovalchik 1987, 1992, 2001, Crowe and Clausnitzer 1997); for Nevada (Manning and Padgett 1995); for Colorado (Baker 1988, 1989a, 1989b, 1990, Kittel et al. 1994, 1995, 1999a, 1999b); for Montana (Butler 1979, 1985, Malanson and Butler 1984, Hansen et al. 1989); for British Columbia (MacKenzie and Moran 2004); for Utah (Padgett et al. 1989, Tuhy et al. 2002); for New Mexico and Arizona (Szaro 1989, Muldavin et al. 2000a); and for Wyoming (Walford 1996, Walford et al. 2001).

Dynamics:

DISTRIBUTION

Geographic Range: This group is found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, Alberta and British Columbia, and west into the Intermountain West region and the Colorado Plateau.

Spatial Scale & Pattern [optional]: Linear

Nations: CA, US

States/Provinces: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = Blue Spruce: 216 (Eyre 1980) [Blue spruce commonly occurs in riparian zones]
- = ER Engelmann Spruce Riparian (Ecosystems Working Group 1998)

- < Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980) [Engelmann spruce occurs as a dominant in riparian zones.]
- < Riparian (422) (Shiflet 1994)

LOWER LEVEL UNITS

Alliances:

- A3761 *Picea pungens* Riparian Forest Alliance
- A4154 *Acer negundo* - *Alnus incana* ssp. *tenuifolia* - *Cornus sericea* Riparian Woodland Alliance
- A3759 *Populus angustifolia* Riparian Forest Alliance
- A3797 *Pinus ponderosa* - *Juniperus scopulorum* - *Abies concolor* Riparian Woodland Alliance
- A3760 *Populus tremuloides* Riparian Forest Alliance
- A3762 *Abies grandis* Rocky Mountain Riparian Forest Alliance
- A3758 *Pinus contorta* var. *murrayana* - *Pinus contorta* var. *latifolia* Swamp Forest Alliance
- A3757 *Abies lasiocarpa* - *Picea engelmannii* Swamp Forest Alliance

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2011)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 05/11/2015

Classif Resp Region: West

Internal Author: GK 10-10, 9-13, 5-15, 12-15

REFERENCES

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Butler 1979, Butler 1985, Crowe and Clausnitzer 1997, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2017a, Hansen et al. 1989, Kittel 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, MacKenzie and Moran 2004, Malanson and Butler 1984, Manning and Padgett 1995, Muldavin et al. 2000a, Nachlinger et al. 2001, Padgett et al. 1988b, Padgett et al. 1989, Shiflet 1994, Szaro 1989, Tuhy et al. 2002, Walford 1996, Walford et al. 2001

1. Forest & Woodland

1.B.3.Nc. Rocky Mountain-Great Basin Montane Flooded & Swamp Forest

G506. Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

A3762. *Abies grandis* Rocky Mountain Riparian Forest Alliance

Type Concept Sentence: This alliance consists of riparian areas dominated by *Abies grandis*, usually with other conifers. *Abies lasiocarpa*, *Larix occidentalis*, *Pinus monticola*, and *Pseudotsuga menziesii* may be present to codominant. *Betula papyrifera* or *Populus balsamifera* ssp. *trichocarpa* sometimes form a scattered subcanopy. It occupies sites on benches, toeslopes or valley bottoms along mountain streams. The alliance occurs in the Rocky Mountains of western Montana, Idaho and eastern Washington and eastern Oregon, possibly extending into British Columbia Elevations range from 790-1410 m.

OVERVIEW

Scientific Name: *Abies grandis* Rocky Mountain Riparian Forest Alliance

Common Name (Translated Scientific Name): Grand Fir Rocky Mountain Riparian Forest Alliance

Colloquial Name: Rocky Mountain Grand Fir Riparian Forest

Type Concept: This is an alliance of riparian woodlands dominated by *Abies grandis*, usually with other conifers. *Abies lasiocarpa*, *Larix occidentalis*, *Pinus monticola*, and *Pseudotsuga menziesii* may be present to codominant. *Betula papyrifera* or *Populus balsamifera* ssp. *trichocarpa* sometimes forms a scattered subcanopy. There is usually a rich and well-developed shrub layer. Common shrubs include *Acer glabrum*, *Linnaea borealis*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Symphoricarpos albus*. The herbaceous layer is characterized by a diverse assemblage of moist-site forbs and ferns, including *Aralia nudicaulis*, *Athyrium filix-femina*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Orthilia secunda*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Senecio triangularis*, and *Tiarella trifoliata*. This alliance occurs in the Rocky Mountains of western Montana, Idaho and eastern Washington and eastern Oregon, possibly extending into British Columbia. It occupies sites on benches, toeslopes or valley bottoms along mountain streams. Elevations where the alliance occurs range from 790-1410 m. Soils are typically very cobbly silt loams or sandy loam. Water tables are generally within 1 m of the soil surface in the spring, but the soils are well-drained.

Classification Comments: This alliance does not include *Abies grandis* riparian and wetland locations west of the Cascade Crest. These sites are outside the range of *Thuja plicata*, which dominates similar sites throughout the wetter parts of the Pacific Northwest.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Stands on riparian seasonally wet soils dominated by *Abies grandis* or other conifer species.

VEGETATION

Physiognomy and Structure: Upper canopy of evergreen needle-leaved tall coniferous trees. A sparse subcanopy is occasionally present, composed of broad-leaved winter-deciduous trees. A shrub layer of broad-leaved cold-deciduous shrubs is usually present in moist sites. Herbaceous cover is a species-diverse layer of shade-tolerant forbs and ferns.

Floristics: Vegetation within this alliance is distributed on low- to mid-elevation mountain slopes and bottomlands of the northern Rocky Mountains. *Picea engelmannii* is often a codominant with *Abies grandis* in stands of this alliance. *Pseudotsuga menziesii* or *Larix occidentalis* may be present at the drier margins, and *Abies lasiocarpa* may occur in higher elevation or frost pocket locations. *Betula papyrifera* or *Populus balsamifera ssp. trichocarpa* sometimes form a scattered subcanopy. There is usually a rich and well-developed shrub layer. Common shrubs include *Acer glabrum*, *Linnaea borealis*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Symphoricarpos albus*. The herbaceous layer is characterized by a diverse assemblage of moist-site forbs and ferns, including *Aralia nudicaulis*, *Athyrium filix-femina*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Orthilia secunda*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Senecio triangularis*, and *Tiarella trifoliata*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance generally occupies sites on benches, toeslopes or valley bottoms along mountain streams. Elevations where the alliance occurs range from 790-1410 m. Soils are typically very cobbly silt loams or sandy loam (Hansen et al. 1995). Water tables are generally within 1 m of the soil surface in the spring, but the soils are well-drained. Vegetation occurs within the maritime-influenced region of the northern Rocky Mountains.

Dynamics: The nominal species of this alliance is a long-lived, shade-tolerant conifer which can regenerate under a dense forest canopy. This type is often adjacent to drier *Pseudotsuga menziesii* or drier *Abies grandis* forests. Although *Abies grandis* is regarded as a climax species at such sites, repeated fire or disturbance can allow early-seral, but long-lived species, such as *Picea engelmannii* to codominate for many years. In mature, wet stands of this alliance, regeneration may be limited to rotting logs or stumps which allow germination above the wet forest floor.

DISTRIBUTION

Geographic Range: This alliance occurs in the Rocky Mountains of western Montana, Idaho and eastern Washington and eastern Oregon, possibly extending into British Columbia.

Nations: CA?, US

States/Provinces: BC?, ID, MT, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Abies grandis* Series (Cooper et al. 1987)

LOWER LEVEL UNITS

Associations:

- CEG000280 *Abies grandis* / *Senecio triangularis* Riparian Forest
- CEG000270 *Abies grandis* / *Athyrium filix-femina* Riparian Forest
- CEG003441 *Pinus monticola* / *Deschampsia cespitosa* Riparian Forest

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Burns and Honkala 1990a, Cooper et al. 1987, Faber-Langendoen et al. 2017b, Hansen et al. 1991, Hansen et al. 1995

1. Forest & Woodland

1.B.3.Nc. Rocky Mountain-Great Basin Montane Flooded & Swamp Forest

G506. Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

A3757. *Abies lasiocarpa* - *Picea engelmannii* Swamp Forest Alliance

Type Concept Sentence: This alliance includes subalpine riparian or seep slope conifer forests characterized by the codominance of the conifers *Abies lasiocarpa* and *Picea engelmannii*. Other conifer species that may be present to codominant include *Picea engelmannii* x *glauca*, *Picea glauca*, *Pinus contorta*, and *Tsuga mertensiana* in the upper montane and subalpine areas of the Rocky Mountains. These forests occur in landscape positions where snowmelt moisture creates shallow water tables, seeps, or streamside flooding during much of the growing season.

OVERVIEW

Scientific Name: *Abies lasiocarpa* - *Picea engelmannii* Swamp Forest Alliance

Common Name (Translated Scientific Name): Subalpine Fir - Engelmann Spruce Swamp Forest Alliance

Colloquial Name: Subalpine Fir - Engelmann Spruce Swamp Forest

Type Concept: This alliance includes subalpine riparian or seep slope conifer forests characterized by the codominance of the conifers *Abies lasiocarpa* and *Picea engelmannii*. Other conifer species that may be present to codominant include *Picea engelmannii* x *glauca*, *Picea glauca*, *Pinus contorta*, and *Tsuga mertensiana*. Additional conifers may also be present in small amounts. The shrub layer is often well-developed, occurring as a dense ribbon along streams or where there is a break in the forest canopy. Important shrubs include *Alnus incana*, *Alnus viridis* ssp. *sinuata*, *Ledum glandulosum*, *Lonicera* spp., *Oplopanax horridus*, *Ribes lacustre*, *Salix* spp., *Vaccinium* spp., and *Xerophyllum tenax*. The herbaceous layer is typically lush and dominated by a mixture of mesophytic mostly forbs and some graminoids, including *Arnica cordifolia*, *Calamagrostis* spp., *Caltha leptosepala*, *Cardamine cordifolia*, *Carex* spp., *Deschampsia cespitosa*, *Dodecatheon jeffreyi*, *Equisetum* spp., *Ligusticum porteri*, *Ligusticum* spp., *Linnaea borealis*, *Mertensia ciliata*, *Mitella pentandra*, *Orthilia secunda*, *Oxypolis fendleri*, *Senecio triangularis*, *Senecio triangularis*, and *Streptopus amplexifolius*. These forests occur in the upper montane and subalpine areas of the Rocky Mountains in landscape positions where snowmelt moisture creates shallow water tables, seeps, or streamside flooding during much of the growing season. Sites include moist toeslopes, subirrigated stream terraces, alluvial benches, pond margins, wet meadows, or slopes and hillsides that are wet in spring and early summer. Soils often show evidence of podzolization processes and gleying due to seasonally saturated conditions, and tend to be acidic. They often have high organic matter content throughout the profile, but can vary from shallow to deep, and coarse to fine-textured.

Classification Comments: This alliance covers both closed-canopy and open-canopy woodlands and forests along riparian areas. One *Pinus flexilis* community type documented from Idaho and Wyoming is included in this alliance but there is no floristic or environmental information about it. We assume that it occurs at similar elevations as the other associations listed here.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic characteristics of these forests are that the tree canopy is dominated by *Abies lasiocarpa* and/or *Picea engelmannii* as the predominant conifer in the tree regeneration layer, and they occur on sites saturated until late summer by snowmelt, occurring below seeps on lower hillslopes or in riparian habitats.

VEGETATION

Physiognomy and Structure: These are forests dominated by needle-leaved evergreen trees up to 30 m in height and of high cover (60-100%). A moderately dense shrub layer is usually present, dominated by ericaceous or, less commonly, cold-deciduous species. The herbaceous layer is dominated by perennial forbs, and herbaceous cover increases with increasing light availability and/or soil moisture.

Floristics: These forests are characterized by the codominance of *Abies lasiocarpa* and *Picea engelmannii* in the tree canopy, but *Pinus contorta* can be dominant on some sites. Other conifers can occur, typically as individuals of *Picea pungens*, *Larix occidentalis*, or *Pseudotsuga menziesii*. In the Northern Rockies, there is a well-developed shrub layer in these forests, although sometimes it can be patchy. *Alnus viridis* ssp. *sinuata* is the dominant shrub, averaging 35% cover, with lesser amounts of *Vaccinium membranaceum*, *Vaccinium scoparium*, or *Xerophyllum tenax*. The herbaceous layer in these Northern Rockies stands is not lush, and the most constant species are *Orthilia secunda* and *Arnica cordifolia*. In the Southern Rockies of Colorado and New Mexico, these forests do

not have a significant layer of shrubs, but at high elevations *Vaccinium myrtilloides* occasionally is present with 0-50% cover. *Salix drummondiana*, *Lonicera involucrata*, and *Ribes* species can be present, but with less than 10% cover. The herbaceous layer is a diverse mixture of mesophytic forbs and is often well over 80% in cover. Important species include *Cardamine cordifolia*, *Caltha leptosepala*, *Ligusticum porteri*, *Mertensia ciliata*, *Mitella pentandra*, *Oxypolis fendleri*, *Senecio triangularis*, and *Saxifraga odontoloma* (= *Micranthes odontoloma*).

ENVIRONMENT & DYNAMICS

Environmental Description: These are semi-riparian or seep slope forests in upper montane and subalpine areas of the northern and central Rocky Mountains. Annual precipitation generally exceeds 75 cm in these forests in the Northern Rockies, snowpacks are typically deep and late-lying, and summers are cool. Summer frosts are characteristic in these habitats, due to cold-air drainage. Elevations range from 1525-2290 m in the northern Rocky Mountains, and from 2500-3480 m in Colorado and New Mexico. These forests occur in landscape positions where snowmelt moisture creates shallow water tables or seeps for a portion of the growing season. Sites include lower and middle slopes, stream terraces, benches, narrow valleys, or seep slopes. Slope aspects vary, but are often northerly, and can be flat to moderately steep (up to 55%). When these forests occur along streams, they are usually within 5 m of the stream channel and within 2 m of channel bankfull height (Kittel et al. 1999a). Soils often show evidence of podzolization processes and gleying due to seasonally saturated conditions. They often have high organic matter content throughout the profile. These forests are a specialized type within the *Abies - Picea* matrix type in subalpine areas of the Rocky Mountains, but may extend into montane habitats due to cold-air drainage and cool, moist microhabitats. Adjacent upland forests include *Picea engelmannii* or *Abies lasiocarpa* forests at the upper elevation boundary and *Pseudotsuga menziesii*, *Abies grandis*, or *Tsuga heterophylla - Thuja plicata* forests at lower elevations. Wetter sites often support herbaceous, cold-deciduous, or ericaceous riparian plant communities, or *Abies lasiocarpa* seasonally flooded forest communities.

Dynamics: *Abies lasiocarpa* temporarily flooded forests develop at sites with cool summer temperatures and wet soils. Tree growth is very slow in these habitats, and forests are rapidly colonized by much more rapidly growing shade-intolerant species, such as *Pinus contorta*, *Populus tremuloides*, or *Alnus viridis ssp. sinuata*, following fire, clearcut logging, or windthrow disturbance. Extensive windthrow is not common due to the relatively sheltered topographic positions. Removal of the tree layer at these sites can lead to rising water tables and expansion of anaerobic wetland soils, precluding recolonization by trees.

DISTRIBUTION

Geographic Range: This alliance is found throughout the Rocky Mountains from eastern Oregon and Washington, southern British Columbia and Alberta, Montana, Wyoming, Colorado, Utah, New Mexico, the Sky Islands of Arizona, as well as mountain ranges in Nevada.

Nations: CA, US

States/Provinces: AB, AZ, BC, CO, ID, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Abies lasiocarpa - Picea engelmannii* Series (Johnston 1987)
- >< *Abies lasiocarpa-Picea engelmannii* Series (Johnston 1987)
- >< Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)
- >< Western Needleleaf Forests: 15: Western Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)
- >< Western Needleleaf Forests: 21: Southwestern Spruce-Fir Forest (*Picea-Abies*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEGLO02677 *Picea engelmannii* / *Cornus sericea* Swamp Woodland
- CEGLO00327 *Abies lasiocarpa - Picea engelmannii* / *Salix drummondiana* Swamp Forest
- CEGLO00297 *Abies lasiocarpa - Picea engelmannii* / *Alnus viridis ssp. sinuata* Swamp Forest
- CEGLO00361 *Picea engelmannii* / *Eleocharis quinqueflora* Swamp Woodland
- CEGLO02663 *Abies lasiocarpa - Picea engelmannii* / *Mertensia ciliata* Swamp Forest
- CEGLO00376 *Picea engelmannii* / *Senecio triangularis* Swamp Forest
- CEGLO00357 *Picea engelmannii* / *Caltha leptosepala* Swamp Forest
- CEGLO00339 *Abies lasiocarpa* / *Trautvetteria caroliniensis* Swamp Forest
- CEGLO00359 *Picea engelmannii* / *Carex angustata* Swamp Forest

NBR alliances

- C EGL000302 *Abies lasiocarpa* / *Caltha leptosepala* ssp. *howellii* Swamp Forest
- C EGL000336 *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Swamp Forest
- C EGL000511 *Tsuga mertensiana* / *Streptopus amplexifolius* Swamp Forest
- C EGL000322 *Abies lasiocarpa* - *Picea engelmannii* / *Oplopanax horridus* Swamp Forest
- C EGL002630 *Picea engelmannii* / *Carex scopulorum* var. *prionophylla* Swamp Woodland
- C EGL000314 *Abies lasiocarpa* / *Ledum glandulosum* Swamp Forest
- C EGL002636 *Abies lasiocarpa* / *Carex aquatilis* Swamp Forest
- C EGL000367 *Picea engelmannii* - *Populus angustifolia* / *Heracleum maximum* Swamp Forest
- C EGL000296 *Abies lasiocarpa* - *Picea engelmannii* / *Alnus incana* Swamp Forest
- C EGL000812 *Pinus flexilis* / *Dasiphora fruticosa* ssp. *floribunda* / *Distichlis spicata* Swamp Woodland
- C EGL002678 *Picea engelmannii* / *Calamagrostis canadensis* Swamp Forest
- C EGL005927 *Picea engelmannii* / *Equisetum arvense* Swamp Forest
- C EGL005843 *Picea engelmannii* / *Salix drummondiana* Swamp Woodland
- C EGL005446 *Picea engelmannii* / *Carex scopulorum* Swamp Woodland
- C EGL000414 *Picea* (*engelmannii* x *glauca*, *engelmannii*) / *Packera streptanthifolia* Swamp Forest
- C EGL000300 *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Swamp Forest

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Alexander 1981, Baker 1986a, Baker 1989b, Clausnitzer and Zamora 1987, Cooper and Cottrell 1990, Cooper et al. 1987, DeVelice and Ludwig 1983a, DeVelice et al. 1986, Eyre 1980, Faber-Langendoen et al. 2017b, Hansen et al. 1991, Hansen et al. 1995, Hess 1981, Hess and Alexander 1986, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1996, Kittel et al. 1999a, Komarkova et al. 1988a, Komarkova et al. 1988b, Kovalchik 1993, K uchler 1964, Mauk and Henderson 1984, Padgett et al. 1988b, Peet 1975, Peet 1981, Pfister et al. 1977, Richard et al. 1996, Steele et al. 1981, Steele et al. 1983, Steen and Dix 1974, Terwilliger et al. 1979a, Wasser and Hess 1982, Whipple 1975, Williams and Smith 1990, Williams et al. 1990b, Youngblood and Mauk 1985

1. Forest & Woodland

1.B.3.Nc. Rocky Mountain-Great Basin Montane Flooded & Swamp Forest

G506. Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

A4154. *Acer negundo* - *Alnus incana* ssp. *tenuifolia* - *Cornus sericea* Riparian Woodland Alliance

Type Concept Sentence:

OVERVIEW

Scientific Name: *Acer negundo* - *Alnus incana* ssp. *tenuifolia* - *Cornus sericea* Riparian Woodland Alliance

Common Name (Translated Scientific Name): Box-elder - Thinleaf Alder - Red-osier Dogwood Riparian Woodland Alliance

Colloquial Name: Box-elder - Thinleaf Alder - Red-osier Dogwood Riparian Woodland

Type Concept:

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics:

ENVIRONMENT & DYNAMICS

Environmental Description:

Dynamics:

DISTRIBUTION

Geographic Range:

Nations: CA, US

States/Provinces: AB, AZ, CO, ID, MT, NM, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGLO00627 *Acer negundo* - *Populus angustifolia* / *Cornus sericea* Riparian Forest
- CEGLO00936 *Acer negundo* / *Betula occidentalis* Riparian Woodland
- CEGLO02342 *Acer negundo* - *Ostrya knowltonii* Riparian Woodland
- CEGLO00626 *Acer negundo* / *Equisetum arvense* Riparian Forest
- CEGLO05383 *Acer negundo* - *Alnus oblongifolia* Riparian Forest
- CEGLO05940 *Acer negundo* - *Alnus incana* ssp. *tenuifolia* Riparian Forest
- CEGLO02750 *Acer negundo* / *Rhus trilobata* Riparian Woodland
- CEGLO02797 *Acer negundo* / *Quercus gambelii* Riparian Woodland
- CEGLO03971 *Ostrya knowltonii* Riparian Woodland
- CEGLO00625 *Acer negundo* / *Cornus sericea* Riparian Forest

AUTHORSHIP

Primary Concept Source: G. Kittel

Author of Description:

Acknowledgments:

REFERENCES

1. Forest & Woodland

1.B.3.Nc. Rocky Mountain-Great Basin Montane Flooded & Swamp Forest

G506. Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

A3761. *Picea pungens* Riparian Forest Alliance

Type Concept Sentence: This alliance is characterized by the dominance of *Picea pungens* in the tree canopy. Common associates include *Abies concolor*, *Abies lasiocarpa*, *Picea engelmannii*, *Pinus contorta*, *Pinus ponderosa*, and *Pseudotsuga menziesii* (which may replace *Picea pungens*). *Populus angustifolia* is the most common deciduous tree species, although *Populus tremuloides* may persist as a seral species on well-drained sites. This riparian woodland alliance is found at middle elevations (from 1900-2900 m) of the central and southern Rocky Mountains and the Colorado Plateau. Stands typically occur in narrow or V-shaped valleys and canyons subject to cold-air drainage and limited sunlight. They occupy streambanks, terraces, narrow floodplains or benches, and subirrigated toeslopes; stream gradients are often steep. These sites can be subject to spring flooding, and usually water tables are within 1 m of the soil surface even late in the growing season.

OVERVIEW

Scientific Name: *Picea pungens* Riparian Forest Alliance

Common Name (Translated Scientific Name): Blue Spruce Riparian Forest Alliance

Colloquial Name: Blue Spruce Riparian Forest

Type Concept: This alliance is characterized by the dominance of *Picea pungens* in the tree canopy. Other conifers are usually present in these stands, depending upon geographic location, site moisture, and stand history. Common associates include *Abies concolor*, *Abies lasiocarpa*, *Picea engelmannii*, *Pinus contorta*, *Pinus ponderosa*, and *Pseudotsuga menziesii* (which may replace *Picea*

pungens). *Populus angustifolia* is the most commonly present deciduous tree species, although *Populus tremuloides* may persist as a seral species on well-drained sites of this alliance. A shrub layer is often present but many stands lack a shrub layer. Common shrub species include *Alnus incana*, *Betula occidentalis*, *Cornus sericea*, *Rosa woodsii*, and several species of *Salix*. Other shrubs that may be present include *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Lonicera involucrata*, and *Acer glabrum*. Because of favorable soil moisture, the herbaceous layer is usually a luxuriant mixture of forbs and graminoids, including *Calamagrostis canadensis*, *Carex siccata* (= *Carex foenea*), *Conioselinum scopulorum*, *Equisetum arvense*, *Fragaria virginiana*, *Heracleum sphondylium*, *Maianthemum stellatum*, *Mertensia ciliata*, and *Rudbeckia laciniata*. The herbaceous layer can have very high cover in some stands, but also may be very sparse. This riparian woodland alliance is found at middle elevations (from 1900-2900 m) of the central and southern Rocky Mountains and the Colorado Plateau region. Stands typically occur in narrow, or V-shaped, valleys and canyons subject to cold-air drainage and limited sunlight. They occupy streambanks, terraces, narrow floodplains or benches, and subirrigated toeslopes; stream gradients are often steep. These sites can be subject to spring flooding, and usually water tables are within 1 m of the soil surface even late in the growing season. The soils are somewhat variable, often with signs of mottling.

Classification Comments: This alliance is for conifer-dominated stands that occur in riparian zones on seasonally, intermittently or temporarily flooded/saturated soils.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of this woodland alliance is the dominance of *Picea pungens* or *Pseudotsuga menziesii* with 50% relative cover occurring on sites that have surface water for brief periods during the growing season.

VEGETATION

Physiognomy and Structure: These woodlands are of low to medium stature (10-25 m) and dominated by needle-leaved evergreen trees. Cold-deciduous trees are sometimes mixed in these stands. These communities often have cold-deciduous shrub layers of moderate to dense cover (20-60%). The herbaceous layer is usually well-developed and dominated by mesophytic forbs and graminoids less than 1 m in height.

Floristics: These riparian woodlands are characterized by the dominance of *Picea pungens* and/or *Pseudotsuga menziesii* with occasional *Pinus ponderosa* or *Pinus contorta* trees in the canopy. Other conifers are usually present in these stands, depending upon geographic location, site moisture, and stand history. Common associates include *Abies concolor*, *Abies lasiocarpa*, *Picea engelmannii*, *Pinus contorta*, *Pinus ponderosa*, and *Pseudotsuga menziesii*. The presence of these conifers is usually associated with raised microsites created by root-crown hummocks and windthrow mounds. *Populus angustifolia* is the most commonly present deciduous tree species, although *Populus tremuloides* may persist as a seral species on well-drained sites of this alliance. There is often an abundant tall-shrub layer, with cover ranging from 20-60%, dominated by one or several cold-deciduous species. The most common species include *Alnus incana*, *Betula occidentalis*, *Cornus sericea*, *Rosa woodsii*, and willow species, including *Salix exigua*, *Salix drummondiana*, *Salix monticola*, and *Salix bebbiana*. Other shrubs that may be present include *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Lonicera involucrata*, and *Acer glabrum*. Due to favorable soil moisture, the herbaceous layer is usually a luxuriant mixture of forbs and graminoids, including *Calamagrostis canadensis*, *Carex siccata* (= *Carex foenea*), *Conioselinum scopulorum*, *Equisetum arvense*, *Fragaria virginiana*, *Heracleum sphondylium*, *Maianthemum stellatum*, *Mertensia ciliata*, and *Rudbeckia laciniata*. The herbaceous layer can have very high cover in some stands.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is found at middle elevations (from 1900-2900 m) of the central and southern Rocky Mountains and the Colorado Plateau region. Precipitation averages 46-60 cm annually, with the majority falling as growing-season rainfall. The temperature regime is continental and winters are moderately severe. Stands of this alliance typically occur in narrow, or V-shaped, valleys and canyons subject to cold-air drainage and limited sunlight. They occupy streambanks, terraces, narrow floodplains or benches, and subirrigated toeslopes; stream gradients are often steep. These sites can be subject to spring flooding, and usually water tables are within 1 m of the soil surface even late in the growing season. The soils are somewhat variable, but are primarily derived from glacial or alluvially deposited materials. They range from shallow silty loams over cobbles and gravel, to deep dark-colored clay loams with signs of mottling. The percentage of coarse fragments increases with soil depth, and most sites are well-drained. The pH is neutral to slightly alkaline.

Stands of these riparian woodlands are found within *Pinus ponderosa* or *Pseudotsuga menziesii* montane upland forests. Adjacent vegetation is usually *Pinus ponderosa* - *Pseudotsuga menziesii* forests at the upslope margin and herbaceous or other woody riparian communities where this vegetation grades into wetter streamside sites.

Dynamics: *Picea pungens* is a slow-growing, long-lived tree which regenerates from seed (Burns and Honkala 1990a). Seedlings are shallow-rooted and require perennially moist soils for establishment and optimal growth. *Picea pungens* is intermediate in shade tolerance, being somewhat more tolerant than *Pinus ponderosa* or *Pseudotsuga menziesii*, and less tolerant than *Abies lasiocarpa* or *Picea engelmannii*. It forms climax stands in the subhumid stands of the southern Rocky Mountains, but may occupy a seral position in more mesic northern stands (Burns and Honkala 1990a). In deep, narrow canyons with swift-moving streams and narrow floodplains and benches, *Picea pungens* appears to be a climax riparian species, and will remain on these sites until removed or damaged by a catastrophic flood (Kittel et al. 1999a). It is common for these forests to be heavily disturbed by grazing or fire, as well as recreational uses, such as campgrounds, fishing access, home building, and other activities.

DISTRIBUTION

Geographic Range: This alliance is found in the Rocky Mountains in Colorado, Wyoming, Utah, Idaho, and New Mexico and the highlands of Arizona.

Nations: US

States/Provinces: AZ, CO, ID, NM, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Picea pungens* Series (Moir and Ludwig 1979)
- >< *Picea pungens* Series (Youngblood and Mauk 1985)
- >< *Picea pungens* Series (DeVelice et al. 1986)
- >< *Picea pungens* Series (Alexander et al. 1987)
- >< *Picea pungens* Series (Fitzhugh et al. 1987)
- >< *Picea pungens* Series (Larson and Moir 1987)
- >< *Pseudotsuga menziesii*/*Cornus sericea* Habitat Type (Hansen et al. 1995)
- >< Blue Spruce: 216 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEGLO00396 *Picea pungens* / *Dasiphora fruticosa* ssp. *floribunda* Riparian Woodland
- CEGLO00894 *Picea pungens* / *Alnus incana* Riparian Woodland
- CEGLO00389 *Picea pungens* / *Equisetum arvense* Riparian Woodland
- CEGLO02637 *Picea pungens* / *Betula occidentalis* Riparian Woodland
- CEGLO00899 *Pseudotsuga menziesii* / *Cornus sericea* Riparian Woodland
- CEGLO02639 *Pseudotsuga menziesii* / *Betula occidentalis* Riparian Woodland
- CEGLO00388 *Picea pungens* / *Cornus sericea* Riparian Woodland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Alexander et al. 1987, Baker 1986a, Baker 1989b, Burns and Honkala 1990a, Cooper and Cottrell 1990, DeVelice and Ludwig 1983a, DeVelice et al. 1986, Eyre 1980, Faber-Langendoen et al. 2017b, Fitzhugh et al. 1987, Hansen et al. 1990, Hansen et al. 1991, Hansen et al. 1995, Hess and Wasser 1982, Johnston 1984, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1997a, Kittel et al. 1999a, Komarkova et al. 1988a, Larson and Moir 1987, Moir and Ludwig 1979, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Youngblood and Mauk 1985

1. Forest & Woodland

1.B.3.Nc. Rocky Mountain-Great Basin Montane Flooded & Swamp Forest

G506. Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

A3758. *Pinus contorta* var. *murrayana* - *Pinus contorta* var. *latifolia* Swamp Forest Alliance

Type Concept Sentence: This riparian woodland alliance is characterized by *Pinus contorta*. Other conifers sometimes present may include *Abies grandis*, *Abies lasiocarpa*, *Abies magnifica* var. *shastensis*, *Picea engelmannii*, *Pinus flexilis*, or *Tsuga mertensiana*. This forest alliance occurs in upper montane riparian or wetland areas in the Rocky Mountains and Sierra Nevada. Sites are flat, wet, relatively cold floodplain and basin landforms. Stands occur in forested margins of meadows, lake or forest basins, and along valley bottoms. In all cases, the sites are flat to gently sloping.

OVERVIEW

Scientific Name: *Pinus contorta* var. *murrayana* - *Pinus contorta* var. *latifolia* Swamp Forest Alliance

Common Name (Translated Scientific Name): Sierra Lodgepole Pine - Tall Lodgepole Pine Swamp Forest Alliance

Colloquial Name: Sierra Lodgepole Pine - Tall Lodgepole Pine Swamp Forest

Type Concept: This riparian woodland alliance is characterized by *Pinus contorta*. Other conifers sometimes present may include *Abies grandis*, *Abies lasiocarpa*, *Abies magnifica* var. *shastensis*, *Picea engelmannii*, *Pinus flexilis*, or *Tsuga mertensiana*. The short-shrub layer may be present with *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Ledum glandulosum*, *Lonicera caerulea*, *Spiraea douglasii*, *Vaccinium cespitosum*, and/or *Vaccinium uliginosum*. Herbaceous species are not abundant in shrubby stands. Associate species often present can include *Carex angustata*, *Fragaria* spp., *Geum macrophyllum*, *Ligusticum grayi*, *Maianthemum stellatum*, *Thalictrum occidentale*, and *Trifolium longipes*. Some stands have a lush herbaceous layer is dominated by tall graminoids such as *Calamagrostis canadensis*. This forest alliance occurs in upper montane riparian or wetland areas in the Rocky Mountains and Sierra Nevada. Sites are flat, wet, relatively cold floodplain and basin landforms. Stands occur in forested margins of meadows, lake or forest basins, and along valley bottoms. In all cases, the sites are flat to gently sloping.

Classification Comments: *Pinus contorta* is a poor competitor and occupies both extremes on the moisture gradient. This alliance covers the non-bog, swamp forests types dominated by *Pinus contorta*.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: The dominance of *Pinus contorta* in the moderately dense to dense tree canopy without significant regeneration of other tree species, and the extended flooding and high water tables during the growing season.

VEGETATION

Physiognomy and Structure: The overstory tree canopy is dominated by evergreen needle-leaved trees. A short-shrub layer or an herbaceous layer may be present.

Floristics: *Pinus contorta* is the only tree present in the reported stands, and is the only species represented in the regeneration layer. Other conifers sometimes present may include *Abies grandis*, *Abies lasiocarpa*, *Abies magnifica* var. *shastensis*, *Picea engelmannii*, *Pinus flexilis*, or *Tsuga mertensiana*. The shrub layer may include *Arctostaphylos uva-ursi*, *Ribes* spp., *Rosa woodsii*, *Spiraea douglasii*, *Vaccinium boreale*, and several species of *Salix*, including *Salix boothii*, *Salix geyeriana*, and *Salix lemmonii*. The herbaceous layer can be forb- or graminoid-dominated. Graminoids include *Calamagrostis canadensis*, *Carex angustata*, *Carex angustata*, *Carex aquatilis*, *Danthonia californica*, *Deschampsia cespitosa*, *Elymus glaucus*, *Juncus balticus*, and *Koeleria macrantha*. Forb species include *Achillea millefolium*, *Antennaria* spp., *Dodecatheon jeffreyi*, *Fragaria virginiana*, *Galium boreale*, *Geum macrophyllum*, *Maianthemum stellatum*, *Mimulus primuloides*, *Packera pseud aurea* (= *Senecio pseud aureus*), *Potentilla* spp., *Symphotrichum spatulatum* (= *Aster occidentalis*), *Thalictrum occidentale*, and *Trifolium longipes*.

ENVIRONMENT & DYNAMICS

Environmental Description: Sites include edges of meadows, streamside terraces, lakeshores, and flat to slightly concave drainages and basins. Valleys where it occurs are broad, low-gradient, and usually flat-bottomed. Soils are silts, sandy loams and silty clay loams. Wetter stands will have a significant organic component, sometime with a peat layer (Kovalchik 1987). The soil surface will often be slightly flooded at snowmelt, but by late summer the water table will drop to >1 m depth (Kovalchik 1987).

Dynamics:

DISTRIBUTION

Geographic Range: This alliance occurs in the Sierra Nevada of California and Nevada, and the Rocky Mountains of eastern Oregon, Idaho, Alberta, Montana, Wyoming, Colorado, and Utah.

Nations: CA, US

NBR alliances

States/Provinces: AB, CA, CO, ID, MT, NV, OR, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Picea engelmannii* Forested Wetlands (Chappell et al. 1997)
- >< Aspen: 217 (Eyre 1980)
- >< Lodgepole Pine: 218 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEGL000157 *Pinus contorta* var. *murrayana* - *Populus tremuloides* / *Spiraea douglasii* Swamp Forest
- CEGL000147 *Pinus contorta* / *Deschampsia cespitosa* Swamp Forest
- CEGL005929 *Pinus contorta* / *Cornus sericea* Swamp Woodland
- CEGL000138 *Pinus contorta* / *Calamagrostis canadensis* Swamp Forest
- CEGL000140 *Pinus contorta* / *Carex (aquatilis, angustata)* Swamp Woodland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Chappell et al. 1997, Crowe and Clausnitzer 1997, Eyre 1980, Faber-Langendoen et al. 2017b, Hopkins 1979a, Kovalchik 1987, Volland 1976

1. Forest & Woodland

1.B.3.Nc. Rocky Mountain-Great Basin Montane Flooded & Swamp Forest

G506. Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

A3797. *Pinus ponderosa* - *Juniperus scopulorum* - *Abies concolor* Riparian Woodland Alliance

Type Concept Sentence: This alliance consists of conifer-dominated canopies of low-elevation riparian areas characterized by an open canopy of the conifers *Pinus ponderosa*, *Juniperus scopulorum*, and/or *Abies concolor*. These woodlands can occur as broad, extensive stands on wider floodplain terraces or as narrow, long ribbons. They are found throughout the Rocky Mountains, south into Arizona and New Mexico, and west into eastern mountain valleys of Washington and Oregon.

OVERVIEW

Scientific Name: *Pinus ponderosa* - *Juniperus scopulorum* - *Abies concolor* Riparian Woodland Alliance

Common Name (Translated Scientific Name): Ponderosa Pine - Rocky Mountain Juniper - White Fir Riparian Woodland Alliance

Colloquial Name: Ponderosa Pine - Rocky Mountain Juniper - White Fir Riparian Woodland

Type Concept: Vegetation included in this riparian alliance is characterized by an open canopy of conifers. Dominant species include *Pinus ponderosa*, *Juniperus scopulorum*, and/or *Abies concolor*. Other conifer or deciduous trees may be present but the stand remains characterized by conifer dominance. Typically a tall-shrub layer is present, with species such as *Alnus* spp., *Betula occidentalis*, *Cornus sericea*, *Crataegus douglasii*, *Juglans major*, *Prunus virginiana*, *Quercus garryana*, or *Salix* spp. The herbaceous layer can be dominated by either graminoids or forbs. This alliance occurs on low-elevation streams in valleys that vary from V-shaped to trough-shaped or broad and flat, and stream gradients are typically moderate. These woodlands can occur as broad, extensive stands on wider floodplain terraces or as narrow, long ribbons. Sites include mountain valleys, foothill ravines, terraces and alluvial benches of major streams and rivers. In southern Arizona, stands occur along smaller perennial streams and washes. Soils are cobbly, coarse-textured and derived from alluvium. This alliance is found throughout the Rocky Mountains, south into Arizona and New Mexico, and west into the Columbia Basin of Washington and Oregon.

Classification Comments: Conifer-dominated riparian woodlands tend to be in areas of lower elevation than is typical for the conifer species, or in wide valley bottoms.

Internal Comments: GMK 8-14: This alliance may be too broad geographically and floristically. It may make sense to split north and south along floristic lines. However, there are few conifer only-dominated riparian areas at low elevations, so it may simply be a convenience to have them in one alliance, especially if many of the associations share broader distributed species such as *Pinus ponderosa*.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of this semi-riparian alliance are woodland stands dominated by *Pinus ponderosa*, *Juniperus scopulorum*, or *Abies concolor* with brief seasonal flooding during the growing season.

VEGETATION

Physiognomy and Structure: The tree canopy is dominated by a 5- to 10-m tall coniferous layer. The canopy is relatively open with an understory of widely scattered to dense shrubs. The tall-shrub stratum is moderately dense with 10-25% cover.

Floristics: These are riparian woodlands dominated by conifer trees. Dominant tree species include *Pinus ponderosa*, *Juniperus scopulorum*, and/or *Abies concolor*. Other trees present may include *Acer negundo*, *Juniperus deppeana*, *Pinus discolor*, *Pinus edulis*, *Populus angustifolia*, *Populus balsamifera ssp. trichocarpa*, *Pseudotsuga menziesii*, and *Quercus* spp. Some stands contain no shrub layers, others have luxurious growth of shrubs including *Alnus incana*, *Alnus rhombifolia*, *Amelanchier alnifolia*, *Betula occidentalis*, *Cornus sericea*, *Crataegus douglasii*, *Frangula betulifolia* (= *Rhamnus betulifolia*), *Holodiscus discolor*, *Juglans major*, *Physocarpus malvaceus*, *Prunus virginiana*, *Quercus garryana*, *Rhus aromatica*, *Ribes* spp., *Rosa woodsii*, *Salix* spp., *Solanum dulcamara*, *Symphoricarpos albus*, *Symphoricarpos occidentalis*, *Toxicodendron rydbergii* and/or *Vitis arizonica*. Herbaceous undergrowth can be absent or, if present, may occur both beneath the tree canopy or on exposed point bars. Native graminoids include *Bromus ciliatus* var. *richardsonii* (= *Bromus richardsonii*), *Panicum bulbosum*, *Panicum virgatum*, *Pascopyrum smithii*, and *Piptatheropsis micrantha* (= *Oryzopsis micrantha*). Forbs can include *Achillea millefolium*, *Apocynum androsaemifolium*, *Galium boreale*, *Galium mexicanum ssp. asperrimum* (= *Galium asperrimum*), *Geranium caespitosum*, *Glycyrrhiza lepidota*, *Maianthemum stellatum*, *Potentilla* spp., *Pteridium aquilinum*, *Thalictrum fendleri*, and the fern ally *Equisetum arvense*.

ENVIRONMENT & DYNAMICS

Environmental Description: These are riparian streamside stands that occur on both wide floodplains and narrow valleys with little floodplain development. It can form extensive stands on older alluvial terraces of floodplains of major streams or rivers and others are narrow bands in V-shaped canyons. These woodlands are intolerant of frequent and prolonged flooding; however, they are tolerant of periodic flooding and high water tables. Typically, the soils are shallow, derived from coarse alluvial substrates. Soil textures are sandy clay loams to sandy loams with a high percentage of coarse fragments.

Dynamics: Flooding events that create bare mineral seedbeds on newly created alluvial terraces may be necessary for reproduction of conifers in these riparian sites (Muldavin et al. 1996), as grasses and forbs may compete with conifer seedlings for space and water. Conifer species grow within the flood zone of desert stream reaches, where they are able to germinate and grow on fresh, moist alluvium in the absence of competing grasses (Muldavin et al. 1996).

DISTRIBUTION

Geographic Range: This alliance is found on lower foothills and canyon bottoms of Arizona, New Mexico, Utah, Colorado, Idaho, eastern Washington, eastern Oregon, Wyoming and Montana.

Nations: US

States/Provinces: AZ, CO, ID, MT, NM, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Pinus ponderosa* Series (Muldavin et al. 1996)
- >< Ponderosa Pine Series (Crowe and Clausnitzer 1997)

LOWER LEVEL UNITS

Associations:

- CEGLO00853 *Pinus ponderosa* / *Cornus sericea* Riparian Woodland

- CEGLO02766 *Pinus ponderosa* Riparian Woodland
- CEGLO02638 *Pinus ponderosa* / *Alnus incana* Riparian Woodland
- CEGLO02777 *Juniperus scopulorum* Riparian Woodland [Placeholder]
- CEGLO02754 *Pseudotsuga menziesii* / *Acer negundo* Riparian Woodland
- CEGLO05367 *Abies concolor* - *Acer negundo* / *Alnus incana* ssp. *tenuifolia* Riparian Forest
- CEGLO05384 *Pinus ponderosa* / *Forestiera pubescens* Riparian Woodland
- CEGLO00866 *Pinus ponderosa* / *Symphoricarpos albus* Riparian Woodland
- CEGLO00855 *Pinus ponderosa* / *Crataegus douglasii* Riparian Woodland
- CEGLO00746 *Juniperus scopulorum* / *Cornus sericea* Riparian Woodland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Bassett et al. 1987, Billings 1954, Cronquist et al. 1972, Crowe and Clausnitzer 1997, Evans 1989a, Faber-Langendoen et al. 2017b, Hansen et al. 1991, Hansen et al. 1995, Kauffman et al. 1985, Kittel et al. 1994, Kittel et al. 1996, Kittel et al. 1997a, Kittel et al. 1999a, Mack 1988, Maxey and Eakin 1949, Muldavin et al. 1996, ORNHP unpubl. data, Reid et al. 1994, Simpson 1876, Welsh et al. 1987

1. Forest & Woodland

1.B.3.Nc. Rocky Mountain-Great Basin Montane Flooded & Swamp Forest

G506. Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

A3759. *Populus angustifolia* Riparian Forest Alliance

Type Concept Sentence: This alliance consists of riparian woodlands dominated by *Populus angustifolia* alone or codominated with other deciduous or coniferous trees. It occurs on narrow stream terraces and large floodplains in the Rocky Mountains of Montana, Idaho, Wyoming, Utah, Colorado and New Mexico. It is also found in the mountains of eastern Oregon, Nevada, California's Sierra Nevada, and the highlands of Arizona. Elevations range from 1200-2750 m (4000-9000 feet).

OVERVIEW

Scientific Name: *Populus angustifolia* Riparian Forest Alliance

Common Name (Translated Scientific Name): Narrowleaf Cottonwood Riparian Forest Alliance

Colloquial Name: Narrowleaf Cottonwood Riparian Forest

Type Concept: This alliance consists of riparian forests and woodlands dominated by *Populus angustifolia* alone or codominated with other deciduous or coniferous trees. Due to the broad north to south geographic scope of this alliance, as well as its elevational range from foothill to subalpine, many other tree species may be present within stands. These include *Abies lasiocarpa*, *Acer grandidentatum*, *Acer negundo*, *Juniperus scopulorum*, *Picea engelmannii*, *Picea pungens*, *Pinus ponderosa*, *Populus balsamifera*, *Populus deltoides*, *Pseudotsuga menziesii*, and *Salix amygdaloides*. The shrub layer is dominated by *Acer glabrum*, *Alnus incana*, *Alnus oblongifolia*, *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Brickellia californica*, *Cornus sericea*, *Crataegus rivularis*, *Juniperus deppeana*, *Lonicera involucrata*, *Quercus gambelii*, *Rosa woodsii*, *Salix* spp., and/or *Symphoricarpos occidentalis*. Woody vines may be present, such as *Clematis ligusticifolia*, *Humulus lupulus* var. *lupuloides* (= *Humulus americanus*), *Parthenocissus quinquefolia* (= *Parthenocissus inserta*), and *Vitis arizonica*. The herbaceous undergrowth is often dominated by non-native hay grasses and little forb cover. Common forbs that can be abundant include *Achillea millefolium*, *Heracleum maximum* (= *Heracleum lanatum*), *Maianthemum stellatum*, *Osmorhiza depauperata*, and/or *Thalictrum fendleri*. This alliance occurs in the Rocky Mountains of Montana, Idaho, Wyoming, Utah, Colorado and New Mexico. It is also found in the mountains of eastern Oregon, Nevada, California's Sierra Nevada, and the highlands of Arizona. Stands occur on narrow stream terraces and large floodplains. Elevations range from 1200-2750 m (4000-9000 feet). Microtopography is often smooth to gently undulating with slopes between 2 and 5%. Stands generally occur within 1 m vertical distance of flooding high water mark, but can also occur on higher terraces, up to 3 m above the channel. Water tables fluctuate seasonally, subirrigating soils in spring, but often dropping and drying soils by late August. Soils are typically well-drained with large amounts of coarse fragments in the subsurface horizons. The soil textures are fine sandy loams, clay loams, silty clay loams, and silty clay, sometimes with buried thin organic layers. Stands have also been documented on pure sand, where streams bisected sand dunes.

Classification Comments: While the geographic scope is large for this alliance, the constancy of canopy *Populus angustifolia* and the riparian/ streamside/ alluvial environment maintain a surprisingly consistent set of species composition throughout, even though there are regional expressions, these are variations on a theme. One reviewer suggested geographic separation for these regional

expressions. Gwen Kittel developed these 4 alliance groupings, attempting geographic separation: Suballiance 1. *Populus angustifolia* - *Pinus pungens* - *Salix irrorata* Woodland Suballiance (Central - NV, UT, CO, OR); Suballiance 2. *Populus angustifolia* - *Alnus oblongifolia* - *Acer grandidentatum* Woodland Suballiance (Northern - Canada, MT, WY, ID); Suballiance 3. *Populus angustifolia* - *Juniperus deppeana* - *Forestiera pubescens* Woodland Suballiance (Southern - NM, AZ, CA, TX); and Suballiance 4. *Populus angustifolia* - *Pinus ponderosa* - *Cornus sericea* Woodland Suballiance (Throughout).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of this alliance is the dominance of *Populus angustifolia* in the tree canopy.

VEGETATION

Physiognomy and Structure: The tree canopy is dominated by broad-leaved deciduous (10-15 m tall) trees. The canopy consists of overlapping crowns generally forming 25-100% cover. The tree subcanopy is minor, dominated by 5- to 10-m tall trees with 10-25% cover. The tall- and short-shrub layers range from sparse to moderate cover (10-70%). The herbaceous layer typically is dominated by perennial forbs.

Floristics: Associations within this alliance are defined as cold-deciduous, temporarily flooded woodlands. The tree canopy is typically open and dominated by *Populus angustifolia* with 20-70% cover. Other trees can include *Acer negundo*, *Juniperus scopulorum*, *Picea pungens*, *Pinus ponderosa*, *Picea engelmannii*, and *Salix amygdaloides* at lower elevation sites within the Rocky Mountains and *Populus balsamifera*, *Populus deltoides*, or *Acer grandidentatum* in the northern areas. The shrub layer is can be very dense and diverse with 10-80% cover of *Acer glabrum*, *Alnus incana*, *Amelanchier utahensis*, *Cornus sericea*, *Crataegus rivularis*, *Lonicera involucrata*, *Quercus gambelii*, *Rosa woodsii*, *Salix* spp., or *Symphoricarpos occidentalis*. The shrub layer in Arizona and New Mexico stands also consists of *Juniperus deppeana*, *Brickellia californica*, and *Alnus oblongifolia*. The forb layer includes 0-50% cover of *Achillea millefolium*, *Heracleum maximum* (= *Heracleum lanatum*), *Maianthemum stellatum*, and *Osmorhiza depauperata*. Graminoid cover is insignificant. In New Mexico and Arizona, a significant vine component is present, with cover of 25-60%, consisting mainly of *Clematis ligusticifolia*, *Humulus lupulus* var. *lupuloides* (= *Humulus americanus*), *Parthenocissus quinquefolia* (= *Parthenocissus inserta*), and *Vitis arizonica*.

ENVIRONMENT & DYNAMICS

Environmental Description: Vegetation types in this alliance occur on terraces and floodplains immediately adjacent to streams. Elevations range from 1350 m in the southwest to 2400 m in Colorado. Microtopography is often smooth to gently undulating with slopes between 2 and 5%. Stands generally occur within 1 m of the high water mark, but can also occur on higher terraces, up to 3 m above the channel. Water tables are rarely within 50 cm of the soil surface, and stands are as much as 3-4 m above the stream level (Hansen et al. 1995). Soil pH levels range from slightly acidic to moderately alkaline (pH 6.2-8.4). Soils are typically well-drained with large amounts of coarse fragments in the subsurface horizons. The soil textures are fine sandy loams, clay loams, silty clay loams, and silty clay. Soils are frequently reworked by floods and beavers. Peat deposits, if present, are thin.

Dynamics: Cottonwood forests grow within an alluvial environment that is continually changing due to the ebb and flow of the river. Riparian vegetation is constantly being "re-set" by flooding disturbance. Cottonwood communities are early-, mid- or late-seral, depending on the age class of the trees and the associated species of the stand. Mature cottonwood stands do not regenerate in place, but regenerate by "moving" up and down a river reach. Over time, a healthy riparian area supports all stages of cottonwood communities. The process of cottonwood regeneration is well-documented. Periodic flooding events can leave sandbars of bare, mineral substrate. Cottonwood seedlings germinate and become established on newly-deposited, moist sandbars. In the absence of large floods in subsequent years, seedlings begin to trap sediment. In time, the sediment accumulates and the sandbar rises. The young forest community is then above the annual flood zone of the river channel.

In this newly elevated position, with an absence of excessive browsing, fire, and agricultural conversion, this cottonwood community can grow into a mature riparian forest. At the same time, the river channel continually erodes streambanks and creates fresh, new surfaces for cottonwood establishment. This results in a dynamic patchwork of different age classes, plant associations and habitats.

As cottonwoods mature, other tree species may become established. If the land surface is subject to reworking by the river, successional processes will start over with erosion and subsequent flooding deposition. If the land surface is not subject to alluvial processes, on for example a high terrace, the cottonwoods will be replaced by upland shrub or tree species from adjacent areas.

DISTRIBUTION

Geographic Range: This alliance occurs in the Rocky Mountains and broad river plains of mountain valleys of Alberta, Montana, Idaho, Wyoming, Utah, Colorado and New Mexico. It is also found in the mountains of eastern Oregon, Nevada, California's Sierra Nevada, and the highlands of Arizona.

Nations: CA, US

States/Provinces: AB, AZ, CA, CO, ID, MT, NM, NV, OR, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Great Basin); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< Cottonwood - Willow: 235 (Eyre 1980)
- >< Deciduous Forest Series (Johnston 1987)
- >< Montane Riparian Wetlands (Brown 1982a)

LOWER LEVEL UNITS

Associations:

- CEGLO00646 *Populus angustifolia* / *Acer grandidentatum* Riparian Forest
- CEGLO05962 *Populus angustifolia* / *Forestiera pubescens* var. *pubescens* Riparian Woodland
- CEGLO02646 *Populus angustifolia* / *Salix drummondiana* - *Acer glabrum* Riparian Woodland
- CEGLO00933 *Populus angustifolia* - *Juniperus deppeana* / *Brickellia californica* Riparian Woodland
- CEGLO02643 *Populus angustifolia* Sand Dune Riparian Forest
- CEGLO00656 *Populus angustifolia* - *Populus deltoides* - *Salix amygdaloides* Riparian Forest
- CEGLO00653 *Populus angustifolia* / *Rosa woodsii* Riparian Forest
- CEGLO00934 *Populus angustifolia* - *Picea pungens* / *Alnus incana* Riparian Woodland
- CEGLO02644 *Populus angustifolia* / *Crataegus rivularis* Riparian Woodland
- CEGLO02664 *Populus angustifolia* / *Cornus sericea* Riparian Woodland
- CEGLO00650 *Populus angustifolia* / *Lonicera involucrata* Riparian Forest
- CEGLO02648 *Populus angustifolia* / *Symphoricarpos (albus, occidentalis, oreophilus)* Riparian Woodland
- CEGLO02645 *Populus angustifolia* / *Salix (monticola, drummondiana, lucida)* Riparian Woodland
- CEGLO00648 *Populus angustifolia* / *Betula occidentalis* Riparian Woodland
- CEGLO00935 *Populus angustifolia* - *Pinus ponderosa* Riparian Woodland
- CEGLO02641 *Populus angustifolia* - *Pseudotsuga menziesii* Riparian Woodland
- CEGLO00938 *Populus angustifolia* / *Alnus oblongifolia* Riparian Woodland
- CEGLO02647 *Populus angustifolia* / *Salix irrorata* Riparian Woodland
- CEGLO00652 *Populus angustifolia* / *Rhus trilobata* Riparian Woodland
- CEGLO02642 *Populus angustifolia* / *Alnus incana* Riparian Woodland
- CEGLO02640 *Populus angustifolia* - *Juniperus scopulorum* Riparian Woodland
- CEGLO00651 *Populus angustifolia* / *Prunus virginiana* Riparian Woodland
- CEGLO00654 *Populus angustifolia* / *Salix exigua* Riparian Woodland
- CEGLO05992 *Populus angustifolia* - *Acer negundo* Riparian Woodland
- CEGLO02537 *Populus angustifolia* / *Artemisia tridentata* ssp. *vaseyana* / *Eriogonum umbellatum* Dry Outwash Riparian Woodland
- CEGLO02804 *Populus angustifolia* / *Quercus gambelii* Riparian Woodland
- CEGLO00655 *Populus angustifolia* / *Salix ligulifolia* - *Shepherdia argentea* Riparian Woodland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2016/09/29

REFERENCES

References: Baker 1984a, Baker 1986a, Baker 1989b, Bassett et al. 1987, Beidleman 1954, Boles and Dick-Peddie 1983, Brown 1982a, Candalossi 1979, Cooper and Cottrell 1990, DeLeuw, Cather & Company 1977, Dick-Peddie 1993, Durkin et al. 1994b, Durkin et al. 1995a, Eyre 1980, Faber-Langendoen et al. 2017b, Freeman and Dick-Peddie 1970, Girard et al. 1997, Gom and Rood 1999, Hansen et al. 1991, Hansen et al. 1995, Hess 1981, Hess and Alexander 1986, Hess and Wasser 1982, Johnston 1987, Keammerer 1974a, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1997a, Kittel et al. 1999a, Klish 1977, Komarkova 1986, Laurenzi et al. 1983, Marriott and Jones 1989, Muldavin et al. 1993a, Muldavin et al. 1993b, Olson and Gerhart 1982, Padgett and Manning 1988, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1942, Richard et al. 1996, Smith 1994b,

Thompson and Hansen 2002, Trammell and Trammell 1977, Woodbury et al. 1961, Youngblood et al. 1985a, Youngblood et al. 1985b

1. Forest & Woodland

1.B.3.Nc. Rocky Mountain-Great Basin Montane Flooded & Swamp Forest

G506. Rocky Mountain-Great Basin Montane Riparian & Swamp Forest

A3760. *Populus tremuloides* Riparian Forest Alliance

Type Concept Sentence: This alliance includes only those stands of *Populus tremuloides* that are truly wetlands and riparian in their setting. Most stands of this alliance are found in riparian zones. Some may be near lakes where the ground is flooded or saturated for a short time in the spring. The moderate to closed tree canopy is dominated by *Populus tremuloides*; sometimes other trees are codominant, such as *Populus angustifolia*, *Abies concolor*, *Pinus ponderosa*, and *Picea pungens*. More open stands have a prominent shrub layer containing species such as *Alnus incana*, *Cornus sericea*, and *Salix* spp. This alliance is found in the Rocky Mountains of Alberta, Montana, Idaho, Wyoming, Colorado, Utah, eastern Oregon and Washington, and Great Basin mountain ranges of Nevada, possibly extending into the Sierra Nevada of California. In addition it occurs on high plateaus and canyons of New Mexico.

OVERVIEW

Scientific Name: *Populus tremuloides* Riparian Forest Alliance

Common Name (Translated Scientific Name): Quaking Aspen Riparian Forest Alliance

Colloquial Name: Quaking Aspen Riparian Forest

Type Concept: This alliance includes only those stands of *Populus tremuloides* that are truly wetlands and riparian in their setting. Most stands of this alliance are found in riparian zones. Some may be near lakes where the ground is flooded or saturated for a short time in the spring. The moderate to closed tree canopy is dominated by *Populus tremuloides*; sometimes other trees are codominant, such as *Populus angustifolia*, *Abies concolor*, *Pinus ponderosa*, and *Picea pungens*. More open stands have a prominent shrub layer containing species such as *Alnus incana*, *Cornus sericea*, and *Salix* spp. This alliance is found in the Rocky Mountains of Alberta, Montana, Idaho, Wyoming, Colorado, Utah, eastern Oregon and Washington, and Great Basin mountain ranges of Nevada, possibly extending into the Sierra Nevada of California. In addition it occurs on high plateaus and canyons of New Mexico.

Classification Comments: *Populus tremuloides* is a widespread species that occurs in generally mesic slopes. This alliance is limited to those stands on wetland soils and riparian alluvial areas and draws where water collects.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Riparian and other wetland areas dominated in the upper canopy by *Populus tremuloides*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderately dense to dense tree canopy dominated by cold-deciduous broad-leaved trees (5-20 m tall). Evergreen needle-leaved trees may be present to codominant in the tree canopy. The understory is variable. Sparse to dense, tall- and short-shrub layers may be present and are typically dominated by deciduous broad-leaved species; however, a scale-leaved short shrub dominates the understory of some stands. Sparse to dense, tall or short herbaceous layers may also be present and may be dominated by perennial forbs or graminoids.

Floristics: This alliance is dominated by *Populus tremuloides*. Common tree associates include *Abies concolor*, *Abies lasiocarpa*, *Betula papyrifera*, *Picea engelmannii*, *Picea glauca*, *Pinus contorta*, *Populus balsamifera* ssp. *trichocarpa*, and *Pseudotsuga menziesii*, depending on the elevation. A shrub layer may be dominated by *Alnus incana*, *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Betula nana*, *Betula occidentalis*, *Cornus sericea*, *Prunus americana*, *Prunus pensylvanica*, *Prunus virginiana*, *Quercus gambelii*, *Ribes montigenum*, *Rosa woodsii*, *Rubus idaeus*, *Salix bebbiana*, *Salix drummondiana*, *Salix monticola*, other *Salix* spp., *Sorbus scopulina*, *Symphoricarpos albus*, *Symphoricarpos oreophilus*, and/or *Vaccinium scoparium*. The dwarf-shrubs *Mahonia repens* and *Vaccinium myrtillus* are common. The herbaceous layer may be lush and diverse, dominated by graminoids or tall forbs. Common graminoids may include *Bromus ciliatus*, *Bromus carinatus*, *Calamagrostis canadensis*, *Carex siccata* (= *Carex foenea*), *Carex hoodii*, *Elymus glaucus*, *Elymus trachycaulus*, and *Festuca thurberi*. Forbs may include *Achillea millefolium*, *Delphinium x occidentale*, *Equisetum arvense*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Fragaria virginiana*, *Geranium richardsonii*, *Ligusticum porteri*, *Maianthemum stellatum*, *Mertensia arizonica*, *Osmorhiza occidentalis*, *Senecio bigelovii* var. *bigelovii*, *Thalictrum occidentale*, *Veratrum californicum*, and many others. Exotic grasses such as the perennial *Poa pratensis* and the annual *Bromus tectorum* are often common in stands disturbed by grazing.

ENVIRONMENT & DYNAMICS

Environmental Description: Forests included in this alliance occur in seasonally flooded areas in the Rocky Mountain region. Elevations range from 850-3170 m. Climate is temperate with a relatively long growing season, typically cold winters and often deep snow. Mean annual precipitation is greater than 38 cm and typically greater than 50 cm. The distribution of *Populus tremuloides* forests is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondly, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Habitats vary in aspect according to elevation and latitude in respect to the most limiting factor. Stands in this alliance are restricted to sites saturated by seepage from springs and streams from snowmelt. They occur below seeps on gentle slopes, wet draws and flats, and in depressions along streambank terraces. Aspects are variable. In Colorado they are typically on cool, moist north and northeast aspects, whereas in northwestern Wyoming, aspects often are on warmer eastern or western slopes. Soils are often fine-textured, poorly drained, consisting of silts and clays, often forming an organic muck (Youngblood and Mueggler 1981). However, some the alluvial soils are coarse-textured and permit rapid groundwater movement (Hansen et al. 1995). The water table is typically at or near the soil surface in the spring but may drop more than 1 m by midsummer (Hansen et al. 1995). Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but it appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Dynamics: Stands in this alliance often originate, and likely are maintained by, stand-replacing disturbances such as crown fire, disease and windthrow, or clearcutting by man and beaver. The stems of these thin-barked, clonal trees are easily killed by surface fires. They can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1994). Stands are favored by fire in the conifer zone (Mueggler 1988). The stems are relatively short-lived (100-150 years) and individual stands will succeed to longer-lived conifer forest if undisturbed. With adequate disturbance, a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because the long warm, moist conditions required to establish are rare in the habitats where it occurs.

DISTRIBUTION

Geographic Range: This alliance is found in the Rocky Mountains of Alberta, Montana, Idaho, Wyoming, Colorado, Utah, eastern Oregon and Washington, and Great Basin mountain ranges of Nevada, possibly extending into the Sierra Nevada of California. In addition it occurs on high plateaus and canyons of New Mexico.

Nations: CA, US

States/Provinces: AB, CA?, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Great Basin)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Pinus ponderosa* Riparian Woodlands (Chappell et al. 1997) [includes Oregon's *Pinus ponderosa* - *Populus tremuloides* / *Carex* spp. - (*Poa* spp.) Forest. This type may have a flood regime.]
- >< *Populus tremuloides* (Aspen groves) Alliance (Sawyer et al. 2009) [61.111.00]
- ? *Populus tremuloides* Riparian/Wetland Forests and Woodlands (Chappell et al. 1997)
- >< Aspen Forest (#81B00) (Holland 1986b)
- >< Aspen Series (Sawyer and Keeler-Wolf 1995)
- >< Aspen: 217 (Eyre 1980)

LOWER LEVEL UNITS

Associations:

- CEGLO00621 *Populus tremuloides* / *Veratrum californicum* Riparian Forest
- CEGLO01082 *Populus tremuloides* / *Alnus incana* - *Salix* spp. Riparian Forest
- CEGLO00576 *Populus tremuloides* Canyon Formation Riparian Forest
- CEGLO00599 *Populus tremuloides* / *Ranunculus alismifolius* Riparian Forest
- CEGLO00574 *Populus tremuloides* / *Calamagrostis canadensis* Riparian Forest
- CEGLO00577 *Populus tremuloides* / *Carex pellita* Riparian Forest
- CEGLO01149 *Populus tremuloides* / *Alnus incana* / *Betula nana* - *Ribes* spp. Riparian Forest
- CEGLO01150 *Populus tremuloides* / *Alnus incana* Riparian Forest
- CEGLO03149 *Populus tremuloides* / *Rosa woodsii* Riparian Forest
- CEGLO02902 *Populus tremuloides* / *Salix drummondiana* Riparian Forest

- CEGL000590 *Populus tremuloides* / *Senecio bigelovii* var. *bigelovii* Riparian Forest
- CEGL000600 *Populus tremuloides* / *Ribes montigenum* Riparian Forest
- CEGL002650 *Populus tremuloides* / *Betula occidentalis* Riparian Forest
- CEGL003442 *Populus tremuloides* / *Carex aquatilis* var. *aquatilis* Riparian Forest
- CEGL003147 *Populus tremuloides* - *Pinus jeffreyi* Riparian Forest
- CEGL000584 *Populus tremuloides* / *Equisetum arvense* Riparian Forest
- CEGL000191 *Pinus ponderosa* - *Populus tremuloides* / *Carex* spp. - (*Poa* spp.) Riparian Forest
- CEGL005418 *Abies concolor* - (*Populus tremuloides*) / *Salix boothii* / *Carex scopulorum* Riparian Forest
- CEGL005419 *Abies concolor* - *Populus tremuloides* / *Carex scopulorum* Riparian Forest
- CEGL000582 *Populus tremuloides* / *Cornus sericea* Riparian Forest
- CEGL003371 *Populus tremuloides* / *Carex obnupta* Riparian Forest

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Bock and Bock 1984, Boggs et al. 1990, Chappell et al. 1997, Cooper and Heidel 1997, Cooper and Pfister 1981, DeByle 1985, Evans 1989a, Evenden 1990, Eyre 1980, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Freeman and Dick-Peddie 1970, Hall 1967, Hansen et al. 1990, Hansen et al. 1991, Hansen et al. 1995, Hayward 1928, Hoffman and Alexander 1980, Holland 1986b, Hopkins 1979a, Johnston and Hendzel 1985, Kagan 1985, Kettler and McMullen 1996, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1997a, Kittel et al. 1999b, Klimas 1988a, Knight 1994, Kovalchik 1987, Manning and Padgett 1991, Manning and Padgett 1995, Mueggler 1988, Mueggler and Campbell 1986, Mutel 1973, Padgett 1982, Padgett et al. 1988b, Padgett et al. 1989, Powell 1988a, Richard et al. 1996, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Smith 1994b, Van Auken and Bush 1988, WNHP unpubl. data, Watson 1912, Youngblood and Mueggler 1981

1.B.3.Nd. Western North American Interior Flooded Forest

This lowland riparian forest and woodland type is dominated by broad-leaved deciduous trees (cottonwoods, sycamores, and hackberries) and palms that occur along perennial and intermittent rivers, springs and oases of the California Central Valley, Southwest U.S. deserts, and the Tamaulipan region of south Texas and adjacent Mexico.

M036. Interior Warm & Cool Desert Riparian Forest

This macrogroup covers warm and cold climate riparian and wetland forested vegetation of the southwestern deserts and western interior U.S., including the Tamaulipan area of southern Texas. Some of the dominant trees species of this highly diverse macrogroup include *Vachellia farnesiana*, *Celtis laevigata*, *Ebenopsis ebano*, *Juglans major*, *Platanus racemosa*, *Platanus wrightii*, *Populus deltoides* ssp. *wislizeni*, *Populus deltoides* ssp. *monilifera*, *Populus fremontii*, *Prosopis glandulosa*, *Salix laevigata*, and *Salix gooddingii*. This macrogroup also includes oases dominated by evergreen palms *Washingtonia filifera* or *Sabal mexicana*.

1. Forest & Woodland

1.B.3.Nd. Western North American Interior Flooded Forest

1.B.3.Nd.2.b. M036 Interior Warm & Cool Desert Riparian Forest

G797. Western Interior Riparian Forest & Woodland

Type Concept Sentence: This group consists of riparian woodlands dominated by trees and tall arborescent shrubs, with species such as *Acer negundo*, *Celtis laevigata* var. *reticulata*, *Cephalanthus occidentalis*, *Fraxinus velutina*, *Juglans major*, *Platanus wrightii*, *Populus deltoides*, *Populus fremontii*, *Platanus racemosa*, *Quercus lobata*, *Salix gooddingii*, *Salix laevigata*, *Sapindus saponaria*, and *Washingtonia filifera*. It is found throughout lowlands of the Interior West, including southwestern warm and cool deserts and Mediterranean California.

OVERVIEW

Scientific Name: Western Interior Riparian Forest & Woodland Group

Common Name (Translated Scientific Name): Western Interior Riparian Forest & Woodland Group

Colloquial Name: Box-elder - Singleleaf Ash - Netleaf Hackberry Riparian Woodland

Type Concept: This group consists of riparian woody vegetation. Dominant trees may include *Acer negundo*, *Celtis laevigata* var. *reticulata*, *Cephalanthus occidentalis*, *Fraxinus velutina*, *Juglans major*, *Platanus wrightii*, *Populus deltoides* ssp. *wislizeni*, *Populus*

deltoides ssp. monilifera, *Populus fremontii*, *Platanus racemosa*, *Quercus lobata*, *Salix amygdaloides*, *Salix gooddingii*, *Salix laevigata*, *Sapindus saponaria*, and *Washingtonia filifera*. Dominant shrubs include *Alnus oblongifolia*, *Baccharis salicifolia*, *Prunus spp.*, *Salix exigua*, *Salix lasiolepis*, *Shepherdia argentea*, and *Vitis californica*. Other dominants on serpentine substrates include *Aquilegia eximia*, *Carex serratodens*, *Cirsium fontinale*, *Hesperocyparis sargentii* (= *Cupressus sargentii*), *Frangula californica ssp. tomentella* (= *Rhamnus tomentella*), *Mimulus glaucescens*, *Mimulus guttatus*, *Packera clevelandii* (= *Senecio clevelandii*), *Salix breweri*, *Solidago spp.*, *Stachys albens*, and *Umbellularia californica*. The variety of plant associations within this group reflects elevation, stream gradient, floodplain width, and flooding events. It also includes springs, seeps, and perennial and intermittent streams and riparian areas found on serpentine substrates. These are disturbance-driven systems that require flooding, scour and deposition for germination and maintenance. Periodic flooding and associated sediment scour are necessary to maintain growth and reproduction of vegetation. Flooding regimes have been significantly altered in all but a few tributaries that support this group. This group occurs throughout lowlands of the interior west, including southwest warm and cool deserts and Mediterranean California, generally below about 1800 m (6000 feet) elevation. Known occurrences include the following rivers and their tributaries: Colorado, Gila, Pecos, Rio Grande, Sacramento, San Joaquin, Santa Cruz, Salt, San Pedro, Truckee, Snake and others.

Classification Comments: This group combines warm southwestern deserts with cool interior lower elevation rivers, and occurs from sea level, but does not include montane elevations.

Similar NVC Types:

- G510 Interior West Ruderal Riparian Forest & Scrub
- G533 North American Warm Desert Riparian Low Bosque & Shrubland
- G541 Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope

Diagnostic Characteristics: This group is wide-ranging in the western U.S. and occurs in the warm desert regions (Sonoran and Mojave) of the southwestern U.S. and adjacent Mexico, Mediterranean California, and the cool desert interior in riparian corridors along perennial and seasonally intermittent streams and spring-fed depressions. Diagnostic tree species trees include *Juglans major*, *Platanus racemosa*, *Platanus wrightii*, *Populus deltoides ssp. monilifera*, *Populus deltoides ssp. wislizeni*, *Populus fremontii*, *Salix amygdaloides*, *Salix laevigata*, and *Washingtonia filifera*. Shrubs are rich and varied. Stands are always adjacent to streams or their floodplains and have been observed to follow narrow tributaries. Seasonal flooding and soil saturation by a rising water table are necessary to maintain growth and reproduction of vegetation.

VEGETATION

Physiognomy and Structure: Open to closed woodlands of tall cold-deciduous trees and shrubs, forming linear bands following stream and river courses and alluvial floodplains. Herbaceous undergrowth is variable depending on the amount of shading in the overstory.

Floristics: The vegetation is a mix of riparian woodlands dominated by trees and tall arborescent shrubs. Dominant trees include *Acer macrophyllum*, *Acer negundo*, *Alnus rhombifolia*, *Alnus rubra*, *Celtis laevigata var. reticulata*, *Cephalanthus occidentalis*, *Fraxinus velutina*, *Juglans major*, *Platanus racemosa*, *Platanus wrightii*, *Populus deltoides ssp. wislizeni*, *Populus deltoides ssp. monilifera*, *Populus fremontii*, *Pseudotsuga menziesii*, *Quercus agrifolia*, *Quercus lobata*, *Salix amygdaloides*, *Salix gooddingii*, *Salix laevigata*, *Salix lasiolepis*, *Sapindus saponaria*, and *Washingtonia filifera*. Shrub dominants include *Alnus oblongifolia*, *Baccharis salicifolia*, *Prunus spp.*, *Salix exigua*, *Salix geyeriana*, *Salix lasiolepis*, and *Vitis californica*. Other dominants on serpentine substrates include *Aquilegia eximia*, *Carex serratodens*, *Cirsium fontinale*, *Hesperocyparis sargentii* (= *Cupressus sargentii*), *Frangula californica ssp. tomentella* (= *Rhamnus tomentella*), *Mimulus glaucescens*, *Mimulus guttatus*, *Packera clevelandii* (= *Senecio clevelandii*), *Salix breweri*, *Solidago spp.*, *Stachys albens*, and *Umbellularia californica*. These are disturbance-driven systems that require flooding, scour and deposition for germination and maintenance. Exotic species that may be present include *Ailanthus altissima*, *Eucalyptus spp.*, and *Tamarix spp.*, and herbs such as *Arundo donax*.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands occur on streambanks and floodplains. The variety of plant associations within this group reflects elevation, stream gradient, floodplain width, and flooding events. It also includes springs, seeps, and perennial and intermittent streams on serpentine substrates.

Dynamics: Vegetation is dependent upon annual or periodic flooding and associated sediment scour and/or annual rise in the water table for growth and reproduction. Permanent subsurface water is required to maintain *Washingtonia filifera*. Salinity is low in the root zone, but increases near the surface where evaporation leaves salt accumulations. Reproduction of *Washingtonia filifera* is limited by water supply, surface salinity, rainfall, and fire. Fan palms are fire-tolerant, while the understory species are not, and fires open up the understory allowing palm seedlings to establish. Removal of the understory also decreases competition for water. There are currently 24 known occurrences of *Washingtonia filifera* in Arizona, Nevada, and California (Sawyer et al. 2009).

DISTRIBUTION

Geographic Range: The group occurs throughout Mediterranean California, California's Central Valley, the southern Coast Ranges of Oregon, the lower valleys of Nevada and southern Idaho and the Colorado Plateau south into the canyons and desert valleys of the Sonoran and Mojave deserts of southwestern United States and adjacent Mexico. Specifically, it is known in California, southern Oregon, Nevada, Utah, Colorado, southern Arizona, New Mexico, adjacent Mexico (Baja California, Baja California del Sur, Chihuahua), and western Texas. Elevation ranges from sea level up to 1800 m.

Spatial Scale & Pattern [optional]:

Nations: MX, US

States/Provinces: AZ, CA, CO, ID, MXBC?, MXBS, MXCH, MXSO, NM, NV, OR, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Quercus lobata* (Valley oak woodland) Alliance (Sawyer et al. 2009) [71.040.00]
- >< Arizona Cypress: 240 (Eyre 1980)
- >< Cottonwood - Willow: 235 (Eyre 1980)
- >< Port Orford-Cedar: 231 (Eyre 1980)
- < Riparian Woodland (203) (Shiflet 1994) [Serpentine substrates are not specifically mentioned in Shiflet (1994).]

LOWER LEVEL UNITS**Alliances:**

- A0953 *Alnus oblongifolia* Riparian Forest Alliance
- A3801 *Platanus wrightii* Riparian Forest Alliance
- A0957 *Juglans major* - *Juglans microcarpa* Riparian Forest Alliance
- A3796 *Acer negundo* - *Fraxinus anomala* - *Celtis laevigata* var. *reticulata* Riparian Woodland Alliance
- A0485 *Washingtonia filifera* Wet Woodland Alliance
- A3750 *Platanus racemosa* - *Quercus agrifolia* - *Juglans californica* Riparian Woodland Alliance
- A3803 *Populus fremontii* - *Fraxinus velutina* - *Salix gooddingii* Riparian Forest & Woodland Alliance
- A3752 *Salix gooddingii* - *Salix laevigata* Riparian Forest Alliance
- A0644 *Populus fremontii* Great Basin Riparian Forest Alliance
- A0945 *Juglans microcarpa* Riparian Scrub Alliance
- A3798 *Populus deltoides* ssp. *wislizeni* - *Populus deltoides* ssp. *monilifera* - *Salix amygdaloides* Riparian Woodland Alliance
- A3802 *Populus deltoides* ssp. *wislizeni* - *Populus deltoides* ssp. *monilifera* Riparian Forest Alliance
- A0618 *Quercus lobata* Riparian Forest Alliance

AUTHORSHIP

Primary Concept Source: G. Kittel, P. Comer and T. Keeler-Wolf in Faber-Langendoen et al. (2015)

Author of Description: G. Kittel

Acknowledgments: Julie Evens, Todd Keeler-Wolf

Version Date: 09/29/2016

Classif Resp Region: West

Internal Author: MSR 11-14; GK 5-15, 12-15, 9-16

REFERENCES

References: Barbour and Major 1988, Brown 1982a, Dick-Peddie 1993, Eyre 1980, Faber-Langendoen et al. 2017a, Holland and Keil 1995, MacMahon 1988, Muldavin et al. 2000a, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shiflet 1994, Stout et al. 2013, Szaro 1989, Thomas et al. 2004, Vogl and McHargue 1966

1. Forest & Woodland

1.B.3.Nd. Western North American Interior Flooded Forest

G797. Western Interior Riparian Forest & Woodland

A3796. *Acer negundo* - *Fraxinus anomala* - *Celtis laevigata* var. *reticulata* Riparian Woodland Alliance

Type Concept Sentence: This alliance consists of riparian woodlands dominated by *Acer negundo*, *Fraxinus anomala*, and/or *Celtis laevigata* var. *reticulata*. Common associates include *Alnus incana*, *Betula occidentalis*, *Brickellia grandiflora*, *Brickellia longifolia*, *Cornus sericea*, *Quercus gambelii*, *Rhus trilobata*, and others. It is found on intermittently dry streams and/or in slickrock canyons, and occurs on the Colorado Plateau and south into Arizona and New Mexico.

OVERVIEW

Scientific Name: *Acer negundo* - *Fraxinus anomala* - *Celtis laevigata* var. *reticulata* Riparian Woodland Alliance

Common Name (Translated Scientific Name): Box-elder - Singleleaf Ash - Netleaf Hackberry Riparian Woodland Alliance

Colloquial Name: Box-elder - Singleleaf Ash - Netleaf Hackberry Riparian Woodland

Type Concept: This alliance consists of riparian woodlands dominated by *Acer negundo*, *Fraxinus anomala*, and/or *Celtis laevigata* var. *reticulata*. Common associates include *Alnus incana*, *Betula occidentalis*, *Brickellia grandiflora*, *Brickellia longifolia*, *Cornus sericea*, *Quercus gambelii*, *Rhus trilobata*, and others. Cottonwoods and willows are usually not present and, if present, are in very low abundance. It is found adjacent to streams and rivers, seeps and springs, near the base of colluvial slopes, and on alluvial terraces or in slickrock canyons, and occurs on the Colorado Plateau and south into Arizona and New Mexico.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:**Diagnostic Characteristics:****VEGETATION**

Physiognomy and Structure: These are broad-leaved deciduous woodlands typically with the canopy 10-20 m tall, with a sparse shrub layer and dense to sparse herbaceous layer.

Floristics: Stands are dominated by *Fraxinus anomala*, *Acer negundo*, and/or *Celtis laevigata* var. *reticulata*, usually in monotypic stands but occasionally can be seen together. Other trees present may include *Juniperus osteosperma*, *Pinus edulis*, or *Pseudotsuga menziesii*. Associated tall shrubs include *Amelanchier alnifolia*, *Betula occidentalis*, *Forestiera pubescens*, *Quercus gambelii*, *Rhus trilobata*, and *Salix exigua*. Short shrubs contribute low cover and include *Ephedra viridis*, *Ericameria nauseosa*, *Holodiscus dumosus*, *Rhus trilobata*, *Symphoricarpos rotundifolius*, and the vines *Clematis ligusticifolia* and *Vitis arizonica*. The herbaceous layer may have *Elymus glaucus*, *Equisetum arvense*, *Equisetum hyemale*, *Maianthemum stellatum*, *Mentha arvensis*, and *Phalaris arundinacea*. Exotic graminoids such as *Poa pratensis* or *Agrostis stolonifera* can be abundant.

ENVIRONMENT & DYNAMICS

Environmental Description: This vegetation is restricted to mesic sites, such as near seeps, springs and ephemeral stream channels, on immediate riverbanks, within 2 m of the active channel, or streambanks immediately below perennial or seasonal springs or on lower colluvial slopes where additional soil moisture is available. Sites are flat to gently sloping and may have any aspect. Substrates are nearly always derived from colluvium but often have been transported or redistributed by water to form alluvial deposits. Soils are shallow to deep and well-drained to rapidly drained. Soil texture varies widely and can be coarse-loamy to fine-loamy and generally has large amounts of gravel and cobble. The water table is seasonally within 1 m of the surface.

Dynamics: With scouring floods, *Acer negundo* may survive only if it grows on upper colluvial slopes. This may provide a seed source for regeneration after flooding and deposition. Female trees of the dioecious *Acer negundo* are better adapted to growing along the channel edge and are recommended over male trees for restoration of disturbed streambanks. *Acer negundo* is not rhizomatous, but has strong roots that provide streambank stability.

DISTRIBUTION

Geographic Range: This alliance ranges from Idaho to Montana south through Nevada, Utah, Colorado, Arizona and New Mexico.

Nations: CA, US

States/Provinces: AZ, CO, ID, MT, NM, NV, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL**USNVC Confidence Level with Comments:** Moderate.**SYNONYMY****LOWER LEVEL UNITS****Associations:**

- CEGLO02692 *Acer negundo* / *Brickellia (grandiflora, longifolia)* Riparian Woodland
- CEGLO02752 *Fraxinus anomala* Riparian Woodland
- CEGLO05953 *Celtis laevigata* var. *reticulata* / *Brickellia californica* Riparian Woodland
- CEPS009676 *Acer negundo* / *Quercus turbinella* Woodland [Park Special]
- CEGLO05941 *Acer negundo* - *Fraxinus velutina* Riparian Woodland
- CEGLO02599 *Acer negundo* - *Celtis laevigata* var. *reticulata* Riparian Woodland
- CEGLO05942 *Acer negundo* / *Salix exigua* Riparian Woodland

AUTHORSHIP**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2013)**Author of Description:** G. Kittel**Acknowledgments:****Version Date:** 2014/09/26**REFERENCES****References:** Faber-Langendoen et al. 2017b, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1999a, Padgett et al. 1989, Welsh et al. 1987

1. Forest & Woodland

1.B.3.Nd. Western North American Interior Flooded Forest

G797. Western Interior Riparian Forest & Woodland

A3798. *Populus deltoides* ssp. *wislizeni* - *Populus deltoides* ssp. *monilifera* - *Salix amygdaloides* Riparian Woodland Alliance**Type Concept Sentence:** This alliance consists of woodlands dominated by *Populus deltoides* ssp. *wislizeni*, *Populus deltoides* ssp. *monilifera*, or *Salix amygdaloides*. Other tree species include *Acer negundo*. Stands are found on alluvial floodplains, terraces and streambanks of rivers and streams, and sometimes around lakes and ponds. These stands occur along rivers and streams of Wyoming, Colorado, New Mexico, and on to the Colorado Plateau of Utah.**OVERVIEW****Scientific Name:** *Populus deltoides* ssp. *wislizeni* - *Populus deltoides* ssp. *monilifera* - *Salix amygdaloides* Riparian Woodland Alliance**Common Name (Translated Scientific Name):** Rio Grande Cottonwood - Plains Cottonwood - Peachleaf Willow Riparian Woodland Alliance**Colloquial Name:** Rio Grande Cottonwood - Plains Cottonwood - Peachleaf Willow Riparian Woodland**Type Concept:** This alliance is dominated by *Populus deltoides* ssp. *wislizeni*, *Populus deltoides* ssp. *monilifera*, or *Salix amygdaloides*. Other tree species include *Acer negundo*. Shrub species present many include *Artemisia tridentata*, *Prunus virginiana*, *Rhus trilobata*, *Salix exigua*, and *Symphoricarpos occidentalis*. Typical herbaceous species include *Carex* spp., *Distichlis spicata*, *Elymus* spp., *Equisetum* spp., *Juncus* spp., and *Pascopyrum smithii*. Exotics found in this alliance are *Poa pratensis*, *Melilotus officinalis*, and *Bromus inermis*, among many others. Stands of this alliance are found on alluvial floodplains and terraces of rivers and streams, and sometimes around lakes and ponds. These communities tolerate and depend on periodic flooding and seasonal soil saturation in the spring and after heavy rains. The soils are silts, loams, and sands, and are derived from alluvial material. This alliance occurs near rivers and large streams of Montana, Wyoming, Colorado, Idaho, Arizona and New Mexico; from the western slope of Colorado it extends into mountain valleys and on to the Colorado Plateau of Utah.**Classification Comments:****Internal Comments:** GK 9-16: ID added for Minidoka.**Other Comments:****Similar NVC Types:****Diagnostic Characteristics:** Riparian gallery forests and woodland dominated by *Populus deltoides* ssp. *wislizeni*, *Populus deltoides* ssp. *monilifera*, or *Salix amygdaloides*.

VEGETATION

Physiognomy and Structure: The tree layer is dominated by tall (20-35 m) single-stemmed, deciduous species. The canopy is open, generally forming 25-60% cover. The herbaceous layer is dominated by both graminoids and forbs with up to 20% cover.

Floristics: This alliance is dominated by *Populus deltoides* ssp. *wislizeni*, *Populus deltoides* ssp. *monilifera*, or *Salix amygdaloides*. Secondary canopy species include *Acer negundo* or (rarely) *Populus angustifolia*. A shrub layer may be present, including *Cornus sericea*, *Prunus virginiana*, *Salix exigua*, *Salix ligulifolia*, *Salix lucida*, *Salix lutea*, *Symphoricarpos occidentalis*, and others. Herbaceous layer may have *Carex pellita* (= *Carex lanuginosa*), *Carex* spp., *Cenchrus longispinus*, *Elymus* spp., *Equisetum* spp., *Glycyrrhiza lepidota*, *Juncus* spp., *Pascopyrum smithii*, *Phalaris arundinacea*, and *Poa palustris*. Common exotics found in this alliance are *Bromus inermis*, *Cirsium arvense*, *Melilotus officinalis* (= *Melilotus albus*), and *Poa pratensis*.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands of this alliance are found on level to gently sloping topography along rivers, streams, lakes, and ponds. The areas may have been very recently deposited by water action or they may have been deposited earlier and occupied by other communities. The water table fluctuates with the level of the adjacent water body. This can lead to periods of flooding and soil saturation in the spring and after heavy rains and also to periods of drought when the water level falls in the summer and fall. The soils are silts, loams, and sands, and are derived from alluvial material. Stands are located on immediate streambanks, or on distance river terraces, in backwater areas and overflow channels of large rivers, on narrow floodplains of small creeks, and on the edges of ponds and lakes. The water table is within 1 m of the soil surface during the growing season (Hansen et al. 1995), and the vegetation is tolerant of prolonged flooding.

Dynamics: Cottonwood forests grow within an alluvial environment that is continually changing due to the ebb and flow of the river. Riparian vegetation successional stage is "re-set" by flooding disturbance. Cottonwood communities are early-, mid- or late-seral, depending on the age class of the trees and the associated species of the stand. Mature cottonwood stands do not regenerate in place, but regenerate in different settings up and down a river reach. Over time, a healthy riparian area supports all stages of cottonwood communities. The process of cottonwood regeneration is well-documented. Periodic flooding events can leave sandbars of bare, mineral substrate. Cottonwood seedlings germinate and become established on newly-deposited, moist sandbars. In the absence of large floods in subsequent years, seedlings begin to trap sediment. In time, the sediment accumulates and the sandbar rises. The young forest community is then above the annual flood zone of the river channel. In addition, seasonal floods that leave fresh deposits of sediment are also areas available for colonization. This process often favors the establishment of aggressive native and exotic plants, as well as cottonwood seedlings.

Salix amygdaloides requires a moist, mineral substrate for seeds to germinate. Seeds can germinate under a sparse canopy of vegetation (Johnson 1992, cited in Jones and Walford 1995).

DISTRIBUTION

Geographic Range: This alliance occurs near rivers and large streams of Montana, Wyoming, Colorado, Idaho, Arizona and New Mexico; from the western slope of Colorado it extends into mountain valleys and on to the Colorado Plateau of Utah.

Nations: CA, US

States/Provinces: AZ, CO, ID, MT, NM, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Salix amygdaloides* Community Type (Hansen et al. 1995)
- >< Cottonwood: 63 (Eyre 1980)
- >< Eastern Broadleaf Forests: 98: Northern Floodplain Forest (*Populus-Salix-Ulmus*) (Küchler 1964)
- ? Peachleaf Willow Dominance Type (Jones and Walford 1995)

LOWER LEVEL UNITS

Associations:

- CEGLO00939 *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Distichlis spicata* Riparian Woodland
- CEGLO02685 *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Salix exigua* Riparian Woodland
- CEGLO00947 *Salix amygdaloides* Riparian Woodland
- CEGLO00948 *Salix amygdaloides* / *Salix exigua* Riparian Woodland
- CEGLO00940 *Populus deltoides* ssp. *wislizeni* / *Rhus trilobata* Riparian Woodland

- CEGLO02680 *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Pascopyrum smithii* Riparian Woodland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2016/09/29

REFERENCES

References: Bunin 1985, Christy 1973, Cooper 1988, Crouch 1961a, Crouch 1961b, Crouch 1978, Crouch 1979a, Crouch 1979b, Eyre 1980, Faber-Langendoen et al. 2017b, Fitzgerald 1978, Hansen et al. 1991, Hansen et al. 1995, Jackson 1972, Jackson and Lindauer 1978, Jones and Walford 1995, Keammerer 1974a, Keammerer 1974b, Kittel and Lederer 1993, Kittel et al. 1996, Kittel et al. 1997a, Kittel et al. 1999a, Knopf 1985, Küchler 1964, Lindauer 1970, Lindauer 1978, Lindauer and Christy 1972, Lindauer and Fitzgerald 1974, Lindauer and Ward 1968, Lindauer et al. 1973, Masek 1979, McEachern 1979, Moseley et al. 1992, Moulton et al. 1981, Thilenius and Smith 1985, Thilenius et al. 1995, USBOR 1976, Welsh et al. 1987

M298. Interior West Ruderal Flooded & Swamp Forest & Woodland

This macrogroup consists of low-elevation riparian and lacustrine areas throughout the southwestern U.S. and into Mexico that are dominated by non-native invasive woody species such as *Tamarix* spp., *Elaeagnus angustifolia*, or *Phoenix dactylifera*.

1. Forest & Woodland

1.B.3.Nd. Western North American Interior Flooded Forest

1.B.3.Nd.90.a. M298 Interior West Ruderal Flooded & Swamp Forest & Woodland

G510. Interior West Ruderal Riparian Forest & Scrub

Type Concept Sentence: Stands of *Tamarix* spp., *Elaeagnus angustifolia*, or other introduced facultative wet-tolerant species in low-elevation riparian areas throughout the western U.S. and into Mexico.

OVERVIEW

Scientific Name: *Tamarix* spp. - *Elaeagnus angustifolia* Ruderal Riparian Forest & Scrub Group

Common Name (Translated Scientific Name): Tamarisk species - Russian-olive Ruderal Riparian Forest & Scrub Group

Colloquial Name: Ruderal Box-elder Riparian Forest

Type Concept: This group consists of low-elevation riparian areas, seeps and springs throughout the southwestern U.S. and into Mexico that are dominated by non-native invasive woody species. Present to abundant species include *Elaeagnus angustifolia*, *Myoporum laetum*, *Phoenix canariensis*, *Prunus mahaleb*, *Robinia pseudoacacia*, *Schinus molle*, *Schinus terebinthifolius*, *Tamarix* spp., *Ulmus pumila*, or *Washingtonia robusta*. Salt-cedar habitats tend to support fewer species and individuals than native habitats. If present, native species contribute less than 10% relative cover. Elevation ranges from sea level to above 2135 m (7000 feet). Sites are typically streambanks and benches, floodplains and canyons with permanent, intermittent or temporary waterflow.

Classification Comments: The name is "scrub" rather than forest or woodland to capture lower heights and more open canopy densities and the fact that some dominant species are multi-stemmed and may not meet "forest" or "woodland" criteria. Planted stands of *Washingtonia robusta*, *Washingtonia filifera*, and *Phoenix canariensis* are not part of this group but would be considered "cultural" vegetation. *Washingtonia robusta* is native to Mexico, so only naturalized stands within the U.S. belong to this group.

Similar NVC Types:

- G797 Western Interior Riparian Forest & Woodland

Diagnostic Characteristics: Tall, deciduous trees dominated by naturalized, invasive species not considered native to North America or, if native to North America, naturalized beyond their native ranges.

VEGETATION

Physiognomy and Structure: Open- to closed-canopy riparian woodlands that can have a scrubby appearance (multi-stemmed, 1-20 m tall) dominated by non-native woody species, generally following linear paths of adjacent streams, rivers and floodplains.

Floristics: Present to abundant species include *Elaeagnus angustifolia*, *Myoporum laetum*, *Phoenix canariensis*, *Prunus mahaleb*, *Robinia pseudoacacia*, *Schinus molle*, *Schinus terebinthifolius*, *Tamarix* spp., *Ulmus pumila*, or *Washingtonia robusta*. Some of these are not necessarily restricted to riparian/wetland settings. Salt-cedar habitats tend to support fewer species and individuals than native habitats (Smith and Douglas 1989, Barbour et al. 2007, Sogge et al. 2008, Sawyer et al. 2009). Non-native understory species

NBR alliances

may include *Acroptilon repens*, *Aegilops* sp., *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus geniculatus*, *Alopecurus pratensis*, *Arundo donax*, *Conyza canadensis*, *Cirsium arvense*, *Echinochloa crus-galli*, *Eichhornia crassipes*, *Hordeum murinum*, *Phalaris arundinacea*, *Phleum pratense*, *Phragmites australis*, *Poa palustris*, *Poa pratensis*, *Rumex crispus*, and *Sonchus arvensis*.

ENVIRONMENT & DYNAMICS

Environmental Description: Elevation ranges from sea level to above 2135 m (7000 feet). *Climate:* Warm Temperate.
Soil/substrate/hydrology: Sites are typically alluvial streambanks and floodplains, with slightly alkaline soils and water heavy in agricultural runoff (Smith and Douglas 1989, Barbour et al. 2007, Sogge et al. 2008, Sawyer et al. 2009).

Dynamics:

DISTRIBUTION

Geographic Range: This group is found throughout the western interior of the U.S. and into Mexico.

Spatial Scale & Pattern [optional]: Large patch, Linear

Nations: MX, US

States/Provinces: AZ, CA, ID, NM, NV, OK, TX

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A4160 *Rubus armeniacus* - *Sesbania punicea* - *Ficus carica* Ruderal Riparian Scrub Alliance
- A4155 *Acer negundo* - *Populus* spp. - *Picea* spp. Ruderal Riparian Forest Alliance
- A4161 *Phoenix dactylifera* - *Washingtonia filifera* Ruderal Riparian Woodland Alliance
- A4218 *Prosopis* spp. Lowland Ruderal Understory Wet Scrub Alliance
- A3566 *Elaeagnus angustifolia* Ruderal Riparian Scrub Alliance
- A0842 *Tamarix* spp. Ruderal Riparian Scrub Alliance
- A4192 *Salix alba* - *Salix fragilis* Ruderal Riparian Forest Alliance

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2011)

Author of Description: G. Kittel

Acknowledgments:

REFERENCES

-
1. Forest & Woodland
1.B.3.Nd. Western North American Interior Flooded Forest
G510. Interior West Ruderal Riparian Forest & Scrub

A4155. *Acer negundo* - *Populus* spp. - *Picea* spp. Ruderal Riparian Forest Alliance [Low - Poorly Documented]

Type Concept Sentence:

OVERVIEW

Scientific Name: *Acer negundo* - *Populus* spp. - *Picea* spp. Ruderal Riparian Forest Alliance

Common Name (Translated Scientific Name): Box-elder - Cottonwood species - Spruce species Ruderal Riparian Forest Alliance

Colloquial Name: Ruderal Box-elder Riparian Forest

Type Concept:

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics:

ENVIRONMENT & DYNAMICS

Environmental Description:

Dynamics:

DISTRIBUTION

Geographic Range:

Nations: US

States/Provinces: AZ, CO, ID, NM, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- C EGL005485 *Populus fremontii* / *Tamarix* sp. Ruderal Riparian Woodland
- C EGL002693 *Acer negundo* / Disturbed Understory Riparian Woodland
- C EGL003749 *Populus angustifolia* / Invasive Perennial Grasses Ruderal Riparian Woodland
- C EGL005958 *Picea pungens* / *Poa pratensis* Ruderal Riparian Woodland
- C EGL003810 *Populus deltoides* ssp. *wislizeni* / Disturbed Understory Ruderal Flooded Woodland
- C EGL005961 *Populus angustifolia* - *Acer negundo* / *Poa pratensis* Ruderal Riparian Woodland

AUTHORSHIP

Primary Concept Source: G. Kittel

Author of Description:

Acknowledgments:

REFERENCES

-
1. Forest & Woodland
1.B.3.Nd. Western North American Interior Flooded Forest
G510. Interior West Ruderal Riparian Forest & Scrub

A3566. *Elaeagnus angustifolia* Ruderal Riparian Scrub Alliance [Low - Poorly Documented]

Type Concept Sentence: This alliance is dominated by the introduced tree species *Elaeagnus angustifolia* with a variety of native and introduced species in the shrub and herbaceous layers. It is a widespread woodland alliance found throughout much of the southwestern United States. It is a naturalized species whose seeds are spread by birds. Stands tend to be small and linear and occur in a variety of native habitats, particularly more mesic ones, such as near streams and rivers, upland basins and drainages.

OVERVIEW

Scientific Name: *Elaeagnus angustifolia* Ruderal Riparian Scrub Alliance

Common Name (Translated Scientific Name): Russian-olive Ruderal Riparian Scrub Alliance

Colloquial Name: Ruderal Russian-olive Riparian Scrub

Type Concept: This wooded alliance is dominated by the introduced tree species *Elaeagnus angustifolia* with a variety of native and introduced species in the shrub and herbaceous layers. Additional associated species have not been documented. The alliance is widespread and found throughout much of the southwestern United States. It is a naturalized species that has been widely planted

NBR alliances

in hedgerows for windbreaks. It has since spread (by birds distributing their seeds) to a variety of native habitats, particularly more mesic ones, such as near streams and rivers. Stands tend to be small and linear.

Classification Comments: Often a co-inhabitant with tamarisk but forms woodlands and stands in slightly less wet and less frequently flooded areas than tamarisk.

Internal Comments: GK 9-16: ID added for Minidoka.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Woodlands dominated by *Elaeagnus angustifolia*.

VEGETATION

Physiognomy and Structure:

Floristics: The vegetation in this ruderal alliance is characterized by the dominance of the introduced tree species *Elaeagnus angustifolia* with a variety of native and introduced species in the shrub and herbaceous layers. Native species present include (with less than 10% cover) *Amorpha fruticosa*, *Atriplex patula*, *Distichlis spicata*, *Hordeum jubatum*, *Pascopyrum smithii*, *Populus fremontii*, *Salix exigua*, and *Sporobolus airoides*. Introduced species that may also be present include *Bassia scoparia* (= *Kochia scoparia*), *Descurainia sophia*, *Lepidium latifolium*, *Tamarix ramosissima*, and many others.

ENVIRONMENT & DYNAMICS

Environmental Description: *Elaeagnus angustifolia* has since spread to a variety of native habitats, particularly more mesic ones, such as near streams and rivers. Habitats include shorelines of lakes, streambanks and floodplains of rivers, subirrigated upland basins and drainages.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found throughout disturbed mesic areas of the southwestern U.S.

Nations: US

States/Provinces: AZ, CO, ID, ND, SD, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGL005269 *Elaeagnus angustifolia* Ruderal Riparian Woodland

AUTHORSHIP

Primary Concept Source: D. Faber-Langendoen and K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Faber-Langendoen et al. 2017b

1. Forest & Woodland
1.B.3.Nd. Western North American Interior Flooded Forest
G510. Interior West Ruderal Riparian Forest & Scrub

A4192. *Salix alba* - *Salix fragilis* Ruderal Riparian Forest Alliance [Low - Poorly Documented]

Type Concept Sentence: Naturalized stands of *Salix fragilis* and/or *Salix alba* occurring along riverbanks and lakeside margins and found throughout the western U.S. and probably in the western Great Plains.

OVERVIEW

Scientific Name: *Salix alba* - *Salix fragilis* Ruderal Riparian Forest Alliance

Common Name (Translated Scientific Name): White Willow - Crack Willow Ruderal Riparian Forest Alliance

Colloquial Name: Ruderal White Willow - Crack Willow Riparian Forest

Type Concept: *Salix fragilis* and *Salix alba* are large tree willows that were introduced to the United States as ornamental and/or shade trees. These have naturalized along streams and rivers throughout the western U.S. and probably in the western Great Plains. They can reproduce vegetatively and will spread slowly, and usually not far from their source planting. They appear both as individual trees and in large stands. Ecologically they compete with the native tree willows, such as *Salix amygdaloides*, *Salix nigra*, and *Salix gooddingii*, as well as native cottonwoods. Native shrubs such as *Salix exigua*, and *Toxicodendron rydbergii* may be present. Understory species include native sedges, grasses and forbs such as *Beckmannia syzigachne*, *Carex aquatilis*, *Carex utriculata*, *Carex nebrascensis*, *Carex hystericina*, *Calamagrostis* spp., *Galium* spp., *Maianthemum stellatum*, *Mentha arvensis*, and *Urtica dioica*, and others. Non-native herbaceous species can also be abundant, such as *Arctium minus*, *Cynoglossum officinale*, *Bromus tectorum*, *Bromus inermis*, *Poa pratensis*, *Phleum pratense*, *Cirsium arvense*, *Melilotus officinalis*, *Dactylis glomerata*, *Conium maculatum*, and others. Stands are found in disturbed places, generally near settlements, that are wet naturally or irrigated, such as riparian areas, golf courses, city parks, floodplains, streambanks, ditches and lake margins below 2286 m (7500 feet) in elevation.

Classification Comments: Hybrids between *Salix fragilis* and *Salix alba* exist, and can be difficult to identify. Also, they are known to hybridize with native willows, such as *Salix nigra* and *Salix amygdaloides*.

Internal Comments: GK 9-16: AZ, CA, CO, MT, NM, NV, OR, UT, WA, WY added.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics: *Salix fragilis* and *Salix alba* are large tree willows that were introduced to the United States as ornamental and/or shade trees. These have naturalized along streams and rivers throughout the western U.S. and probably in the western Great Plains. They can reproduce vegetatively and will spread slowly, and usually not far from their source planting. They appear both as individual trees and in large stands. Ecologically it competes with the native tree willows, such as *Salix amygdaloides*, *Salix nigra*, and *Salix gooddingii*, as well as native cottonwoods. Native shrubs such as *Salix exigua*, and *Toxicodendron rydbergii* may be present. Understory species include native sedges, grasses and forbs such as *Beckmannia syzigachne*, *Carex aquatilis*, *Carex utriculata*, *Carex nebrascensis*, *Carex hystericina*, *Calamagrostis* spp., *Galium* spp., *Maianthemum stellatum*, *Mentha arvensis*, and *Urtica dioica*, and others. Non-native herbaceous species can also be abundant, such as *Arctium minus*, *Cynoglossum officinale*, *Bromus tectorum*, *Bromus inermis*, *Poa pratensis*, *Phleum pratense*, *Cirsium arvense*, *Melilotus officinalis*, *Dactylis glomerata*, *Conium maculatum*, and others.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands are found in disturbed places, generally near settlements, that are wet naturally or irrigated, such as riparian areas, golf courses, city parks, floodplains, streambanks, ditches and lake margins below 2286 m (7500 feet) in elevation.

Dynamics: *Salix fragilis* is called crack willow because it is highly susceptible to wind, ice and snow damage. It has escaped cultivation and can form pure stands. Willows can spread easily from detached twigs floating downstream.

DISTRIBUTION

Geographic Range: This alliance is known from throughout the western U.S. and probably also occurs in the western Great Plains.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- C EGL005622 *Salix (fragilis, alba)* Ruderal Riparian Woodland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2015)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2016/09/28

REFERENCES

References: Czarapata 2005, Faber-Langendoen et al. 2017b, Hickman 1993

1. Forest & Woodland

1.B.3.Nd. Western North American Interior Flooded Forest

G510. Interior West Ruderal Riparian Forest & Scrub

A0842. Tamarix spp. Ruderal Riparian Scrub Alliance [Low - Poorly Documented]

Type Concept Sentence: This alliance is composed of shrublands dominated by introduced species of *Tamarix*, including *Tamarix chinensis*, *Tamarix gallica*, *Tamarix parviflora*, and *Tamarix ramosissima*. It forms moderately dense to dense thickets on banks of larger streams, rivers and playas across the southwestern U.S. and northern Mexico.

OVERVIEW

Scientific Name: *Tamarix* spp. Ruderal Riparian Scrub Alliance

Common Name (Translated Scientific Name): Tamarisk species Ruderal Riparian Scrub Alliance

Colloquial Name: Ruderal Tamarisk Riparian Scrub

Type Concept: This alliance is composed of shrublands dominated by introduced species of *Tamarix*, including *Tamarix chinensis*, *Tamarix gallica*, *Tamarix parviflora*, and *Tamarix ramosissima*. It forms moderately dense to dense thickets on banks of larger streams, rivers and playas across the southwestern U.S. and northern Mexico. Introduced from the Mediterranean, *Tamarix* spp. have become naturalized in various sites, including salt flats, springs, and especially along streams and regulated rivers, often replacing *Salix* or *Prosopis* spp. shrublands or other native vegetation. A remnant herbaceous layer may be present, depending on the age and density of the shrub layer. These species have become a critical nuisance along most large rivers in the semi-arid western U.S.

Classification Comments: Stands also occur in Oklahoma, and this alliance includes them as well.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Riparian woodlands and washes dominated by *Tamarix* spp.

VEGETATION

Physiognomy and Structure:

Floristics: This alliance consists of shrublands with moderate to dense cover of a tall-shrub layer that is solely or strongly dominated by *Tamarix*, including (commonly) *Tamarix chinensis*, *Tamarix gallica*, *Tamarix parviflora*, and *Tamarix ramosissima*. Other introduced species of *Tamarix* have been documented in the U.S., but whether these form full stands is yet to be documented. Additional *Tamarix* species include *Tamarix africana*, *Tamarix aphylla*, *Tamarix aralensis*, *Tamarix canariensis*, and *Tamarix tetragyna* (Kartesz 1999). Other native shrubs may be present and include species of *Salix* (especially *Salix exigua*) and *Prosopis*, *Rhus trilobata*, and *Sarcobatus vermiculatus*, but with low cover (if shrub species are codominant, then stand may be classified as a native shrubland type). Scattered native *Acer negundo*, *Elaeagnus angustifolia*, *Populus* spp., or *Salix amygdaloides* trees may also be

present. Depending on stand age and density of the shrub layer, an herbaceous layer may be present. Associated native species include *Distichlis spicata*, *Sporobolus airoides*, and introduced forage species such as *Agrostis gigantea*, *Agrostis stolonifera*, and *Poa pratensis*. Other introduced herbaceous species such as *Conyza canadensis*, *Lepidium latifolium*, and *Polypogon monspeliensis* may also be present.

ENVIRONMENT & DYNAMICS

Environmental Description: These widespread shrublands are common along larger streams, rivers, and around playas. Elevation ranges from 75 m below sea level to 1860 m. Sites include riverbanks, floodplains, basins, sandbars, side channels, springs, salt flats, and other saline habitats. Substrates are commonly thin sandy loam soil over alluvial deposits of sand, gravel or cobbles. Stands grow especially well along regulated rivers and rivers with agricultural runoff that increase the salts in the water.

Dynamics: *Tamarix* spp. are extremely drought- and salt-tolerant, produce prolific wind-dispersed seeds over much of the growing season, can resprout after burning or cutting, and, if kept moist, buried or broken branches will develop adventitious roots and grow. Stands seem to favor disturbed and flow-regulated rivers, but establish well in pristine areas, too. Once established, stands are extremely difficult to eradicate, requiring cutting and herbicide application on stumps to prevent resprouting (Smith and Douglas 1989).

In California, tamarisk species are among the most invasive, widely distributed, and troublesome non-natives to infest wetlands. Multiple, interacting factors facilitate tamarisk invasion, including intentional planting for erosion control and windbreaks; land conversion to agriculture; reduced flood frequencies after damming rivers; changing and stabilizing waterflows, times, and rates downstream from reservoirs; and increased salinity levels in the rivers from evaporation in the reservoirs (Everitt 1980). Tamarisk vigorously sprouts and increases flowering and seed production after fire. Mixed riparian stands often change to tamarisk-dominated stands after fires (Zouhar 2003b, Brooks and Minnich 2006). Active programs to remove tamarisk are ongoing in the state (Lovich 2000). Discouraging tamarisk establishment by biological and mechanical control is the most effective method of control. Once established in large stands, control and eradication efforts are difficult and costly; many managers recommend integrated management approaches (Lovich 2000, Zouhar 2003b, Carpenter 2005).

DISTRIBUTION

Geographic Range: This alliance is found throughout the southwestern U.S. and northern Mexico.

Nations: MX, US

States/Provinces: AZ, CA, CO, MT, MXCH, MXCO, MXSO, NM, NV, OK, TX, UT, WY

TNC Ecoregions [optional]: 11:C, 13:C, 15:C, 16:C, 17:C, 23:C

USFS Ecoregions (2007): 261B:CC, 262A:CC, 322Ab:CCC, 322Al:CCC, 322At:CCC, 322Av:CCC, 322Ay:CCC, 322Az:CCC, 322B:CC, 322C:CC, 341Fc:CCC, M261A:CC, M261B:CC, M261C:CC, M261F:CC, M262A:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Joshua Tree, Lake Mead, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

- = *Tamarix* spp. (Tamarisk thickets) Semi-natural Stands (Sawyer et al. 2009) [63.810.00]
- ? *Tamarix chinensis* Community Type (Hansen et al. 1995)
- ? *Tamarix chinensis* shrubland alliance (Hoagland 1998a)
- ? *Tamarix pentandra* Community Type (Szaro 1989)
- ? *Tamarix ramosissima* (Salt cedar) Association (Nachlinger and Reese 1996)
- = *Tamarix* spp. Semi-Natural Shrubland Stands (Evens et al. 2012)
- = *Tamarix* spp. Semi-Natural Stands (Tamarisk thickets) (Buck-Diaz et al. 2012)
- = *Tamarix* spp. Semi-natural Shrubland Alliance (Evens et al. 2014)
- = *Tamarix* spp. Shrubland Semi-Natural Alliance (CNPS 2017) [63.810.00]
- ? Salt cedar series (Paysen et al. 1980)
- = Saltcedar Alliance (Muldavin et al. 2000a)
- ? Saltcedar Series (Dick-Peddie 1993)
- = Tamarisk Scrub (#63810) (Holland 1986b)
- = Tamarisk series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEPP005697 *Tamarix chinensis* Ruderal Lakeshore Scrub
- CEGLO03114 *Tamarix* spp. Ruderal Riparian Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid and K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Brooks and Minnich 2006, Brown 1982a, Buck-Diaz et al. 2012, CNPS 2017, Campbell and Dick-Peddie 1964, Carpenter 2005, DiTomaso and Healy 2007, Dick-Peddie 1993, Evens and San 2006, Evens et al. 2012, Evens et al. 2014, Faber-Langendoen et al. 2017b, Hansen et al. 1995, Hefley 1937, Hoagland 1998a, Holland 1986b, Johnson 1987b, Keeler-Wolf et al. 1998a, Keeler-Wolf et al. 2005, Klein and Evens 2006, Little 1996, Lovich 2000, Muldavin et al. 2000a, Nachlinger and Reese 1996, Neill 1985, Paysen et al. 1980, Powell 1988b, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Smith and Douglas 1989, Sproul et al. 2011, Szaro 1989, Thomas et al. 2004, USBOR 1976, Von Loh et al. 2002, Zouhar 1993b

2. SHRUB & HERB VEGETATION

Grasslands, shrublands, open tree savannas, marshes, bogs and fens dominated by broadly mesomorphic (including scleromorphic) shrub and herb growth forms (including *broad-leaved*, *needle-leaved*, and *sclerophyllous shrubs*, and *forb* and *graminoid herbs*) with an irregular horizontal canopy structure, mesomorphic trees typically <10% cover (but tropical tree savannas typically <40%), tropical to boreal and subalpine climates, and wet to dry substrate conditions.

2.B. Temperate & Boreal Grassland & Shrubland

Temperate & Boreal Grassland & Shrubland is dominated by mesomorphic grasses and shrubs, with or without scattered trees (and trees typically <10% cover), ranging from temperate coastal to inland lowland and montane grasslands and shrublands, with a strongly seasonal climate and at least some frost to extended cold seasons.

2.B.1. Mediterranean Scrub & Grassland

Mediterranean Scrub & Grassland includes the sclerophyllous scrub that develops in Mediterranean climates found in the Mediterranean Basin, lowland California in the United States, west-central Chile, the western Cape Province of South Africa, and southwestern and southern Australia. It also includes Mediterranean grasslands, "wildflower fields," and prairies from California.

2.B.1.Na. Californian Scrub & Grassland

This division encompasses Californian scrub (chaparral), grassland and meadow vegetation within the warm-temperate Californian Floristic Province, from southwestern Oregon through California, west of the Sierra-Cascades divide and south into northwestern Baja California, Mexico.

M046. Californian Ruderal Grassland, Meadow & Scrub

This macrogroup encompasses non-native-dominated by annual grassland, forbland and scrub found in the "Mediterranean" region of California, especially in disturbed areas. Dominant introduced species include the herbs *Avena barbata*, *Avena fatua*, *Brassica nigra*, *Bromus diandrus*, *Bromus hordeaceus*, *Bromus rubens*, *Centaurea* spp., *Erodium* spp., *Lolium perenne* ssp. *multiflorum*, and *Raphanus sativus*. Species in non-native shrublands include *Ulex europaeus*, *Cytisus scoparius*, and species of *Genista* and *Spartium*, among others.

2. Shrub & Herb Vegetation

2.B.1.Na. Californian Scrub & Grassland

2.B.1.Na.90.a. M046 Californian Ruderal Grassland, Meadow & Scrub

G497. Californian Ruderal Grassland, Meadow & Scrub

Type Concept Sentence: This warm-temperate Californian ruderal grassland, forbland and scrub group is most commonly dominated by non-native annual or perennial herbaceous species which compose >75% of the foliar cover and include many graminoids such as *Avena barbata*, *Avena fatua*, *Bromus diandrus*, *Bromus hordeaceus*, *Bromus madritensis*, *Cortaderia jubata*, *Cortaderia selloana*, *Lolium perenne* ssp. *multiflorum*, *Hordeum murinum*, *Taeniatherum caput-medusae*, *Vulpia bromoides*, *Vulpia myuros*, and forbs, including *Carduus pycnocephalus*, *Centaurea* spp., *Erodium botrys*, *Erodium cicutarium*, *Medicago polymorpha*, *Geranium dissectum*, *Hypochaeris glabra*, and *Raphanus sativus*.

OVERVIEW

Scientific Name: *Avena fatua* - *Bromus diandrus* Ruderal Grassland, Meadow & Scrub Group

Common Name (Translated Scientific Name): Wild Oat - Riggut Brome Ruderal Grassland, Meadow & Scrub Group

Colloquial Name: Californian Ruderal Annual Grassland

Type Concept: This group encompasses the non-native-dominated annual or perennial grasslands and forblands found in warm-temperate or Mediterranean California. They occur on the coastal plains, in the Central Valley, in the foothills and in disturbed rural and urban areas. Native graminoid and forb species can be present with low or insignificant cover. The overwhelming dominance of the introduced species is undeniable. Non-native species make up 50-96% of the foliar cover. Dominant introduced graminoid species include *Aegilops triuncialis*, *Avena fatua*, *Avena barbata*, *Bromus diandrus*, *Bromus hordeaceus*, *Bromus madritensis*, *Cortaderia jubata*, *Cortaderia seloana*, *Lolium perenne* ssp. *multiflorum* (= *Lolium multiflorum*), *Hordeum murinum*, *Pennisetum ciliare*, *Pennisetum setaceum*, *Taeniatherum caput-medusae*, *Vulpia bromoides*, and *Vulpia myuros*. Introduced forb species include *Brassica nigra*, *Carduus pycnocephalus*, *Centaurea* spp., *Erodium botrys*, *Erodium cicutarium*, *Medicago polymorpha*, *Geranium dissectum*, *Hypochaeris glabra*, *Medicago polymorpha*, and *Raphanus sativus*. Species in non-native shrublands include *Ulex europaeus*, *Cytisus scoparius*, and species of *Genista* and *Spartium*, among others. There are many more species that can be dominant. California annual grassland is found on a wide variety of soils, sometimes in complex mosaics. Most are noncalicic Mollisols, medium to heavy texture, about 0.5 m deep.

Classification Comments: Non-native scrub types were added to this group. They need better characterization. Preliminary notes include the following observations: Some exotic grasses, forbs and shrubs of this macrogroup are shared with Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group (G648), including *Cytisus scoparius* and *Ulex europaeus*. It is not clear whether sufficient diagnostics provide an effective way to discriminate stands dominated by these exotics across divisions (cool-temperate Pacific coastal versus warm-temperate/Mediterranean California).

Similar NVC Types:

- G496 Californian Perennial Grassland: differs in that native species have 10% or greater relative cover in the herbaceous layer and 5% or greater absolute cover.
- G648 Southern Vancouverian Lowland Ruderal Grassland & Shrubland

Diagnostic Characteristics: Dominance by exotic, introduced and/or non-native annual or perennial grass and forb species, such as *Aegilops triuncialis*, *Avena barbata*, *Avena fatua*, *Brachypodium distachyon*, *Briza maxima*, *Bromus diandrus*, *Bromus hordeaceus*, *Bromus madritensis*, *Bromus rubens*, *Cortaderia jubata*, *Cortaderia seloana*, *Cynosurus echinatus*, *Hordeum murinum*, *Lolium perenne* ssp. *multiflorum*, *Hordeum murinum*, *Pennisetum ciliare*, *Pennisetum setaceum*, *Taeniatherum caput-medusae*, *Vulpia bromoides*, and *Vulpia myuros*. Introduced forb species include *Brassica nigra*, *Carduus pycnocephalus*, *Centaurea solstitialis*, *Centaurea melitensis*, *Centaurea virgata*, *Conium maculatum*, *Foeniculum vulgare*, *Erodium botrys*, *Erodium cicutarium*, *Medicago polymorpha*, *Geranium dissectum*, *Hypochaeris glabra*, *Medicago polymorpha*, and *Raphanus sativus*. Species in non-native shrublands include *Ulex europaeus*, *Cytisus scoparius*, and species of *Genista* and *Spartium*, among others. Native herbaceous species may be present, but these with less than 10% relative cover in the herbaceous layer.

VEGETATION

Physiognomy and Structure: Herbaceous vegetation composed of perennial or annual grasses and forbs. Height variable, but generally <0.5 m, although some can be much taller (e.g., *Cortaderia* spp. stands).

Floristics: Graminoids include *Aegilops triuncialis*, *Avena barbata*, *Avena fatua*, *Brachypodium distachyon*, *Briza maxima*, *Bromus diandrus*, *Bromus hordeaceus*, *Bromus madritensis*, *Bromus rubens*, *Cortaderia jubata*, *Cortaderia seloana*, *Cynosurus echinatus*, *Hordeum murinum*, *Lolium perenne* ssp. *multiflorum* (= *Lolium multiflorum*), *Pennisetum ciliare*, *Pennisetum setaceum*, *Schismus arabicus*, *Schismus barbatus*, *Taeniatherum caput-medusae*, *Vulpia bromoides*, and *Vulpia myuros*. Forb species include *Brassica nigra*, *Carduus pycnocephalus*, *Centaurea melitensis*, *Centaurea solstitialis*, *Centaurea virgata*, *Conium maculatum*, *Erodium botrys*, *Erodium cicutarium*, *Foeniculum vulgare*, *Geranium dissectum*, *Hypochaeris glabra*, *Medicago polymorpha*, and *Raphanus sativus*.

Species in non-native shrublands include *Ulex europaeus*, *Cytisus scoparius*, and species of *Genista* and *Spartium*, among others. Native herbaceous species may be present, but these with less than 10% relative cover in the herbaceous layer. The most ubiquitous ruderal shrub species in central California is *Genista monspessulana*. It tends to colonize bare soils exposed on construction sites in the California Coast Ranges and northern Sierra Nevada foothills. It quickly builds up a seed bank and, for invasives control, removal of shrubs must be followed up with repeated removal of seedlings for years. Hybrids of several species of introduced *Genista* and *Cytisus* have colonized slopes in central and southern coastal California.

Floristic information is summarized from the following sources: Evens and San (2004, 2006), Klein and Evens (2005), Keeler-Wolf and Evens (2006), and Sawyer et al. (2009).

ENVIRONMENT & DYNAMICS**Environmental Description:**

Dynamics: Stands are a result of historic or recent heavy continuous grazing or other disturbance. Classification to this ruderal group does not preclude the possibility of successful restoration back to the native California grassland group. Stands dominated by these annual and perennial species are adapted to frequent fires and summer droughts. Stands dominated by introduced cool-season, annual grasses have germinating seeds that survive the sporadic wetting and drying cycles that occur through the growing season. Most seeds germinate after the first significant rain in the fall. Plants set seed and die by the end of the growing season in the spring (Sawyer et al. 2009).

DISTRIBUTION

Geographic Range: This group occurs in the warm-temperate ("Mediterranean") California coastal plain and Central Valley, also in the southeastern portions of the state in transitions to California desert regions.

Spatial Scale & Pattern [optional]:

Nations: MX, US

States/Provinces: CA, OR?

TNC Ecoregions [optional]: 13:C, 14:C, 15:C, 16:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY**LOWER LEVEL UNITS****Alliances:**

- A4214 *Brassica nigra* - *Raphanus* spp. Ruderal Annual Forb Meadow Alliance
- A3870 *Avena fatua* - *Bromus* spp. Ruderal Annual Grassland Alliance
- A3872 *Centaurea virgata* ssp. *squarrosa* - *Conium maculatum* - *Foeniculum vulgare* Ruderal Meadow Alliance
- A1203 *Cortaderia jubata* - *Cortaderia selloana* Ruderal Grassland Alliance
- A3871 *Lolium perenne* Ruderal Grassland Alliance

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2011)

Author of Description: G. Kittel, M. Reid and D. Faber-Langendoen

Acknowledgments:

Version Date: 01/13/2016

Classif Resp Region: West

Internal Author: GK 11-10, mod. MSR 9-13, mod, KAS 11-15, mod. DFL 1-16

REFERENCES

References: Bartolome et al. 2007, Buck-Diaz and Evens 2011b, Buck-Diaz et al. 2012, Buck-Diaz et al. 2013, Evens and San 2004, Evens and San 2006, Faber-Langendoen et al. 2017a, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Rodriguez et al. 2017, Sawyer et al. 2009, Shiflet 1994

2. Shrub & Herb Vegetation

2.B.1.Na. Californian Scrub & Grassland

G497. Californian Ruderal Grassland, Meadow & Scrub

A3870. Avena fatua - Bromus spp. Ruderal Annual Grassland Alliance

Type Concept Sentence: This is a non-native-dominated alliance of annual grasslands and forblands of California and Baja California. The composition varies widely. Many alien annual species may be present, including *Aegilops triuncialis*, *Aira caryophyllea*, *Avena barbata*, *Avena fatua*, *Brachypodium distachyon*, *Brassica* spp., *Bromus diandrus*, *Bromus hordeaceus*, *Bromus madritensis*, *Centaurea melitensis*, *Centaurea solstitialis*, and *Cynosurus echinatus*.

OVERVIEW

Scientific Name: *Avena fatua* - *Bromus* spp. Ruderal Annual Grassland Alliance

Common Name (Translated Scientific Name): Wild Oat - Brome species Ruderal Annual Grassland Alliance

Colloquial Name: Californian Ruderal Annual Grassland

Type Concept: This alliance of non-native annual grasslands and forblands is composed of cool-season, annual grasses mostly introduced from Europe. They are invasive in disturbed areas throughout much of California. The composition varies widely. Many alien annual species may be present, including *Aegilops triuncialis*, *Aira caryophylla*, *Avena barbata*, *Avena fatua*, *Brachypodium distachyon*, *Brassica* spp., *Bromus diandrus*, *Bromus hordeaceus*, *Bromus madritensis*, *Centaurea melitensis*, *Centaurea solstitialis*, and *Cynosurus echinatus*. The composition of this alliance is largely determined by amount of disturbance coupled with fall temperatures and precipitation, light intensity, litter thickness and microtopography. The percentage of exotic alien species is often directly related to disturbance history with heavy disturbance correlating with heavy exotic invasion. Annual grasses are supremely adapted to the Mediterranean climate of California; many species evolved under similar conditions in southern Europe and northern Africa. Plants germinate during winter rains, and complete their life cycles by the beginning of the summer drought. Seeds often remain viable for many years.

Classification Comments: This is a large alliance, but the high variability of the exotic annual-dominated grasslands of California suggests keeping all of these types together in one alliance. Name could be revised to include either *Centaurea* or *Brassica* instead of "annual forbs."

Internal Comments: mjr 1-15: AZ added for Lake Mead (MOJN).

Other Comments:

Similar NVC Types:

- A4166 *Brassica tournefortii* - *Malcolmia africana* Ruderal Desert Forbs Alliance

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure: These short, temperate, annual grasslands and forblands form an herbaceous canopy less than 1 m in height. Emergent shrubs and trees may be present.

Floristics: The composition varies widely. Many alien annual species may be present, including *Aegilops triuncialis*, *Aira caryophylla*, *Avena barbata*, *Avena fatua*, *Brachypodium distachyon*, *Brassica* spp., *Bromus diandrus*, *Bromus hordeaceus*, *Bromus madritensis*, *Centaurea melitensis*, *Centaurea solstitialis*, and *Cynosurus echinatus*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance can be found where heavy disturbance occurs, but occurs largely outside of the highest elevations.

Dynamics: The composition of this alliance is largely determined by fall temperatures and precipitation, light intensity, litter thickness and microtopography. The percentage of exotic alien species is often directly related to the amount of disturbance history with heavy disturbance correlating with heavy exotic invasion. Annual grasses are supremely adapted to the Mediterranean climate of California; many species evolved under similar conditions in southern Europe and northern Africa. Plants germinate during winter rains, and complete their life cycles by the beginning of the summer drought. Seeds often remain viable for many years.

DISTRIBUTION

Geographic Range: This alliance occurs in California south into Baja California, Mexico.

Nations: MX, US

States/Provinces: AZ, CA, MXBC

TNC Ecoregions [optional]: 4:C, 5:C, 12:C, 13:C, 14:C, 15:C, 16:C

USFS Ecoregions (2007): 261A:CC, 261B:CC, 262A:CC, 263A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC, M262A:CC, M262B:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Channel Islands)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Aegilops triuncialis* (Barbed goatgrass patches) Provisional Semi-natural Stands (Sawyer et al. 2009) [42.003.00]
- > *Avena (barbata, fatua)* (Wild oats grasslands) Semi-natural Stands (Sawyer et al. 2009) [44.150.00]
- > *Avena (barbata, fatua)* Semi-Natural Stands (Wild oats grasslands) (Buck-Diaz et al. 2012)
- = *Avena* spp. - *Bromus* spp. Semi-natural Alliance (Klein et al. 2015)

NBR alliances

- = *Avena* spp. - *Bromus* spp. Semi-natural Grassland Alliance (Rodriguez et al. 2017)
- > *Brassica nigra* and Other Mustards Semi-Natural Stands (Upland mustards) (Buck-Diaz et al. 2012)
- > *Brassica nigra* and other mustards (Upland mustards) Semi-natural Stands (Sawyer et al. 2009) [42.011.00]
- > *Bromus (diandrus, hordeaceus) - Brachypodium distachyon* (Annual brome grasslands) Semi-natural Stands (Sawyer et al. 2009) [42.026.00]
- > *Bromus (diandrus, hordeaceus)-Brachypodium distachyon* Semi-Natural Stands (Annual brome grasslands) (Buck-Diaz et al. 2012)
- >< *Centaurea (solstitialis, melitensis)* (Yellow star-thistle fields) Semi-natural Stands (Sawyer et al. 2009) [42.042.00]
- > *Centaurea (solstitialis, melitensis)* Semi-Natural Stands (Yellow star-thistle fields) (Buck-Diaz et al. 2012)
- ? *Centaurea solstitialis* Herbaceous Alliance (Keeler-Wolf et al. 2012)
- > *Cynosurus echinatus* (Annual dogtail grasslands) Semi-natural Stands (Sawyer et al. 2009) [42.044.00]
- ? California Annual Herbland Alliance (Keeler-Wolf et al. 2012)
- >< Non-native Grassland (#42200) (Holland 1986b)
- >< Valley and Foothill Grassland (#42000) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEG002906 *Bromus diandrus* Ruderal Grassland
- CEG002916 *Bromus diandrus - Avena* spp. Ruderal Grassland
- CEG002878 *Avena fatua* Ruderal Grassland
- CEPP005712 *Bromus hordeaceus - Erodium botrys* Ruderal Annual Grassland
- CEG003018 *Bromus (diandrus, hordeaceus, madritensis)* Ruderal Grassland
- CEG003374 *Brachypodium distachyon* Ruderal Grassland
- CEPP005678 *Atriplex semibaccata - Hordeum murinum* Ruderal Coastal Scrub
- CEG008666 *Bromus diandrus - Bromus hordeaceus - Trifolium* spp. - *Daucus pusillus* Ruderal Grassland

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2015)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Buck-Diaz et al. 2012, Evens and San 2004, Faber-Langendoen et al. 2017b, Holland 1986b, Jimerson et al. 2000, Keeler-Wolf and Evens 2006, Keeler-Wolf et al. 2003b, Keeler-Wolf et al. 2012, Keeley 2006b, Klein and Evens 2006, Klein et al. 2007, Klein et al. 2015, Rodriguez et al. 2017, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Schlising and Sanders 1982, Solomeshch and Barbour 2006, Sproul et al. 2011, VegCAMP and AIS 2013

2. Shrub & Herb Vegetation

2.B.1.Na. Californian Scrub & Grassland

G497. Californian Ruderal Grassland, Meadow & Scrub

A4214. *Brassica nigra - Raphanus* spp. Ruderal Annual Forb Meadow Alliance [Low - Poorly Documented]

Type Concept Sentence:

OVERVIEW

Scientific Name: *Brassica nigra - Raphanus* spp. Ruderal Annual Forb Meadow Alliance

Common Name (Translated Scientific Name): Black Mustard - Radish species Ruderal Annual Forb Meadow Alliance

Colloquial Name: Californian Ruderal Annual Forb Meadow

Type Concept:

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics:

ENVIRONMENT & DYNAMICS

Environmental Description:

Dynamics:

DISTRIBUTION

Geographic Range:

Nations: US

States/Provinces: CA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- C EGL002879 *Brassica nigra* Ruderal Grassland
- C EGL003465 *Raphanus sativus* Ruderal Forbland
- C EGL002880 *Brassica nigra* - *Bromus diandrus* Ruderal Grassland
- C EGL002881 *Brassica nigra* - *Centaurea melitensis* Ruderal Grassland

AUTHORSHIP

Primary Concept Source: M. Reid, in Faber-Langendoen et al.

Author of Description:

Acknowledgments:

REFERENCES

2. Shrub & Herb Vegetation

2.B.1.Na. Californian Scrub & Grassland

G497. Californian Ruderal Grassland, Meadow & Scrub

A3872. *Centaurea virgata* ssp. *squarrosa* - *Conium maculatum* - *Foeniculum vulgare* Ruderal Meadow**Alliance**

Type Concept Sentence: This alliance consists of meadows dominated by non-native perennial forbs such as *Centaurea stoebe* ssp. *micranthos*, *Centaurea diffusa*, *Centaurea virgata* ssp. *squarrosa*, *Centaurea calcitrapa*, *Conium maculatum*, *Daucus carota*, and/or *Foeniculum vulgare*. This alliance is found in California and probably north into Oregon.

OVERVIEW

Scientific Name: *Centaurea virgata* ssp. *squarrosa* - *Conium maculatum* - *Foeniculum vulgare* Ruderal Meadow Alliance**Common Name (Translated Scientific Name):** Squarrose Knapweed - Poison-hemlock - Sweet Fennel Ruderal Meadow Alliance**Colloquial Name:** Pacific Ruderal Perennial Meadow

Type Concept: This alliance consists of meadows dominated by perennial herbs, including *Centaurea stoebe* ssp. *micranthos*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea virgata* ssp. *squarrosa*, *Conium maculatum*, *Daucus carota*, and/or *Foeniculum vulgare*, that are dominant or codominant with other non-natives in the herbaceous layer. This alliance is found in California and probably north into Oregon, at elevations ranging from sea level to 2000 m. Habitats are open disturbed sites, roadsides, upland grasslands, moist meadows, rangeland, and open hillsides.

Classification Comments: Combined two Sawyer et al. (2009) semi-natural stand types on the basis of being primarily perennial forb-dominated, and occurring in a variety of disturbed areas, including wet meadows or wetlands, as well as drier sites (pastures, roadsides, etc.). Some of these dominant species are FACW plants (USFWS Wetland Inventory 1996).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Alliance is primarily perennial forb-dominated, occurring in a variety of disturbed areas, including wet meadows or wetlands, as well as drier sites (pastures, roadsides, etc.). Dominated by *Centaurea stoebe ssp. micranthos*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea virgata*, *Centaurea calcitrapa*, *Conium maculatum*, *Daucus carota*, and/or *Foeniculum vulgare*.

VEGETATION

Physiognomy and Structure: Perennial herbaceous forbs <2 m in height.

Floristics: This alliance consists of meadows dominated by perennial herbs, including *Centaurea stoebe ssp. micranthos*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea virgata ssp. squarrosa*, *Conium maculatum*, *Daucus carota*, and/or *Foeniculum vulgare*, that are dominant or codominant with other non-natives in herbaceous layer.

ENVIRONMENT & DYNAMICS

Environmental Description: Habitats are open disturbed sites, roadsides, upland grasslands, moist meadows, rangeland, and open hillsides. Elevation ranges from sea level to 2000 m.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found in California and probably north into Oregon.

Nations: US

States/Provinces: CA, OR?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Centaurea (virgata)* (Knapweed and purple-flowered star-thistle fields) Provisional Semi-natural Stands (Sawyer et al. 2009) [42.043.00]
- > *Conium maculatum - Foeniculum vulgare* (Poison hemlock or fennel patches) Semi-natural Stands (Sawyer et al. 2009) [45.556.00]
- > *Conium maculatum-Foeniculum vulgare* Semi-Natural Stands (Poison hemlock or fennel patches) (Buck-Diaz et al. 2012)
- > *Foeniculum vulgare* Herbaceous Alliance (Keeler-Wolf and Evens 2006)
- < Non-native Grassland (#42200) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

AUTHORSHIP

Primary Concept Source: M.S. Reid after Sawyer et al. (2009)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Buck-Diaz et al. 2012, Faber-Langendoen et al. 2017b, Holland 1986b, Keeler-Wolf and Evens 2006, Sawyer et al. 2009, Sproul et al. 2011

2. Shrub & Herb Vegetation

2.B.1.Na. Californian Scrub & Grassland

G497. Californian Ruderal Grassland, Meadow & Scrub

A1203. Cortaderia jubata - Cortaderia seloana Ruderal Grassland Alliance

Type Concept Sentence: This alliance consists of stands dominated by *Cortaderia jubata* and/or *Cortaderia seloana*. It occurs primarily in coastal California in disturbed areas, estuaries, inland grasslands, urban areas, and wetlands.

OVERVIEW

Scientific Name: *Cortaderia jubata* - *Cortaderia seloana* Ruderal Grassland Alliance

Common Name (Translated Scientific Name): Purple Pampas Grass - Uruguayan Pampas Grass Ruderal Grassland Alliance

Colloquial Name: Ruderal Pampas Grass Tussock Grassland

Type Concept: This alliance consists of invading patches of *Cortaderia jubata* and/or *Cortaderia seloana* where they are dominant in the herbaceous and shrub layers. Emergent shrubs and trees may be present in low cover. Herbs are <4 m in height, and the canopy cover is open to continuous. It occurs in California at elevations ranging from sea level to 800 m. Habitats are coastal land, disturbed areas, estuaries, grasslands, urban areas, and wetlands. Areas where this alliance thrives receive between 100-200 cm of rain per year. Stands of *Cortaderia* invade coastal bluff and coastal scrub stands of *Artemisia californica*, *Baccharis pilularis*, and *Eriogonum fasciculatum*. They also invade moist forest stands of *Picea sitchensis*, *Pseudotsuga menziesii*, and *Sequoia sempervirens*, and invade inland riparian stands of herbs and trees in the Central Valley.

Classification Comments: The nominal species of this alliance are exotic and invasive. Stands of *Cortaderia* invade coastal bluff and coastal scrub stands of *Artemisia californica*, *Baccharis pilularis*, and *Eriogonum fasciculatum* alliances. They grow in moist, open forest stands and infest inland riparian stands in the Great Valley.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure: This tall, temperate bunch grassland forms an open canopy of graminoids less than 4 m in height. An understory of shrubs, or emergent trees (0-10%), may be present.

Floristics: In this invasive herbaceous grassland of California, *Cortaderia jubata* or *Cortaderia seloana* are the sole or dominant species in the herbaceous layer. Shrub species present may include *Artemisia californica*, *Eriogonum fasciculatum*, and *Baccharis pilularis*. In disturbed forest areas emergent trees may be present and could include *Pseudotsuga menziesii*, *Sequoia sempervirens*, and *Picea sitchensis*.

ENVIRONMENT & DYNAMICS

Environmental Description: This herbaceous alliance of the temperate regions of California invades several shrubland vegetation types and disturbed forest sites. Stands are found on all topographic positions, from sea level to 800 m. Areas where this alliance thrives receive between 100-200 cm of rain per year.

Dynamics: In forested areas the nominal species of this alliance require a disturbance such as logging to open the canopy for invasion to occur. As the forest grows, stands of *Cortaderia* spp. gradually decline as light levels decrease. In shrub alliances, *Cortaderia* spp. can be much more persistent and invasive. Seeds are windblown and can germinate under all but the densest shrub canopies. Disturbed shrublands along the outer Coast Ranges can be replaced by virtual monocultures of *Cortaderia*. These species can increase fire fuel loads and fire intensity, especially in areas already altered by other non-natives with which they commonly grow.

DISTRIBUTION

Geographic Range: This alliance occurs in California, primarily in coastal areas.

Nations: US

States/Provinces: CA

TNC Ecoregions [optional]: 13:C, 14:C, 15:C, 16:C

USFS Ecoregions (2007): 261A:CC, 261B:CC, 262A:CC, 263A:CC, M261B:CC, M262A:CC, M262B:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Cortaderia (jubata, selloana)* (Pampas grass patches) Semi-natural Stands (Sawyer et al. 2009) [42.070.00]
- = *Cortaderia (jubata, selloana)* Semi-Natural Stands (Pampas grass patches) (Buck-Diaz et al. 2012)
- = *Cortaderia (jubata, selloana)* Herbaceous Semi-Natural Alliance (CNPS 2017) [42.070.00]
- < Non-native Grassland (#42200) (Holland 1986b)
- = Pampas grass series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

AUTHORSHIP

Primary Concept Source: J.O. Sawyer et al. (2009)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Buck-Diaz et al. 2012, CNPS 2017, DiTomaso et al. 1999, Faber-Langendoen et al. 2017b, Fuller 1976, Hickson and Keeler-Wolf 2007, Holland 1986b, Lambrinos 2000, Lambrinos 2001, Lambrinos 2002, Peterson and Russo 1988, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Vaghti and Keeler-Wolf 2004, Walgren et al. 2005

2. Shrub & Herb Vegetation

2.B.1.Na. Californian Scrub & Grassland

G497. Californian Ruderal Grassland, Meadow & Scrub

A3871. *Lolium perenne* Ruderal Grassland Alliance [Low - Poorly Documented]

Type Concept Sentence: This alliance consists of meadows where *Lolium perenne* is dominant or codominant with other non-natives in the herbaceous layer. It occurs throughout California. Generally, this type occurs in seasonally moist to wet environments that are regularly disturbed through grazing, fire, flooding, or mechanical means.

OVERVIEW

Scientific Name: *Lolium perenne* Ruderal Grassland Alliance

Common Name (Translated Scientific Name): Perennial Ryegrass Ruderal Grassland Alliance

Colloquial Name: Ruderal Ryegrass Grassland

Type Concept: This alliance consists of meadows where *Lolium perenne* is dominant or codominant with other non-natives in the herbaceous layer, including *Agrostis stolonifera*, *Alopecurus aequalis*, *Asclepias fascicularis*, *Avena fatua*, *Brassica nigra*, *Bromus diandrus*, *Bromus hordeaceus*, *Centaureum muehlenbergii*, *Cirsium vulgare*, *Cryptantha flaccida*, *Euphorbia spathulata*, *Schedonorus arundinaceus* (= *Festuca arundinacea*), *Holcus lanatus*, *Hordeum brachyantherum*, *Hordeum murinum*, *Leontodon taraxacoides*, *Leymus triticoides*, *Lotus corniculatus*, *Microseris douglasii*, *Nassella pulchra*, *Phalaris aquatica*, *Plantago erecta*, *Poa pratensis*, *Nasturtium officinale* (= *Rorippa nasturtium-aquaticum*), *Rumex crispus*, and *Trifolium* spp. Herbs are <1 m tall and the canopy cover is intermittent to continuous. Emergent trees and shrubs may be present at low cover. It occurs throughout California at elevations ranging from sea level to 1000 m. Generally, this type occurs in seasonally moist to wet environments that are regularly disturbed through grazing, fire, flooding, or mechanical means. Habitats are lowlands with periodic flooding, disked fields, and uplands, including serpentine substrates.

Classification Comments: The USFWS Wetland Inventory (1996 National List) lists *Lolium perenne* as a FAC+ plant.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: *Lolium perenne* is dominant or codominant.

VEGETATION

Physiognomy and Structure: Annual or perennial grasses <1 m tall.

Floristics: *Lolium perenne* is dominant or codominant with other non-natives in the herbaceous layer, including *Agrostis stolonifera*, *Alopecurus aequalis*, *Asclepias fascicularis*, *Avena fatua*, *Brassica nigra*, *Bromus diandrus*, *Bromus hordeaceus*, *Centaureum muhlenbergii*, *Cirsium vulgare*, *Cryptantha flaccida*, *Euphorbia spathulata*, *Schedonorus arundinaceus* (= *Festuca arundinacea*), *Holcus lanatus*, *Hordeum brachyantherum*, *Hordeum murinum*, *Leontodon taraxacoides*, *Leymus triticoides*, *Lotus corniculatus*, *Microseris douglasii*, *Nassella pulchra*, *Phalaris aquatica*, *Plantago erecta*, *Poa pratensis*, *Nasturtium officinale* (= *Rorippa nasturtium-aquaticum*), *Rumex crispus*, and *Trifolium* spp. Herbs are <1 m tall and the canopy cover is intermittent to continuous. Emergent trees and shrubs may be present at low cover.

ENVIRONMENT & DYNAMICS

Environmental Description: Generally, this type occurs in seasonally moist to wet environments that are regularly disturbed through grazing, fire, flooding, or mechanical means. Habitats are lowlands with periodic flooding, disked fields, and uplands including serpentine substrates. Elevation ranges from 0-1000 m.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found throughout California.

Nations: US

States/Provinces: CA

TNC Ecoregions [optional]: 13:C, 14:C, 15:C, 16:C

USFS Ecoregions (2007): 261A:CC, 261B:CC, 262A:CC, 263A:CC, M261F:CC, M262A:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

- = *Lolium perenne* (Perennial rye grass fields) Semi-natural Stands (Sawyer et al. 2009) [41.321.00]
- = *Lolium perenne* Semi-Natural Stands (Perennial rye grass fields) (Buck-Diaz et al. 2012)
- = *Lolium perenne* Herbaceous Semi-Natural Alliance (CNPS 2017) [41.321.00]
- < California Annual Grassland Series (Sawyer and Keeler-Wolf 1995)
- < Non-native Grassland (#42200) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Buck-Diaz et al. 2012, CNPS 2017, Evens and San 2004, Evens et al. 2004, Faber-Langendoen et al. 2017b, Hickson and Keeler-Wolf 2007, Holland 1986b, Junak et al. 2007, Keeler-Wolf and Evens 2006, Keeler-Wolf and Vaghti 2000, Keeler-Wolf et al. 2007, Klein et al. 2007, Pickart 2006, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Sproul et al. 2011, Sullivan 1992

2.B.2. Temperate Grassland & Shrubland

Temperate Grassland, Meadow & Shrubland is dominated by perennial grasses, forbs and shrubs typical of moderately dry to moist habitats, and is found in the mid-latitude regions of all continents (23° to 55°N and S), varying from large open grassland landscapes to droughty hillside meadows in forested landscapes.

2.B.2.Na. Western North American Grassland & Shrubland

This division contains cool-temperate lowland to subalpine shrubland, grassland, and meadow communities that are dominated by cold-deciduous shrubs or cool-season bunchgrasses or mesic forbs in the mountainous regions of western North America, from

Alaska's Aleutian Islands south to the central coast of California, and down through the Intermountain West ranges and Rocky Mountains to Arizona and New Mexico.

M049. Southern Rocky Mountain Montane Shrubland

This shrubland macrogroup is found in the foothills, canyon slopes and montane zone of mountains of the southern Rocky Mountains and Colorado Plateau and extends out onto outcrops and canyon slopes in the western and southern Great Plains. The vegetation is characterized by an open to dense shrub layer typically dominated by *Cercocarpus montanus*, *Purshia tridentata*, and/or *Quercus gambelii*, and several other characteristic shrubs.

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

2.B.2.Na.1.a. M049 Southern Rocky Mountain Montane Shrubland

G277. Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland

Type Concept Sentence: This group occurs in the mountains, plateaus and foothills of the southern Rocky Mountains and Colorado Plateau, and is typically dominated by *Quercus gambelii* alone or codominant with *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Cercocarpus montanus*, *Fraxinus anomala*, *Prunus virginiana*, *Purshia stansburiana*, *Purshia tridentata*, *Robinia neomexicana*, *Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*.

OVERVIEW

Scientific Name: *Quercus gambelii* - *Amelanchier* spp. - *Prunus virginiana* Southern Rocky Mountain Montane Shrubland Group

Common Name (Translated Scientific Name): Gambel Oak - Serviceberry species - Chokecherry Southern Rocky Mountain Montane Shrubland Group

Colloquial Name: Fendler's Ceanothus Shrubland & Shrub-Steppe

Type Concept: This group occurs in the mountains, plateaus and foothills of the southern Rocky Mountains and Colorado Plateau, including the Uinta and Wasatch ranges and the Mogollon Rim. The vegetation is typically dominated by *Quercus gambelii* alone or codominant with *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Cercocarpus montanus*, *Fendlera rupicola*, *Fraxinus anomala*, *Holodiscus dumosus*, *Jamesia americana*, *Prunus virginiana*, *Purshia stansburiana*, *Purshia tridentata*, *Robinia neomexicana*, *Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*. There may be inclusions of other mesic montane shrublands with *Quercus gambelii* absent or as a relatively minor component. These shrublands are most commonly found along dry foothills, lower mountain slopes, and at the edge of the western Great Plains from approximately 2000 to 2900 m in elevation, and are often situated above pinyon-juniper woodlands. Substrates are variable and include soil types ranging from calcareous, heavy, fine-grained loams to sandy loams, gravelly loams, clay loams, deep alluvial sand, or coarse gravel. This group intergrades with Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland Group (G276) and shares many of the same site characteristics. However, this group includes more mesic communities. Density and cover of *Quercus gambelii* and *Amelanchier* spp. often increase after fire.

Classification Comments: Disjunct *Quercus gambelii*-dominated shrublands found in the Davis Mountains and probably the Guadalupe Range in the Trans-Pecos of Texas are included in the concept of Eastern Madrean Chaparral Group (G280). *Quercus gambelii* apparently occurs as a significant component of a shrubland of the Trans-Pecos of Texas; however, most of the other species that codominate in this group do not occur in the Trans-Pecos. This group is not currently attributed to Texas, and it seems more appropriate to modify the description of Eastern Madrean Chaparral Group (G280) to allow for the presence of *Quercus gambelii* as a significant component of some occurrences. However, *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland (CEGL001117) is an association found in the Trans-Pecos. Also, there is a need to clarify the concept of Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland Group (G276).

Similar NVC Types:

- G272 Central Rocky Mountain Montane-Foothill Deciduous Shrubland
- G276 Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland

Diagnostic Characteristics: Stands of this group are typically dominated by broad-leaved, deciduous shrubs, which are typical of the montane zones of the southern Rocky Mountains. *Quercus gambelii* is the main species in most occurrences, although some may have equal amounts of (or only) *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Cercocarpus montanus*, *Ceanothus fendleri*, *Fendlera rupicola*, *Fraxinus anomala*, *Holodiscus dumosus*, *Jamesia americana*, *Prunus virginiana*, *Purshia stansburiana*, *Purshia tridentata*, *Rhus trilobata*, *Robinia neomexicana*, *Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*. The herbaceous layer is not consistent, having sparse to moderately dense cover and mostly composed of graminoids, including *Carex geyeri*, *Carex inops*, *Festuca thurberi*, *Hesperostipa comata*, *Muhlenbergia montana*, and *Poa fendleriana*.

VEGETATION

Physiognomy and Structure: The vegetation may occur as sparse to dense broad-leaved deciduous shrublands composed of moderate to tall shrubs, or occasionally small trees. Occurrences may be multi-layered, with some short shrubby species occurring in the understory of the dominant overstory species. They can range from dense thickets with little understory to relatively mesic mixed shrublands with a rich understory of shrubs, grasses and forbs. These shrubs often have a patchy distribution with grass growing in between. Scattered trees are occasionally present in stands.

Floristics: In many occurrences of this group, the canopy is dominated by the broad-leaved deciduous shrub *Quercus gambelii*, which occasionally reaches small tree size. It may form dense thickets with little understory or be relatively open with a rich understory of shrubs, grasses and forbs. Scattered trees are occasionally present and typically include species of *Juniperus* or *Pinus*. Characteristic shrubs that may co-occur, or be singularly dominant, include *Amelanchier alnifolia*, *Amelanchier utahensis*, *Arctostaphylos patula*, *Artemisia tridentata*, *Ceanothus fendleri*, *Cercocarpus montanus*, *Fendlera rupicola*, *Fraxinus anomala*, *Holodiscus dumosus*, *Jamesia americana*, *Ptelea trifoliata*, *Prunus virginiana*, *Purshia stansburiana*, *Robinia neomexicana*, *Rosa* spp., *Symphoricarpos oreophilus*, and *Symphoricarpos rotundifolius*. The herbaceous layer is sparse to moderately dense, ranging from 1-40% cover. Perennial graminoids are the most abundant species, particularly *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Aristida* spp., *Carex inops*, *Carex geyeri*, *Elymus arizonicus*, *Eragrostis* spp., *Festuca* spp., *Koeleria macrantha*, *Muhlenbergia* spp., and *Hesperostipa* spp. Many forb and fern species can occur, but none have much cover. Commonly present forbs include *Achillea millefolium*, *Artemisia* spp., *Geranium* spp., *Maianthemum stellatum*, *Thalictrum fendleri*, and *Vicia americana*. Ferns include species of *Cheilanthes* and *Woodsia*. Annual grasses and forbs are seasonally present, and weedy annuals are often present, at least seasonally.

ENVIRONMENT & DYNAMICS

Environmental Description: This group typically occupies the lower slope positions of the foothill and lower montane zones. Stands may occur on level to steep slopes, cliffs, escarpments, rimrock slopes, rocky outcrops, and scree slopes. Climate is semi-arid and characterized by mostly hot-dry summers with mild to cold winters and annual precipitation of 25 to 70 cm. Precipitation mostly occurs as winter snows but may also consist of some late-summer rains. Soils are typically poorly developed, rocky to very rocky, and well-drained. Parent materials include alluvium, colluvium, and residuum derived from igneous, metamorphic or sedimentary rocks such as granite, gneiss, limestone, quartz, monzonite, rhyolite, sandstone, schist, and shale.

Climate: Climate is semi-arid and characterized by mostly hot-dry summers with mild to cold winters and annual precipitation of 25 to 70 cm. Precipitation mostly occurs as winter snows but may also consist of some late-summer or monsoonal rains.

Soil/substrate/hydrology: Soils are typically poorly developed, rocky to very rocky, and well-drained. Parent materials include alluvium, colluvium, and residuum derived from igneous, metamorphic or sedimentary rocks such as granite, gneiss, limestone, quartz, monzonite, rhyolite, sandstone, schist, and shale.

Dynamics: Fire typically plays an important role, causing die-back of the dominant shrub species in some areas, promoting stump sprouting of the dominant shrubs in other areas, and controlling the invasion of trees into the shrubland system. Natural fires typically result in a mosaic of dense shrub clusters and openings dominated by herbaceous species. In some instances, these associations may be seral to the adjacent *Pinus ponderosa*, *Abies concolor*, and *Pseudotsuga menziesii* woodlands and forests. Ream (1964) noted that on many sites in Utah, Gambel oak may be successional and replaced by *Acer grandidentatum*.

DISTRIBUTION

Geographic Range: This group occurs in the mountains, plateaus and foothills of the southern Rocky Mountains and Colorado Plateau, including the Uinta and Wasatch ranges and the Mogollon Rim.

Spatial Scale & Pattern [optional]: Large patch

Nations: US

States/Provinces: AZ, CO, NM, NV?, UT, WY

TNC Ecoregions [optional]: 9:P, 10:P, 11:P, 18:C, 19:C, 20:C, 21:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313C:C?, 313D:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 331B:CC, 331F:CC, 331G:CC, 331I:CC, 331J:CC, 331M:CC, 341A:CC, 341B:CC, 341C:CC, 341F:CC, 342A:CC, 342E:CC, 342G:CC, 342J:CC, M313A:CC, M313B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M334A:??, M341A:CC, M341B:CC, M341C:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Arches)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = Gambel Oak (413) (Shiflet 1994)

LOWER LEVEL UNITS

Alliances:

- A3737 *Ceanothus fendleri* Shrubland & Shrub-Steppe Alliance
- A3735 *Quercus gambelii* - *Symphoricarpos oreophilus* Shrubland Alliance
- A3738 *Quercus gambelii* - *Robinia neomexicana* Shrubland Alliance
- A3736 *Fraxinus anomala* - *Rhus trilobata* - *Fendlera rupicola* Talus & Rock Outcrop Shrubland Alliance

AUTHORSHIP

Primary Concept Source: R.D. Ream (1960)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: MEH 3-10, 9-13, mod. KAS 11-15

REFERENCES

References: Christensen 1955, Faber-Langendoen et al. 2017a, Kunzler and Harper 1980, Kunzler et al. 1981, McKell 1950, Ream 1960, Ream 1964, Shiflet 1994

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G277. Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland

A3737. *Ceanothus fendleri* Shrubland & Shrub-Steppe Alliance

Type Concept Sentence: This alliance is characterized by either shrubland and shrub-steppe vegetation where the dominant shrub is *Ceanothus fendleri*. It is described from Bandelier National Monument in north-central New Mexico and Grand Canyon National Park in northern Arizona and likely occurs elsewhere in the southern Rocky Mountains and Colorado Plateau.

OVERVIEW

Scientific Name: *Ceanothus fendleri* Shrubland & Shrub-Steppe Alliance

Common Name (Translated Scientific Name): Fendler's *Ceanothus* Shrubland & Shrub-Steppe Alliance

Colloquial Name: Fendler's *Ceanothus* Shrubland & Shrub-Steppe

Type Concept: The vegetation is characterized by an open to moderately dense short-shrub layer dominated by *Ceanothus fendleri*. The herbaceous layer is usually moderately dense to dense (to 80% total cover) with *Muhlenbergia montana* or *Poa fendleriana* predominant. Codominants often include *Elymus elymoides*, *Muhlenbergia wrightii*, *Pascopyrum smithii*, or *Schizachyrium scoparium*. Forb cover is highly variable. This montane shrubland and steppe alliance is described from Bandelier National Monument in north-central New Mexico and Grand Canyon National Park in northern Arizona and likely occurs elsewhere in the southern Rocky Mountains and Colorado Plateau. Stands are found on gently rolling mesatops and high level plateaus (5-15% slope), though occasionally they can be found on moderately steep upper sideslopes (30% slope). Aspect is variable. Soils are primarily well-developed, silty or sandy loams. This alliance occurs in areas that have experienced somewhat recent high-intensity, stand-replacing fire events, and typically occurs within a matrix of live *Pinus ponderosa* woodlands, so scattered *Pinus ponderosa* are occasionally present as seedlings or remnant live mature trees.

Classification Comments: This alliance is geographically broad, but conceptually narrow in scope consisting of two poorly documented associations documented only from Grand Canyon National Park and Bandelier National Monument. More survey and classification work are needed to fully characterize this type.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Temperate broad-leaved, deciduous shrubland or shrub-steppe in which *Ceanothus fendleri* is the dominant shrub. The understory is dominated by perennial grasses and may reach as much as 80% cover. The most common dominants are *Poa fendleriana* and *Muhlenbergia montana*.

VEGETATION

Physiognomy and Structure: Vegetation in this shrubland and shrub-steppe alliance is characterized by a moderately dense cover of broad-leaved deciduous short shrubs (2-8 cm tall). The graminoid layer is open to dense (to 80% cover) and dominated by medium-

tall bunchgrasses. The forb layer is generally sparse but may have high species diversity. Annual grasses and forbs are seasonally present.

Floristics: This shrubland and shrub-steppe alliance is characterized by an open to moderately dense short-shrub layer dominated by *Ceanothus fendleri*. *Quercus gambelii* and *Robinia neomexicana* are frequent associates, but are usually poorly represented and are clearly not dominant. The herbaceous layer is usually moderately dense to dense (>80% total cover) with *Muhlenbergia montana* or *Poa fendleriana* predominant. Codominants often include *Elymus elymoides*, *Muhlenbergia wrightii*, *Pascopyrum smithii*, or *Schizachyrium scoparium*. Forb cover is highly variable from stand to stand; common associates include *Artemisia carruthii*, *Chenopodium* sp., *Epilobium brachycarpum*, *Erigeron divergens*, *Gayophytum diffusum*, *Heterotheca villosa* and *Solidago velutina*. Exotic species *Bromus tectorum* and *Conyza canadensis* are frequent in disturbed stands. Scattered *Pinus ponderosa* saplings and mature trees can occur, but cover is less than 10%.

ENVIRONMENT & DYNAMICS

Environmental Description: This montane shrubland and shrub-steppe is described from Bandelier National Monument in north-central New Mexico and Grand Canyon National Park in northern Arizona and likely occurs elsewhere in the southern Rocky Mountains and Colorado Plateau. Elevation ranges between 2200 and 2575 m (7210-8422 feet). Stands are found on gently rolling mesatops and high level plateaus (5-15% slope), though occasionally they can be found on moderately steep upper sideslopes (30% slope). Aspect is variable with lower elevation stands occurring on north-facing slopes and higher elevation stands occurring on warmer south-facing slopes. Soils are primarily well-developed, silty or sandy loams, including Mollisols derived from pumice or rhyolitic tuff alluvium or colluvium parent materials, or on occasion, fine-textured Alfisols developed from eolian deposits over rhyolitic tuff parent materials. The ground surface is characterized by scattered patches of exposed soil and herbaceous litter amid an abundant herbaceous layer. This alliance occurs in areas that have experienced somewhat recent high-intensity, stand-replacing fire events, and typically occurs within a matrix of live *Pinus ponderosa* woodlands, so scattered *Pinus ponderosa* are occasionally present as seedlings or remnant live mature trees.

Dynamics: This seral alliance occurs in areas that have experienced somewhat recent high-intensity, stand-replacing fire events.

DISTRIBUTION

Geographic Range: This montane shrubland and shrub-steppe alliance is described from Bandelier National Monument in north-central New Mexico and Grand Canyon National Park in northern Arizona and likely occurs elsewhere in the southern Rocky Mountains and Colorado Plateau.

Nations: US

States/Provinces: AZ, NM

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGL005501 *Ceanothus fendleri* / *Poa fendleriana* Shrub-Steppe
- CEGL005376 *Ceanothus fendleri* / *Muhlenbergia montana* Shrubland

AUTHORSHIP

Primary Concept Source: E. Muldavin et al. (2011b)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by K. Christie and K.S. King after A. Browder and E. Muldavin.

Version Date: 2014/12/18

REFERENCES

References: Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Muldavin et al. 2011b, Reid and Hall 2010

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G277. Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland

A3736. Fraxinus anomala - Rhus trilobata - Fendlera rupicola Talus & Rock Outcrop Shrubland Alliance

Type Concept Sentence: This mixed shrub alliance of the southern Rocky Mountains encompasses shrublands dominated by *Brickellia californica*, *Fraxinus anomala*, *Fendlera rupicola*, *Jamesia americana*, *Prunus virginiana*, and/or *Rhus trilobata* occupying talus, scree, rock outcrop and moderate to steep colluvial slope sites.

OVERVIEW

Scientific Name: *Fraxinus anomala* - *Rhus trilobata* - *Fendlera rupicola* Talus & Rock Outcrop Shrubland Alliance

Common Name (Translated Scientific Name): Singleleaf Ash - Skunkbush Sumac - Cliff Fendlerbush Talus & Rock Outcrop Shrubland Alliance

Colloquial Name: Singleleaf Ash - Skunkbush Sumac - Cliff Fendlerbush Talus & Rock Outcrop Shrubland

Type Concept: This shrubland alliance occurs in Colorado Plateau, southern Rocky Mountains, and Great Basin. Vegetation in this mixed, short (<2 m tall) shrubland alliance is variable. The shrub canopy has sparse to moderate cover, often with irregularly distributed dense shrub patches located below cliffs, on benches, in dry channels, on toeslopes and lower slopes, and near seeps where soil moisture is more available. Stands are often characterized by a sparse to low cover (<15% total cover) mix of xeric shrubs; *Brickellia californica*, *Fraxinus anomala*, *Fendlera rupicola*, and *Rhus trilobata* are conspicuous and usually at least codominant. At higher elevations and in microsites, mesic- and cool-site shrubs such as *Jamesia americana*, *Prunus virginiana*, *Ribes cereum*, *Rubus deliciosus*, *Holodiscus dumosus*, *Dasiphora fruticosa* ssp. *floribunda*, and *Acer glabrum* are characteristic. Many other shrub species may be present. The herbaceous layer is also variable depending on site characteristics and may include many species but none provides more than a few percent cover. Biological soil crust formation is rare on active slopes. Lichens provide large amounts of foliar cover, at times from 30-60% on more stable rock. This shrubland alliance occurs in canyons, plateaus, foothill and mountain slopes or rocky colluvial slopes and rock outcrop/large cliff faces. Elevations range from 1268 to 2715 m (4160-8900 feet). Slopes are moderate to very steep and are often oriented to the cooler north or east aspects. Soils tend to be sandy and skeletal.

Classification Comments: Associations included here not only have overlapping environmental characteristics, but floristics as well with the exception of *Jamesia americana* - (*Physocarpus monogynus*, *Holodiscus dumosus*) Rock Outcrop Shrubland (CEGL002783) which has a more unique suite of species and has been added here provisionally.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Temperate cold-deciduous shrublands dominated by *Brickellia californica*, *Fraxinus anomala*, *Fendlera rupicola*, *Jamesia americana*, *Prunus virginiana*, and/or *Rhus trilobata* occupying talus, scree, rock outcrop and moderate to steep colluvial slope sites.

VEGETATION

Physiognomy and Structure: Temperate cold-deciduous shrublands with sparse to moderately dense, often patchy short-shrub layer (<20 tall) with a sparse herbaceous layer of a mixture of species.

Floristics: Vegetation in this mixed, short (<20 m tall) shrubland alliance is variable. The shrub canopy has sparse to moderate cover, often with irregularly distributed dense shrub patches located below cliffs, on benches, in dry channels, on toeslopes and lower slopes, and near seeps where soil moisture is more available. Stands are often characterized by a sparse to low cover (<15% total cover) mix of xeric shrubs; *Brickellia californica*, *Fraxinus anomala*, *Fendlera rupicola*, and *Rhus trilobata* are conspicuous and usually at least codominant. At higher elevations and in microsites, mesic- and cool-site shrubs such as *Jamesia americana*, *Prunus virginiana*, *Ribes cereum*, *Rubus deliciosus*, *Holodiscus dumosus*, *Dasiphora fruticosa* ssp. *floribunda*, and *Acer glabrum* are characteristic. Many other shrub species may be present, including *Artemisia bigelovii*, *Artemisia tridentata*, *Atriplex confertifolia*, *Cercocarpus montanus*, *Chrysothamnus viscidiflorus*, *Ephedra torreyana*, *Ephedra viridis*, *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Opuntia* spp., and *Philadelphus microphyllus*. If *Quercus gambelii* is present, it has low cover (<5%) and does not dominate the site. The herbaceous layer is also variable depending on site characteristics and may include many species but none provides more than a few percent cover. *Achnatherum hymenoides*, *Artemisia dracuncululus*, *Artemisia ludoviciana*, *Bouteloua gracilis*, *Chamaesyce fendleri*, *Muhlenbergia montana*, *Pleuraphis jamesii*, *Stanleya pinnata*, and *Xylorhiza* spp. are the most consistent species. Biological soil crust formation is rare on active slopes. Lichens provide large amounts of foliar cover, at times from 30-60% on more stable rock.

ENVIRONMENT & DYNAMICS

Environmental Description: This shrubland alliance occurs in canyons, foothill, plateaus and mountain slopes or rocky colluvial slopes and rock outcrop/large cliff faces in the Colorado Plateau, southern Rocky Mountains, and Great Basin. Elevations range from 1268 to 2715 m (4160-8900 feet). Slopes are moderate to very steep and are often oriented to cooler north or east aspects. The

shrubs often grow within the cracks on the rocks and around the base of the rocks where accumulations of small gravel and soil occur. The high cover of rock on the ground surface acts both to concentrate runoff and as mulch to slow evaporation from the soil. Thus, relatively mesic species are able to persist on otherwise dry sites. The unvegetated surface is mostly covered by rocks, gravel, boulders, bedrock and bare soil, with little litter or dead wood evident. Soils tend to be sandy, skeletal, with a few stands on silt loams or clay loams derived from shale.

Dynamics:**DISTRIBUTION**

Geographic Range: This shrubland alliance is known from canyons, plateaus and mountain slopes in the Colorado Plateau, southern Rocky Mountains, and Great Basin of Utah, Colorado, New Mexico and Nevada.

Nations: US

States/Provinces: CO, NM, NV, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Fendlera rupicola* Shrubland Alliance (Coles et al. 2009a)
- > *Jamesia americana* Shrubland Alliance (Muldavin et al. 2011b)
- > *Prunus virginiana* Shrubland Alliance (Schulz and Hall 2011)

LOWER LEVEL UNITS**Associations:**

- CEGLO03493 *Brickellia californica* - *Rhus trilobata* Shrubland
- CEGLO02783 *Jamesia americana* - (*Physocarpus monogynus*, *Holodiscus dumosus*) Rock Outcrop Shrubland
- CEGLO05444 *Prunus virginiana* - Mixed Shrub Talus Shrubland
- CEGLO02765 *Fendlera rupicola* Talus Shrubland
- CEGLO03963 *Fraxinus anomala* - *Rhus trilobata* Dry Talus and Slickrock Shrubland

AUTHORSHIP

Primary Concept Source: M.E. Hall, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by G. Kittel and M.E. Hall.

Version Date: 2014/12/18

REFERENCES

References: Coles et al. 2009a, Faber-Langendoen et al. 2017b, Muldavin et al. 2011b, Reid and Hall 2010, Schulz and Hall 2011

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G277. Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland

A3738. Quercus gambelii - Robinia neomexicana Shrubland Alliance

Type Concept Sentence: This alliance of north-central New Mexico and the Mogollon Rim in north-central Arizona is characterized by shrublands dominated or codominated by *Quercus gambelii* and/or *Robinia neomexicana*.

OVERVIEW

Scientific Name: *Quercus gambelii* - *Robinia neomexicana* Shrubland Alliance

Common Name (Translated Scientific Name): Gambel Oak - New Mexico Locust Shrubland Alliance

Colloquial Name: Gambel Oak - New Mexico Locust Shrubland

Type Concept: This alliance occurs in desert mountains in southern New Mexico north into the southern Rocky Mountains in northern New Mexico and west to the Mogollon Rim in north-central Arizona. Stands are characterized by shrublands dominated or codominated by *Robinia neomexicana* and *Quercus gambelii*. Stands have a moderately dense to dense woody layer up to 2-5 m tall. The understory may be dominated by mesic forbs such as *Thalictrum fendleri*, but little other information is available. Stands in the montane conifer zone are considered seral and may have seedlings of *Pinus ponderosa*, *Abies concolor*, or conifer species that are

colonizing the stand. *Robinia neomexicana* is considered a semi-riparian species by some researchers. Thickets occur along drainages in canyons at lower elevations (1500-2000 m). On upland sites it is restricted to cooler north aspects at lower montane elevations, but may occur on any aspects at higher montane elevations. Sites are nearly level to moderately steep slopes. Substrate ranges from alluvial deposits on stream terraces to colluvial slopes.

Classification Comments: Several Rocky Mountain *Quercus gambelii* associations were combined with the former *Robinia neomexicana* alliance recognizing their more southern and eastern distribution as well as floristic elements of those regions.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3735 *Quercus gambelii* - *Symphoricarpos oreophilus* Shrubland Alliance: may be codominated by *Quercus gambelii*, but lacks *Robinia neomexicana*.

Diagnostic Characteristics: Temperate cold-deciduous shrublands dominated or codominated by *Quercus gambelii* and/or *Robinia neomexicana* ranging up to 5 m tall. Understories may be either forb-, grass- or sedge-dominated.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderate to dense layer of extremely xeromorphic deciduous shrubs that is less than 5 m tall. The herbaceous layer is typically sparse and dominated by perennial forbs and graminoids with annual grasses and forbs seasonally present.

Floristics: This alliance is characterized by a moderately dense to dense shrub layer (>80% cover) up to 2-5 m tall that is dominated or codominated by deciduous broadleaf shrub *Robinia neomexicana* with *Quercus gambelii* absent to codominant. *Robinia neomexicana* and *Quercus gambelii* can occur as either a tall or short shrub depending upon duration since the last fire. *Mahonia repens* is common at low cover. While infrequent, stands can sometimes have significant cover of *Ceanothus fendleri* and *Rosa woodsii*. The herbaceous layer richness is moderate, but variable in cover (5-80%) depending on density of the shrub layer and substrate. Characteristic graminoids include *Carex inops* ssp. *heliophila* and other deer sedges (*Carex geophila*, *Carex occidentalis*, and *Carex rossii*), *Koeleria macrantha*, *Muhlenbergia montana*, and *Poa fendleriana*. On sites that have been seeded following fire, common to abundant species may include *Agropyron cristatum*, *Bromus inermis*, *Elymus trachycaulus*, and *Pascopyrum smithii*, among others. While forbs are diverse, composition is variable from stand to stand, and cover is usually less than 10%. Fire-adapted *Gayophytum diffusum*, *Erigeron divergens*, *Solidago velutina*, and *Chenopodium* sp. are common components of the understory. Mesic stands may include *Thalictrum fendleri*. Stands in the montane conifer zone are considered seral and may have seedlings of *Pinus ponderosa*, *Abies concolor*, *Pseudotsuga menziesii*, or conifer species that are colonizing the stand.

ENVIRONMENT & DYNAMICS

Environmental Description: Shrublands included in this alliance have been described in south-central New Mexico, the southern Rocky Mountains of northern New Mexico and west to the Mogollon Rim across central Arizona north to the Grand Canyon. Climate is arid to semi-arid. Precipitation varies with elevation. *Robinia neomexicana* is considered a semi-riparian species by Dick-Peddie (1993). Thickets occur along drainages in canyons at lower elevations (1500-2150 m). Sites are nearly level to moderately steep slopes. Substrate ranges from alluvial deposits on stream terraces to colluvial slopes. On upland sites it is restricted to cooler north aspects at lower montane elevations, but may occur on any aspects at higher montane elevations. Elevation ranges between 2000 and 2700 m. This montane shrubland typically occurs in burned areas that once supported pine and mixed conifer forests. At mid-elevations, stands occur on sites with moderate to high solar exposure that increases with elevation. Stands occur on gentle to moderate slopes (5-20%), including rolling mesatops and mountain shoulder slopes, and occasionally on steep canyon or mountain slopes (>40%). Soils are primarily well-developed Mollisols derived from pumice, or occasionally fine-textured Alfisols derived from eolian deposits over rhyolitic tuff residuum. The ground surface is typically characterized by scattered bunchgrasses amid litter, pumice gravel, or exposed soil. Adjacent stands may include xeric grasslands, other shrublands, riparian forests, montane conifer forests and encinal woodlands.

Dynamics: *Robinia neomexicana*-dominated stands occur along riparian corridors and as patches of montane upland scrub. Dick-Peddie (1993) wrote that *Robinia neomexicana* and a common associate, *Quercus gambelii*, form persistent seral thickets in disturbed areas within conifer forests. The species is a common understory species in *Abies concolor*- or *Quercus gambelii*-dominated woodlands (Dick-Peddie 1993). This alliance is associated with very high-intensity stand-replacing fires, and typically occurs within a larger matrix of unburned *Pinus ponderosa* woodlands.

DISTRIBUTION

Geographic Range: This alliance is known from the southern Rocky Mountains, Colorado Plateau, Arizona-New Mexico Mountains and desert mountains in the northern Chihuahuan Desert.

Nations: US

States/Provinces: AZ, NM

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Quercus gambelii* - *Robinia neomexicana* Plant Association (Muldavin et al. 1994a)
- < *Quercus gambelii* Association (132.111) (Brown 1982a) [included within Great Basin Montane Scrub, Oak-scrub Series.]
- < *Quercus gambelii* Series (Johnston 1987)
- > Gambel oak - New Mexico locust deciduous scrub (Anderson et al. 1985)
- = Oak-Locust Successional Series (Dick-Peddie 1993) [only mixed stands of *Quercus gambelii* and *Robinia neomexicana*.]

LOWER LEVEL UNITS

Associations:

- CEG001125 *Robinia neomexicana* / *Thalictrum fendleri* Shrubland
- CEG001116 *Quercus gambelii* / *Robinia neomexicana* / *Symphoricarpos rotundifolius* Shrubland
- CEG001115 *Quercus gambelii* / *Robinia neomexicana* Shrubland
- CEG005505 *Robinia neomexicana* Shrubland
- CEG005379 *Quercus gambelii* - *Robinia neomexicana* / *Carex inops* ssp. *heliophila* Shrubland
- CEG005380 *Quercus gambelii* - *Robinia neomexicana* / *Muhlenbergia montana* Shrubland
- CEG005375 *Robinia neomexicana* / *Carex inops* ssp. *heliophila* Shrubland

AUTHORSHIP

Primary Concept Source: W.A. Dick-Peddie (1993)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Anderson et al. 1985, Baker 1982b, Blackhawk Coal Company 1981, Boucek 1986, Brown 1982a, Cedar Creek Associates, Inc. 1987, Christensen 1949, Christensen 1955, Clary 1992, Dick-Peddie 1993, Dillinger 1970, Ellis and Hackney 1981, Erdman 1962, Evans 1926, Evans 1936, Faber-Langendoen et al. 2017b, Ferchau 1973, Forsling and Storm 1929, Hanson and Ball 1928, Hess and Wasser 1982, Hinckley 1944, Hoffman and Alexander 1980, Johnston 1987, Keammerer and Peterson 1981, Kearney et al. 1969, Kittel et al. 1994, Kittel et al. 1999a, Komarkova et al. 1988a, Komarkova et al. 1988b, Kunzler et al. 1981, Livingston 1947, Livingston 1949, McKell 1950, Muldavin and Mehlhop 1992, Muldavin et al. 1994a, Muldavin et al. 1998b, Muldavin et al. 2011b, Neilson and Wullstein 1983, Ream 1960, Reid and Hall 2010, Schmoll 1935, Soil Conservation Service 1978, Szaro 1989, Thorne Ecological Institute 1973a, Vories 1974, Wallmo 1955, Warren and Treadwell 1980, Warren et al. 1982, Watson 1912, Whittaker and Niering 1964

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G277. Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland

A3735. *Quercus gambelii* - *Symphoricarpos oreophilus* Shrubland Alliance

Type Concept Sentence: This shrubland alliance of the Colorado Plateau and southern Rocky Mountains is characterized by dominance or codominance of *Quercus gambelii* in association with other mid-elevation shrubs.

OVERVIEW

Scientific Name: *Quercus gambelii* - *Symphoricarpos oreophilus* Shrubland Alliance

Common Name (Translated Scientific Name): Gambel Oak - Mountain Snowberry Shrubland Alliance

Colloquial Name: Gambel Oak - Mountain Snowberry Shrubland

Type Concept: This shrubland alliance occurs in the Colorado Plateau and southern Rocky Mountains and is characterized by dominance or codominance of *Quercus gambelii* in a moderately dense to dense tall- or short-shrub layer, typically 2-5 m tall, but can also occur as 1-m tall clumps to small trees over 5 m tall. The variable structure includes patches of oak shrubs with grass growing in between, dense oak thickets with little understory, and relatively mesic, tall shrublands with a rich understory of short

shrubs, grasses and forbs. Scattered trees are occasionally present in stands and typically include species of *Pinus* or *Juniperus*. Characteristic shrubs that may codominate or form a separate short-shrub layer include *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Cercocarpus montanus*, *Fendlera rupicola*, *Prunus virginiana*, *Rhus trilobata*, *Symphoricarpos oreophilus*, and *Symphoricarpos rotundifolius*. The herbaceous layer is sparse to moderately dense, ranging from 1-40% cover and is dominated by perennial graminoids, particularly *Bouteloua curtipendula*, *Bouteloua gracilis*, *Carex geyeri*, *Carex inops*, *Elymus arizonicus*, *Festuca thurberi*, *Koeleria macrantha*, *Muhlenbergia montana*, *Hesperostipa comata*, and *Poa fendleriana*. Many forb and fern species can occur, but none has much cover. Stands occur in the foothills and lower montane slopes, mesas and canyons. Elevations range from 1550-2950 m. Sites range from nearly level mesatops to steep (to 80%), rocky slopes on upper slopes and ridgetops. Other stands occur in canyon bottoms and along drainages. Soils are generally deep, coarse-textured, and well-drained.

Classification Comments:

Internal Comments: KAS 12-14: move CEGL002951 *Symphoricarpos oreophilus* Shrubland to A3208 *Artemisia tridentata* ssp. *vaseyana* - Mixed Shrubland Alliance (better fit).

Other Comments:

Similar NVC Types:

- A3738 *Quercus gambelii* - *Robinia neomexicana* Shrubland Alliance: is dominated or codominated by *Robinia neomexicana* and occurs in the southern extent of this group's range.

Diagnostic Characteristics: Temperate cold-deciduous shrublands 1-2 m tall dominated or codominated by *Quercus gambelii* in association with other mid-elevation shrubs. Understories are sparse to dense and typically grass- or sedge-dominated. Stands codominated by *Robinia neomexicana* are not included in this alliance.

VEGETATION

Physiognomy and Structure: Vegetation in this shrubland alliance is characterized by a moderately dense cover of broad-leaved deciduous shrubs. The graminoid layer is sparse to moderately dense and dominated by medium-tall bunchgrasses. The forb layer is generally sparse but may have high species diversity. Annual grasses and forbs are seasonally present.

Floristics: This shrubland alliance is characterized by dominance or codominance of *Quercus gambelii* in a moderately dense to dense tall- or short-shrub layer, typically 2-5 m tall, but can also occur as 1-m tall clumps to small trees over 5 m tall. The variable structure includes patches of oak shrubs with grass growing in between, dense oak thickets with little understory, and relatively mesic, tall shrublands with a rich understory of short shrubs, grasses and forbs. Scattered trees are occasionally present in stands and typically include *Pinus edulis*, *Pinus ponderosa*, or *Juniperus* spp. Characteristic shrubs that may codominate or form a separate short-shrub layer include *Arctostaphylos patula*, *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Cercocarpus montanus*, *Fendlera rupicola*, *Holodiscus dumosus*, *Paxistima myrsinites*, *Ptelea trifoliata*, *Prunus virginiana*, *Rhus trilobata*, *Rosa* spp., *Symphoricarpos oreophilus*, and *Symphoricarpos rotundifolius*. The herbaceous layer is sparse to moderately dense, ranging from 1-40% cover and is dominated by perennial graminoids, particularly *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Carex geyeri*, *Carex inops*, *Elymus arizonicus*, *Festuca thurberi*, *Koeleria macrantha*, *Muhlenbergia montana*, *Hesperostipa comata*, and *Poa fendleriana*. Many forb and fern species can occur, but none has much cover. Commonly present forbs include *Achillea millefolium*, *Artemisia* spp., *Geranium* spp., *Maianthemum stellatum*, *Thalictrum fendleri*, and *Vicia americana*. Ferns include species of *Cheilanthes* and *Woodsia*. Annual grasses and forbs are seasonally present. In Texas occurrences, associated species can include *Holodiscus dumosus* and *Symphoricarpos oreophilus*. Additional species found in associations of this alliance include *Cercocarpus montanus*, *Carex geyeri*, *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Carex inops*, *Paxistima myrsinites*, *Rhus trilobata* and *Symphoricarpos rotundifolius*.

ENVIRONMENT & DYNAMICS

Environmental Description: Shrublands included in this alliance occur in the foothills and lower montane slopes of isolated desert mountain ranges, mesas and canyons from Nevada to western Texas, as well as in the lower montane zone of the southern Rocky Mountains, Uinta Mountains and high plateaus of southern Utah. Elevations range from 1550-2950 m. Climate is semi-arid. Summers are generally hot, and winters range from mild with cold periods and occasional snows in the southern part of its range to extended periods of freezing temperatures in the northern part of its range. The seasonality of precipitation varies, but most of the 35-70 cm of mean annual precipitation occurs during the growing season. Stands occur on nearly level to steep (to 80%), rocky slopes in canyons, mountain slopes and ridgetops while other stands occur in canyon bottoms and along drainages. Aspect does not seem important except in the southern range extent where stands are restricted to the more mesic north slopes. Soils are generally deep, coarse-textured, and well-drained. Soil texture is typically a cobbly and gravelly loamy sand and gravelly loam, but the alliance also occurs on well-drained clay soil. Parent materials are varied and include quartzite, monzonite, shale and alluvium. Adjacent vegetation at higher elevations is typically conifer woodlands or forests dominated by *Pinus ponderosa*, *Pinus contorta*, or *Pseudotsuga menziesii*, but *Populus tremuloides* forests are also common in the northern part of its range. Adjacent vegetation

below these stands is often medium-tall grasslands in southeastern Colorado or shrublands dominated by *Artemisia* spp. in western Colorado.

Dynamics: The distribution of *Quercus gambelii* was studied by Neilson and Wullstein (1983) with respect to climatic patterns. They found the species to be limited by seedling mortality from severe spring frosts and summer drought. The northern extent of the species is in alignment with the winter polar front that runs along the boundary between southern Wyoming and Colorado and Utah. Its western range limit aligns with the westward extent of summer moisture from the Arizona monsoon, which approximates the western Arizona border. Reproducing stands in northern Utah that exist north of summer monsoon moisture are restricted to more mesic sites. Seedling recruitment is more common in the southern part of its range than the northern (Neilson and Wullstein 1983).

Quercus gambelii is a fire-adapted species (Clary 1992). The root systems are well-developed and draw moisture from a large volume of soil allowing for rapid resprouting after fire. Muldavin et al. (1998b) reported that, in the Organ Mountains in southwestern New Mexico after a severe fire, *Quercus gambelii* resprouted into a dense thicket that excluded both herbaceous understory and conifer species. They suggested frequent small cool fires would favor the establishment of conifers and maintain an herbaceous understory. *Quercus gambelii* shrubs also resprout vigorously after stems are killed with almost all herbicides or removed by chaining or cutting for firewood (Clary 1992). Altered fire regimes, fuelwood harvest, and grazing by livestock have significant impacts to the quality of sites. More study is needed to understand and manage these shrublands ecologically.

DISTRIBUTION

Geographic Range: This alliance is known from the Colorado Plateau, southern Rocky Mountains, Great Basin, Utah High Plateaus, and Wyoming basins of Utah, Colorado, Wyoming, New Mexico and Arizona.

Nations: US

States/Provinces: AZ, CO, NM, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Quercus gambelii* Association (132.111) (Brown 1982a) [included within Great Basin Montane Scrub, Oak-scrub Series]
- = *Quercus gambelii* Series (Johnston 1987)

LOWER LEVEL UNITS

Associations:

- CEG002695 *Arctostaphylos patula* - *Quercus gambelii* - (*Amelanchier utahensis*) Shrubland
- CEG005995 *Quercus gambelii* / *Carex geyeri* Shrubland
- CEG001113 *Quercus gambelii* - *Cercocarpus montanus* / (*Carex geyeri*) Shrubland
- CEG001109 *Quercus gambelii* / *Amelanchier alnifolia* Shrubland
- CEG001111 *Quercus gambelii* / *Artemisia tridentata* Shrubland
- CEG002915 *Quercus gambelii* / *Hesperostipa comata* Shrubland
- CEG002949 *Quercus gambelii* / *Poa fendleriana* Shrubland
- CEG001114 *Quercus gambelii* / *Paxistima myrsinites* Shrubland
- CEG001117 *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland
- CEG002805 *Quercus gambelii* / *Festuca thurberi* Shrubland
- CEG001112 *Quercus gambelii* / *Carex inops* Shrubland
- CEG002910 *Rhus trilobata* Rocky Mountain Shrubland
- CEG002337 *Quercus gambelii* / Sparse Understory Shrubland
- CEG002338 *Quercus gambelii* / *Rhus trilobata* Shrubland
- CEG002341 *Quercus gambelii* - *Holodiscus dumosus* Shrubland
- CEG002477 *Quercus gambelii* Shrubland
- CEG004010 *Quercus gambelii* / *Fendlera rupicola* Shrubland
- CEG005994 *Quercus gambelii* / *Prunus virginiana* Shrubland
- CEG001110 *Quercus gambelii* / *Amelanchier utahensis* Shrubland

AUTHORSHIP

Primary Concept Source: D.E. Brown (1982a)

Author of Description: K.A. Schulz

Acknowledgments:**Version Date:** 2014/12/18**REFERENCES**

References: Anderson et al. 1985, Baker 1982b, Barbour and Major 1977, Blackhawk Coal Company 1981, Boucek 1986, Brown 1982a, Cedar Creek Associates, Inc. 1987, Christensen 1949, Christensen 1955, Clary 1992, Conard and Radosevich 1982, Dillinger 1970, Ellis and Hackney 1981, Erdman 1962, Evans 1926, Evans 1936, Faber-Langendoen et al. 2017b, Ferchau 1973, Forsling and Storm 1929, Hanson and Ball 1928, Hess and Wasser 1982, Hinckley 1944, Hoffman and Alexander 1980, Johnston 1987, Keammerer and Peterson 1981, Kittel et al. 1994, Kittel et al. 1999a, Komarkova et al. 1988a, Komarkova et al. 1988b, Kunzler et al. 1981, Livingston 1947, Livingston 1949, McKell 1950, Mazingo 1987, Muldavin 1994, Muldavin and Mehlhop 1992, Muldavin et al. 1998b, Neilson and Wullstein 1983, Ream 1960, Schmoll 1935, Soil Conservation Service 1978, Thorne Ecological Institute 1973a, Townsend 1966, Vories 1974, Warren and Treadwell 1980, Warren et al. 1982, Watson 1912

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

2.B.2.Na.1.b. M049 Southern Rocky Mountain Montane Shrubland

G276. Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland

Type Concept Sentence: This foothills shrubland group occurs in the Rocky Mountains and Colorado Plateau from lower montane zone to canyons and breaks in the western Great Plains and is characterized by an open to closed shrub layer of nearly pure *Cercocarpus montanus* or a mixed shrub layer with *Amelanchier utahensis*, *Quercus x pauciloba*, *Purshia tridentata*, *Rhus trilobata*, *Ribes cereum*, or *Symphoricarpos oreophilus*.

OVERVIEW**Scientific Name:** *Cercocarpus montanus* - *Quercus x pauciloba* - *Rhus trilobata* Foothill Shrubland Group**Common Name (Translated Scientific Name):** Alderleaf Mountain-mahogany - Wavyleaf Oak - Skunkbush Sumac Foothill Shrubland Group**Colloquial Name:** Utah Serviceberry - Mountain-mahogany Shrubland

Type Concept: This Rocky Mountain foothill shrubland group ranges from southern New Mexico north into Wyoming, and west into the Intermountain West region. *Cercocarpus montanus* dominates pure stands in parts of Wyoming and Colorado. The vegetation is typically dominated by a variety of shrubs, including *Amelanchier utahensis*, *Cercocarpus montanus*, *Quercus x pauciloba*, *Purshia tridentata*, *Rhus trilobata*, *Ribes cereum*, *Symphoricarpos oreophilus*, or *Yucca glauca*. Grasses and sedges are dominant in the understory and may include *Achnatherum scribneri*, *Bouteloua curtipendula*, *Carex geyeri*, *Elymus lanceolatus*, *Hesperostipa comata*, *Hesperostipa neomexicana*, *Leymus ambiguus*, *Muhlenbergia montana*, and *Pseudoroegneria spicata*. Scattered trees or inclusions of grassland patches or steppe may be present. Stands are found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. These shrublands occur between 1500 and 2900 m elevation and are usually associated with exposed sites, rocky substrates, and dry conditions, which limit tree growth. It is common where *Quercus gambelii* is absent, such as the northern Colorado Front Range and in drier foothills and prairie hills. This group is generally drier than Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland Group (G277), but may include mesic montane shrublands where *Quercus gambelii* does not occur. Fires play an important role in this group as the dominant shrubs usually have a severe die-back, although some plants will stump sprout. *Cercocarpus montanus* requires a disturbance such as fire to reproduce, either by seed sprout or root-crown sprouting. Fire suppression may have allowed an invasion of trees into some of these shrublands, but in many cases, sites are too xeric for tree growth.

Classification Comments: While *Cercocarpus montanus* is the common dominant shrub in this group, it is not the only dominant, and in many occurrences is not found at all. In addition, in some occurrences, shrub cover is low, which allows for some stands to be graminoid-dominated. In Wyoming, stands where *Cercocarpus montanus* is a component of mixed shrublands are placed in Central Rocky Mountain Montane-Foothill Deciduous Shrubland Group (G272).

Similar NVC Types:

- G277 Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland
- G272 Central Rocky Mountain Montane-Foothill Deciduous Shrubland

Diagnostic Characteristics: Open to dense broadleaf shrublands or shrub-grasslands where *Cercocarpus montanus* occurs as the most often dominant shrub, but may be a codominant or be absent in some stands. Other characteristic shrubs include *Amelanchier utahensis*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Fallugia paradoxa*, *Fendlera rupicola*, *Glossopetalon spinescens*, *Purshia tridentata*, *Quercus x pauciloba*, *Ribes cereum*, and *Rhus trilobata*. The herbaceous layer is characterized by an open to dense layer

of grasses and sedges. Typical species include *Achnatherum scribneri*, *Bouteloua curtipendula*, *Carex geyeri*, *Elymus lanceolatus*, *Hesperostipa comata*, *Hesperostipa neomexicana*, *Leymus ambiguus*, *Muhlenbergia montana*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: Open to dense, broadleaf deciduous shrublands or shrub-grasslands with canopies 1-2 m tall. Occurrences are typically multi-layered shrub-dominated stands where grasses occur in canopy openings. In occurrences where shrub cover is open, grasses may attain higher cover than overstory shrubs.

Floristics: This group consists of two major cover types: those most commonly dominated by *Cercocarpus montanus* or by *Purshia tridentata*. Within these communities, either nominal may be dominant, codominant or absent. Other shrubs include *Amelanchier utahensis*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Fallugia paradoxa*, *Fendlera rupicola*, *Glossopetalon spinescens*, *Quercus x pauciloba*, *Rhus trilobata*, *Ribes cereum*, *Symphoricarpos oreophilus*, or *Yucca glauca*. Grasses are prominent and include *Andropogon gerardii*, *Achnatherum scribneri*, *Bouteloua curtipendula*, *Elymus lanceolatus ssp. lanceolatus*, *Hesperostipa comata*, *Hesperostipa neomexicana*, *Muhlenbergia montana*, and *Pseudoroegneria spicata*.

ENVIRONMENT & DYNAMICS

Environmental Description: This group is found on gentle to extremely steep slopes (5-60%) on slopes, ridges, canyons, mesas, and less often sand dunes. Sites are often subject to drought stress. Elevations range from 1500 to 2700 m. Geologic substrates can include sandstone, shale, basalt, and limestone. Soils are generally poorly developed, rapidly drained and include sand, sandy loam, coarse gravels, loams, and clay loams.

Dynamics:

DISTRIBUTION

Geographic Range: This group is found in the foothills, canyon slopes and lower mountains of the southern Rocky Mountains and on outcrops and canyon slopes in the western and southern Great Plains. It ranges from southern New Mexico, extending north into Wyoming, and west into the Intermountain West region.

Spatial Scale & Pattern [optional]: Large patch

Nations: US

States/Provinces: CO, MT, NE?, NM, NV?, SD, TX, UT, WY

TNC Ecoregions [optional]: 9:P, 10:C, 11:P, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C, 27:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 315A:CC, 315B:CC, 315H:CP, 321A:CC, 331B:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341B:CC, 341C:CC, 342E:CC, 342F:CC, 342G:CC, M313B:CC, M331A:CP, M331B:CP, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332G:??, M334A:??, M341B:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = Mountain Mahogany - Mixed Shrub Series (Dick-Peddie 1993)

LOWER LEVEL UNITS

Alliances:

- A3733 *Cercocarpus montanus* - *Quercus x pauciloba* Shrubland Alliance
- A3731 *Purshia tridentata* - *Ribes cereum* Shrubland Alliance
- A3730 *Fallugia paradoxa* - *Rhus trilobata* Shrubland Alliance
- A3732 *Amelanchier utahensis* - *Cercocarpus montanus* - *Cercocarpus intricatus* Shrubland Alliance

AUTHORSHIP

Primary Concept Source: K. Hess and C.H. Wasser (1982)

Author of Description: M.E. Hall and K.A. Schulz

Acknowledgments:

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: MEH 3-10, 9-13, mod, KAS 11-15

REFERENCES

References: Dick-Peddie 1993, Faber-Langendoen et al. 2017a, Hess 1981, Hess and Wasser 1982, Johnston 1987, Marriott and Faber-Langendoen 2000, Muldavin 1994, Muldavin et al. 2000b, Shiflet 1994, Thilenius et al. 1995

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G276. Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland

A3732. *Amelanchier utahensis* - *Cercocarpus montanus* - *Cercocarpus intricatus* Shrubland Alliance

Type Concept Sentence: This alliance is characterized by shrublands dominated by *Amelanchier utahensis*, *Cercocarpus montanus* or *Cercocarpus intricatus* in the southern Rocky Mountains, Wyoming Basins, Colorado Plateau and extending west to the Great Basin.

OVERVIEW

Scientific Name: *Amelanchier utahensis* - *Cercocarpus montanus* - *Cercocarpus intricatus* Shrubland Alliance

Common Name (Translated Scientific Name): Utah Serviceberry - Alderleaf Mountain-mahogany - Littleleaf Mountain-mahogany Shrubland Alliance

Colloquial Name: Utah Serviceberry - Mountain-mahogany Shrubland

Type Concept: This alliance is known from the southern Rocky Mountains, Wyoming Basins, Colorado Plateau and extending west to the Great Basin. Stands are characterized by mixed tall-shrub canopies dominated by *Amelanchier utahensis*, *Cercocarpus montanus*, or *Cercocarpus intricatus*. Species that may codominate in some stands include *Artemisia tridentata*, *Fendlera rupicola*, *Glossopetalon spinescens*, and *Rhus trilobata*. Total canopy cover ranges from sparse to moderately dense. Occasional trees, such as *Juniperus* spp., *Quercus* spp., *Pinus edulis*, *Pinus ponderosa*, or *Pseudotsuga menziesii*, may be scattered in some stands. The herbaceous layer is variable and may have sparse to moderate cover. The most typical dominants are graminoids and may include *Carex geyeri*, *Elymus lanceolatus* ssp. *lanceolatus*, *Hesperostipa comata*, and *Pseudoroegneria spicata*. Elevations range from 1800-2700 m. Sites are variable but are generally xeric and rocky with moderate to very steep slopes or on ridges. Stands are found on various aspects, but typically the higher elevation and northern sites are on warmer, southern exposures, and lower elevation and southern stands are restricted to more mesic north slopes.

Classification Comments: Inclusion of *Cercocarpus intricatus* Montane Shrubland (CEGL002587) is tentative as it occupies the same geographic range and montane environments of other associations in this alliance and has similar floristics. *Cercocarpus intricatus* - *Glossopetalon spinescens* Shrubland (CEGL005426) is included in that it is montane with some floristic overlap, but is a geographic outlier, therefore placement here is low in confidence. Other *Cercocarpus intricatus* associations are more associated with slickrock environments and range more western and southern.

Internal Comments: mjr 12-14: CA added for MOJN.

Other Comments:

Similar NVC Types: This alliance is distinguished from the alliance listed above in have species with more northern distributions.

- A3733 *Cercocarpus montanus* - *Quercus x pauciloba* Shrubland Alliance: has species with more southern distributions.

Diagnostic Characteristics: Mixed montane shrublands dominated *Amelanchier utahensis*, *Cercocarpus montanus*, or occasionally *Cercocarpus intricatus*. Shrub cover may be sparse to moderate. These shrublands may be either codominated by other shrub species or have sparse to dense understories of graminoids. Tree may be present, but are scattered and have low cover.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a moderate to dense canopy of cold-deciduous shrubs up to 4 m in height. There is often another stratum (sometimes two) of low cold-deciduous shrubs from 0.5-2 m tall. The ground layer is usually a species-rich assemblage of cespitose graminoids and erect forbs.

Floristics: These shrublands are typically sparse to dense and tall with multiple vegetation layers. The upper shrub layer is typically dominated by *Amelanchier utahensis*, *Cercocarpus montanus*, or *Cercocarpus intricatus*. Species that may codominate in some stands include *Artemisia tridentata*, *Fendlera rupicola*, *Glossopetalon spinescens*, and *Rhus trilobata*. Other shrub associates may include *Chrysothamnus viscidiflorus*, *Ephedra viridis*, *Eriogonum corymbosum*, *Holodiscus dumosus*, *Mahonia repens*, *Purshia tridentata*, *Ribes cereum*, *Rosa woodsii*, *Symphoricarpos oreophilus*, and *Tetradymia canescens*. Occasional trees, such as *Juniperus* spp., *Quercus* spp., *Pinus edulis*, *Pinus ponderosa* or *Pseudotsuga menziesii*, may be scattered in some stands. The herbaceous layer is variable and may have sparse to moderate cover and is most often dominated by graminoids. Dominant graminoids may include *Carex geyeri*, *Elymus lanceolatus* ssp. *lanceolatus*, *Hesperostipa comata*, and *Pseudoroegneria spicata*. Other associated graminoids may include *Achnatherum hymenoides*, *Koeleria macrantha*, *Leymus salinus*, *Poa fendleriana*, and *Poa fendleriana*. Forbs do not

contribute significant cover, but may be diverse in some stands. Associates may include *Artemisia ludoviciana*, *Balsamorhiza sagittata*, *Collinsia parviflora*, *Hedeoma hispida*, *Lathyrus pauciflorus*, and *Symphotrichum oblongifolium* (= *Aster oblongifolius*).

ENVIRONMENT & DYNAMICS

Environmental Description: Plant associations in this alliance occur at middle elevations (1850-2700 m) of mountains. Climate is semi-arid. Summers are hot and winters are typically cold, with freezing temperatures and snow common, however, stands on the southwestern U.S. may have mild winter temperatures. Precipitation ranges from 30-50 cm annually with a large proportion falling as winter snow. Sites are variable but are generally xeric and rocky with moderate to very steep slopes or on ridges. Stands are found on various aspects, but typically the higher elevation and northern sites are on warmer, southern exposures, and lower elevation and southern stands are restricted to more mesic north slopes. Environments include sheltered rocky canyons, mesa slopes, slickrock, moderate to very steep slopes and ridges. Soils are variable, from shallow and skeletal near rock outcroppings, to moderately deep with abundant organic matter. Soil textures range from sandy loam to clay. Soils range from slightly acidic to slightly alkaline depending on parent material, which includes alluvium, colluvium and residuum from igneous, metamorphic or sedimentary rocks such as granite, gneiss, limestone, quartz monzonite, rhyolite, sandstone, schist and shale.

Dynamics: Yake and Brotherson (1979) noted that regeneration of *Amelanchier utahensis* was most favorable on moderately deep, fine-textured soils of northerly-aspected sites. They noted that seedling herbivory by native ungulates was greater at such sites. Annual grasses were noted to have a negative effect on seedling densities. *Amelanchier utahensis* hybridizes with *Amelanchier alnifolia*, and distinctions between the two species may become blurred in areas where their ranges overlap. *Cercocarpus montanus* is a dominant understory species in several woodland and forests dominated by *Juniperus deppeana*, *Juniperus monosperma*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus edulis*, *Pinus ponderosa*, *Pseudotsuga menziesii*, *Quercus gambellii*, *Quercus grisea*, and *Quercus x pauciloba*. *Cercocarpus montanus* stands often occur in the more xeric habitat below these woodland and forest stands. In xeric habitats studied by Greenwood and Brotherson (1978), *Cercocarpus montanus* sites had significantly more rock than the *Pinus edulis* and *Juniperus osteosperma* sites. Brotherson et al. (1984) suggested that stands are moisture-limited because stands on southern aspects were always higher in elevation than stands on northern aspects. They also found that the *Cercocarpus montanus* stands were more likely to occur on northern slopes than on southern in central Utah. However, *Cercocarpus montanus* did not typically occur with mesic shrubs such as *Symphoricarpos oreophilus* and *Amelanchier alnifolia*. There is often a broad *Cercocarpus montanus* shrub/herbaceous ecotone between these shrublands and grasslands. Ecological factors that control shrub densities such as fire and drought need more investigation. Unlike other species of *Cercocarpus*, *Cercocarpus montanus* is a fire-resistant species because it can resprout from the base after a fire has killed the top (Cronquist et al. 1997). In the southern portion of its range, *Cercocarpus montanus* functions as an evergreen shrub by retaining leaves during mild winters and losing them during cold winters (Dick-Peddie 1993). *Cercocarpus montanus* is preferred winter range browse for deer (Roughton 1966, 1972, Hoffman and Alexander 1987). Stands can also produce significant forage that can be utilized by grazing livestock provided the slopes are not too steep (Hoffman and Alexander 1987). More information is needed on the effects of livestock grazing and wildlife browsing on the structure and function of these shrublands.

DISTRIBUTION

Geographic Range: This alliance is known from the southern Rocky Mountains, Arizona-New Mexico mountains, north to the Wyoming Basins, east to escarpments of the Great Plains and west to the Colorado Plateau and parts of the Great Basin.

Nations: US

States/Provinces: AZ, CA, CO, NE, NM, NV, SD, TX, UT, WY

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007): 322Aj:CCC, 341Fb:CCC, 341Fc:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Great Basin, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Cercocarpus intricatus* (Small leaf mountain mahogany scrub) Provisional Alliance (Sawyer et al. 2009) [76.300.00]
- > *Cercocarpus intricatus* Shrubland Alliance (Evens et al. 2014)

LOWER LEVEL UNITS

Associations:

- CEGLO03494 *Chamaebatiaria millefolium* - *Yucca baccata* - (*Mahonia repens*) Shrubland
- CEGLO01069 *Amelanchier utahensis* / *Pseudoroegneria spicata* Shrubland
- CEGLO01067 *Amelanchier utahensis* Shrubland
- CEGLO01090 *Cercocarpus montanus* / *Pseudoroegneria spicata* Shrubland
- CEGLO02912 *Cercocarpus montanus* - *Rhus trilobata* / *Andropogon gerardii* Shrubland

- CEGLO01087 *Cercocarpus montanus* / *Elymus lanceolatus* ssp. *lanceolatus* Shrubland
- CEGLO01070 *Amelanchier* (*utahensis*, *alnifolia*) - *Cercocarpus montanus* Shrubland
- CEGLO01092 *Cercocarpus montanus* / *Hesperostipa comata* Shrubland
- CEGLO02798 *Cercocarpus montanus* Shale Shrubland
- CEGLO02587 *Cercocarpus intricatus* Montane Shrubland
- CEGLO03817 *Amelanchier utahensis* - *Fendlera rupicola* Shrubland
- CEGLO03820 *Cercocarpus montanus* - *Fendlera rupicola* Shrubland
- CEGLO05805 *Cercocarpus montanus* - *Artemisia tridentata* Shrubland
- CEGLO05393 *Cercocarpus intricatus* - (*Quercus turbinella*) Mixed Shrubland
- CEGLO05426 *Cercocarpus intricatus* - *Glossopetalon spinescens* Shrubland
- CEGLO01068 *Amelanchier utahensis* - Mixed Shrub / *Carex geyeri* Shrubland

AUTHORSHIP

Primary Concept Source: D. Sarr, J. Coles, K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Brotherson and Barnes 1984, Cronquist et al. 1997, Dick-Peddie 1993, Evens et al. 2014, Faber-Langendoen et al. 2017b, Greenwood and Brotherson 1978, Hoffman and Alexander 1987, Roughton 1966, Roughton 1972, Sawyer et al. 2009, Thomas et al. 2004, Yake and Brotherson 1979

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G276. Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland

A3733. *Cercocarpus montanus* - *Quercus x pauciloba* Shrubland Alliance

Type Concept Sentence: This alliance is characterized by shrublands dominated or codominated by *Cercocarpus montanus* and *Quercus x pauciloba* occurring in the southern Rocky Mountains south to the northern Chihuahuan Desert and east to the Southern Shortgrass Prairie with outlying occurrences in adjacent ecoregions.

OVERVIEW

Scientific Name: *Cercocarpus montanus* - *Quercus x pauciloba* Shrubland Alliance

Common Name (Translated Scientific Name): Alderleaf Mountain-mahogany - Wavyleaf Oak Shrubland Alliance

Colloquial Name: Alderleaf Mountain-mahogany - Wavyleaf Oak Shrubland

Type Concept: The vegetation of this alliance is characterized by shrublands most commonly dominated by *Cercocarpus montanus*, but in the southern portion of its range is codominated by *Quercus x pauciloba*. Structure varies from dense to having little to no canopy overlap with lush herbaceous layers. Shrub associates may include *Ceanothus greggii*, *Dasyllirion leiophyllum*, *Quercus grisea* (shrub form), and *Quercus turbinella*. The understory is most commonly graminoid-dominated by *Bouteloua curtipendula*, *Hesperostipa neomexicana*, *Muhlenbergia montana*, or *Petrophytum caespitosum*. Additional species may include *Achnatherum scribneri*, *Bouteloua gracilis*, *Carex geyeri*, *Elymus albicans* (= *Elymus lanceolatus* ssp. *albicans*), *Festuca arizonica*, and the perennial forbs *Helianthus pumilus*, *Heterotheca villosa*, *Potentilla fissa*, and *Scutellaria brittonii*. Introduced annual grass *Bromus tectorum* is often present. This alliance primarily occurs in the southern Rocky Mountains, northern Chihuahuan Desert and east to the Southern Shortgrass Prairie, but has outlying occurrences in adjacent ecoregions. It occurs on montane slopes at 915 to 2440 m (3000-8000 feet) elevation. Stands are found on various aspects, but typically the higher elevation and northern sites are on warmer, southern exposures, and lower elevation and southern stands are restricted to more mesic north slopes.

Classification Comments: This alliance includes *Cercocarpus montanus* associations previously included in one larger Rocky Mountain alliance, but has been created separately to reflect the more southern floristic elements of this new alliance. Stands in this alliance appear to be separated from stands in *Cercocarpus montanus* Madrean Montane Chaparral Alliance (A3791) by the density of the shrub layer alone. Stands in this shrub-herbaceous alliance have only been described from southwestern New Mexico but may occur throughout the range of *Cercocarpus montanus*. A *Cercocarpus montanus* / *Stipa neomexicana* shrubland has been described from the Colorado Front Range foothills by the Colorado Natural Heritage Program but has not yet been included in the National Vegetation Classification (S. Kettler pers. comm.).

Internal Comments:

Other Comments:

Similar NVC Types:

- A3732 *Amelanchier utahensis* - *Cercocarpus montanus* - *Cercocarpus intricatus* Shrubland Alliance
- A3791 *Cercocarpus montanus* Madrean Montane Chaparral Alliance

Diagnostic Characteristics: Broad-leaved shrublands dominated or codominated by the hybrid scrub oak *Quercus x pauciloba* and *Cercocarpus montanus* with grasses predominant in the understory. Understory associated species tend to reflect southern distributions.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderately sparse to moderately dense cover of broad-leaved deciduous shrubs 2 m tall. The sparse to moderately dense herbaceous layer is usually less than 1 m tall and dominated by graminoids. Some stands have herbaceous layers dominated by perennial forbs, but generally forb cover is sparse. Annuals are seasonally present.

Floristics: The sparse to moderately dense shrub layer is 1-2 m tall and is dominated by the cold-deciduous, broad-leaved shrub *Cercocarpus montanus* or the hybrid oak *Quercus x pauciloba*. Occasional trees, such as *Juniperus* spp., *Pinus edulis*, *Pinus ponderosa*, *Pseudotsuga menziesii*, or *Quercus* spp., may be scattered in some stands. Shrub cover is generally denser on northern aspects and increases with elevation. Lower elevation stands grade into shrub savannas with decreasing elevation. The herbaceous layer is sparse to moderately dense depending on the density of the shrub layer and soil moisture. It is dominated by perennial graminoids or forbs with annuals present seasonally. Associated species vary with location. In the western Great Plains, *Artemisia frigida* and *Rhus trilobata* are common woody species. The herbaceous layer is sparse to moderately dense and is dominated by the warm-season, perennial midgrass *Bouteloua curtipendula*. *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Aristida purpurea*, *Elymus elymoides*, *Hesperostipa comata* (= *Stipa comata*), and *Piptatheropsis micrantha* (= *Oryzopsis micrantha*) may also be present. Common forbs are *Artemisia ludoviciana*, *Hedeoma hispida*, and *Symphotrichum oblongifolium* (= *Aster oblongifolius*). Stands in the Rocky Mountain foothills are similar, but with the graminoid layer usually dominated by the cool-season, perennial midgrasses *Bouteloua gracilis*, *Hesperostipa comata*, or *Hesperostipa neomexicana* (= *Stipa neomexicana*). In addition to *Artemisia frigida* and *Rhus trilobata*, associated shrubs and dwarf-shrubs may include *Purshia tridentata*, *Quercus gambelii*, and *Ribes cereum*. Other associated species, such as *Allium textile*, *Artemisia ludoviciana*, *Astragalus parryi*, *Bouteloua gracilis*, *Eriogonum umbellatum*, *Helianthus pumilus*, and *Poa* spp., are common in the herbaceous layer. In the Chihuahuan Desert montane scrublands, the dominant species may be a different subspecies, *Cercocarpus montanus* var. *paucidentatus*. Associated shrubs and dwarf-shrubs include Madrean elements such as *Agave parryi*, *Ceanothus greggii*, *Dasyllirion leiophyllum*, *Dasyllirion wheeleri*, *Ericameria laricifolia*, *Garrya flavescens*, *Garrya wrightii*, *Petrophytum caespitosum*, *Quercus grisea* (shrub form), *Quercus turbinella*, *Yucca baccata*, and shrubby species of *Opuntia*, sometimes forming a mixed cold-deciduous/evergreen stand. Occasional trees such as *Quercus arizonica*, *Quercus gambelii*, and other *Quercus* spp. and conifers such as *Juniperus deppeana* may be present. The herbaceous layer is sparse on the very rocky sites to moderately dense, and usually is dominated by perennial grasses, including *Aristida ternipes*, *Bothriochloa barbinodis*, *Bouteloua curtipendula*, *Bouteloua gracilis*, *Eragrostis intermedia*, *Koeleria macrantha*, *Lycurus phleoides*, *Muhlenbergia emersleyi*, *Muhlenbergia montana*, and *Muhlenbergia pauciflora*. Forbs may be diverse and include *Artemisia ludoviciana*, *Eriogonum jamesii*, *Hedeoma plicata*, *Heliomeris longifolia*, *Heliomeris multiflora*, *Mirabilis multiflora*, and *Viguiera dentata*.

ENVIRONMENT & DYNAMICS

Environmental Description: Shrublands included in this alliance are found on prairie breaks and on slopes of foothills, mountains and canyons. Elevations range from 915 to 2440 m (3000-8000 feet). Climate is semi-arid. Summers are hot and winters are typically cold, with freezing temperatures and snow common. Mean annual precipitation ranges from 24-55 cm with precipitation occurring bimodally during the winter and late summer with a droughty period in late spring/early summer. The late-summer rain often occurs as high-intensity thunderstorms. Sites are variable but are generally xeric and rocky with moderate to very steep slopes or on ridges. Stands are found on various aspects, but typically the higher elevation and northern sites are on warmer, southern exposures, and lower elevation and southern stands are restricted to more mesic north slopes. Substrates are typically thin, well-drained, poorly developed, lithic soils with abundant rock outcrops. Soil textures range from sandy loam to clay. Soils range from slightly acidic to slightly alkaline depending on parent material, which includes alluvium, colluvium and residuum from igneous, metamorphic or sedimentary rocks such as granite, gneiss, limestone, quartz monzonite, rhyolite, sandstone, schist and shale.

Dynamics: *Cercocarpus montanus* is a dominant understory species in several woodland and forests dominated by *Juniperus deppeana*, *Juniperus monosperma*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus edulis*, *Pinus ponderosa*, *Pseudotsuga menziesii*, *Quercus gambelii*, *Quercus grisea*, and *Quercus x pauciloba*. *Cercocarpus montanus* stands often occur in the more xeric habitat below these woodland and forest stands. In xeric habitats studied by Greenwood and Brotherson (1978), *Cercocarpus montanus* sites had significantly more rock than the *Pinus edulis* and *Juniperus osteosperma* sites. Brotherson et al. (1984) suggested that stands are moisture-limited because stands on southern aspects were always higher in elevation than stands on northern aspects. However, *Cercocarpus montanus* did not typically occur with mesic shrubs such as *Symphoricarpos oreophilus* and

Amelanchier alnifolia. There is often a broad *Cercocarpus montanus* shrub/herbaceous ecotone between these shrublands and grasslands. Ecological factors that control shrub densities such as fire and drought need more investigation. Unlike other species of *Cercocarpus*, *Cercocarpus montanus* is a fire-resistant species because it can resprout from the base after a fire has killed the top (Cronquist et al. 1997). In the southern portion of its range, *Cercocarpus montanus* functions as an evergreen shrub by retaining leaves during mild winters and losing them during cold winters (Dick-Peddie 1993). *Cercocarpus montanus* is preferred winter range browse for deer (Roughton 1966, 1972, Hoffman and Alexander 1987). Stands can also produce significant forage that can be utilized by grazing livestock provided the slopes are not too steep (Hoffman and Alexander 1987). More information is needed on the effects of livestock grazing and wildlife browsing on the structure and function of these shrublands.

DISTRIBUTION

Geographic Range: This alliance is known from the southern Rocky Mountains south to the northern Chihuahuan Desert and east to the Southern Shortgrass Prairie of Colorado, New Mexico and Texas.

Nations: US

States/Provinces: CO, NM, TX

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Cercocarpus montanus* - *Rhus aromatica* / *Bouteloua curtipendula* Plant Association (Johnston 1987) [*Rhus aromatica* is a synonym for *R. tridentata*]
- ? *Cercocarpus montanus* / *Bouteloua curtipendula* Habitat Type (Hoffman and Alexander 1987)
- ? *Cercocarpus montanus* (Mountain Mahogany) Series (Muldavin et al. 1998b)
- ? Mountain Mahogany-Mixed Shrub Series (Dick-Peddie 1993) [included within the Montane Scrubland Vegetation Type]
- ? Mountain mahogany Series (133.34) (Brown 1982a) [included within Interior Chaparral]

LOWER LEVEL UNITS

Associations:

- C EGL004589 *Cercocarpus montanus* var. *paucidentatus* / *Petrophyton caespitosum* Shrubland
- C EGL002913 *Cercocarpus montanus* / *Achnatherum scribneri* Shrubland
- C EGL002914 *Cercocarpus montanus* / *Muhlenbergia montana* Shrubland
- C EGL005378 *Quercus x pauciloba* / *Bouteloua curtipendula* Shrubland
- C EGL001118 *Quercus x pauciloba* / *Cercocarpus montanus* Shrubland
- C EGL001091 *Cercocarpus montanus* / *Rhus trilobata* var. *trilobata* Shrubland
- C EGL002911 *Cercocarpus montanus* / *Hesperostipa neomexicana* Shrubland
- C EGL001086 *Cercocarpus montanus* / *Bouteloua curtipendula* Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid and K.A. Schulz, in Faber-Langendoen et al. (2014)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Brotherson et al. 1984, Brown 1982a, Cronquist et al. 1997, Diamond 1993, Dick-Peddie 1993, Faber-Langendoen et al. 2017b, Greenwood and Brotherson 1978, Hoffman and Alexander 1987, Johnston 1987, Kettler pers. comm., Muldavin et al. 1998b, Roughton 1966, Roughton 1972

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G276. Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland

A3730. *Fallugia paradoxa* - *Rhus trilobata* Shrubland Alliance

Type Concept Sentence: This alliance is characterized by short, open shrublands occupying lava flows of El Malpais National Monument dominated by *Fallugia paradoxa*, *Ribes cereum*, or *Rhus trilobata* singly or in combination.

OVERVIEW

Scientific Name: *Fallugia paradoxa* - *Rhus trilobata* Shrubland Alliance

Common Name (Translated Scientific Name): Apache Plume - Skunkbush Sumac Shrubland Alliance

Colloquial Name: Apache Plume - Skunkbush Sumac Shrubland

Type Concept: This alliance is characterized by short, open shrublands occupying lava flows of El Malpais National Monument dominated by *Fallugia paradoxa*, *Ribes cereum*, or *Rhus trilobata* singly or in combination. Tree species such as *Juniperus monosperma*, *Pinus edulis*, or *Populus tremuloides* are frequently present in these shrublands as saplings or mature individuals, but never exceed 10% total cover. Frequent shrub associates include *Forestiera pubescens* and *Holodiscus dumosus*. *Bouteloua gracilis*, *Bouteloua curtipendula*, *Elymus elymoides*, *Piptatheropsis micrantha* (= *Piptatherum micranthum*), *Poa fendleriana*, and *Schizachyrium scoparium* are the most frequently occurring graminoids, though cover of any individual species is low. Forbs can range as high as 20% total cover and may include *Artemisia carruthii* and *Heterotheca villosa*. These shrublands occur between 2000-2400 m in elevation on gently rolling lava plateaus and collapse features. The ground surface cover is composed of lava rock and gravel, with areas interspersed where finer wind- or water-borne soils have accumulated.

Classification Comments: This alliance is poorly documented, but likely found elsewhere regionally on coarse volcanic substrates within the region. This could be potentially grouped into another alliance within this group, but is distinguished by occurring on volcanic substrates.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Vegetation is characterized by short shrublands of varying cover, ranging from sparse to well-developed on volcanic substrates and dominated by *Fallugia paradoxa*, *Ribes cereum*, or *Rhus trilobata* singly or in combination.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance is dominated by a moderately dense layer of cold-deciduous shrubs. A sparse to moderately dense herbaceous layer may be present that is dominated by perennial graminoids. Scattered perennial forbs are usually present. Annual forbs and grasses are seasonally present.

Floristics: These shrublands are dominated by *Fallugia paradoxa*, *Ribes cereum*, or *Rhus trilobata* singly or in combination. Tree species such as *Juniperus monosperma*, *Pinus edulis*, or *Populus tremuloides* are frequently present in these shrublands as saplings or mature individuals, but never exceed 10% total cover. Frequent shrub associates include *Forestiera pubescens* and *Holodiscus dumosus*. *Bouteloua gracilis*, *Bouteloua curtipendula*, *Elymus elymoides*, *Piptatheropsis micrantha* (= *Piptatherum micranthum*), *Poa fendleriana*, and *Schizachyrium scoparium* are the most frequently occurring graminoids, though cover of any individual species is low. Forbs can range as high as 20% total cover and may include *Artemisia carruthii* and *Heterotheca villosa*.

ENVIRONMENT & DYNAMICS

Environmental Description: These shrublands occur between 2000-2400 m in elevation on gently rolling lava plateaus and collapse features. The ground surface cover is composed of lava rock and gravel, with areas interspersed where finer wind- or water-borne soils have accumulated.

Dynamics: *Rhus trilobata* has seeds that are impermeable and exhibit embryonic dormancy. Germination requires scarification either through cold stratification, fire, or animal ingestion. However, the primary means of reproduction is vegetative through root sprouts which can result in dense thickets.

DISTRIBUTION

Geographic Range: This alliance is currently only known from El Malpais National Monument in northwestern New Mexico.

Nations: US

States/Provinces: NM

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Fallugia paradoxa* - *Rhus trilobata* Shrubland (Muldavin et al. 2013c)

LOWER LEVEL UNITS**Associations:**

- CEGLO02330 *Fallugia paradoxa* / Rockland Shrubland
- CEGLO02222 *Fallugia paradoxa* - *Rhus trilobata* Shrubland
- CEGLO02333 *Rhus trilobata* - *Ribes cereum* Shrubland

AUTHORSHIP

Primary Concept Source: E. Muldavin et al. (2013c)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b, Muldavin et al. 2013c

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G276. Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland

A3731. Purshia tridentata - Ribes cereum Shrubland Alliance

Type Concept Sentence: This alliance is characterized by shrublands of the eastern Front Range of Colorado within canyons dominated by *Purshia tridentata* or *Ribes cereum*.

OVERVIEW

Scientific Name: *Purshia tridentata* - *Ribes cereum* Shrubland Alliance

Common Name (Translated Scientific Name): Antelope Bitterbrush - Wax Currant Shrubland Alliance

Colloquial Name: Antelope Bitterbrush - Wax Currant Shrubland

Type Concept: This shrubland alliance is found on gentle to very steep slopes in the foothills and mountains in the Colorado Front Range. Shrublands included in this alliance are characterized by a *Purshia tridentata*- or *Ribes cereum*-dominated shrub canopy. *Artemisia frigida* is the most constant shrub associate. *Arctostaphylos uva-ursi*, *Artemisia tridentata* ssp. *vaseyana*, *Ceanothus fendleri*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Jamesia americana*, *Juniperus communis*, *Prunus virginiana*, *Rhus trilobata*, and *Rubus deliciosus* are sometimes present. Scattered trees such as *Juniperus scopulorum*, *Pinus ponderosa*, and *Pseudotsuga menziesii* may be present at low covers. Graminoids are the most common herbaceous dominants, the most constant being *Hesperostipa comata*, *Leymus ambiguus*, and *Muhlenbergia montana*. Other common herbaceous associates include *Achillea millefolium*, *Achnatherum scribneri* (= *Stipa scribneri*), *Antennaria* sp., *Artemisia ludoviciana*, *Astragalus* sp., *Bouteloua gracilis*, *Chenopodium leptophyllum*, *Cryptantha virgata*, *Elymus albicans*, *Erigeron* spp., *Geranium caespitosum*, *Harbouria trachypleura*, *Helianthus pumilus*, *Heterotheca villosa*, *Penstemon virens*, *Phacelia heterophylla*, *Potentilla fissa*, *Scutellaria brittonii*, and *Symphytotrichum falcatum*. Sites where found are exposed, steep (30-90% slope) mountain slopes with southerly aspects on the eastern slopes of the Front Range, from 1700 to 2800 m in elevation. These sites are typically too xeric to support extensions of the surrounding coniferous forests. Parent materials are colluvial and residual metamorphic rocks.

Classification Comments: This alliance is very narrowly defined and may be better included in a *Cercocarpus montanus* alliance as the range is overlapping. The inclusion of *Ribes cereum* is tentative here since it occupies steeper, talus slope environments than those of the other associations, but has some floristic and geographic overlap.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: broad-leaved semi-evergreen shrublands of steep canyons and mountain slopes dominated by *Purshia tridentata* or *Ribes cereum*. Shrub cover may range from sparse to open.

VEGETATION

Physiognomy and Structure: These are typically moderately dense to open (15-40% cover) microphyllous evergreen (or late cold-deciduous) shrublands with the dominant shrubs varying from 0.5-3 m in height. Maximum shrub height generally decreases with latitude and altitude, reaching a minimum in subalpine stands. A second tier of microphyllous evergreen or cold-deciduous shrubs

may be present. Cespitose graminoids are typical herbaceous associates and may strongly dominate the ground layer. Some regional variants may have a substantial forb component as well. Lichens and mosses may cover the ground surface in good-condition stands.

Floristics: Shrublands included in this alliance are characterized by a *Purshia tridentata*- or *Ribes cereum*-dominated shrub canopy. Canopies are 1-2 m tall and total cover ranges from 15-40%. Other shrubs are poorly represented, but *Artemisia frigida* is the most constant shrub associate. *Arctostaphylos uva-ursi*, *Artemisia tridentata* ssp. *vaseyana*, *Ceanothus fendleri*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Jamesia americana*, *Juniperus communis*, *Prunus virginiana*, *Rhus trilobata*, and *Rubus deliciosus* are sometimes present. Scattered trees such as *Juniperus scopulorum*, *Pinus ponderosa*, and *Pseudotsuga menziesii* may be present at low covers. The herbaceous layer is dominated by perennial graminoids 0.5-m tall, the most constant species being *Hesperostipa comata*, *Leymus ambiguus*, and *Muhlenbergia montana*. Other common herbaceous associates include *Achillea millefolium*, *Achnatherum scribneri* (= *Stipa scribneri*), *Antennaria* sp., *Artemisia ludoviciana*, *Astragalus* sp., *Bouteloua gracilis*, *Chenopodium leptophyllum*, *Cryptantha virgata*, *Elymus albicans*, *Erigeron* spp., *Geranium caespitosum*, *Harbouria trachypleura*, *Helianthus pumilus*, *Heterotheca villosa*, *Penstemon virens*, *Phacelia heterophylla*, *Potentilla fissa*, *Scutellaria brittonii*, *Symphotrichum falcatum*.

ENVIRONMENT & DYNAMICS

Environmental Description: Most of the region where this alliance occurs is arid to semi-arid with annual precipitation ranging from 15 to 75 cm. The entire range is under a continental temperature regime of cold winters, cool to warm summers and large diurnal variation. These shrublands are found on exposed, steep (30-90% slope) mountain slopes with southerly aspects on the eastern slopes of the Front Range (Hess 1981). Elevations range from 1700 to 2800 m. These sites are typically too xeric to support extensions of the surrounding coniferous forests. Parent materials are colluvial and residual metamorphic rocks which have developed into soils classified as Entisols. These soils are poorly developed and rocky, with loamy and sandy textures, and shallow A horizons over rocky C horizons. The soil surface is also moderately rocky.

Dynamics: Sawyer and Keeler-Wolf (1995) report that stands of *Purshia tridentata* can reach 125 years of age on deep, well-drained sites, but more commonly become decadent at 30 years, and die at 40-50 years of age. Stands appear to result from either a disturbance event (such as fire), or from rare years when many seedlings survive. This results in even-aged stands (Sawyer and Keeler-Wolf 1995). *Purshia tridentata* displays considerable plasticity in growth across its range. The broad range in height and form of different populations appears to be related to ecotypic variation (Mozingo 1987). Although mycorrhizae are considered important in establishment and growth of individual plants, *Purshia tridentata* is one of the first species to colonize barren volcanic substrates following eruption. The species is valuable as winter browse for native ungulates and livestock and is used extensively. Moderate livestock utilization (<60% of the year's current growth) has been reported to stimulate twig growth the following spring (Mueggler and Stewart 1980).

DISTRIBUTION

Geographic Range: This alliance is currently known from the eastern Front Range of Colorado.

Nations: US

States/Provinces: CO

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Elymus ambiguus* Series (Hess 1981) [*Elymus ambiguus*/*Ribes cereum* is the sole habitat type in this series.]
- >< *Ribes* spp. Series (Johnston 1987)

LOWER LEVEL UNITS

Associations:

- CEG001057 *Purshia tridentata* / *Muhlenbergia montana* Shrubland
- CEG001055 *Purshia tridentata* / *Artemisia frigida* / *Hesperostipa comata* Shrubland
- CEG001124 *Ribes cereum* / *Leymus ambiguus* Shrubland

AUTHORSHIP

Primary Concept Source: D. Sarr and K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b, Hess 1981, Johnston 1987, Mozingo 1987, Sawyer and Keeler-Wolf 1995

M048. Central Rocky Mountain Montane-Foothill Grassland & Shrubland

This macrogroup occurs in the foothills and mountains throughout the Central Rockies, from central and eastern Wyoming north and west into British Columbia and Alberta and is composed of shrub- and/or herbaceous-dominated stands forming shrublands, shrub-steppe, or grasslands. Characteristic shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Holodiscus discolor*, *Menziesia ferruginea*, *Physocarpus malvaceus*, *Symphoricarpos albus*, *Symphoricarpos occidentalis*, and species of *Prunus*, *Rhus*, *Ribes*, *Rosa*, *Rubus parviflorus*, *Spiraea*, and *Vaccinium*. The herbaceous layer is characterized by *Festuca idahoensis*, *Pseudoroegneria spicata*, and other cool-season graminoids.

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

2.B.2.Na.2.a. M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland

G267. Central Rocky Mountain Montane Grassland

Type Concept Sentence: This central Rocky Mountains grassland group occurs in an upper montane to subalpine zone and is dominated by perennial grasses, particularly *Achnatherum nelsonii*, *Festuca idahoensis*, and *Leucopoa kingii*, with many other graminoid and forb species present to codominant.

OVERVIEW

Scientific Name: *Leymus innovatus* - *Festuca idahoensis* - *Leucopoa kingii* Grassland Group

Common Name (Translated Scientific Name): Downy Ryegrass - Idaho Fescue - Spike Fescue Grassland Group

Colloquial Name: Central Rocky Mountain Montane Mesic Idaho Fescue Grassland

Type Concept: This is an upper montane to subalpine grassland group is dominated by perennial grasses and forbs on relatively dry sites in the northern Rocky Mountains and Cascades, but is more extensive in the Rocky Mountains cordillera, from the Canadian Rockies south into western Montana, northern Wyoming, eastern Oregon, eastern Washington, and Idaho. The herbaceous layer is frequently composed of *Achnatherum nelsonii*, *Calamagrostis rubescens*, *Festuca idahoensis*, and *Leucopoa kingii* with many other perennial graminoid species present to codominant, such as *Achnatherum occidentale* (= *Stipa occidentalis*), *Achnatherum richardsonii* (= *Stipa richardsonii*), *Danthonia intermedia*, *Deschampsia cespitosa*, *Elymus trachycaulus*, *Koeleria macrantha*, *Leymus innovatus* (= *Elymus innovatus*), *Phleum alpinum*, *Poa fendleriana*, *Trisetum spicatum*, and a variety of Carices, such as *Carex filifolia*, *Carex hoodii*, *Carex elynoides*, *Carex obtusata*, and *Carex scirpoidea*. Important forbs include *Chamerion angustifolium* (= *Epilobium angustifolium*), *Eriogonum caespitosum*, *Fragaria virginiana*, *Lupinus argenteus* var. *laxiflorus*, *Lupinus sericeus*, *Oxytropis campestris*, *Phlox pulvinata*, *Potentilla diversifolia*, and *Potentilla flabellifolia*. The upper montane to subalpine dry grassland stands range from small meadows to large open parks surrounded by conifer trees but lack tree cover within them. In relatively mesic areas such as the northern Rocky Mountains and Cascades, it is found on drier sites, particularly south-facing slopes or ridgetops. In general, soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. Although these grasslands are composed primarily of tussock-forming species, they do exhibit a dense sod that makes root penetration difficult for tree species. Disturbance such as fire also plays a role in maintaining these open grassy areas. This group is similar to Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group (G273) but is found at higher elevations and is more often composed of species of *Festuca*, *Achnatherum*, and/or *Hesperostipa* with additional floristic components of more subalpine taxa. It is also similar to Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow Group (G271), differing by occurring in drier settings and being predominantly grasslands rather than forby and grassy mesic meadows. Occurrences of this group are often more forb-rich than Southern Rocky Mountain Montane-Subalpine Grassland Group (G268), which tends to be drier.

Classification Comments: For now, this group is kept as a separate unit, but it is possible it should be merged with Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow Group (G271). Another possibility is to consider this "grassland" group to contain what people refer to as "mesic grassy meadows," and the mesic herbaceous meadow group to contain predominantly forb meadows and tall forblands which in many cases are more seasonally wet than mesic. In addition, the Rockies and Cascades support a number of forb types found on talus and rocky scree slopes, which are not sparsely vegetated, and which often have little to no grass component, though Carices may be abundant. These types often have heavy snow loading in winter, or are adjacent to snow fields, and sub-surface moisture below the rocks/scree is significant throughout the growing season. These forb types are poorly documented, and their group placement presently is in Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow Group (G271).

Similar NVC Types:

NBR alliances

- G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
- G271 Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow
- G268 Southern Rocky Mountain Montane-Subalpine Grassland

Diagnostic Characteristics: This meadow group is dominated by graminoids, typically forming 70 to 80% cover. Bunchgrasses are the major lifeform, and the important taxa include *Leymus innovatus*, *Koeleria macrantha*, *Festuca idahoensis*, *Achnatherum occidentale*, *Achnatherum richardsonii*, *Elymus trachycaulus*, and a variety of sedges such as *Carex hoodii*, *Carex obtusata*, and *Carex scirpoidea*.

VEGETATION

Physiognomy and Structure: Structurally simple grasslands dominated by perennial bunch grasses and forbs on relatively dry sites.

Floristics: Typical dominant species are *Achnatherum nelsonii*, *Festuca idahoensis*, and *Leucopoa kingii* with many other perennial graminoid species present to codominant such as *Achnatherum occidentale* (= *Stipa occidentalis*), *Achnatherum richardsonii* (= *Stipa richardsonii*), *Danthonia intermedia*, *Deschampsia cespitosa*, *Elymus trachycaulus*, *Koeleria macrantha*, *Leymus innovatus* (= *Elymus innovatus*), *Phleum alpinum*, *Poa fendleriana*, *Trisetum spicatum*, and a variety of Carices, such as *Carex filifolia*, *Carex hoodii*, *Carex elynoides*, *Carex obtusata*, and *Carex scirpoidea*. Important forbs include *Chamerion angustifolium* (= *Epilobium angustifolium*), *Eriogonum caespitosum*, *Fragaria virginiana*, *Lupinus argenteus* var. *laxiflorus*, *Lupinus sericeus*, *Oxytropis campestris*, *Phlox pulvinata*, *Potentilla diversifolia*, and *Potentilla flabellifolia*. Grasslands dominated by *Calamagrostis rubescens* are also in this group.

ENVIRONMENT & DYNAMICS

Environmental Description: This is an upper montane to subalpine grassland group dominated by perennial grasses and forbs on dry sites (in the context of the northern Rocky Mountains and Cascades), particularly south-facing slopes or ridgetops. Many occurrences are small patch in spatial character, and are often found in mosaics with woodlands, more dense shrublands, or just below alpine communities. Elevations range from 600 to 2011 m (2000-7500 feet) in the northern Rocky Mountains and up to 2286 to 2682 m (7500-8800 feet) in the mountains of southwestern Montana and Wyoming. These communities occur on gentle to moderate-gradient slopes, although occasionally on steep slopes. Soils are typically seasonally moist in the spring, but dry out later in the growing season. In general, soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. Although these grasslands are composed primarily of tussock-forming species (bunchgrasses), they do exhibit a dense sod that makes root penetration difficult for tree species.

Dynamics: Disturbance such as fire plays a role in maintaining these open grassy areas in predominantly forested landscapes.

DISTRIBUTION

Geographic Range: This group is most extensive in the Canadian Rockies portion of the Rocky Mountains cordillera, extending south into western Montana, northwestern Wyoming, central and eastern Oregon, eastern Washington, and Idaho. It also occurs in the "island ranges" of central Montana, though it is not common, and is also found in the Bighorn Range of north-central Wyoming. A couple of associations in this group also occur in Colorado.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, US

States/Provinces: AB, BC, CO, ID, MT, OR, WA, WY

TNC Ecoregions [optional]: 3:P, 4:P, 7:C, 8:C, 9:C, 26:C, 68:C

USFS Ecoregions (2007): 331A:??, 341G:CC, 342A:CP, 342C:CC, 342D:CC, 342H:CC, 342I:C?, 342J:CC, M242B:C?, M242C:CP, M242D:CC, M331A:PP, M331B:PP, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A3966 *Festuca idahoensis* - *Calamagrostis rubescens* - *Achnatherum nelsonii* Central Rocky Mountain Montane Mesic Grassland Alliance
- A3965 *Festuca idahoensis* - *Carex scirpoidea* - *Danthonia intermedia* Central Rocky Mountain Subalpine Dry Grassland Alliance
- A1323 *Leucopoa kingii* - *Carex elynoides* - *Phlox pulvinata* Central Rocky Mountain Subalpine-Alpine Grassland Alliance

AUTHORSHIP

Primary Concept Source: W.F. Mueggler and W.L. Stewart (1980)

Author of Description: M.S. Reid and K.A. Schulz

Acknowledgments:

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: MSR 3-10, mod. KAS 11-15

REFERENCES

References: Cooper et al. 1995, Faber-Langendoen et al. 2017a, Johnson 2004, Mueggler and Stewart 1980, Shiflet 1994

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G267. Central Rocky Mountain Montane Grassland

A3966. *Festuca idahoensis* - *Calamagrostis rubescens* - *Achnatherum nelsonii* Central Rocky Mountain Montane Mesic Grassland Alliance

Type Concept Sentence: This alliance is characterized by a moderately dense to dense and diverse herbaceous layer dominated by medium-tall perennial graminoids *Achnatherum nelsonii*, *Calamagrostis rubescens*, *Carex hoodii*, *Deschampsia cespitosa*, or *Festuca idahoensis* with *Achnatherum richardsonii*, *Carex filifolia*, *Elymus trachycaulus*, *Koeleria macrantha*, or perennial forb *Lupinus sericeus* present to codominant. It is described from relatively mesic sites on montane slopes in the central Rocky Mountains of central and southern Idaho, western and south-central Montana, eastern Oregon, Washington and northwestern Wyoming.

OVERVIEW

Scientific Name: *Festuca idahoensis* - *Calamagrostis rubescens* - *Achnatherum nelsonii* Central Rocky Mountain Montane Mesic Grassland Alliance

Common Name (Translated Scientific Name): Idaho Fescue - Pinegrass - Columbia Needlegrass Central Rocky Mountain Montane Mesic Grassland Alliance

Colloquial Name: Central Rocky Mountain Montane Mesic Idaho Fescue Grassland

Type Concept: The vegetation of this grassland alliance is characterized by a moderately dense to dense and diverse herbaceous layer dominated by medium-tall perennial graminoids with perennial forbs. The dominant and diagnostic species are *Achnatherum nelsonii*, *Calamagrostis rubescens*, *Carex hoodii*, *Deschampsia cespitosa*, or *Festuca idahoensis* with *Achnatherum richardsonii*, *Carex filifolia*, *Elymus trachycaulus*, *Koeleria macrantha*, *Lupinus sericeus*, *Pseudoroegneria spicata*, or *Pascopyrum smithii* present to codominant. Commonly associated forbs are often relatively mesic, such as *Achillea millefolium*, *Packera pseud aurea* (= *Senecio pseud aureus*), *Symphotrichum foliaceum* (= *Aster foliaceus*), and *Zigadenus elegans*. Shrubs may be present with up to 25% cover, but are not diagnostic of this alliance. Shrub species are relatively mesic with *Amelanchier alnifolia*, *Rubus parviflorus*, and *Symphoricarpos albus* most common. This alliance is described from montane slopes in the central Rocky Mountains of central and southern Idaho, western and south-central Montana, eastern Oregon, Washington and northwestern Wyoming. These grasslands form in openings on the slopes and benches in shrublands, woodlands and forests ranging from 1100-3322 m (3600-10,900 feet) elevation. Stands occur on mesic sites under a broad range of environmental conditions, ranging from gentle, broad, dissected plateau ridgetops to steep mountain sideslopes at 1830-2410 m (6000-7900 feet) elevation. Sites are nearly level to gently sloping with gentle topography. The soils are shallow to moderately deep and have high organic matter content. Soil texture varies from loam to sandy loam.

Classification Comments: Stands of *Festuca idahoensis* - *Elymus trachycaulus* Grassland (CEGL001614) reported from Colorado need additional review for inclusion in this central Rocky Mountain grassland alliance.

Internal Comments:

Other Comments:

Similar NVC Types: This alliance has similarities to other temperate grassland alliances that are dominated or codominated by *Festuca idahoensis* in several other groups, such as G141, G268, G269, G271, G273, and G331.

- A1323 *Leucopoa kingii* - *Carex elynoides* - *Phlox pulvinata* Central Rocky Mountain Subalpine-Alpine Grassland Alliance: occurs on high subalpine and alpine sites in the central Rocky Mountains and is typically codominated by cushion plants.
- A3965 *Festuca idahoensis* - *Carex scirpoidea* - *Danthonia intermedia* Central Rocky Mountain Subalpine Dry Grassland Alliance: occurs on dry and often rocky, wind-desiccated sites on subalpine and lower alpine slopes in the central Rocky Mountains.

Diagnostic Characteristics: The relatively mesic vegetation is characterized by a moderately dense to dense and diverse herbaceous layer dominated by medium-tall perennial graminoids. The diagnostic species *Achnatherum nelsonii*, *Calamagrostis rubescens*, or *Festuca idahoensis* dominate with *Achnatherum richardsonii*, *Carex filifolia*, *Carex hoodii*, *Deschampsia cespitosa*, *Elymus trachycaulus*, *Koeleria macrantha*, *Lupinus sericeus*, *Pseudoroegneria spicata*, or *Pascopyrum smithii* codominating. Commonly associated forbs are *Achillea millefolium*, *Arnica sororia*, *Antennaria parvifolia*, *Antennaria rosea*, *Arenaria congesta*, *Fragaria virginiana*, *Gaillardia aristata*, *Galium boreale*, *Gentiana affinis*, *Geum triflorum*, *Hieracium cynoglossoides*, *Lupinus argenteus* var. *laxiflorus*, *Packera pseudaurea*, *Symphyotrichum foliaceum*, and *Zigadenus elegans*. Scattered mesic shrubs may also be present, such as *Amelanchier alnifolia*, *Dasiphora fruticosa* ssp. *floribunda*, *Rubus parviflorus*, and *Symphoricarpos albus*.

VEGETATION

Physiognomy and Structure: This alliance is characterized by moderately dense to dense cover of perennial graminoids. The graminoid stratum is dominated by both sedges and bunch grasses, ranging from 60-100% cover. The forb stratum is dominated by perennials, with 25-60% cover. Scattered shrubs may also be present.

Floristics: The vegetation is characterized by a moderately dense to dense and diverse herbaceous layer dominated by medium-tall perennial graminoids with perennial forbs. The dominant and diagnostic species are *Achnatherum nelsonii*, *Calamagrostis rubescens*, *Carex hoodii*, *Deschampsia cespitosa*, or *Festuca idahoensis* with *Achnatherum richardsonii*, *Carex filifolia*, *Elymus trachycaulus*, *Koeleria macrantha*, *Lupinus sericeus*, *Pseudoroegneria spicata*, or *Pascopyrum smithii* present to codominant. Other associated graminoids include *Achnatherum occidentale* (= *Stipa occidentalis*), *Carex geyeri*, and *Danthonia intermedia*. Commonly associated forbs are a mix of relatively mesic and dry species such as *Achillea millefolium*, *Arnica sororia*, *Antennaria parvifolia*, *Antennaria rosea*, *Arenaria congesta*, *Fragaria virginiana*, *Gaillardia aristata*, *Galium boreale*, *Gentiana affinis*, *Geranium viscosissimum*, *Geum triflorum*, *Hieracium scouleri* var. *albertinum* (= *Hieracium albertinum*), *Lupinus argenteus* var. *laxiflorus* (= *Lupinus laxiflorus*), *Packera pseudaurea* (= *Senecio pseudaureus*), *Symphyotrichum foliaceum* (= *Aster foliaceus*), and *Zigadenus elegans*. Shrubs may be present with up to 25% cover when perennial graminoid cover is high (>50% cover), but are not diagnostic of this alliance. Shrub species tend to be relatively mesic; *Amelanchier alnifolia*, *Dasiphora fruticosa* ssp. *floribunda*, *Rubus parviflorus*, and *Symphoricarpos albus* are the most common. *Artemisia tridentata*, *Mahonia repens*, *Rosa woodsii*, and *Vaccinium cespitosum* may also be present in low amounts. Tree saplings may also be present with significant cover.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is described from relatively mesic sites on montane slopes in the central Rocky Mountains of central and southern Idaho, western and south-central Montana, eastern Oregon, Washington and northwestern Wyoming. These grasslands form in openings on mesic slopes and benches in shrublands, woodlands and forests ranging from 1100-3322 m (3600-10,900 feet) elevation. Stands occur on mesic sites under a broad range of environmental conditions, ranging from gentle, broad, dissected plateau ridgetops to steep mountain sideslopes at 1830-2410 m (6000-7900 feet) elevation. Sites are nearly level to gently sloping and include drier sites in extensive moist meadows. The soils are shallow to deep and have high organic matter content. Soils are typically medium-textured loams to sandy loams from a variety of parent materials.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is described from montane slopes in the central Rocky Mountains in Waterton Lakes National Park, Alberta, and on the west side of Glacier National Park, Montana, in the mountains of southwestern Montana and northern Wyoming on both sides of the Continental Divide, in the Blue Mountains of eastern Oregon and Washington, and Idaho on high-elevation ridges of the Wallowa and Seven Devil mountains.

Nations: CA, US

States/Provinces: AB, ID, MT, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG001614 *Festuca idahoensis* - *Elymus trachycaulus* Grassland
- CEG001900 *Festuca idahoensis* - *Deschampsia cespitosa* Grassland

- CEGLO05862 *Calamagrostis rubescens* Grassland
- CEGLO05469 *Achnatherum nelsonii* - *Lupinus argenteus* Grassland
- CEGLO01609 *Festuca idahoensis* - *Carex hoodii* Grassland
- CEGLO01898 *Festuca idahoensis* - *Carex filifolia* Grassland
- CEGLO05860 *Achnatherum nelsonii* - *Lupinus sericeus* Grassland
- CEGLO01595 *Carex hoodii* - *Festuca idahoensis* Grassland
- CEGLO01625 *Festuca idahoensis* - *Achnatherum richardsonii* Grassland
- CEGLO01707 *Achnatherum nelsonii* - *Koeleria macrantha* Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M.S. Reid for group description.

Version Date: 2014/03/14

REFERENCES

References: Cronquist et al. 1977, Dastrup 1963, Faber-Langendoen et al. 2017b, Graham 1937, Hermann 1970, Tisdale 1986, Welsh et al. 1987

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G267. Central Rocky Mountain Montane Grassland

A3965. *Festuca idahoensis* - *Carex scirpoidea* - *Danthonia intermedia* Central Rocky Mountain Subalpine Dry Grassland Alliance

Type Concept Sentence: This alliance is characterized by a sparse to moderately dense herbaceous layer dominated by the diagnostic perennial bunchgrass *Festuca idahoensis* with *Carex obtusata*, *Carex scirpoidea*, *Danthonia intermedia*, *Eriogonum caespitosum*, *Leucopoa kingii*, or *Potentilla diversifolia* codominating. It is described from dry and often rocky subalpine and lower alpine slopes exposed to desiccating winds in the central Rocky Mountains of central and southern Idaho, western and south-central Montana, and northwestern Wyoming.

OVERVIEW

Scientific Name: *Festuca idahoensis* - *Carex scirpoidea* - *Danthonia intermedia* Central Rocky Mountain Subalpine Dry Grassland Alliance

Common Name (Translated Scientific Name): Idaho Fescue - Northern Single-spike Sedge - Timber Oatgrass Central Rocky Mountain Subalpine Dry Grassland Alliance

Colloquial Name: Central Rocky Mountain Subalpine Dry Idaho Fescue Grassland

Type Concept: The vegetation of this grassland alliance is characterized by a sparse to moderately dense herbaceous layer dominated by the diagnostic perennial bunchgrass *Festuca idahoensis* with *Carex obtusata*, *Carex scirpoidea*, *Danthonia intermedia*, *Eriogonum caespitosum*, *Leucopoa kingii* (= *Festuca kingii*), or *Potentilla diversifolia* codominating. In more exposed settings, *Festuca idahoensis* sometimes relinquishes dominance to *Festuca campestris*. Many other species are reported to occur, the most abundant being *Agoseris glauca*, *Antennaria corymbosa*, *Carex filifolia*, *Carex praticola*, *Deschampsia cespitosa*, *Erigeron linearis*, *Eriogonum ovalifolium*, *Galium boreale*, *Geum triflorum*, *Ivesia gordonii*, *Lupinus argenteus*, *Packera cana* (= *Senecio canus*), *Phleum alpinum*, *Phlox hoodii*, *Potentilla diversifolia*, *Pseudoroegneria spicata*, and *Stenotus acaulis* (= *Haplopappus acaulis*). Cushion plants are common on more exposed sites. Scattered low shrubs (*Artemisia frigida* or *Artemisia tridentata* ssp. *vaseyana*) may be present. This alliance is described from subalpine and lower alpine slopes in the central Rocky Mountains of central and southern Idaho, western and south-central Montana, and northwestern Wyoming. Stands range from 1980-2655 m (6500-8700 feet) elevation. Sites are dry and often rocky, and exposed to desiccating winds. This dry meadow vegetation occurs on a variety of soil types on upland slopes and broad ridgetops. The composition of the vegetation depends in part on soil type; graminoid cover reaches its maximum in stands on coarse-textured soils derived from granitic bedrock, and forb cover reaches its maximum in stands on finer-textured soils derived from sedimentary bedrock.

Classification Comments: There are similarities between *Festuca idahoensis* - *Carex scirpoidea* Grassland (CEGL001899) and *Festuca idahoensis* - (*Festuca campestris*) / *Potentilla diversifolia* Grassland (CEGL001623) that may warrant classifying the two types into one association. In addition, Hurd (1961) reported a *Festuca idahoensis* / *Carex obtusata* grassland for the Bighorn Mountains in Wyoming, between 2135 and 2560 m elevation. The Pryor Mountains in Montana are a northwestern extension of the Bighorns. *Carex obtusata* and *Carex scirpoidea* are closely related and could possibly be confused. These two grasslands may actually be the

same (Reid et al. 1994). For further confusion, *Festuca idahoensis* - *Carex scirpoidea* Grassland (CEGL001899) was based on a single stand in central Montana that had 40% cover of *Carex scirpoidea* and 10% cover of *Festuca idahoensis* (Mueggler and Stewart 1980).

~*Festuca idahoensis* Grassland (CEGL001897) in this alliance is reported from alpine habitats in Colorado, Oregon and possibly California, but is poorly defined. *Festuca idahoensis*-dominated stands in California need further investigation and association-level description, especially any alpine types that may be included in this alliance (Sawyer and Keeler-Wolf 1995). Some of the associations included in this alliance occur largely in the alpine and may be considered alpine turf.

Internal Comments:

Other Comments:

Similar NVC Types: This alliance has similarities to other temperate grassland alliances that are dominated or codominated by *Festuca idahoensis* in several other groups, such as G141, G268, G269, G271, G273, and G331

- A1323 *Leucopoa kingii* - *Carex elynoides* - *Phlox pulvinata* Central Rocky Mountain Subalpine-Alpine Grassland Alliance: occurs on high subalpine and alpine sites in the central Rocky Mountains and is typically codominated by cushion plants.
- A3966 *Festuca idahoensis* - *Calamagrostis rubescens* - *Achnatherum nelsonii* Central Rocky Mountain Montane Mesic Grassland Alliance: occurs on relatively mesic sites.

Diagnostic Characteristics: This alliance is characterized by a sparse to moderately dense herbaceous layer dominated by the diagnostic perennial bunchgrass *Festuca idahoensis* with other diagnostic species codominating, including *Carex obtusata*, *Carex scirpoidea*, *Danthonia intermedia*, *Eriogonum caespitosum*, *Leucopoa kingii*, or *Potentilla diversifolia*. In more exposed settings, *Festuca idahoensis* sometimes relinquishes dominance to *Festuca campestris*. Associated species include *Agoseris glauca*, *Antennaria corymbosa*, *Artemisia frigida*, *Artemisia tridentata* ssp. *vaseyana*, *Carex filifolia*, *Carex praticola*, *Deschampsia cespitosa*, *Erigeron linearis*, *Eriogonum ovalifolium*, *Galium boreale*, *Geum triflorum*, *Ivesia gordonii*, *Lupinus argenteus*, *Packera cana*, *Phleum alpinum*, *Phlox hoodii*, *Potentilla diversifolia*, *Pseudoroegneria spicata*, and *Stenotus acaulis*.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by moderate to dense cover of graminoids that is dominated by perennial bunch grasses less than 0.5 m tall. There is also a sparse to moderate cover of perennial forbs (<0.5 m tall). Annual forbs (and grasses) may be seasonally present but have very low cover.

Floristics: The vegetation is characterized by a sparse to moderately dense herbaceous layer dominated by the diagnostic perennial bunchgrass *Festuca idahoensis* with *Carex obtusata*, *Carex scirpoidea*, *Danthonia intermedia*, *Eriogonum caespitosum*, *Leucopoa kingii* (= *Festuca kingii*), or *Potentilla diversifolia* codominating. In more exposed settings, *Festuca idahoensis* sometimes relinquishes dominance to *Festuca campestris*. Many other species are reported to occur, the most abundant being *Agoseris glauca*, *Antennaria corymbosa*, *Arenaria capillaris*, *Campanula rotundifolia*, *Carex filifolia*, *Carex praticola*, *Deschampsia cespitosa*, *Erigeron linearis*, *Eriogonum ovalifolium*, *Eriophyllum lanatum*, *Galium boreale*, *Geum triflorum*, *Ivesia gordonii*, *Lathyrus nevadensis*, *Lupinus arcticus* ssp. *subalpinus*, *Lupinus argenteus*, *Packera cana* (= *Senecio canus*), *Phleum alpinum*, *Phlox hoodii*, *Polygonum bistortoides*, *Potentilla diversifolia*, *Pseudoroegneria spicata*, and *Stenotus acaulis* (= *Haplopappus acaulis*). Cushion plants are common on more exposed sites. Scattered low shrubs (*Artemisia frigida* or *Artemisia tridentata* ssp. *vaseyana*) may be present. Occasional trees may be scattered in these stands such as individuals of *Abies lasiocarpa*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is described from subalpine and lower alpine slopes in the central Rocky Mountains of central and southern Idaho, western and south-central Montana, and northwestern Wyoming. Stands range from 1980-2655 m (6500-8700 feet) elevation. Sites are dry and often rocky, and exposed to desiccating winds. This dry meadow vegetation occurs on a variety of soil types on gentle to moderately steep upland slopes and broad ridgetops. The composition of the vegetation depends in part on soil type; graminoid cover reaches its maximum in stands on coarse-textured soils derived from granitic bedrock, and forb cover reaches its maximum in stands on finer-textured soils derived from sedimentary bedrock. The alliance appears to be restricted to high-elevation sites of intermediate productivity where combined factors of duration of snow cover, exposure to winter desiccation, and growing-season soil-moisture availability allow its occurrence.

Dynamics: These stands occur in alpine and in upper subalpine parks and meadows that have been created by fire or where other disturbance or edaphic factors limit tree growth. Environmental factors important to alpine vegetation include soil moisture, amount and length of snow cover, aspect, and exposure to wind. These stands are on warmer/drier southern and western exposures where snow clears relatively early (mid-June) and wind exposure is less than the cushion plant vegetation types (Kuramoto and Bliss 1970).

DISTRIBUTION

Geographic Range: This alliance is described from subalpine and lower alpine slopes of the Pioneer, White Knob, and Beaverhead mountains of central Idaho and western Montana, the Pryor Mountains in south-central Montana, Blackpine Mountains of southern

Idaho, the Bighorn Mountain sand central plateau of Yellowstone National Park and adjacent Grand Teton National Park in northern Wyoming.

Nations: CA?, US

States/Provinces: AB?, CA?, CO, ID, MT, OR, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- < *Festuca idahoensis* Series (Johnston 1987) [includes thirteen *Festuca idahoensis*-dominated plant associations.]
- < *Festuca idahoensis* Series (Tisdale 1986)
- >< Subalpine and Alpine Grasslands (Chappell et al. 1997)

LOWER LEVEL UNITS

Associations:

- CEG001899 *Festuca idahoensis* - *Carex scirpoidea* Grassland
- CEG001611 *Festuca idahoensis* - *Carex obtusata* Grassland
- CEG001623 *Festuca idahoensis* - (*Festuca campestris*) / *Potentilla diversifolia* Grassland
- CEG001615 *Festuca idahoensis* - *Eriogonum caespitosum* Grassland
- CEG001897 *Festuca idahoensis* Grassland
- CEG001901 *Festuca idahoensis* - *Leucopoa kingii* Grassland
- CEG001612 *Festuca idahoensis* - *Danthonia intermedia* Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: S.V. Cooper contributed to Classification Comments, and M.S. Reid wrote the group description.

Version Date: 2014/03/14

REFERENCES

References: Caicco 1983, Chappell et al. 1997, Cooper and Lesica 1992, Cooper et al. 1995, Cooper et al. 1997, Crawford et al. 1994, Daubenmire 1970, Daubenmire 1992, DeVelice and Lesica 1993, Evans et al. 1984, Faber-Langendoen et al. 2017b, Hansen 1985, Hansen and Hoffman 1988, Hurd 1961, Johnson 1970a, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Johnston 1987, Klish 1977, Kuramoto and Bliss 1970, Lang 1961, Lewis 1971, MTNHP unpubl. data, Macdonald 1989, Magee 1985, Mattson 1984, McLean 1970, Moseley 1987a, Mueggler and Stewart 1980, Paulsen 1969, Poulton 1955, Reid et al. 1994, Sawyer and Keeler-Wolf 1995, Terwilliger et al. 1979a, Tisdale 1947, Tisdale 1986, Tisdale and Bramble-Brodahl 1983, Turner and Dortignac 1954, WNHP unpubl. data

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G267. Central Rocky Mountain Montane Grassland

A1323. *Leucopoa kingii* - *Carex elynoides* - *Phlox pulvinata* Central Rocky Mountain Subalpine-Alpine Grassland Alliance

Type Concept Sentence: This alliance is characterized by a sparse to moderately dense herbaceous layer dominated by diagnostic graminoid *Leucopoa kingii* with *Carex elynoides*, *Oxytropis campestris*, *Phlox pulvinata*, or *Poa fendleriana* ssp. *fendleriana* present to codominant. It occurs on windward exposures on broad, gentle alpine slopes and ridges of the Challis Volcanics and Beaverhead Mountains in east-central Idaho and similar high subalpine sites in northwestern Wyoming.

OVERVIEW

Scientific Name: *Leucopoa kingii* - *Carex elynoides* - *Phlox pulvinata* Central Rocky Mountain Subalpine-Alpine Grassland Alliance

Common Name (Translated Scientific Name): Spike Fescue - Blackroot Sedge - Cushion Phlox Central Rocky Mountain Subalpine-Alpine Grassland Alliance

Colloquial Name: Central Rocky Mountain Upper Subalpine-Alpine Spike Fescue Grassland

Type Concept: Vegetation of this grassland alliance is dominated by diagnostic graminoid species *Leucopoa kingii* (= *Festuca kingii*) with *Carex elynoides*, *Oxytropis campestris*, *Phlox pulvinata*, or *Poa fendleriana* ssp. *fendleriana* present to codominant. Other associated species include *Agoseris glauca*, *Cymopterus nivalis*, *Erigeron compositus*, *Lupinus argenteus*, *Minuartia obtusiloba*, *Oxytropis sericea*, *Poa secunda*, and *Potentilla ovina*. This alliance occurs on broad, gentle alpine slopes and ridges of the Challis Volcanics and Beaverhead Mountains in east-central Idaho and similar high subalpine sites in northwestern Wyoming. Stands occur on gentle to moderately steep, convex, southwest- to north-facing ridgetops. Sites are often on windward exposures at 2990-3170 m (9800-10,400 feet) elevation. Soils are shallow to moderately deep gravelly soils derived from limestone, siliceous volcanic rocks, and quartzite.

Classification Comments: This alliance needs review for possible inclusion in Rocky Mountain-Sierran Alpine Turf & Fell-Field Group (G314). Some of the associations in this alliance have similar species compositions and need to be crosswalked to identify redundant associations. Cooper et al. (1997) described Moseley's (1987a) community types as variants or phases of the *Hesperochloa kingii* / *Oxytropis campestris* community type in southwestern Montana. *Leucopoa kingii* stands may also occur in Utah (Ream 1964).

Internal Comments:

Other Comments:

Similar NVC Types: This alliance has similarities to other temperate grassland alliances that are dominated or codominated by *Festuca idahoensis* in several other groups, such as G141, G268, G269, G271, G273, and G331

- A3965 *Festuca idahoensis* - *Carex scirpoidea* - *Danthonia intermedia* Central Rocky Mountain Subalpine Dry Grassland Alliance: occurs on dry and often rocky, wind-desiccated sites on subalpine and lower alpine slopes in the Central Rocky Mountains.
- A3966 *Festuca idahoensis* - *Calamagrostis rubescens* - *Achnatherum nelsonii* Central Rocky Mountain Montane Mesic Grassland Alliance: occurs on relatively mesic sites.

Diagnostic Characteristics: This grassland alliance is dominated by diagnostic graminoid species *Leucopoa kingii* with *Carex elynoides*, *Oxytropis campestris*, *Phlox pulvinata*, or *Poa fendleriana* ssp. *fendleriana* present to codominant. Other associated species include *Agoseris glauca*, *Cymopterus nivalis*, *Erigeron compositus*, *Lupinus argenteus*, *Minuartia obtusiloba*, *Oxytropis sericea*, *Poa secunda*, and *Potentilla ovina*.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by a moderate to dense cover of graminoids that is dominated by perennial bunch grasses less than 0.5 m tall. There is also a sparse to moderate cover of perennial forbs (cushion plants) <0.5 m tall. Annual forbs and grasses are sparse, if present.

Floristics: Stands in this alliance are dominated by diagnostic graminoid species *Leucopoa kingii* (= *Festuca kingii*) with *Carex elynoides*, *Oxytropis campestris*, *Phlox pulvinata*, or *Poa fendleriana* ssp. *fendleriana* present to codominant. Other associated species include *Agoseris glauca*, *Cymopterus nivalis*, *Erigeron compositus*, *Lupinus argenteus*, *Minuartia obtusiloba*, *Oxytropis sericea*, *Poa secunda* (= *Poa scabrella*), *Potentilla ovina* and *Solidago multiradiata*. Scattered shrubs and dwarf-shrubs may be present in lower elevation stands, such as *Artemisia frigida*, *Artemisia tridentata*, and *Chrysothamnus viscidiflorus*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs on broad, gentle alpine slopes and ridges of the Challis Volcanics and Beaverhead Mountains in east-central Idaho and similar high subalpine sites in northwestern Wyoming. Stands occur on gentle to moderately steep, convex, southwest- to north-facing ridgetops. Sites are often on windward exposures at 2990-3170 m (9800-10,400 feet) elevation. Soils are shallow to moderately deep gravelly soils derived from limestone, siliceous volcanic rocks, and quartzite.

Dynamics: Alpine vegetation is controlled mostly by a moisture-exposure gradient with soil movement and geologic substrate also important (Moseley 1987a). Turf communities are associated with sites with relatively gentle terrain where the wind scours the winter snow. Where wind exposure increases, the soils are shallow, rocky, less developed and support cushion plant communities (Cooper et al. 1997). The presence of species such as *Phlox pulvinata* indicate a relatively stable substrate, as opposed to *Leucopoa kingii* stands on steep, unstable or eroding slopes, which tend to have lower vegetative cover, higher cover of bare ground, lack mat species such as *Phlox pulvinata*, and instead include disturbance indicators such as *Achillea millefolium*, *Penstemon attenuatus*, and *Poa secunda* (Moseley 1987a).

DISTRIBUTION

Geographic Range: This alliance occurs in the central Rocky Mountains on broad, gentle alpine ridges of the Challis Volcanics and Beaverhead Mountains in east-central Idaho and similar high subalpine sites in northwestern Wyoming.

Nations: US

States/Provinces: ID, MT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Hesperochloa kingii* / *Oxytropis campestris* community type (Cooper et al. 1997)

LOWER LEVEL UNITS

Associations:

- CEGL001913 *Leucopoa kingii* - *Phlox pulvinata* Grassland
- CEGL001910 *Leucopoa kingii* Grassland
- CEGL001912 *Leucopoa kingii* - *Oxytropis campestris* Grassland
- CEGL001914 *Leucopoa kingii* - *Poa fendleriana* ssp. *fendleriana* Grassland
- CEGL001911 *Leucopoa kingii* - *Carex elynoides* Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M.S. Reid for group description.

Version Date: 2014/03/14

REFERENCES

References: Comer et al. 1999, Cooper and Lesica 1992, Cooper et al. 1997, Faber-Langendoen et al. 2017b, MTNHP unpubl. data, Moseley 1987a, Nesser et al. 1997, Ream 1964

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

2.B.2.Na.2.b. M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland

G272. Central Rocky Mountain Montane-Foothill Deciduous Shrubland

Type Concept Sentence: This is a dry central Rocky Mountain shrubland group where dominant shrubs are *Amelanchier alnifolia*, *Holodiscus discolor*, *Physocarpus malvaceus*, *Prunus emarginata*, *Prunus virginiana*, *Rhus glabra*, *Rosa nutkana*, *Rosa woodsii*, *Symphoricarpos albus*, and/or *Symphoricarpos oreophilus*, and understory grasses and forbs are common. Stands occur across the western U.S. and Canada within the matrix of surrounding low-elevation grasslands and sagebrush shrublands of low to mid elevations of the Rocky Mountains.

OVERVIEW

Scientific Name: *Amelanchier alnifolia* - *Symphoricarpos* spp. - *Rhus glabra* Central Rocky Mountain Shrubland Group

Common Name (Translated Scientific Name): Saskatoon Serviceberry - Snowberry species - Smooth Sumac Central Rocky Mountain Shrubland Group

Colloquial Name: Central Rocky Mountain Montane-Foothill Saskatoon Serviceberry Shrubland

Type Concept: This shrubland group is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Northern Rockies. The most common dominant shrubs are *Amelanchier alnifolia*, *Holodiscus discolor*, *Physocarpus malvaceus*, *Prunus emarginata*, *Prunus virginiana*, *Rhus glabra*, *Rosa nutkana*, *Rosa woodsii*, *Symphoricarpos albus*, and *Symphoricarpos oreophilus*, occurring alone or any combination. Stands in central and eastern Wyoming can include *Artemisia tridentata* ssp. *vaseyana* and *Cercocarpus montanus*, but neither of these species are dominant, and where they occur the stands are truly mixes of shrubs, often with *Amelanchier alnifolia*, *Prunus virginiana*, and others being the predominant taxa. *Aristida purpurea*, *Calamagrostis rubescens*, *Carex geyeri*, *Deschampsia cespitosa*, *Festuca campestris*, *Festuca idahoensis*, *Koeleria macrantha*, *Poa secunda*, and *Pseudoroegneria spicata* are the most important grasses. *Achnatherum thurberianum* and *Leymus cinereus* can be locally important. *Bromus tectorum* and *Phleum pratense* are common introduced grasses. *Balsamorhiza sagittata*, *Geum triflorum*, *Lomatium triternatum*, *Oenanthe sarmentosa*, *Potentilla gracilis*, *Xerophyllum tenax*, and species of *Eriogonum*, *Phlox*, and *Erigeron* are important forbs. These shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands. They also occur in the ponderosa pine and Douglas-fir zones, but rarely up into the subalpine zone, where they are restricted to dry sites. The shrublands are usually found on steep slopes of canyons and in areas with some soil development, either loess deposits or volcanic clays; they occur on all aspects. Fire, flooding and erosion all impact these shrublands,

but they typically will persist on sites for long periods. These communities also develop near talus slopes as garlands, at the heads of dry drainages, and toeslopes in the moist shrub-steppe and steppe zones.

Classification Comments: This group needs review from Northern Rockies ecologists. Its transition to Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland Group (G276) will need to be further clarified, but there are definitely distinct floristics separating the two groups. In addition, the southern Rocky Mountain group tends to be drier than this group.

Similar NVC Types:

- G276 Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland
- G277 Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland

Diagnostic Characteristics: Shrublands found in lower montane or foothill settings of the northern Rocky Mountains, typically in dry and warm settings.

VEGETATION

Physiognomy and Structure: These are variable shrublands composed of broad-leaved, cold-deciduous taxa, generally between 1 and 3 m in height. Shrub density will vary with substrate, fire and grazing history, and moisture, but these are rarely dense "thickets." They are typically found in small patches within the lower montane zone of Douglas-fir or ponderosa woodlands, or in a mosaic with sage shrub-steppe or valley grasslands. Grasses and forbs are the herbaceous component and can be abundant to sparse.

Floristics: The most common dominant shrubs are *Amelanchier alnifolia*, *Holodiscus discolor*, *Physocarpus malvaceus*, *Prunus emarginata*, *Prunus virginiana*, *Rhus glabra*, *Rosa nutkana*, *Rosa woodsii*, *Symphoricarpos albus*, and *Symphoricarpos oreophilus* occurring alone or any combination. Occurrences in central and eastern Wyoming can include *Artemisia tridentata ssp. vaseyana* and *Cercocarpus montanus*, but neither of these species are dominant, and where they occur the stands are truly mixes of shrubs, often with *Amelanchier alnifolia*, *Prunus virginiana*, and others being the predominant taxa. The open to moderately dense herbaceous layer is dominated by bunchgrasses, especially *Festuca idahoensis* and *Pseudoroegneria spicata*. *Aristida purpurea*, *Festuca campestris*, *Calamagrostis rubescens*, *Carex geyeri*, *Deschampsia cespitosa*, *Koeleria macrantha*, and *Poa secunda* are other important grasses. *Achnatherum thurberianum* and *Leymus cinereus* can be locally important. *Bromus tectorum* and *Phleum pratense* are common introduced grasses. Important forbs are *Balsamorhiza sagittata*, *Geum triflorum*, *Lomatium triternatum*, *Oenanthe sarmentosa*, *Potentilla gracilis*, *Xerophyllum tenax* and species of *Eriogonum*, *Phlox*, and *Erigeron*.

ENVIRONMENT & DYNAMICS

Environmental Description: This small-patch shrubland group is found in foothill and lower montane sites around the Columbia Basin and Northern Rockies and extends into the northwestern Great Plains at elevations of 500-2500 m depending on latitude. These shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands. They also occur in the ponderosa pine and Douglas-fir zones, but rarely up into the subalpine zone, where they are restricted to dry sites. The shrublands are usually found on steep slopes of canyons and in areas with some soil development, either loess deposits or volcanic clays; they occur on all aspects. Fire, flooding and erosion all impact these shrublands, but they typically will persist on sites for long periods. These communities also develop near talus slopes as garlands, at the heads of dry drainages, and toeslopes in the moist shrub-steppe and steppe zones.

Dynamics:

DISTRIBUTION

Geographic Range: This group is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Northern Rockies, including east into central Montana around the "Sky Island" ranges. It also occurs farther south into central and eastern Wyoming, where it forms compositionally diverse shrublands. They also extend north into Alberta along the foothills of the Front Range.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, US

States/Provinces: AB, BC, CA?, CO, ID, MT, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 3:?, 4:?, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 26:C, 68:C

USFS Ecoregions (2007): 331A:CC, 331D:CP, 331N:CC, 341G:PP, 342A:CP, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:PP, M261G:P?, M331A:CC, M331B:CC, M331D:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341A:PP

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- >< Bittercherry (419) (Shiflet 1994)
- >< Chokecherry - Serviceberry - Rose (421) (Shiflet 1994)
- < MS Montane Shrub/Grassland Dry Subdivision sites (Ecosystems Working Group 1998)

LOWER LEVEL UNITS**Alliances:**

- A3963 *Amelanchier alnifolia* Central Rocky Mountain Montane-Foothill Shrubland Alliance
- A3964 *Rhus glabra* - *Rhus trilobata* Central Rocky Mountain Montane-Foothill Shrubland Alliance
- A3967 *Rosa nutkana* Central Rocky Mountain Shrubland Alliance
- A3975 *Physocarpus malvaceus* - *Symphoricarpos albus* Mesic Shrubland Alliance

AUTHORSHIP

Primary Concept Source: E.W. Tisdale (1986)

Author of Description: M.S. Reid and K.A. Schulz

Acknowledgments:

Version Date: 05/20/2015

Classif Resp Region: West

Internal Author: MSR 3-10, mod. KAS 5-15, mod. GK 12-15

REFERENCES

References: Ecosystems Working Group 1998, Faber-Langendoen et al. 2017a, Franklin and Dyrness 1973, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Knight 1994, Mueggler and Stewart 1980, Poulton 1955, Shiflet 1994, Tisdale 1986

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G272. Central Rocky Mountain Montane-Foothill Deciduous Shrubland

A3963. Amelanchier alnifolia Central Rocky Mountain Montane-Foothill Shrubland Alliance

Type Concept Sentence: This shrubland alliance is characterized by the dominance of *Amelanchier alnifolia* and is found in the lower montane and foothill regions around the northern Great Basin, Columbia Basin and central Rocky Mountains.

OVERVIEW

Scientific Name: *Amelanchier alnifolia* Central Rocky Mountain Montane-Foothill Shrubland Alliance

Common Name (Translated Scientific Name): Saskatoon Serviceberry Central Rocky Mountain Montane-Foothill Shrubland Alliance

Colloquial Name: Central Rocky Mountain Montane-Foothill Saskatoon Serviceberry Shrubland

Type Concept: The shrubland vegetation is characterized by the dominance of *Amelanchier alnifolia*. Other shrubs may include *Acer glabrum*, *Artemisia tridentata*, *Holodiscus discolor*, *Prunus emarginata*, *Prunus virginiana*, *Purshia tridentata*, *Rosa* spp., *Rubus parviflorus*, *Spiraea betulifolia*, and *Symphoricarpos albus*. A moderate to dense herbaceous layer is present and may be diverse. Graminoids consist primarily of *Carex geyeri*, *Calamagrostis rubescens*, *Festuca idahoensis*, or *Pseudoroegneria spicata*. Common forb species include *Fragaria virginiana*, *Achillea millefolium*, and *Galium boreale*. *Xerophyllum tenax* may dominate some northern Rocky Mountains stands. Other grasses present include both native and exotic species, such as *Bromus carinatus*, *Poa pratensis*, and *Phleum pratense*. This small-patch shrubland alliance is found in foothill and lower montane sites around the Columbia Basin and Central Rockies and extends into the northwestern Great Plains at elevations of 1330-2500 m depending on latitude. In the drier Intermountain West, it occurs on all aspects in mesic ranges but is generally best developed on north-facing slopes in xeric areas. Soils are variable, from shallow and skeletal near rock outcroppings, to moderately deep with abundant organic matter. To the north it has been described from sites as disparate as the foothill's mosaic of grasslands, shrublands and forest openings, a gravelly alluvial fan at foothills/mountains transition, to an upper subalpine site that has experienced a hot burn in the last 50 years. Here this type is largely successional, having resulted from stand-replacing fire. Stands occur primarily on south- through west-facing, moderate to steep slopes, often on spur ridges or wind-buffeted slope shoulders. These sites probably had shallow soils before burning, and there are indications that soil loss occurred following the fires. There is also considerable exposed substrate and rock. Soils are moderately to well-drained sandy or clay loams or, occasionally, rapidly drained soils on glacio-fluvial or till deposits. Most of the ground surface is covered with litter and duff.

Classification Comments: Further clarification of the concept and characteristics of this alliance are needed. The placement of *Amelanchier alnifolia* / *Symphoricarpos oreophilus* Shrubland (CEGL002569) in this alliance needs further review as it is known only from Dinosaur National Monument in northwestern Colorado, which is peripheral to the central Rocky Mountains. Finally,

Amelanchier alnifolia / *Xerophyllum tenax* Grassland (CEGL001066) is included in this alliance, but is very poorly documented. Del Moral (1973) is the only reference source presently known for this association, which needs further review. Stands included in *Amelanchier alnifolia* Shrubland (CEGL002183) are placed *Prunus virginiana* - *Symphoricarpos occidentalis* - *Amelanchier alnifolia* Great Plains Shrubland Alliance (A4036) in Northern Great Plains Mesic Mixedgrass Prairie Group (G141), which primarily occurs in North Dakota and Saskatchewan and extends into Wyoming. Some stands of this alliance may be similar to stands in this alliance, especially in transition areas in Montana and Alberta where *Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland (CEGL001065) extends into the northwestern Great Plains.

Internal Comments: KAS 2-14: Johnston (1987) needs to be reviewed to evaluate *Amelanchier* spp.-dominated plant associations classified and referenced from northern Colorado and Wyoming for his *Amelanchier* spp. Series.

Other Comments:

Similar NVC Types: *Amelanchier alnifolia* Shrubland (CEGL002183) in *Prunus virginiana* - *Symphoricarpos occidentalis* - *Amelanchier alnifolia* Great Plains Shrubland Alliance (A4036), in Northern Great Plains Mesic Mixedgrass Prairie Group (G141) is similar but primarily occurs in North Dakota and Saskatchewan and extends into Wyoming.

- A4036 *Prunus virginiana* - *Symphoricarpos occidentalis* - *Amelanchier alnifolia* Great Plains Shrubland Alliance: also may have stands dominated or codominated by *Amelanchier alnifolia*.

Diagnostic Characteristics: The vegetation is characterized by the dominance of diagnostic shrub species *Amelanchier alnifolia*. Other shrubs may include *Acer glabrum*, *Artemisia tridentata*, *Holodiscus discolor*, *Prunus emarginata*, *Prunus virginiana*, *Purshia tridentata*, *Rosa* spp., *Rubus parviflorus*, *Spiraea betulifolia*, and *Symphoricarpos albus*. High-constancy graminoid associates consist primarily of *Carex geyeri*, *Calamagrostis rubescens*, *Festuca idahoensis*, or *Pseudoroegneria spicata*. *Xerophyllum tenax* may dominate this layer in some northern Rocky Mountains stands. Other common grasses present include both native *Bromus carinatus* and introduced *Poa pratensis* and *Phleum pratense*.

VEGETATION

Physiognomy and Structure: These communities are characterized by a moderate to dense canopy of cold-deciduous shrubs up to 4 m in height. There is often another stratum (sometimes two) of low cold-deciduous shrubs from 0.5-2 m tall. The herbaceous layer is usually a species-rich assemblage of cespitose graminoids and erect forbs.

Floristics: This alliance is distinguished by dominance of *Amelanchier alnifolia* in the upper shrub layer. It is best described from the Rocky Mountain and ranges in the northern Great Basin, where it forms a prominent component of montane shrublands. Such stands typically contain a tall-shrub layer of *Amelanchier alnifolia*, often with other shrubs of various sizes that sometimes form a short-shrub layer. These shrubs differ somewhat by region and include *Acer glabrum*, *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Chrysothamnus viscidiflorus*, *Dasiphora fruticosa* ssp. *floribunda*, *Holodiscus discolor*, *Purshia tridentata*, *Rhus trilobata*, *Ribes aureum*, *Rosa woodsii*, *Rubus parviflorus*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Symphoricarpos oreophilus*. The dwarf-shrubs *Juniperus communis*, *Mahonia repens*, and *Paxistima myrsinites* may also occur in the more protected sites. The open to dense herbaceous layer is composed of primarily perennial graminoids especially bunchgrasses and also differs slightly by region. In the Rocky Mountains *Bromus carinatus*, *Carex geyeri*, and *Festuca campestris* are more important to the north and *Achnatherum nelsonii* ssp. *dorei* (= *Stipa columbiana*), *Carex rossii*, *Leucopoa kingii* (= *Festuca kingii*), and *Pseudoroegneria spicata* more important to the south. In drier southern portions *Achnatherum lettermanii*, *Elymus glaucus*, *Elymus trachycaulus*, *Hesperostipa comata*, and/or *Poa fendleriana* occur. *Festuca idahoensis* is constant throughout much of the western range. Other associated graminoid species include *Calamagrostis rubescens*, *Elymus elymoides*, *Poa secunda* (= *Poa sandbergii*), and *Pseudoroegneria spicata*, as well as exotic species *Poa pratensis* and *Phleum pratense*. There are no diagnostic forbs, but a number with high constancy that also occur in mesic grasslands/open forests include *Achillea millefolium*, *Balsamorhiza sagittata*, *Campanula rotundifolia*, *Eriogonum flavum*, *Eriogonum umbellatum*, *Eurybia conspicua* (= *Aster conspicuus*), *Fragaria virginiana*, *Galium boreale*, *Geranium viscosissimum*, *Lithospermum ruderale*, *Lomatium dissectum*, *Potentilla gracilis*, *Potentilla glandulosa*, and *Penstemon confertus*. *Xerophyllum tenax* may dominate this layer in some northern Rocky Mountains stands. Nonvascular species cover is insignificant. In some cases, individuals or small clumps of the trees *Populus tremuloides* and *Juniperus scopulorum* may occur but do not contribute enough cover to constitute a stratum. In the higher elevation stands, occasional *Betula papyrifera*, *Picea engelmannii*, *Pinus ponderosa*, or *Pseudotsuga menziesii* are present within a young tree canopy, but these have insignificant cover.

ENVIRONMENT & DYNAMICS

Environmental Description: This shrubland alliance is found in foothill and lower montane sites around the Columbia Basin and Central Rockies, and extends northeast into the northwestern Great Plains. Climate is cold temperate. Precipitation ranges from 30-50 cm annually with a large proportion falling as winter snow. This small-patch alliance occurs at middle elevations (1800-2500 m) of mountains in the Intermountain West where it occurs on all aspects in mesic ranges but is generally best developed on north-facing slopes in xeric areas. Soils are variable, from shallow and skeletal near rock outcroppings, to moderately deep with abundant organic matter. It has been documented from Montana and extends northward along the Rocky Mountain Front and foothills well into

Alberta, at elevations down to 1330 m. To the north it has been described from sites as disparate as the foothill's mosaic of grasslands, shrublands and forest openings, a gravelly alluvial fan at foothills/mountains transition, to an upper subalpine site that has experienced a hot burn in the last 50 years. In Glacier National Park and Waterton Lakes National Park, this type is largely successional, having resulted from stand-replacing fire. Stands occur primarily on south- through west-facing, moderate to steep slopes, often on spur ridges or wind-buffeted slope shoulders. These sites probably had shallow soils before burning, and there are indications (e.g., pedicelling) that soil loss occurred following the fires and continues to this day. There is considerable exposed substrate and rock, not infrequently exceeding 20% on northern examples of this alliance. Soils tend to be moderately to well-drained sandy or clay loams or, occasionally, a rapidly drained Orthic Regosol. Sites are usually situated on glacio-fluvial or till deposits. Most of the ground surface is covered with litter and duff.

Dynamics: In the southern portion of the type's range and in certain locations in the foothills and lower elevation sites along the Rocky Mountain Front, this is conceived to be a long-term stable (climax) vegetation type. Northward in its range this type becomes more associated with disturbance phenomena, particularly stand-replacing fire and erosion (subsequent) and is distinctly a seral type. However, reforestation may require well in excess of 100 years if soil loss has accompanied the disturbance. Stumps and burned downed logs are common on some sites within the northern range. Also ubiquitous in the northern range is the severe browsing on *Amelanchier*; on some sites this species is no higher than 0.4-0.5 m, though its potential is several times this height.

Amelanchier utahensis hybridizes with *Amelanchier alnifolia* and distinctions between the two species may be come blurred in areas where their ranges overlap. *Amelanchier* spp. are palatable to both livestock and native ungulates and compose a valuable element of the winter range in the Great Basin and Rocky Mountains.

DISTRIBUTION

Geographic Range: This small-patch shrubland alliance is found in the prairie breaks, foothill and lower montane sites in the northern Great Basin, Columbia Basin and Central Rockies extending from northwestern Colorado across Wyoming, along the Rocky Mountains of Montana and Alberta and extends out into the northwestern Great Plains.

Nations: CA, US

States/Provinces: AB, CA?, CO, MT, NV, UT, WA?, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Amelanchier* spp. Series (Johnston 1987) [USFS Region 2 is mostly outside the central Rocky Mountains and includes two plant associations not described in this alliance.]

LOWER LEVEL UNITS

Associations:

- CEG001065 *Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland
- CEG001064 *Amelanchier alnifolia* / *Artemisia tridentata* / *Festuca idahoensis* Shrubland
- CEG002569 *Amelanchier alnifolia* / *Symphoricarpos oreophilus* Shrubland
- CEG005885 *Amelanchier alnifolia* / (Mixed Grass, Forb) Shrubland
- CEG001066 *Amelanchier alnifolia* / *Xerophyllum tenax* Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M.S. Reid and D. Sarr

Version Date: 2014/03/14

REFERENCES

References: Blackburn et al. 1968a, Bunin 1975c, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Harvey 1980, Johnston 1987, Komarkova 1986, Mozingo 1987, Terwilliger and Smith 1978, Terwilliger and Tiedemann 1978, del Moral 1973

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G272. Central Rocky Mountain Montane-Foothill Deciduous Shrubland

A3975. *Physocarpus malvaceus* - *Symphoricarpos albus* Mesic Shrubland Alliance

Type Concept Sentence: This mesic shrubland alliance is dominated by diagnostic species *Physocarpus malvaceus*, *Rosa acicularis*, *Rosa nutkana*, *Rosa woodsii*, and/or *Symphoricarpos albus*. It is known from canyons of the northern Wallowa Mountains, Imnaha River, and Snake River within the Columbia Plateau, the foothills and plains of the central Rocky Mountains and ranges in the Great Basin and eastern California.

OVERVIEW

Scientific Name: *Physocarpus malvaceus* - *Symphoricarpos albus* Mesic Shrubland Alliance

Common Name (Translated Scientific Name): Mallow Ninebark - Common Snowberry Mesic Shrubland Alliance

Colloquial Name: Mallow Ninebark - Common Snowberry Mesic Shrubland

Type Concept: The vegetation of this mesic shrubland alliance is characterized by a moderately dense to dense, sometimes patchy shrub layer (usually less than 2 m tall) that is dominated by diagnostic species *Physocarpus malvaceus*, *Rosa acicularis*, *Rosa nutkana*, *Rosa woodsii*, and/or *Symphoricarpos albus*. Other low-cover associated shrubs may include scattered *Amelanchier alnifolia*, *Crataegus douglasii*, *Mahonia repens*, *Prunus virginiana*, *Salix scouleriana*, and *Spiraea betulifolia*. *Toxicodendron rydbergii* may be present with moderate cover. The herbaceous layer is typically relatively sparse to moderate (typically 10-25% cover), but may be dense depending on shrub cover, and is composed of a mixture of perennial bunchgrasses such as *Pseudoroegneria spicata* and *Festuca idahoensis* and perennial forbs. Moss and lichen cover is often important and ranges from 10-90% cover. Introduced herbaceous species are sometime abundant, including the forage grass *Poa pratensis*, the weedy forb *Cirsium arvense*, and the annual grass *Bromus briziformis*. This mesic shrubland alliance is known from canyons of the northern Wallowa Mountains, Imnaha River, and Snake River within northeastern Oregon, southeastern Washington, and west-central Idaho, the mountains, foothills and plains of Montana, Idaho, Nevada, and eastern California. It is found on upper slope positions of steep, northeast- to northwest-facing canyon slopes, on flat to gentle benches, valley floors, alluvial terraces, ridges, and slopes and occurs in floodplains and on alluvial terraces along rivers and streams, on hillsides below springs, and in ravines and swales where overland flow from snowmelt and summer thunderstorms provides additional moisture. Soils are moderately deep with textures ranging from sandy and silt loams to silts to clays.

Classification Comments: Stands of *Festuca idahoensis* - *Symphoricarpos albus* Grassland (CEGL001509) may be similar but have sparse shrub layers and are not included in this alliance. Hall (1973) described similar vegetation from the Blue Mountains of Oregon that needs further investigation if it is to be included in this alliance. Stands classified as *Physocarpus malvaceus* - *Symphoricarpos albus* by Johnson and Simon (1987) were considered to have marginal potential for tree establishment. Other *Physocarpus malvaceus*-dominated communities are known to occur but are poorly documented within the Pacific Northwest region.

Internal Comments:

Other Comments:

Similar NVC Types: Stands dominated or codominated by *Rosa nutkana* are placed in two other alliances in two other groups: *Rosa nutkana* - *Festuca idahoensis* Grassland (CEGL001626) is placed in *Festuca idahoensis* - *Pseudoroegneria spicata* - *Poa secunda* Dry Grassland Alliance (A3987) in Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group (G273). *Rosa nutkana* / *Deschampsia cespitosa* Shrubland (CEGL003344) and *Rosa nutkana* / *Oenanthe sarmentosa* Shrubland (CEGL003457) both are placed in *Rosa nutkana* Central Rocky Mountain Shrubland Alliance (A3967) in Central Rocky Mountain-North Pacific High Montane Mesic Shrubland Group (G305).

- A3967 *Rosa nutkana* Central Rocky Mountain Shrubland Alliance: occurs in Oregon in moist areas and is dominated by *Rosa nutkana*.

Diagnostic Characteristics: The vegetation is dominated by diagnostic species *Physocarpus malvaceus*, *Rosa acicularis*, *Rosa nutkana*, *Rosa woodsii*, and/or *Symphoricarpos albus*. Other associated shrubs may include *Artemisia tridentata*, *Ribes aureum*, *Symphoricarpos occidentalis*, and *Toxicodendron rydbergii*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderate to dense, cold-deciduous, broad-leaved short-shrub layer (<2 m tall) with a moderately dense to dense herbaceous layer (<1 m tall) that is typically dominated by perennial graminoids, but may be codominated by perennial forbs. Sparse cover of annual forbs and grasses may be seasonally present.

Floristics: This central Rocky Mountains and Columbia Plateau shrubland alliance is characterized by a moderately dense to dense, sometimes patchy shrub layer (usually less than 2 m tall) that is dominated by cold-deciduous broad-leaved shrubs. Dominant and diagnostic species are *Physocarpus malvaceus*, *Rosa acicularis*, *Rosa nutkana*, *Rosa woodsii*, and/or *Symphoricarpos albus*. Other low-cover associated shrubs may include scattered *Amelanchier alnifolia*, *Crataegus douglasii*, *Mahonia repens*, *Prunus virginiana*, *Salix scouleriana*, and *Spiraea betulifolia*. *Toxicodendron rydbergii* may be present with moderate cover in some stands. The

herbaceous layer is typically relatively sparse to moderate (typically 10-25% cover), but may be dense depending on shrub cover. It is composed of a mixture of perennial bunchgrasses such as *Pseudoroegneria spicata* and *Festuca idahoensis* and perennial forbs. Associated forbs include *Achillea millefolium*, *Agastache urticifolia*, *Ambrosia psilostachya*, *Artemisia ludoviciana*, *Balsamorhiza sagittata*, *Cirsium brevifolium*, *Fragaria virginiana*, *Fraseria albicaulis*, *Geum macrophyllum*, *Geum triflorum*, *Hieracium scouleri* var. *albertinum* (= *Hieracium albertinum*), *Lomatium dissectum*, *Perideridia gairdneri*, *Plectritis macrocera*, and *Solidago canadensis*. Other perennial graminoids may be present such as *Carex* spp., *Elymus glaucus*, *Juncus balticus*, and *Muhlenbergia racemosa*. The annual forb *Galium aparine* may be present to abundant. Moss and lichen cover is often important and ranges from 10-90% cover. Introduced herbaceous species are sometime abundant. Stands described by Hansen et al. (1995) had a moderately dense to dense herbaceous layer dominated by the exotic forage grass *Poa pratensis* and the weedy forb *Cirsium arvense*. The exotic species *Bromus briziformis* is often present and may be relatively abundant.

ENVIRONMENT & DYNAMICS

Environmental Description: This mesic shrubland alliance is known from canyonlands of the northern Wallowa Mountains, Imnaha River, and Snake River within northeastern Oregon, southeastern Washington, and west-central Idaho, the mountains, foothills and plains of Montana, Idaho, Nevada, and eastern California. Stands in the Snake and Salmon river canyons in Idaho and eastern Oregon and eastern Washington occur at elevations from 670-1370 m, and on north slopes in the central Rocky Mountains in Montana are at elevations of 500-1770 m. The climate is temperate continental with mean annual precipitation of approximately 25-30 cm. Precipitation primarily occurs in the winter as snow or rain. This moisture is stored in the soil and utilized during the typically dry summers. Stands are typically found on moderately steep to steep upper and middle canyon slopes. Sites need to be relatively mesic to support these shrubs in the bunchgrass zone, and at lower elevations they are often restricted to north aspects and ravines, swales and depressions where deep snow drifts form and snowmelt and summer thunderstorms provide additional moisture. Stands also occur in floodplains and on alluvial terraces along rivers and streams, on hillsides below springs where soil moisture concentrates, and near the footslopes of rocky slopes where water may seep. These sites are flat to moderately steep and aspect does not appear important because stands have supplemental moisture. Although these sites are temporarily flooded, they are well-drained and do not have a shallow water table. Soils are moderately deep with textures ranging from sandy and silt loams to silts to clays (Hansen et al. 1995). Rock fragments are less than 15% of the soil volume. Parent materials include loess, basalt colluvium, lava, tuff, ash and other volcanic rock. Adjacent stands include grasslands dominated by *Pseudoroegneria spicata* or *Festuca idahoensis* on hotter/drier aspects, and *Pseudotsuga menziesii* / *Physocarpus malvaceus* forests and woodlands on mid or lower slopes where soil moisture is concentrated from slope seepage. Along rivers and streams, adjacent vegetation includes *Salix exigua* or *Salix amygdaloides* riparian shrublands, and riparian woodlands dominated by *Fraxinus pennsylvanica* or *Acer negundo*.

Dynamics: Dominant shrub species *Physocarpus malvaceus*, *Rosa* spp., and *Symphoricarpos albus* are adapted to low- to moderate-intensity fires by responding with basal sprouting or sprouting from rhizomes located in mineral soil; however, high-intensity fires will kill these species (FEIS 1998, Johnson and Simon 1987). Stands are restricted to relatively mesic northern slopes in river canyons and mountains. Periodic fires may be important in maintaining these stands where *Pseudotsuga menziesii* trees may invade. Exotic plants have invaded many of these stands. Exotic annual grasses, such as *Bromus briziformis*, *Bromus arvensis*, and *Bromus tectorum*, are often present and may be relatively abundant. Many of these stands have been invaded by the perennial species *Poa pratensis*. Cover of *Poa pratensis* has also increased because of its tolerance to both grazing and shading from the shrubs (Johnson and Simon 1987). Other exotics often include forage species such as *Bromus inermis*, *Phleum pratense*, and *Dactylis glomerata* (Hansen et al. 1995) and highly invasive forbs such as *Cirsium arvense*.

DISTRIBUTION

Geographic Range: This central Rocky Mountain and Columbia Plateau shrubland alliance is known from canyonlands of the northern Wallowa Mountains, Imnaha River, and Snake River plain of northeastern Oregon, southeastern Washington, and southern Idaho, the mountains, foothills and plains of Montana, Idaho, Nevada, and eastern California.

Nations: CA?, US

States/Provinces: CA, ID, MT, NV, OR, SK?, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Symphoricarpos albus* Series (Tisdale 1986)

LOWER LEVEL UNITS

Associations:

- CEGLO01130 *Symphoricarpos albus* - *Rosa nutkana* Shrubland
- CEGLO01171 *Physocarpus malvaceus* - *Symphoricarpos albus* Shrubland
- CEGLO05606 *Prunus virginiana* / *Leymus cinereus* Shrubland
- CEGLO05890 *Symphoricarpos albus* Shrubland
- CEGLO05602 *Philadelphus lewisii* / *Penstemon deustus* Open Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Daubenmire 1970, FEIS 1998, Faber-Langendoen et al. 2017b, Hall 1973, Hansen et al. 1990, Hansen et al. 1991, Hansen et al. 1995, Johnson and Simon 1987, Johnston 1987, Manning and Padgett 1995, Sawyer et al. 2009, Tisdale 1986

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G272. Central Rocky Mountain Montane-Foothill Deciduous Shrubland

A3964. *Rhus glabra* - *Rhus trilobata* Central Rocky Mountain Montane-Foothill Shrubland Alliance

Type Concept Sentence: This shrubland alliance is characterized by a sparse to moderately dense shrub layer dominated by *Rhus glabra* or *Rhus trilobata* with a sparse to moderately dense herbaceous layer composed of grasses such as *Aristida purpurea*, *Festuca idahoensis*, and *Pseudoroegneria spicata*. It is found in the lower montane and foothill regions around the Columbia Basin, including river canyons, and extends north and east into the Central Rockies and to the foothills and breaks in the western Great Plains.

OVERVIEW

Scientific Name: *Rhus glabra* - *Rhus trilobata* Central Rocky Mountain Montane-Foothill Shrubland Alliance

Common Name (Translated Scientific Name): Smooth Sumac - Skunkbush Sumac Central Rocky Mountain Montane-Foothill Shrubland Alliance

Colloquial Name: Central Rocky Mountain Montane-Foothill Sumac Shrubland

Type Concept: The vegetation is characterized by a sparse to moderately dense shrub layer dominated by *Rhus glabra* or *Rhus trilobata*. The sparse to moderately dense herbaceous layer is composed of *Aristida purpurea* var. *longiseta*, *Festuca idahoensis*, *Pseudoroegneria spicata*, and other graminoids or forbs. This shrubland alliance is found in the lower montane and foothill regions around the Columbia Basin, including river canyons, and extends north and east into the Central Rockies and to the foothills and breaks in the western Great Plains. Stands occur on a variety of sites, including steep lower slopes in canyons and valley bottoms where gravel and boulder colluvium accumulates, near talus slopes as garlands, at the heads of dry drainages, and toeslopes in the moist shrub-steppe zones. Stands also occur in patches or strips along the shoulder slopes of river breaks. Soils are often shallow and rocky.

Classification Comments: It is often difficult to determine the borders of stands within this alliance because one of the primary distinguishing features of this alliance, the presence of a 10-25% canopy of *Rhus trilobata*, is not continuous over the entire stand (Johnson and Simon 1987). When grassland communities adjoin stands of this alliance, they usually contain many of the same species. The presence and approximate limits of stands within this alliance is judged from physiognomic and sometimes floristic differences between adjacent stands. In the dry environments in which stands of this alliance are found, certain species not commonly found in the open grow in the shade of shrubs (Hansen and Hoffman 1988).

In his *Rhus aromatica* ssp. *trilobata* Series, Johnston (1987) described two other plant associations with *Sporobolus cryptandrus*- and *Muhlenbergia montana*-dominated herbaceous layers that need to be reviewed for possible inclusion into this alliance. Grasslands with clumps of *Rhus trilobata* are common in the foothills of the Colorado Front Range and also need association-level classification and review for possible inclusion in this alliance.

Internal Comments: KAS 2-14: Stands included from the plains and Southern Rockies are included in this alliance and may need further review to determine if this is appropriate.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: The vegetation is characterized by the dominance of diagnostic species *Rhus glabra* or *Rhus trilobata*. High-constancy associated graminoid species consist primarily of *Aristida purpurea* var. *longiseta*, *Festuca idahoensis*, or *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance has a sparse to dense, sometimes patchily distributed layer of cold-deciduous shrubs (10-85% cover) that are less than 2 m tall with the sparse to moderately dense herbaceous layer dominated by perennial graminoids, mostly bunch grasses. There is also a sparse cover of perennial forbs. Annual forbs and grasses are seasonally present.

Floristics: This shrubland alliance is characterized by a short (1 m tall), relatively sparse to moderately dense (10-60% cover), broad-leaved deciduous shrub layer that is dominated by *Rhus glabra* or *Rhus trilobata* (Mueggler and Stewart 1980, Hansen and Hoffman 1988). However, the shrub layer may range up to 85% cover and exceed 3 m in protected sites (Johnson and Simon 1987). Small amounts of other shrubs, such as *Artemisia tridentata*, *Chrysothamnus* spp., *Prunus virginiana*, *Ribes cereum*, *Symphoricarpos occidentalis*, and dwarf-shrubs *Artemisia frigida*, *Gutierrezia sarothrae*, *Rosa* spp., or *Yucca glauca*, may also be present. The herbaceous cover ranges from sparse to moderately dense (5-60% cover) and is often dominated by *Aristida purpurea* var. *longiseta*, *Festuca idahoensis*, or *Pseudoroegneria spicata* (Brown 1971, Mueggler and Stewart 1980, Thilenius et al. 1995). Other characteristic species include graminoids such as *Bouteloua curtipendula*, *Bouteloua gracilis*, *Calamovilfa longifolia*, *Carex filifolia*, *Carex inops* ssp. *heliophila*, *Dalea purpurea*, *Hesperostipa comata*, *Koeleria macrantha*, *Muhlenbergia cuspidata*, *Pascopyrum smithii*, *Poa secunda*, *Schizachyrium scoparium*, and *Sporobolus cryptandrus*, and forbs such as *Achillea millefolium*, *Artemisia dracunculus*, *Astragalus inflexus*, *Echinacea angustifolia*, *Erigeron pumilus*, *Eriogonum* spp., *Gaura coccinea*, *Heterotheca villosa*, *Liatris punctata*, *Lomatium macrocarpum*, *Opuntia polyacantha*, *Phacelia heterophylla*, *Phlox hoodii*, *Phlox colubrina*, *Scutellaria angustifolia*, *Sphaeralcea coccinea*, and *Symphytichum ericoides* (Brown 1971, Mueggler and Stewart 1980, Thilenius et al. 1995). Mosses and lichens are present and average about 5% cover. Exotic species, namely *Bromus tectorum*, *Bromus arvensis* (= *Bromus japonicus*), and *Bromus briziformis*, are often present and may dominate the herbaceous layer of some disturbed stands. Cover of nonvascular plants such as *Selaginella densa* may be common on grazed stands (DeVelice et al. 1995).

ENVIRONMENT & DYNAMICS

Environmental Description: This shrubland alliance is found in the lower montane and foothill regions around the Columbia Basin, including river canyons, and extends north and east into the Central Rockies and to the foothills and breaks in the western Great Plains. Valley bottom and canyon sites range from less than 200 m to slightly over 610 m elevation, while sites in the surrounding plateaus and mountains may be over 2700 m. Plains sites range from 1000-1400 m elevation. The climate is temperate, relatively xeric and continental. The east slope and plains sites have a mean annual precipitation of 33-50 cm with most of the precipitation (75%) occurring during the growing season from April to September. Columbia Basin sites have a mean annual precipitation of approximately 25-30 cm that primarily occurs in the winter as snow or rain. This moisture is stored in the fractures in the highly weathered bedrock and utilized during the typically dry summers. Stands are typically found on steep footslopes and toeslopes in canyons, valley bottoms where gravel and boulder colluvium accumulates, near talus slopes as garlands, at the heads of dry drainages, and toeslopes in the moist shrub-steppe zones. Stands also occur in patches or strips along the shoulder slopes of river breaks (but may extend to the footslopes), and on gently rolling to steep, rocky hillsides (Mueggler and Stewart 1980, Hansen and Hoffman 1988, MTNHP 1988). Sites are predominately on hot, dry southern to western aspects, although it may occur on all aspects.

Soils are typically shallow to moderately deep, well-drained, neutral to slightly alkaline (pH 7-7.9) loams or sandy loams that often have a high percentage of rock fragments (greater than 35% by volume and 50% ground cover). However, some valley bottom sites have deep, nearly stone-free, sandy alluvial soils (Hansen and Hoffman 1988, Thilenius et al. 1995). In the Columbia Basin parent materials are colluvium and alluvium derived from basalt, metabasalt, or granitic colluvium and loess. The more common gravelly substrates are less stable than boulder-sized ones. Some stands are reported from colluvial talus cones. Northwestern plains substrates include calcareous sandstones, shales, porcelanite and occasionally extrusive volcanic rock (Brown 1971, DeVelice et al. 1995). A biological crust may be present on better sites with less disturbance, while litter may cover as much as 65% of the ground surface. Most stands of this association have been severely disturbed by livestock grazing and have been converted to a zootic climax, dominated by herbaceous annuals, such as *Bromus tectorum*, *Bromus arvensis*, and *Erodium cicutarium*.

Dynamics: The dominant shrubs *Rhus glabra* and *Rhus trilobata* are adapted to tolerate fires. It is rarely killed when burned and sprouts vigorously from underground rhizomes following a fire (FEIS 1998, Mueggler and Stewart 1980). Vegetative reproduction is the primary mode of re-establishment after fire; however, *Rhus glabra* and *Rhus trilobata* may also reproduce through seed. Fire has variable effects on *Pseudoroegneria spicata* bunch grasses. Plants usually survive burning and growth is often stimulated, except when fire occurs in the driest month when the crowns will burn because of low moisture in the vegetation and the meristems are damaged (Johnson and Simon 1987). In fact, post-fire sprouts and seedlings may not compete well with grassland vegetation, and frequent fire is thought to exclude *Rhus glabra* from grasslands (Johnson and Simon 1987). Stands occur on rocky slopes that are likely to have few fires (Johnson and Simon 1987).

Livestock grazing does not impact stands on the steeper slopes, but where stands are more accessible, heavy summer use will reduce the abundance of the more palatable species such as *Pseudoroegneria spicata*, *Festuca idahoensis* and *Hesperostipa comata*. Less palatable species such as *Artemisia frigida*, *Heterotheca villosa*, and *Achillea millefolium* will increase. *Rhus trilobata* may also be favored by continued overgrazing (Mueggler and Stewart 1980).

The biggest threat is exotic plants that have invaded many stands. Common exotics include annual grasses such as *Bromus tectorum*, *Bromus arvensis*, and *Bromus briziformis*, and the perennial forbs *Hypericum perforatum* and *Conyza canadensis*. *Bromus tectorum* often occurs in these stands and contributes significant cover on sites disturbed by livestock or small mammals (Mueggler and Stewart 1980).

DISTRIBUTION

Geographic Range: This shrubland alliance is found in the lower montane and foothill regions around the Columbia Basin, including the Salmon, Snake and Imnaha river canyons, and extends north and east into the Central Rockies and to the foothills and breaks in the western and northwestern Great Plains steppe of Montana and Wyoming.

Nations: US

States/Provinces: ID, MT, OR, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Rhus aromatica* ssp. *trilobata* Series (Johnston 1987) [USFS Region 2 is mostly outside the central Rocky Mountains and includes two habitat types not described in this alliance: a subalpine type in Colorado and a sandy plains type in Oklahoma,]
- > *Rhus glabra* Series (Tisdale 1986)
- > *Rhus trilobata* Series (Mueggler and Stewart 1980)

LOWER LEVEL UNITS

Associations:

- CEG001120 *Rhus trilobata* / *Pseudoroegneria spicata* Shrub Grassland
- CEG001505 *Rhus trilobata* / *Festuca idahoensis* Shrub Grassland
- CEG001122 *Rhus glabra* / *Pseudoroegneria spicata* Shrub Grassland
- CEG001507 *Rhus glabra* / *Aristida purpurea* var. *longiseta* Shrub Grassland

AUTHORSHIP

Primary Concept Source: K.A Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Brown 1971, Culwell and Scow 1982, Daubenmire 1970, DeVelice et al. 1995, FEIS 1998, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Hansen 1985, Hansen and Hoffman 1986, Hansen and Hoffman 1988, Hansen et al. 1984, Johnson and Simon 1987, Johnston 1987, MTNHP 1988, Mueggler and Stewart 1980, Thilenius et al. 1995, Tisdale 1986, Tweit and Houston 1980

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G272. Central Rocky Mountain Montane-Foothill Deciduous Shrubland

A3967. *Rosa nutkana* Central Rocky Mountain Shrubland Alliance

Type Concept Sentence: Shrublands in this alliance are dominated by *Rosa nutkana* with an herbaceous layer dominated by *Deschampsia cespitosa* or *Oenanthe sarmentosa*. It is found in the mountains of Oregon at montane elevations.

OVERVIEW

Scientific Name: *Rosa nutkana* Central Rocky Mountain Shrubland Alliance

Common Name (Translated Scientific Name): Nootka Rose Central Rocky Mountain Shrubland Alliance

Colloquial Name: Central Rocky Mountain Nootka Rose Shrubland

Type Concept: The vegetation of this Pacific Northwest shrubland alliance is characterized by a *Rosa nutkana*-dominated shrub layer. Common associates are *Cornus sericea* and *Symphoricarpos albus* which may occur with low cover. The moderate to dense herbaceous layer is dominated by mesic perennial graminoids and forbs, including *Deschampsia cespitosa* or *Oenanthe sarmentosa*. Scattered trees may be present with low cover. This small-patch shrubland alliance is found in the mountains of Oregon at montane elevations. It typically occurs in moist sites such as in floodplains, along open streambanks, and in mesic meadows.

Classification Comments: Kept as a single-dominant alliance as it is composed of two S1 and S2 associations in Oregon.

Internal Comments: KAS 2-14: We need to contact ORNHP and get information on these G1 and G2 *Rosa nutkana* shrubland plant associations.

Other Comments:

Similar NVC Types: Stands dominated or codominated by *Rosa nutkana* are placed in two other alliances in two other groups in the NVC. *Rosa nutkana* - *Festuca idahoensis* Grassland (CEGL001626) is placed in *Festuca idahoensis* - *Pseudoroegneria spicata* - *Pascopyrum smithii* Mesic Grassland Alliance (A3988) in Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group (G273). *Symphoricarpos albus* - *Rosa nutkana* Shrubland (CEGL001130) is placed in *Physocarpus malvaceus* - *Symphoricarpos albus* Mesic Shrubland Alliance (A3975) in Central Rocky Mountain Montane-Foothill Deciduous Shrubland Group (G272).

- A3975 *Physocarpus malvaceus* - *Symphoricarpos albus* Mesic Shrubland Alliance

Diagnostic Characteristics: This alliance is characterized by a dominance of diagnostic species *Rosa nutkana* in the shrub layer with an herbaceous layer dominated by *Deschampsia cespitosa* or *Oenanthe sarmentosa*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderate to dense, cold-deciduous, broad-leaved, short-shrub layer (<2 m tall) with a moderately dense to dense herbaceous layer (<1 m tall) that is typically dominated by perennial graminoids.

Floristics: This shrubland alliance is characterized by a moderate to dense shrub layer dominated by *Rosa nutkana*. Common associates are *Cornus sericea* and *Symphoricarpos albus* which may occur with low cover. The moderate to dense herbaceous layer is dominated by mesic perennial graminoids and forbs. High constancy, sometimes dominant species include *Deschampsia cespitosa* or *Oenanthe sarmentosa*. Scattered trees may be present with low cover, such as *Populus tremuloides* and *Populus balsamifera* ssp. *trichocarpa* (= *Populus trichocarpa*) (Reed 1993).

ENVIRONMENT & DYNAMICS

Environmental Description: This Pacific Northwest shrubland alliance is found in the mountains of Oregon at montane elevations. This small-patch alliance typically occurs in moist sites such as in floodplains, along open streambanks, and in mesic meadows (Reed 1993). *Rosa nutkana* grows best at pH ranges of 5.6 to 7.0. It thrives on moderately fertile, well-drained clay loam, sandy loam, or sandy soils (Haeussler et al. 1990, Reed 1993).

Dynamics: *Rosa nutkana* is frequently top-killed by fire and will root-sprout from rhizomes and root crowns following fire and may also regenerate from surviving seed in the seed bank (Haeussler et al. 1990, Reed 1993). However, high-severity fire may kill *Rosa* shrubs when root crowns and rhizomes are shallowly buried (Haeussler et al. 1990, Reed 1993). The species is tolerant of both sun and shade and shows increased growth and fruit production with increasing light (Haeussler et al. 1990, Reed 1993).

DISTRIBUTION

Geographic Range: This shrubland alliance is known from the mountains of Oregon.

Nations: US

States/Provinces: OR

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGLO03457 *Rosa nutkana* / *Oenanthe sarmentosa* Shrubland
- CEGLO03344 *Rosa nutkana* / *Deschampsia cespitosa* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Aller et al. 1981, Faber-Langendoen et al. 2017b, Haeussler et al. 1990, Reed 1993a

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

2.B.2.Na.2.c. M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland

G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland

Type Concept Sentence: This wide-ranging lower montane, foothill and valley grassland group is found in the central Rocky Mountains and extends north onto the Okanagan and Fraser plateaus, the valleys around the Fraser, Nicola, and Similkameen rivers in British Columbia, and foothills in Alberta and is dominated by cool-season perennial bunchgrasses, such as *Festuca campestris*, *Festuca idahoensis*, and *Pseudoroegneria spicata* with diverse forbs (>25% cover) and sometimes a sparse (<10% cover) shrub layer.

OVERVIEW

Scientific Name: *Festuca campestris* - *Festuca idahoensis* - *Pseudoroegneria spicata* Central Rocky Mountain Foothill Grassland Group

Common Name (Translated Scientific Name): Rough Fescue - Idaho Fescue - Bluebunch Wheatgrass Central Rocky Mountain Foothill Grassland Group

Colloquial Name: Kinnikinnick / Fescue - Bluebunch Wheatgrass Steppe

Type Concept: These grasslands of the northern Rocky Mountains are found at lower montane to foothill elevations in the mountains and large valleys of northwestern Wyoming and western Montana, west through Idaho into the Blue Mountains of Oregon, and north into the Okanagan and Fraser plateaus of British Columbia and the Canadian Rockies. They also occur to the east in the central Montana mountain "islands" foothills, as well as the Rocky Mountain Front and Big and Little Belt ranges. They also extend along the eastern slopes of the Alberta Rockies. The most important species are cool-season perennial bunchgrasses and forbs (>25% cover), sometimes with a sparse (<10% cover) shrub layer. *Festuca campestris* and *Festuca idahoensis* are dominants, and *Pseudoroegneria spicata* occurs as a codominant, as well as a diversity of other native grasses. To the north, *Danthonia parryi* becomes codominant. Forb diversity is typically high in both mesic and dry aspects of this group. A soil crust of lichen covers almost all open soil between clumps of grasses; *Cladonia* and *Peltigera* species are the most common lichens. Unvegetated mineral soil is commonly found between clumps of grass and the lichen cover. *Festuca campestris* is easily eliminated by grazing and does not occur in all areas of this group.

This group also includes grasslands commonly known as "Palouse Prairie." These northern lower montane and valley grasslands represent a shift in the precipitation regime from summer monsoons and cold snowy winters found in the Southern Rockies to predominantly dry summers and winter precipitation. The Palouse region is characterized by rolling topography composed of loess hills and plains over basalt plains. The climate of this region has warm-hot, dry summers and cool, wet winters. Annual precipitation is high, 38-76 cm (15-30 inches). The soils are typically deep, well-developed, and old.

Outside of the Palouse Prairie region, these grasslands are influenced by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. In the eastern portion of its range in Montana, winter precipitation is replaced by a huge spring peak in precipitation. Elevations range from 300 to 1650 m, ranging from small meadows to large open parks surrounded by conifers in the lower montane, to extensive foothill and valley grasslands below the lower treeline. Many of these valleys may have been primarily sage-steppe with patches of grassland in the past, but because of land-use history post-settlement (herbicide, grazing, fire suppression, pasturing, etc.), they have been converted to grassland-dominated areas. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline, often with a microphytic crust.

In Alberta, this group occurs along the lower and eastern flanks of the Foothills Geologic Belt, primarily in the Foothills Fescue Grassland and Foothills Parkland Natural subregions. Glaciation and bedrock topography in combination result in a complex physiography from sloping lower foothills to hummocky to rolling uplands, mainly on glacial till, with significant lacustrine materials in valleys. Elevation ranges from 500 to 1525 m. At upper elevations, stands may be small-patch grasslands on southern slopes between *Populus tremuloides* woodlands or *Salix bebbiana* shrublands becoming quite extensive on moister sites at lower elevation. Soils are deep, usually Black Chernozems.

Classification Comments: This is the same as the Interior Plateau Grassland also called "Northern Plateau Grassland" of the Okanagan Ecoregional Plan. In Wyoming, this is distinguished from northwestern Great Plains mixedgrass prairies by the presence of *Festuca idahoensis* or *Carex rossii*, the lack of *Bouteloua gracilis* (which is common in mixedgrass prairie), or the presence of *Artemisia nova* or *Artemisia tripartita ssp. rupicola*, neither of which occur in mixedgrass prairie. This group is also similar to Central Rocky Mountain Montane Grassland Group (G267) in that some of the dominant grasses are shared between the lower and higher elevation grasslands, but the associated forbs shift, as do some of the other graminoid taxa.

Similar NVC Types:

- G267 Central Rocky Mountain Montane Grassland
- G271 Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow
- G331 Northern Great Plains Dry Mixedgrass Prairie
- G332 Northern Great Plains Rough Fescue Prairie
- G141 Northern Great Plains Mesic Mixedgrass Prairie
- G311 Intermountain Semi-Desert Grassland

Diagnostic Characteristics: Herbaceous communities dominated by cool-season bunchgrasses, found in the lower montane and foothill zones of the northern Rocky Mountains and in the inter-montane valleys. These are typically extensive grasslands, not grass-dominated patches within the sagebrush shrub-steppe group. *Festuca campestris*, *Pseudoroegneria spicata*, and *Festuca idahoensis* are the major grasses, although a number of other species occur, including *Hesperostipa comata*, *Achnatherum hymenoides*, *Achnatherum occidentale*, *Achnatherum richardsonii*, *Achnatherum scribneri*, *Danthonia* species, *Elymus lanceolatus*, *Leymus condensatus*, *Leymus cinereus*, *Koeleria macrantha*, *Pascopyrum smithii*, or *Poa secunda*.

VEGETATION

Physiognomy and Structure: Herbaceous communities dominated by cool-season bunchgrasses, generally less than 1 m in height, and often dense in cover. Forb diversity is typically high in both mesic and dry aspects of this group. On slightly more mesic or protected sites (north slopes, toeslopes, swales), scattered or even dense patches of deciduous, broadleaf shrubs can occur (when the patches are large enough they can form associations that are included in one of the shrubland groups). A soil crust of lichen covers almost all open soil between clumps of grasses; *Cladonia* and *Peltigera* species are the most common lichens. Unvegetated mineral soil is commonly found between clumps of grass and the lichen cover.

Floristics: On pristine moist sites, *Festuca campestris* can form a nearly continuous cover and is interspersed with *Festuca idahoensis* and the rhizomatous ecotype of *Pseudoroegneria spicata*. *Danthonia parryi* becomes codominant moving north into the Alberta foothills. Other graminoids include *Achnatherum occidentale*, *Achnatherum richardsonii*, *Danthonia* spp., *Koeleria macrantha*, *Poa secunda*, *Pascopyrum smithii*, *Elymus lanceolatus*, and *Leymus cinereus*. These moister sites support a forb-rich community that includes species such as *Balsamorhiza sagittata*, *Achillea millefolium*, *Lupinus sericeus*, *Geranium viscosissimum*, *Lomatium triternatum*, *Potentilla glandulosa*, *Potentilla gracilis*, *Penstemon confertus*, *Delphinium bicolor*, *Oxytropis* spp., *Gentiana affinis*, *Fragaria virginiana*, and *Castilleja* spp. Endemic rare species such as *Silene spaldingii* inhabit the moister aspects of this group.

On drier sites dominated by *Festuca idahoensis* and the bunchgrass ecotype of *Pseudoroegneria spicata*, common forbs include *Achillea millefolium*, *Gaillardia aristata*, *Galium boreale*, *Geum triflorum*, *Arnica sororia*, *Antennaria microphylla*, *Potentilla gracilis*, *Lupinus argenteus*, *Lupinus sericeus*, *Lomatium macrocarpum*, *Phlox alyssifolia*, *Phlox hoodii*, *Liatri punctata*, *Lithospermum ruderale*, *Eriogonum* spp., *Penstemon eriantherus*, *Solidago missouriensis*, *Oxytropis* spp., *Heuchera* spp., *Pulsatilla patens*, *Opuntia fragilis*, *Artemisia ludoviciana*, *Artemisia frigida*, and *Erigeron* spp. Endemic species in the northwestern Great Plains, such as *Douglasia montana*, *Penstemon nitidus*, and *Penstemon albertinus*, are common in the drier, rocky sites of this group. Other graminoids present within this drier community include *Achnatherum scribneri*, *Achnatherum hymenoides*, *Danthonia intermedia*, *Koeleria macrantha*, *Poa secunda*, *Carex geyeri*, *Carex filifolia*, and *Carex petasata*. On pristine sites, *Selaginella densa* and a soil crust of lichen covers almost all open soil between clumps of grasses. *Cladonia* and *Peltigera* spp. are the most common lichens present. Important exotic grasses include *Phleum pratense*, *Bromus inermis*, and *Poa pratensis*.

Shrub species may be scattered or patchy, including *Dasiphora fruticosa ssp. floribunda*, *Rosa nutkana*, *Rosa woodsii*, *Rosa arkansana*, *Arctostaphylos uva-ursi*, *Symphoricarpos* spp., *Artemisia tridentata*, *Juniperus communis*, and in Wyoming *Artemisia tripartita ssp. rupicola*. Several species of *Eriogonum* are also common. *Amelanchier alnifolia*, *Crataegus douglasii*, and *Prunus virginiana* often occur as patches on north-facing slopes of foothills where snow persists longer into the growing season. *Salix bebbiana* copses form a unique groveland area in Alberta.

ENVIRONMENT & DYNAMICS

Environmental Description: These grasslands of the northern Rocky Mountains are found at lower montane to foothill elevations along the mountain flanks, in the mountains and in large intermountain valleys. This group also includes grasslands commonly known as Palouse Prairie. These northern lower montane and valley grasslands reflect a shift in the precipitation regime from summer monsoons and cold snowy winters found in the Southern Rockies to predominantly dry, cool summers and winter

precipitation. The Palouse region is characterized by rolling topography composed of loess hills and plains over basalt plains. The climate of this region has warm-hot, dry summers and cool, wet winters. Annual precipitation is high, 38-76 cm (15-30 inches). The soils are typically deep, well-developed, and old. Outside of the Palouse Prairie region, these grasslands are influenced by shorter cooler summers, colder winters, and young soils derived from recent glacial and alluvial material. In the eastern portion of its range in Montana, winter precipitation is replaced by a huge spring peak in precipitation. Elevations range from 300 to 1650 m, ranging from small meadows to large open parks surrounded by conifers in the lower montane, to extensive foothill and valley grasslands below the lower treeline.

Climate: These northern lower montane and valley grasslands reflect a shift in the precipitation regime from summer monsoons and cold snowy winters found in the southern Rockies to predominantly dry summers and winter precipitation. In the Palouse region the climate has warm-hot, dry summers and cool, wet winters. Annual precipitation is high, 38-76 cm (15-30 inches). Outside of the Palouse Prairie region, these grasslands are influenced by shorter summers and colder winters. In the eastern portion of its range in Montana, winter precipitation is replaced by a huge spring peak in precipitation. **Soil/substrate/hydrology:** The Palouse region is characterized by rolling topography composed of loess hills and plains over basalt plains. The soils are typically deep, well-developed, and old. Outside of the Palouse Prairie region, these grasslands occur on young soils derived from recent glacial and alluvial material. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline, often with a microphytic crust.

Dynamics: The natural fire regime of this group likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. The fire regime of this group maintains a grassland due to rapid fire return that retards shrub invasion or landscape isolation and fragmentation that limits seed dispersal of native shrub species. Fire frequency is presumed to be less than 20 years. These are extensive grasslands, not grass-dominated patches within the sagebrush shrub steppe group. Shrubs may increase following heavy grazing and/or with fire suppression. Microphytic crust is very important in this group. Summer overgrazing for 2 to 3 years can result in the loss of *Festuca campestris*, which is very grazing sensitive. Long-term heavy grazing on moister sites can result in a shift to a *Poa pratensis* - *Phleum pratense* type. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris*, tolerates dormant-period grazing well but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. Exotic species threatening this group through invasion and potential complete replacement of native species include *Bromus arvensis*, *Potentilla recta*, *Euphorbia esula*, and all manner of knapweed, especially *Centaurea stoebe* ssp. *micranthos*. In the Palouse Prairie, excessive grazing, past land use and invasion by introduced annual species have resulted in a massive conversion to agriculture or shrub-steppe and annual grasslands dominated by *Artemisia* spp. and *Bromus tectorum* or *Poa pratensis*. Remnant grasslands are now typically associated with steep and rocky sites or small and isolated sites within an agricultural landscape.

DISTRIBUTION

Geographic Range: This lower montane, foothill and valley grassland group occurs throughout the southern interior and southern portion of the Fraser Plateau, as well as the valleys around the Fraser River in the Pavilion Ranges, the Nicola River and the Similkameen River in British Columbia. It includes high-elevation grasslands along the eastern mountain slopes down to rolling valleys in Alberta. It also occurs in the mountains and large valleys of northwestern Wyoming and western Montana, east to the central Montana Rocky Mountain Front and mountain "island" ranges, west through Idaho into the Blue Mountains of Oregon, mountains in northeastern California, and central Washington.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, US

States/Provinces: AB, BC, CA, ID, MT, NV?, OR, UT?, WA, WY

TNC Ecoregions [optional]: 4:C, 6:C, 7:C, 8:C, 9:C, 10:P, 26:C, 68:C

USFS Ecoregions (2007): 331A:CC, 331D:CC, 331N:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CP, 342F:CP, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M331A:CP, M331B:CC, M331D:CP, M331J:CP, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CP, M333C:CC, M333D:CP, M341A:C?

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: High. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- > Idaho Fescue - Western Wheatgrass (309) (Shiflet 1994)
- > Rough Fescue - Bluebunch Wheatgrass (311) (Shiflet 1994)

LOWER LEVEL UNITS

Alliances:

- A3985 *Elymus lanceolatus* - *Hesperostipa comata* - *Phacelia hastata* Central Rocky Mountain Sand Deposit Grassland Alliance
- A3987 *Festuca idahoensis* - *Pseudoroegneria spicata* - *Poa secunda* Dry Grassland Alliance
- A3989 *Festuca idahoensis* - *Pseudoroegneria spicata* Palouse Grassland Alliance
- A3988 *Festuca idahoensis* - *Pseudoroegneria spicata* - *Pascopyrum smithii* Mesic Grassland Alliance
- A4095 *Arctostaphylos uva-ursi* / *Festuca* spp. - *Pseudoroegneria spicata* Steppe Alliance
- A3986 *Festuca campestris* - *Festuca idahoensis* Mesic Grassland Alliance
- A4096 *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* - *Festuca idahoensis* Shrub-steppe Alliance

AUTHORSHIP

Primary Concept Source: E.W. Tisdale (1982)

Author of Description: M.S. Reid, L. Allen and K.A. Schulz

Acknowledgments:

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: MSR 3-10, mod. L. Allen 9-13, mod. KAS 11-15

REFERENCES

References: BCCDC unpubl. data, Daubenmire 1988, Ecosystems Working Group 1998, Faber-Langendoen et al. 2017a, Mueggler and Stewart 1980, Natural Regions Committee 2006, Shiflet 1994, Steen and Coupé 1997, Tisdale 1982

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland

A4095. *Arctostaphylos uva-ursi* / *Festuca* spp. - *Pseudoroegneria spicata* Steppe Alliance

Type Concept Sentence: This central Rocky Mountain alliance is characterized by an open to dense, usually patchy dwarf-shrub layer dominated by *Arctostaphylos uva-ursi* with a sparse to moderately dense cover of perennial graminoids dominated by *Festuca campestris*, *Festuca idahoensis*, or *Pseudoroegneria spicata*. It occurs in the subalpine and lower alpine zones mountains of northwestern Montana and southwestern Alberta.

OVERVIEW

Scientific Name: *Arctostaphylos uva-ursi* / *Festuca* spp. - *Pseudoroegneria spicata* Steppe Alliance

Common Name (Translated Scientific Name): Kinnikinnick / Fescue species - Bluebunch Wheatgrass Steppe Alliance

Colloquial Name: Kinnikinnick / Fescue - Bluebunch Wheatgrass Steppe

Type Concept: The vegetation of this central Rocky Mountain alliance is characterized by an open to dense, usually patchy dwarf-shrub layer with sparse to moderately dense cover of perennial graminoids and diverse forb associates. *Arctostaphylos uva-ursi* cover is widely variable (5-75%, averaging 30%) and dominates or codominates the dwarf-shrub layer along with wind-dwarfed *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus communis*, *Juniperus horizontalis*, or *Rosa woodsii* shrubs. *Festuca campestris*, *Festuca idahoensis*, or *Pseudoroegneria spicata* typically dominate or codominate the herbaceous layer with 25-35% cover combined. The forb component is highly diverse, though individual stands are not as diverse. Total forb cover is typically less than graminoids (<20%). The forbs with higher constancy or abundance include *Achillea millefolium*, *Agoseris glauca*, *Anemone multifida*, *Campanula rotundifolia*, *Galium boreale*, *Hedysarum sulphurescens*, and *Lupinus sericeus*. This central Rocky Mountain alliance occurs in the mountains of northwestern Montana and southwestern Alberta. This alliance is a prominent small-patch or linear type found in the subalpine and lower alpine zones and may extend down into the montane zone on exposed ridges. Elevation ranges from 1340 to 2130 m (4400-7000 feet). It occurs predominantly on moderate to steep slopes with southerly exposures, though it has been found on all aspects. Substrates are predominantly limestones and siltstones that have weathered into thin, fine-textured, and well- to excessively drained soils. Adjacent vegetation is usually subalpine or alpine grasslands, or subalpine woodlands or krummholz composed of *Abies lasiocarpa* or *Pinus albicaulis*.

Classification Comments: This alliance is variable and can express itself structurally as a grassland with an open evergreen dwarf-shrub layer dominated by *Arctostaphylos uva-ursi* or an *Arctostaphylos uva-ursi*-dominated dwarf-shrubland. Floristic composition does not vary much except when comparing montane stands to lower alpine stands, which obviously have some alpine species also present. Because of the typically prominent graminoid layer dominated by *Festuca campestris*, *Festuca idahoensis*, or *Pseudoroegneria spicata*, it is placed in this group with other grasslands dominated by *Festuca campestris*, *Festuca idahoensis*, or *Pseudoroegneria spicata*. However, it could also be reasonably placed in Central Rocky Mountain Montane Grassland Group (G267) or Rocky Mountain-Sierran Alpine Dwarf-shrubland & Krummholz Group (G316). The cover values for the diagnostic grasses for this alliance are considerably less than half those reported for the next most closely related association, *Festuca campestris* - *Festuca idahoensis* (Mueggler and Stewart 1980).

Internal Comments: KAS 2-14: I left it in G273 for now, but we may need to revisit.

Other Comments:

Similar NVC Types: The other *Arctostaphylos uva-ursi*-dominated association described from Montana is included in *Dryas integrifolia* - *Dryas octopetala* - *Arctostaphylos uva-ursi* Rocky Mountain Fell-field Dwarf-shrubland Alliance (A3178) in Rocky Mountain-Sierran Alpine Dwarf-shrubland & Krummholz Group (G316).

- A4086 *Arctostaphylos uva-ursi* Cascadian Alpine Dwarf-shrubland Alliance
- A3178 *Dryas integrifolia* - *Dryas octopetala* - *Arctostaphylos uva-ursi* Rocky Mountain Fell-field Dwarf-shrubland Alliance

Diagnostic Characteristics: This alliance is characterized by a sparse to dense dwarf-shrub layer dominated by dominant (and diagnostic) species *Arctostaphylos uva-ursi*. Associated wind-dwarfed shrubs (<0.5 m tall) may include *Amelanchier alnifolia*, *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus horizontalis*, *Juniperus communis*, or *Rosa woodsii*. There is an open to moderately dense perennial graminoid layer dominated by diagnostic bunch grasses *Festuca campestris*, *Festuca idahoensis*, or *Pseudoroegneria spicata*. Associated graminoids include *Calamagrostis purpurascens*, *Carex elynoides*, *Danthonia parryi*, and *Koeleria macrantha*. Associated forb include *Achillea millefolium*, *Agoseris glauca*, *Anemone multifida*, *Campanula rotundifolia*, *Galium boreale*, *Hedysarum sulphurescens*, and *Lupinus sericeus*.

VEGETATION

Physiognomy and Structure: Vegetation is characterized by an open to dense (5-75% cover) evergreen dwarf-shrub layer (<0.5 m tall) and a sparse to moderately dense herbaceous layer dominated by perennial bunch grasses. Forbs are present with sparse to moderate cover.

Floristics: This central Rocky Mountain alliance occurs on wind-battered slopes and is composed of an open to dense, usually patchy dwarf-shrub layer with a sparse to moderately dense cover of perennial graminoids and diverse forb associates. *Arctostaphylos uva-ursi* cover is widely variable (5-75%, averaging 30%) and dominates or codominates the dwarf-shrub layer (<50 cm tall). Other consistently present constituents of this layer are wind-dwarfed *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus horizontalis*, *Juniperus communis*, or *Rosa woodsii* shrubs. Extremely browsed specimens of *Amelanchier alnifolia* are often present. *Arctostaphylos* cover appears to be loosely inversely correlated with cover of the dominant (and diagnostic) grasses. *Festuca campestris*, *Festuca idahoensis*, or *Pseudoroegneria spicata* usually dominate or codominate the herbaceous layer with about 25-35% cover combined. Other graminoids frequently present are *Carex obtusata*, *Danthonia parryi* (mesic stands), *Koeleria macrantha*, and at high-elevation sites *Calamagrostis purpurascens* and *Carex elynoides*. The forb component is highly diverse, though individual stands are not as diverse. Total forb cover is typically less than graminoids (<20%). The forbs with higher constancy or abundance include *Achillea millefolium*, *Agoseris glauca*, *Anemone multifida*, *Campanula rotundifolia*, *Galium boreale*, *Hedysarum sulphurescens*, and *Lupinus sericeus*. Other forbs present in at least half the stands include *Allium cernuum*, *Erigeron caespitosus*, *Fragaria virginiana*, *Gaillardia aristata*, *Oxytropis sericea*, *Packera cana* (= *Senecio canus*), *Penstemon confertus*, *Sedum lanceolatum*, and *Zigadenus elegans*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs in the central Rocky Mountains and is well-documented from Glacier-Waterton International Peace Park. It is a prominent small-patch or linear type found in the subalpine and lower alpine zones and may extend down into the montane zone on exposed ridges. Elevation ranges from 1340 to 2130 m (4400-7000 feet). It occurs predominantly on moderate to steep slopes with southerly exposures, though it has been found on all aspects. Whether it occurs on lower or upper slopes, flat or convex topography, it is associated with positions that can be inferred to be wind-battered. It has been recorded exclusively from sedimentary substrates, predominantly limestones and siltstones. These have weathered into thin, fine-textured, and well- to excessively drained soils whose water regime is characterized as predominantly subxeric, ranging from xeric to submesic.

Dynamics: Increased grazing pressure leads to a decline in *Pseudoroegneria* and associated *Festuca* spp. and allows low-growing forbs and *Carex* spp. to increase.

DISTRIBUTION

Geographic Range: This central Rocky Mountain alliance occurs in mountains of northwestern Montana and southwestern Alberta and is well-documented from Glacier-Waterton International Peace Park.

Nations: CA, US

States/Provinces: AB, MT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Arctostaphylos uva-ursi* / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland (Reid et al. 2004)
- > *Arctostaphylos uva-ursi* / *Pseudoroegneria spicata* Dwarf-shrubland (Reid et al. 2004)
- > *Festuca scabrella* - *Arctostaphylos uva-ursi* Vegetation Type (Willoughby 2001)
- > *Festuca scabrella* - *Arctostaphylos uva-ursi* Vegetation Type (Achuff et al. 2002)
- > *Festuca scabrella* - *Carex obtusata* / *Arctostaphylos uva-ursi* Community Type (Willoughby et al. 2001)
- > *Solidagini multiradiatae* - *Arctostaphyletum uva-ursi* plant association (Damm 2001)

LOWER LEVEL UNITS**Associations:**

- CEG005831 *Arctostaphylos uva-ursi* / *Pseudoroegneria spicata* Dwarf-shrubland
- CEG005830 *Arctostaphylos uva-ursi* / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid, S.V. Cooper, and G. Kittel (2004)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M.S. Reid.

Version Date: 2014/03/14

REFERENCES

References: Achuff et al. 2002, Damm 2001, Faber-Langendoen et al. 2017b, Hop et al. 2007, Reid et al. 2004, Willoughby 2001, Willoughby et al. 2001

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland

A4096. *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* - *Festuca idahoensis* Shrub-steppe Alliance

Type Concept Sentence: This small-patch alliance is characterized by an open to moderately dense short-shrub layer dominated by diagnostic species *Dasiphora fruticosa* ssp. *floribunda* and a moderate to dense herbaceous layer dominated by medium-tall perennial bunchgrasses *Festuca campestris* and *Festuca idahoensis*. It occurs infrequently in the central Rocky Mountains and the northwestern Great Plains.

OVERVIEW

Scientific Name: *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* - *Festuca idahoensis* Shrub-steppe Alliance

Common Name (Translated Scientific Name): Shrubby-cinquefoil / Prairie Fescue - Idaho Fescue Shrub-steppe Alliance

Colloquial Name: Shrubby-cinquefoil / Fescue Shrub-steppe

Type Concept: Vegetation is characterized by an open to moderately dense short-shrub layer (10-45% cover) and a moderate to dense (40-100% cover) herbaceous layer with very high species diversity. The shrub layer is dominated by diagnostic species *Dasiphora fruticosa* ssp. *floribunda*. A moderate to dense (40-100% cover) graminoid layer is dominated by medium-tall perennial bunchgrasses *Festuca campestris* and *Festuca idahoensis*. Associated graminoids include *Agrostis scabra*, *Bouteloua gracilis*, *Carex geyeri*, *Carex obtusata*, *Danthonia intermedia*, *Danthonia parryi*, *Koeleria macrantha*, *Pseudoroegneria spicata*, and *Schizachyrium scoparium*. Forb species are typically diverse and include species common in both the foothill and montane zones and northwestern Great Plains. This small-patch alliance occurs infrequently in the central Rocky Mountains and the northwestern Great Plains. Stands occur between 1360-2600 m elevation. It usually occurs on level and gently sloping or rolling topography to steep slopes of all aspects. Soils are loamy and moderately deep derived from a variety of parent materials, including sedimentary rocks and granitics.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types: This alliance is similar to other *Festuca campestris*- and *Festuca idahoensis*-dominated alliances in this group, but has a diagnostic short-shrub layer dominated by *Dasiphora fruticosa* ssp. *floribunda*.

- A0958 *Dasiphora fruticosa* ssp. *floribunda* Wet Shrubland Alliance: occurs in wet meadow and wetland sites is classified in Vancouverian-Rocky Mountain Subalpine Snowbed, Wet Meadow & Dwarf-shrubland Group (G520).
- A3175 *Ribes cereum* - *Ribes montigenum* - *Dasiphora fruticosa* ssp. *floribunda* Alpine Shrubland Alliance

Diagnostic Characteristics: The shrub layer is dominated by diagnostic species *Dasiphora fruticosa* ssp. *floribunda* which characterizes this alliance when there is a moderate to dense (40-100% cover) herbaceous layer dominated by medium-tall perennial bunch grasses *Festuca campestris* and *Festuca idahoensis*. Associated graminoids include *Agrostis scabra*, *Bouteloua gracilis*, *Carex geyeri*, *Carex obtusata*, *Danthonia intermedia*, *Danthonia parryi*, *Koeleria macrantha*, *Muhlenbergia cuspidata*, *Pseudoroegneria spicata*, and *Schizachyrium scoparium*. Associate forb species are diverse. The introduced grass *Phleum pratense* and *Poa pratensis* may be abundant, especially in mesic lowland areas.

VEGETATION

Physiognomy and Structure: Stands within this alliance have an open to moderately dense (10-45% cover) cold-deciduous short-shrub layer (0.5-1 m tall) and a moderate to dense (40-100% cover) herbaceous layer (0.5-1 m tall). The herbaceous layer is dominated by medium-tall, perennial bunch grasses. Other graminoids and perennial broad-leaved forbs are present to codominant.

Floristics: This alliance is characterized by an open to moderately dense short-shrub layer (10-45% cover) and a moderate to dense (40-100% cover) herbaceous layer with very high species diversity. The shrub layer has 5-30% canopy cover of diagnostic species *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*) and may have up to 20% cover of *Artemisia cana* in alluvial bench stands. Other shrubs may be present with low cover and include *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Artemisia frigida*, *Gutierrezia sarothrae*, *Juniperus horizontalis*, *Mahonia repens*, *Penstemon fruticosus*, and *Rosa woodsii*. At lower elevations, stands have 90-100% herbaceous cover, while higher elevation stands have 40-70% total herbaceous cover. The herbaceous layer is dominated by medium-tall perennial graminoids. Forb species are typically diverse and include species common in both montane zones and the northwestern Great Plains. The dominant and diagnostic graminoid species are bunchgrasses *Festuca campestris* and *Festuca idahoensis*. Associated graminoids include *Agrostis scabra*, *Bouteloua gracilis*, *Carex geyeri*, *Carex obtusata*, *Danthonia intermedia*, *Danthonia parryi*, *Koeleria macrantha*, *Muhlenbergia cuspidata*, *Pseudoroegneria spicata*, and *Schizachyrium scoparium*. Forb species are diverse, with *Achillea millefolium*, *Agoseris glauca*, *Arenaria congesta*, *Besseyia wyomingensis*, *Campanula rotundifolia*, *Fragaria virginiana*, *Gaillardia aristata*, *Galium boreale*, *Geum triflorum*, *Hedysarum sulphurescens*, *Heuchera cylindrica*, *Lupinus sericeus*, *Penstemon confertus*, *Potentilla gracilis*, and *Pulsatilla patens* ssp. *multifida* being the most consistent. The introduced grass *Phleum pratense* and *Poa pratensis* may be abundant, especially in mesic lowland areas.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs infrequently in the central Rocky Mountains and the northwestern Great Plains where it is found on gently sloping or rolling topography to steep slopes (1-45%) at elevations from 1360-2600 m. Stands tend to occur on south-facing low and midslopes but can occur on all aspects, and on basin floors. They have been described from relatively mesic, gentle upland slopes with moderately deep soils derived from granitic parent materials in northwestern Montana, and on gently sloping to undulating alluvial benches along drainages in the mesic transition zone between riparian and dry upland areas in Wyoming and Idaho. However, these soils are deeper and derived from glacio-fluvial deposits of limestone, siltstone, sandstone or shale parent materials. Soil textures are sandy loam, loam or silty clay loam. Soils are moderately deep, moderately to well-drained with 25- to 46-cm (10- to 18-inch) rooting depth. Surface rock can be abundant, but little bare ground is exposed. Argillite and limestone rock and gravel are common in the soil profile. Litter may dominate the ground surface, ranging between 6-45%. Small rock, bare soil, and moss are consistently common in most occurrences.

Dynamics: *Dasiphora fruticosa* ssp. *floribunda* will increase in abundance with heavy grazing, and *Festuca campestris*, *Festuca idahoensis*, and *Pseudoroegneria spicata* will decrease.

DISTRIBUTION

Geographic Range: This alliance is found in the central Rocky Mountains and northwestern Great Plains from northern Wyoming and southern Idaho north into southwestern Alberta, and east into western North Dakota and southern Saskatchewan.

Nations: CA, US

States/Provinces: AB, ID, MT, ND, NV, SK, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Dasiphora fruticosa* ssp. *floribunda* Shrub Herbaceous Alliance (A.1534) (Hop et al. 2007)
- > *Dasiphora fruticosa* ssp. *floribunda* Shrub Herbaceous Alliance (A.1534) (Reid et al. 2004)

LOWER LEVEL UNITS

Associations:

- CEG001502 *Dasiphora fruticosa* ssp. *floribunda* / *Festuca idahoensis* Shrub Grassland
- CEG001503 *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* Shrub Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2014)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M.S. Reid and G. Kittel.

Version Date: 2014/03/14

REFERENCES

References: Bourgeron and Engelking 1994, Faber-Langendoen et al. 2017b, Hirsch 1985, Hop et al. 2007, Mattson 1984, Mueggler and Stewart 1980, Reid et al. 2004, Thompson and Knijt 1976, Tweit and Houston 1980, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland

A3985. *Elymus lanceolatus* - *Hesperostipa comata* - *Phacelia hastata* Central Rocky Mountain Sand Deposit Grassland Alliance

Type Concept Sentence: This alliance is characterized by a sparse to moderately dense herbaceous layer dominated by the medium-tall perennial graminoid *Elymus lanceolatus* with *Hesperostipa comata* or *Phacelia hastata* present to codominant and occurs in the Centennial Valley Sandhills in southwestern Montana, a high and cold valley on open, sandy flats in the Columbia River plains.

OVERVIEW

Scientific Name: *Elymus lanceolatus* - *Hesperostipa comata* - *Phacelia hastata* Central Rocky Mountain Sand Deposit Grassland Alliance

Common Name (Translated Scientific Name): Streambank Wheatgrass - Needle-and-Thread - Silverleaf Scorpionweed Central Rocky Mountain Sand Deposit Grassland Alliance

Colloquial Name: Central Rocky Mountain Sand Deposit Grassland

Type Concept: The vegetation of this grassland alliance is characterized by a sparse to moderately dense herbaceous layer dominated by the medium-tall perennial graminoid *Elymus lanceolatus* with *Hesperostipa comata* or *Phacelia hastata* present to codominant. *Elymus lanceolatus* binds the loose sand providing 5-25% cover. Other associated species include shrubs such as *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Tetradymia canescens*, grasses *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Poa secunda*, and forbs *Astragalus sclerocarpus*, *Eriogonum ovalifolium* var. *purpureum*, *Linum perenne*, *Oenothera pallida*, *Phlox longifolia*, and *Psoralea tenuiflora* (= *Psoralea tenuiflora*). Non-native species include *Bromus tectorum*, *Centaurea diffusa*, *Sisymbrium altissimum*, and *Salsola kali*. This alliance occurs in the Centennial Valley Sandhills in southwestern Montana and sandy plains along the Columbia River. Stands found in a high and cold Centennial Valley are at 2000-2135 m elevation and occur in a mosaic with active sand dunes and dune shrublands with occurrences less than one acre in size. Along the Columbia River, stands range from 300-765 m elevation. Sites are level to moderately sloping sandy plains and low dunes. Soils are deep loess or sand. Disturbance is important to the maintenance of these seral communities, and it is associated with recent blowouts.

Classification Comments:

Internal Comments: GK 9-16: ID added for Minidoka. KAS 2-14: Based on association information, Utah and Wyoming were added to the distribution range. The Utah stands might better fit into Southern Rocky Mountain Montane-Subalpine Grassland Group (G268). Information on those stands needs to be included in description of this alliance.

Other Comments:

Similar NVC Types: There are two other *Elymus lanceolatus*-dominated associations in the NVC. One is included in *Hesperostipa curtisetata* - *Elymus lanceolatus* Grassland Alliance (A4029), which is placed in Northern Great Plains Dry Mixedgrass Prairie Group (G331) and the other is in *Festuca arizonica* - *Muhlenbergia montana* - *Poa fendleriana* Southern Rocky Mountain Montane Grassland Alliance (A3953) in Southern Rocky Mountain Montane-Subalpine Grassland Group (G268).

Diagnostic Characteristics: This sand deposit grassland alliance is characterized by a sparse to moderately dense herbaceous layer dominated by the medium-tall diagnostic perennial graminoid *Elymus lanceolatus* often with *Hesperostipa comata* or *Phacelia hastata* present to codominant. Associated species include shrubs such as *Ericameria nauseosa*, *Tetradymia canescens*, grasses

Achnatherum hymenoides, *Poa secunda*, and forbs *Astragalus sclerocarpus*, *Eriogonum ovalifolium* var. *purpureum*, *Linum perenne*, *Oenothera pallida*, *Phlox longifolia*, and *Psoralea tenuiflora*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a sparse to moderately dense herbaceous layer dominated by medium-tall perennial grasses with perennial forbs. Scattered evergreen and deciduous shrubs may be present. Annual forbs and grasses are common in some stands.

Floristics: These sparse grasslands have been described from the Columbia River plains and the sandhills in the Centennial Valley in southwestern Montana. The cool-season perennial grass *Elymus lanceolatus* is usually the dominant species. It is a rhizomatous perennial grass that binds the loose sand providing 5-25% cover or higher. The bunchgrass *Hesperostipa comata* (= *Stipa comata*) and the perennial forb *Phacelia hastata* are codominant in some stands. Other species that may be present with sparse cover include grasses, such as *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Poa secunda*, and forbs such as *Achillea millefolium*, *Astragalus sclerocarpus*, *Eriogonum ovalifolium*, *Linum perenne*, *Oenothera pallida*, *Phlox longifolia*, and *Psoralea tenuiflora* (= *Psoralea tenuiflora*). Very scattered patches of 1- to 2-m tall shrubs occasionally occur, including evergreen and deciduous species such as *Artemisia tridentata*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Purshia tridentata*, and *Tetradymia canescens*. Non-native species are common especially in the Columbia Basin stands and include *Bromus tectorum*, *Centaurea diffusa*, *Salsola kali*, and *Sisymbrium altissimum*. Diagnostic of this alliance is the dominance of *Elymus lanceolatus* with *Hesperostipa comata* and *Phacelia hastata* in the herbaceous layer.

ENVIRONMENT & DYNAMICS

Environmental Description: This vegetation occurs as an open, sandy grassland on flat Columbia River plains and in the Centennial Valley Sandhills, a high and cold valley in southwestern Montana. The climate is semi-arid, with average annual precipitation varying across this region from 20-40 cm. Summers are typically hot and dry. Winters are moderately cold, with most precipitation falling during October through May. Stands along the Columbia River occur from 300-765 m elevations on topography composed of very low (0.5 m) dunes. Open sand comprises almost 50-90% of the cover. Sites are flat to gentle slopes with dry, deep loess or sandy soils. It often is found in a patchwork with sand dunes and dune shrublands. In southwestern Montana, elevations range from approximately 2050-2500 m. Stands are patchily distributed in the sandhills area with occurrences less than one acre in size. Sites are level to moderately sloping sandy plains and dunes. Disturbance is important to the maintenance of these seral communities, and it is associated with recent blowouts. Adjacent vegetation includes shrublands dominated by *Artemisia tridentata* and *Artemisia tripartita*.

Dynamics: This seral vegetation is scattered across open sandy areas where disturbance has created habitat for the strongly rhizomatous *Elymus lanceolatus* ssp. *lanceolatus* to colonize the open sandy area and stabilize the sand, providing 10-15% cover. In stands in Montana, regular fires, grazing and small mammal digging initiate the blowouts that provide the disturbance that maintains this vegetation and the habitat for a number of sensitive species. Were one to suppress fire and remove cattle over this landscape, succession would lead to stable *Artemisia tridentata* ssp. *vaseyana*- and *Artemisia tripartita*-dominated communities and the probable loss of the sensitive species.

DISTRIBUTION

Geographic Range: This alliance occurs in the Centennial Valley Sandhills in southwestern Montana, a high and cold valley and on open, sandy flats in the Columbia River and Snake River plains in Oregon, Washington and Idaho. It is also reported from Utah and Wyoming.

Nations: US

States/Provinces: ID, MT, OR, UT?, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Elymus lanceolatus* Herbaceous Alliance (Bourgeron and Engelking 1994)

LOWER LEVEL UNITS

Associations:

- CEG001746 *Elymus lanceolatus* - *Hesperostipa comata* Grassland
- CEG005595 *Elymus lanceolatus* - *Lupinus argenteus* Grassland

- CEGLO01745 *Elymus lanceolatus* - *Phacelia hastata* Grassland

AUTHORSHIP

Primary Concept Source: P.S. Bourgeron and L.D. Engelking (1994)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2016/09/29

REFERENCES

References: Bourgeron and Engelking 1994, Cooper et al. 1995, Cooper et al. 1999, Copeland 1978, DeVelice 1992, Faber-Langendoen et al. 2017b, Kagan 1987c, Mayfield and Kjelson 1984, Reid et al. 1994

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland

A3986. *Festuca campestris* - *Festuca idahoensis* Mesic Grassland Alliance

Type Concept Sentence: Vegetation of this mesic grassland alliance is characterized by herbaceous cover ranging from 60-100% codominated by diagnostic perennial bunchgrasses *Festuca campestris* and *Festuca idahoensis*. It occurs in the northwestern Great Plains west into the central Rocky Mountains, including the Blue Mountains of eastern Oregon and Washington. Some stands may extend up to montane and subalpine elevations.

OVERVIEW

Scientific Name: *Festuca campestris* - *Festuca idahoensis* Mesic Grassland Alliance

Common Name (Translated Scientific Name): Rough Fescue - Idaho Fescue Mesic Grassland Alliance

Colloquial Name: Rough Fescue - Idaho Fescue Mesic Grassland

Type Concept: Vegetation of this mesic grassland alliance is characterized by herbaceous cover ranging from 60-100% dominated by diagnostic perennial bunchgrasses *Festuca campestris* with *Festuca idahoensis* often codominant. *Achnatherum richardsonii* (= *Stipa richardsonii*), *Carex obtusata*, or *Geranium viscosissimum* may also codominate the herbaceous layer. Occasional shrubs can be present, are generally low in stature (<0.5 m) and cover (<10% total) and include *Artemisia frigida*, *Artemisia tridentata* ssp. *vaseyana*, *Gutierrezia sarothrae*, *Juniperus communis*, *Juniperus horizontalis*, *Rosa arkansana*, *Rosa woodsii*, and *Symphoricarpos albus*. *Arctostaphylos uva-ursi* or *Dasiphora fruticosa* ssp. *floribunda* are typically absent or have low cover (<5%). Other abundant graminoid species include *Carex filifolia*, *Danthonia intermedia*, and *Koeleria macrantha*, with *Bouteloua gracilis*, *Muhlenbergia cuspidata*, and *Hesperostipa comata* being more common on prairie sites. Forb species typically present include *Achillea millefolium*, *Agoseris glauca*, *Antennaria rosea*, *Eriogonum umbellatum*, *Galium boreale*, *Geum triflorum*, *Hedysarum sulphurescens*, *Heterotheca villosa*, *Liatris punctata*, *Lupinus sericeus*, *Oxytropis sericea*, *Packera cana* (= *Senecio canus*), *Penstemon confertus*, *Sedum lanceolatum*, and *Zigadenus elegans*. This alliance occurs in the northwestern Great Plains west into the central Rocky Mountains, including the Blue Mountains of eastern Oregon and Washington. Stands occur in glaciated landscapes, on prairies, foothills and mountain slopes. Elevations range from 500-2100 m, but are found only below 1500 m in Canada. Some stands may extend up to montane and subalpine elevations. It occurs on mesic sites on any aspect, becoming restricted to west- and southwest-facing slopes farther north. Slopes vary from flat to gentle toeslopes and lowslopes, generally less than 30%. Soils are loamy and moderately deep on a variety of soil parent materials.

Classification Comments: *Festuca campestris* is generally recognized as part of the *Festuca scabrella* complex which includes two other species, *Festuca altaica* and *Festuca hallii* (Aiken and Darbyshire 1996, Aiken et al. 1996). *Festuca campestris* is thought to occur as far east as the western edge of the Great Plains. The other two species occur in the northern Great Plains of Saskatchewan and Manitoba, Canada, and likely North Dakota. The range of *Festuca altaica* extends north to Alaska. Further investigation is needed to confirm the distribution of the species in the *Festuca altaica* complex.

Tisdale (1947) described an "Upper Grassland" from British Columbia, Canada, that closely resembles *Festuca campestris* - *Pseudoroegneria spicata* Grassland (CEGL001629). Looman (1969) reported *Festuca altaica* grasslands occurring across southwestern Canada from British Columbia to western Manitoba. Although it is likely stands in eastern Saskatchewan and Manitoba are dominated by *Festuca hallii*, the stands in British Columbia, Alberta and western Saskatchewan may be dominated by *Festuca campestris*.

Internal Comments: KAS 2-14: With *Arctostaphylos uva-ursi* / *Festuca* spp. - *Pseudoroegneria spicata* Dwarf-shrub Herbaceous Alliance (A3989) being defined broadly to include 5% or more cover of *Arctostaphylos uva-ursi*.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: This mesic grassland alliance is characterized by herbaceous cover ranging from 60-100% codominated by diagnostic perennial bunch grasses *Festuca campestris* and *Festuca idahoensis*. *Achnatherum richardsonii*, *Carex obtusata*, or *Geranium viscosissimum* may codominant. Other graminoid associates include *Carex filifolia*, *Danthonia intermedia*, and *Koeleria macrantha*. Forb species typically present include *Achillea millefolium*, *Agoseris glauca*, *Anemone multifida*, *Antennaria parvifolia*, *Antennaria rosea*, *Campanula rotundifolia*, *Eriogonum umbellatum*, *Galium boreale*, *Geum triflorum*, *Hedysarum sulphurescens*, *Lomatium triternatum*, *Lupinus sericeus*, *Oxytropis sericea*, *Packera cana*, *Penstemon confertus*, *Sedum lanceolatum*, and *Zigadenus elegans*. Scattered shrubs such as *Artemisia frigida*, *Artemisia tridentata* ssp. *vaseyana*, *Artemisia frigida*, *Gutierrezia sarothrae*, *Juniperus communis*, *Juniperus horizontalis*, *Rosa acicularis*, *Rosa arkansana*, *Rosa woodsii*, and *Symphoricarpos albus* may be present with low cover (<10% total). If *Arctostaphylos uva-ursi* is present, then cover is <5%.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by a moderate to dense cover of graminoids that is dominated by perennial bunch grasses. There is also sparse to moderate cover of perennial forbs. Annual forbs and grasses are seasonally present.

Floristics: Stands have a moderate to dense graminoid layer of cool-season, medium-tall bunchgrasses that is dominated by *Festuca campestris* sometimes with culms that may be taller than 75 cm. Codominants may include *Achnatherum richardsonii*, *Festuca idahoensis* or *Geranium viscosissimum*. *Carex obtusata* may be common, especially on more mesic sites. *Festuca campestris* is usually less abundant on disturbed sites. The forb layer is sparse to moderately dense, often with relatively high species diversity. Scattered woody species may also be present. Annuals are typically sparse. Overall species composition varies with geography with stands east of the Continental Divide resembling Northern Mixed Prairie and stands west of the divide floristically related to the Intermountain Basin. The east side stands may lack *Festuca idahoensis*, but often include grasses *Bouteloua gracilis*, *Hesperostipa comata* (= *Stipa comata*), *Muhlenbergia cuspidata*; forbs *Artemisia ludoviciana*, *Heterotheca villosa*, *Liatris punctata*, *Lomatium triternatum*; and the dwarf-shrubs *Artemisia frigida* and *Gutierrezia sarothrae*. West of the divide, forbs *Balsamorhiza sagittata*, *Besseyia wyomingensis*, *Castilleja lutescens*, and *Lomatium triternatum* are more common. Other rangewide associate species include graminoids *Achnatherum nelsonii*, *Achnatherum occidentale* (= *Stipa occidentalis*), *Carex filifolia*, *Calamagrostis rubescens*, *Carex petasata*, *Danthonia intermedia*, *Koeleria macrantha*, *Poa secunda*, and *Pseudoroegneria spicata*, and forbs *Achillea millefolium*, *Antennaria rosea*, *Castilleja rhexiifolia*, *Eriogonum umbellatum*, *Galium boreale*, *Geum triflorum*, *Lupinus sericeus*, *Penstemon confertus*, *Potentilla gracilis*, *Potentilla glandulosa*, and *Selaginella densa*. Total shrub cover is usually less than 10%. Shrub species that may be present include *Amelanchier alnifolia*, *Artemisia campestris*, *Artemisia frigida*, *Rosa arkansana*, and *Symphoricarpos albus*. If *Arctostaphylos uva-ursi* is present, then cover is <5%.

ENVIRONMENT & DYNAMICS

Environmental Description: This mesic grassland alliance occurs in the northwestern Great Plains west into the central Rocky Mountains, including the Blue Mountains of eastern Oregon and Washington. Elevations range from 500-2100 m, but are found only below 1500 m in Canada. Climate is temperate, and mean annual precipitation ranges from 40-60 cm. Winters are cold and snowy. Summers are cool. Stands occur in glaciated landscapes, on prairies, foothills and mountain slopes. Sites are mesic, mostly flat to gentle toeslopes and lowslopes on any aspect, but may include steep slopes. In the northern extent it is restricted to warmer west- and southwest-facing slopes. Soils are loamy and moderately deep on a variety of soil parent materials (Mueggler and Stewart 1980). In Glacier National Park, soils are moderately well-drained sandy loams, silt loams or sandy clay loams with neutral pH. Parent material is coarse quartzite and argillite developed on morainal and glacio-fluvial landforms. Litter dominates the ground surface. Bare soil ranges from 5 to 70% cover, and rock and litter is generally less than 40% combined cover. Higher elevation grasslands typically occur in a mosaic with montane forests dominated by *Pinus contorta*.

Dynamics: *Festuca campestris* is highly palatable throughout the grazing season. Summer overgrazing for 2-3 years can result in the loss of *Festuca campestris* in the stand (Hodgkinson and Young 1973). Although a light stocking rate for 32 years did not affect range condition, a modest increase in stocking rate led to a marked decline in range condition. The major change was a measurable reduction in basal area of *Festuca campestris* (Willms et al. 1985). Long-term heavy grazing on moister sites can result in a shift to a Kentucky bluegrass - timothy type (Willoughby 1997). Willms and Fraser (1992) found *Festuca campestris* to be highly susceptible to grazing during the growing season, and conclude that optimum management would include dormant-season grazing. Mueggler and Stewart (1980) also suggest that *Festuca campestris* is least susceptible to grazing damage in fall and winter. Primary increasers include *Artemisia frigida*, *Antennaria rosea*, *Cerastium arvense*, and *Heterotheca villosa*. *Festuca campestris* and *Festuca idahoensis* decrease in cover and vigor with grazing (Mueggler and Stewart 1980).

Festuca campestris is well-adapted to periodic burning. Burn intervals of 5-10 years have been recommended for *Festuca* maintenance. Two to three years are needed to recover from a burn, so short fire-return intervals impede *Festuca* re-establishment. Longer intervals result in excessive litter build-up that causes high tussock mortality. Growing-season burns reduce plant vigor and recovery takes longer. Floral development is initiated in the fall, so spring burning can result in a reduction in seed production (FEIS 1998). *Festuca idahoensis* is also highly palatable in most seasons, but can withstand occasional heavy grazing. It is "a fire-sensitive

species that can be severely damaged by summer and fall fires," and may take many years to recover its pre-fire cover (FEIS 1998). The size of clumps affects fire sensitivity, with smaller ones being less sensitive due to lower fuel build-up. Late summer (August) burns cause more damage than fall (September) burns (FEIS 1998). *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris* (Mueggler and Stewart 1980). It tolerates dormant-period grazing well, but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. Plants usually survive fire, but regrowth may be variable. It is particularly sensitive to defoliation in late spring (FEIS 1998).

DISTRIBUTION

Geographic Range: This mesic grassland alliance occurs in the northwestern Great Plains and montane and foothill slopes in the central Rocky Mountains, including Montana, western Saskatchewan and southern Alberta, southwest to the Blue Mountains of eastern Oregon and Washington. A disjunct occurrence is reported for the Steens Mountains in southeastern Oregon. The alliance likely occurs in British Columbia, but has not yet been described from there.

Nations: CA, US

States/Provinces: AB, BC?, ID, MT, OR, SK, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Festuca campestris* Herbaceous Alliance (Bourgeron and Engelking 1994)
- > *Festuca idahoensis* Series (Tisdale 1986)
- ? *Festuca idahoensis* Series (Johnston 1987) [includes thirteen *Festuca idahoensis*-dominated plant associations.]
- > Fescue Grassland (Coupland 1952)
- > Fescue Prairie (Coupland 1992b)
- ? Upper Grassland (Tisdale 1947)

LOWER LEVEL UNITS

Associations:

- C EGL001629 *Festuca campestris* - *Pseudoroegneria spicata* Grassland
- C EGL005875 *Festuca campestris* - *Festuca idahoensis* Grassland
- C EGL001627 *Festuca campestris* Grassland
- C EGL005870 *Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Grassland
- C EGL005869 *Festuca campestris* - (*Festuca idahoensis*) - *Achnatherum richardsonii* Grassland

AUTHORSHIP

Primary Concept Source: P.S. Bourgeron and L.D. Engelking (1994)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by J. Drake.

Version Date: 2014/03/14

REFERENCES

References: Aiken and Darbyshire 1990, Aiken et al. 1996, Bamberg and Major 1968, Bourgeron and Engelking 1994, Caicco 1983, Chappell et al. 1997, Comer et al. 1999, Cooper and Lesica 1992, Cooper et al. 1995, Cooper et al. 1997, Coupland 1952, Coupland 1992b, Crawford et al. 1994, Daubenmire 1970, Daubenmire 1992, DeVelice and Lesica 1993, Evans et al. 1984, FEIS 1998, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Harrington 1978, Hess 1981, Hess and Wasser 1982, Hodgkinson and Young 1973, Hop et al. 2007, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Johnson and Simon 1987, Johnston 1987, Lang 1961, Looman 1969, Macdonald 1989, Magee 1985, McLean 1970, Mueggler and Stewart 1980, Paulsen 1969, Pfister et al. 1977, Poulton 1955, Reid et al. 1994, Reid et al. 2004, Tisdale 1947, Tisdale 1982, Tisdale 1986, Tisdale and Bramble-Brodahl 1983, Tisdale and McLean 1957, Turner and Dortignac 1954, WNHP unpubl. data, Willms and Fraser 1992, Willms et al. 1985, Willoughby 1997

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland

A3988. Festuca idahoensis - Pseudoroegneria spicata - Pascopyrum smithii Mesic Grassland Alliance

Type Concept Sentence: This mesic grassland association is characterized by an open to moderately dense herbaceous layer dominated by diagnostic perennial grass *Festuca idahoensis* or *Pseudoroegneria spicata* with mesic-site indicator species *Bromus marginatus*, *Elymus lanceolatus*, *Koeleria macrantha*, or *Pascopyrum smithii* and is found primarily east of the Continental Divide in foothills in northwestern Montana.

OVERVIEW

Scientific Name: *Festuca idahoensis* - *Pseudoroegneria spicata* - *Pascopyrum smithii* Mesic Grassland Alliance

Common Name (Translated Scientific Name): Idaho Fescue - Bluebunch Wheatgrass - Western Wheatgrass Mesic Grassland Alliance

Colloquial Name: Idaho Fescue - Wheatgrass Mesic Grassland

Type Concept: This alliance is composed of mesic to subhygric, diverse grasslands characterized by a lush meadow dominated by diagnostic perennial grasses *Festuca idahoensis* and/or *Pseudoroegneria spicata*. Mesic indicator species *Bromus marginatus*, *Elymus lanceolatus*, *Koeleria macrantha*, or *Pascopyrum smithii* are present to codominant in the graminoid layer. The short shrubs *Symphoricarpos albus*, *Rosa nutkana*, or *Rosa woodsii* are frequently present and may form an open layer or scattered clumps, usually with less than a quarter of the bunchgrass cover. *Artemisia frigida* is common in eastern stands. Other grass associates include *Poa cusickii* and *Poa secunda* (= *Poa sandbergii*). The forb component has high species diversity and less cover than graminoids. Non-native grasses *Bromus briziformis*, *Phleum pratense*, and *Poa palustris* are important in some stands. The biological crust is very well-developed on undisturbed sites. This alliance found in the central Rocky Mountains from the Palouse region and Blue Mountains to the foothills east of the Continental Divide in northwestern and Montana and Alberta. Stands occur on gentle to steep slopes at 370 to 2015 m elevation from sites on the dissected basalt plateaus, canyon and mountain slopes of the lower Snake River drainage and on the eastern flanks of the Blue Mountains on relatively deep loessal soils that overlay basalt rock or colluvium. Stands range northeast to east of the Continental Divide on gentle slopes at elevations from 1200-1800 m, but may be found up to 2400 m on moderately deep, moderately well-drained, coarse-textured soils. Litter and small rock dominate the ground surface. Stands typically occur where moisture is available well into summer drought because of cool aspect or subsurface seepage.

Classification Comments: These three relatively mesic *Festuca idahoensis*- and *Pseudoroegneria spicata*-dominated associations are grouped into this central Rocky Mountain grassland alliance. More vegetation survey and classification work are needed to clarify the extent of its component associations. *Bromus marginatus* - *Pseudoroegneria spicata* Grassland (CEGL005861) occurs in subalpine Alberta and may be better classified in Central Rocky Mountain Montane Grassland Group (G267).

Internal Comments: KAS 2-14: There are mixed reports on distribution of *Festuca idahoensis* - *Symphoricarpos albus* Herbaceous Vegetation (CEGL001509). Some claim it occurs in Wyoming, others claim it is restricted to the Palouse region of Washington and Idaho or the central third of Bailey's section 331A. It has been eliminated from adjacent areas of Oregon and Idaho.

Other Comments:

Similar NVC Types:

- A3987 *Festuca idahoensis* - *Pseudoroegneria spicata* - *Poa secunda* Dry Grassland Alliance: occurs on drier sites.

Diagnostic Characteristics: This alliance is characterized by an open to moderately dense herbaceous layer dominated by diagnostic perennial grass *Festuca idahoensis* or *Pseudoroegneria spicata*. Mesic-site indicator species *Bromus marginatus*, *Elymus lanceolatus*, *Koeleria macrantha*, or *Pascopyrum smithii* are present to codominant. The short shrubs *Symphoricarpos albus*, *Rosa nutkana*, or *Rosa woodsii* are frequently present and may form an open shrub layer. Forbs have high diversity and typically low cover. Associated forb species include *Achillea millefolium*, *Antennaria rosea*, *Aquilegia flavescens*, *Artemisia frigida*, *Balsamorhiza sagittata*, *Clarkia pulchella*, *Erigeron peregrinus*, *Fragaria virginiana*, *Gaillardia aristata*, *Galium boreale*, *Geranium viscosissimum*, *Hedysarum sulphurescens*, *Koeleria macrantha*, *Lithospermum ruderales*, *Lupinus sericeus*, *Phlox hoodii*, *Poa cusickii*, *Poa secunda*, *Thalictrum occidentale*, and *Zigadenus elegans*.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by a moderate to dense cover of graminoids that is dominated by perennial bunch grasses less than 1 m tall. There is also sparse to moderate cover of perennial forbs. Annual forbs and grasses are seasonally present and may be abundant. Occasional scattered deciduous shrubs and dwarf-shrubs may be present and sometimes form an open layer.

Floristics: Vegetation in this alliance is characterized by a lush meadow with a moderate to dense herbaceous layer dominated by diagnostic perennial grasses *Festuca idahoensis* and/or *Pseudoroegneria spicata*. *Bromus marginatus*, *Elymus lanceolatus*, *Koeleria macrantha*, or *Pascopyrum smithii* frequently codominate the graminoid layer on these sites and are indicative of more mesic environments. The short shrubs *Symphoricarpos albus*, *Rosa nutkana*, or *Rosa woodsii* are frequently present and may form an open layer or scattered clumps, usually with less than a quarter of the bunchgrass cover. *Artemisia frigida* is common in eastern stands.

Other grass associates include *Poa cusickii* and *Poa secunda* (= *Poa sandbergii*). Non-native grasses *Bromus briziformis*, *Phleum pratense*, and *Poa palustris* are important in some stands. Graminoids are far more abundant than shrubs and forbs. Forbs species are often diverse, and are present to abundant. The most prominent forbs are *Achillea millefolium*, *Anemone multifida*, *Antennaria rosea*, *Aquilegia flavescens*, *Arnica sororia*, *Balsamorhiza sagittata*, *Calochortus apiculatus*, *Castilleja hispida*, *Clarkia pulchella*, *Erigeron peregrinus*, *Eurybia conspicua* (= *Aster conspicuus*), *Fragaria virginiana*, *Frasera albicaulis*, *Gaillardia aristata*, *Galium boreale*, *Geranium viscosissimum*, *Hedysarum sulphurescens*, *Hieracium scouleri* var. *albertinum* (= *Hieracium albertinum*), *Lithospermum ruderales*, *Lomatium triternatum*, *Lupinus sericeus*, *Osmorhiza occidentalis*, *Phlox hoodii*, *Thalictrum occidentale*, *Triteleia grandiflora* var. *grandiflora* (= *Brodiaea douglasii*), *Valeriana dioica*, and *Zigadenus elegans*. The biological crust is very well-developed on undisturbed sites. Grazing reduces the cover of the native perennial grasses. Reduction or elimination of grazing does not appear to restore the native perennial grasses. Other species invading grazed stands include *Lagophylla ramosissima*, *Myosurus apetalus* var. *borealis* (= *Myosurus aristatus*), *Sanguisorba annua* (= *Sanguisorba occidentalis*), and *Veronica arvensis*.

ENVIRONMENT & DYNAMICS

Environmental Description: This is a mesic to subhygric, diverse grassland found in the central Rocky Mountains from the Palouse region and Blue Mountains to the northeast in foothills on the east slope of the Continental Divide in northwestern and Montana and Alberta. Stands occur on gentle to steep, northwest- to northeast-facing slopes at 370 to 2015 m elevation from sites on the dissected basalt plateaus, biscuit-and-swale (mound) formations, and high- and low-elevation canyon and mountain slopes of the lower Snake River drainage and on the eastern flanks and in the rainshadow of the Blue Mountains on relatively deep loessal soils that overlay basalt rock or colluvium. (Daubenmire 1970). Stands range to east of the Continental Divide on gentle slopes at elevations from 1200-1800 m, but may be found up to 2400 m on moderately deep, moderately well-drained, coarse-textured soils developed on morainal or soils derived from sedimentary rock (Reid et al. 2004). Litter and small rock dominate the ground surface. Stands typically occur where moisture is available well into summer drought because of cool aspect or subsurface seepage.

Dynamics: Fire has variable effects on bunch grasses *Pseudoroegneria spicata* and *Festuca idahoensis*. Plants usually survive burning, and growth is often stimulated, except when fire occurs in the driest month when the crowns will burn because of low moisture in the vegetation, and the meristems are damaged (Johnson and Simon 1987). Grazing impacts are concentrated on the gentler slopes accessible to livestock. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris* (Mueggler and Stewart 1980). It tolerates dormant-period grazing well, but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. It is particularly sensitive to defoliation in late spring (Comer et al. 1999). The exotic species *Bromus tectorum* occurs in many stands of the alliance and contributes significant cover on sites disturbed by livestock.

DISTRIBUTION

Geographic Range: This mesic grassland alliance is found in the central Rocky Mountains from the Palouse region and Blue Mountains in eastern Oregon, southwestern Washington, and Idaho to the foothills east of the Continental Divide in northwestern and Montana and Alberta.

Nations: CA, US

States/Provinces: AB, ID, MT, OR, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Festuca idahoensis* Series (Tisdale 1986)
- > Idaho Fescue Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEGLO05653 *Pascopyrum smithii* Central Rocky Mountain Grassland
- CEGLO01621 *Festuca idahoensis* - *Pascopyrum smithii* Grassland
- CEGLO05654 *Pascopyrum smithii* Southern Rocky Mountain Grassland
- CEGLO01626 *Rosa nutkana* - *Festuca idahoensis* Grassland
- CEGLO05861 *Bromus marginatus* - *Pseudoroegneria spicata* Grassland
- CEGLO01509 *Festuca idahoensis* - *Symphoricarpos albus* Grassland
- CEGLO01620 *Festuca idahoensis* - *Koeleria macrantha* Grassland

AUTHORSHIP**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2013)**Author of Description:** K.A. Schulz**Acknowledgments:****Version Date:** 2014/03/14**REFERENCES**

References: Anderson 1956, Bighorn Coal Mine n.d., Caicco 1983, Chappell et al. 1997, Cooper and Lesica 1992, Cooper et al. 1995, Cooper et al. 1997, Cotter-Ferguson Project n.d., Crawford et al. 1994, Daubenmire 1970, Daubenmire 1992, DeVelice 1992, DeVelice and Lesica 1993, DeVelice et al. 1995, Despain 1973a, Evans et al. 1984, Faber-Langendoen et al. 2017b, Fisser et al. 1965, Ganskopp 1979, Hall 1973, Hansen 1985, Hansen and Hoffman 1988, Hansen et al. 1988a, Harrington 1978, Hurd 1961, Hyde 1964, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Johnson and Simon 1987, Lang 1961, Lesica and DeVelice 1992, Lewis 1971, MTNHP unpubl. data, Macdonald 1989, Magee 1985, Mattson 1984, McLean 1970, Mueggler and Stewart 1980, Paulsen 1969, Poulton 1955, Price and Brotherson 1987, Proddgers 1978, Reid et al. 1994, Ross et al. 1973, Sawyer and Keeler-Wolf 1995, Tisdale 1947, Tisdale 1979, Tisdale 1986, Tisdale and Bramble-Brodahl 1983, Turner and Dortignac 1954, Tweit and Houston 1980, WNHP unpubl. data, Ward and Keith 1962, Williams 1961

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland

A3987. *Festuca idahoensis* - *Pseudoroegneria spicata* - *Poa secunda* Dry Grassland Alliance

Type Concept Sentence: This widespread dry grassland alliance is characterized by an open to moderately dense herbaceous layer dominated by diagnostic perennial bunchgrasses *Festuca idahoensis*, *Pseudoroegneria spicata*, and/or *Poa secunda* and occurs in the northwestern Great Plains, central Rocky Mountains and interior Pacific Northwest.

OVERVIEW**Scientific Name:** *Festuca idahoensis* - *Pseudoroegneria spicata* - *Poa secunda* Dry Grassland Alliance**Common Name (Translated Scientific Name):** Idaho Fescue - Bluebunch Wheatgrass - Sandberg Bluegrass Dry Grassland Alliance**Colloquial Name:** Idaho Fescue - Bluebunch Wheatgrass - Sandberg Bluegrass Dry Grassland

Type Concept: Vegetation of this dry grassland alliance is characterized by an open to moderately dense herbaceous layer dominated by diagnostic perennial bunchgrasses *Festuca idahoensis*, *Pseudoroegneria spicata*, and/or *Poa secunda*. *Balsamorhiza sagittata*, *Balsamorhiza serrata*, *Carex filifolia*, *Eriogonum heracleoides*, *Hesperostipa comata*, *Hieracium cynoglossoides*, or *Lomatium cous* may codominate the herbaceous layer. Scattered shrubs may be present, are generally low in stature (<0.5 m) and cover (<5%) and include browsed *Amelanchier alnifolia*, *Artemisia frigida*, *Artemisia tridentata*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Juniperus communis*, and *Juniperus horizontalis*. Other common graminoid species include *Achnatherum occidentale* (= *Stipa occidentalis*), *Danthonia intermedia*, *Leymus cinereus* (= *Elymus cinereus*), and *Poa cusickii*. Forb species are typically diverse with low cover. This widespread dry grassland alliance occurs in the northwestern Great Plains, central Rocky Mountains and interior Pacific Northwest. Stands are found on relatively dry valley bottoms, stream terraces, rolling uplands, canyon benches and slopes, hills, ridges, plateaus and buttes, badlands, foothills, expansive park meadow openings in montane forests, and glacial outwash plains. Elevation ranges from 200-2500 m on any aspect, becoming restricted to west- and southwest-facing slopes farther north. Substrates are variable and range from shallow and lithic soils with a rocky surface of gravel, cobbles or scoria, to moderately deep soils with little rock.

Classification Comments: This alliance includes most of the associations from former *Pseudoroegneria spicata* Herbaceous Alliance (A.1265), former *Poa secunda* Herbaceous Alliance (A.1291), and selected drier site associations from former *Festuca idahoensis* Herbaceous Alliance (A.1251). Some of the associations are variable or not well-defined environmentally and need further review for alliance placement.

Internal Comments:**Other Comments:****Similar NVC Types:**

- A3988 *Festuca idahoensis* - *Pseudoroegneria spicata* - *Pascopyrum smithii* Mesic Grassland Alliance: is typical on relatively dry sites.

Diagnostic Characteristics: This alliance is characterized by an open to moderately dense herbaceous layer dominated by diagnostic perennial bunch grasses *Festuca idahoensis*, *Pseudoroegneria spicata*, and/or *Poa secunda*. Additional diagnostic species include

Balsamorhiza sagittata, *Balsamorhiza serrata*, *Carex filifolia*, *Eriogonum heracleoides*, *Hesperostipa comata*, *Hieracium cynoglossoides*, or *Lomatium cous*, which may codominate the herbaceous layer and indicate relatively dry sites.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by a sparse to dense cover of graminoids that is dominated by perennial bunch grasses less than 1 m tall. There is also sparse to moderate cover of perennial forbs. Occasional scattered shrubs and dwarf-shrubs may be present. Annual forbs and grasses are seasonally present.

Floristics: Vegetation is characterized by an open to moderately dense herbaceous layer dominated by diagnostic perennial bunchgrasses *Festuca idahoensis*, *Pseudoroegneria spicata*, and/or *Poa secunda*. *Balsamorhiza sagittata*, *Balsamorhiza serrata*, *Carex filifolia*, *Eriogonum heracleoides*, *Hesperostipa comata*, *Hieracium cynoglossoides*, or *Lomatium cous* may codominate the herbaceous layer. Scattered shrubs present are generally low in stature (<0.5 m) and cover (<5%) and include browsed *Amelanchier alnifolia*, *Artemisia frigida*, *Artemisia tridentata*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Juniperus communis*, and *Juniperus horizontalis*. Other common graminoid species include *Achnatherum occidentale* (= *Stipa occidentalis*), *Danthonia intermedia*, *Leymus cinereus* (= *Elymus cinereus*), and *Poa cusickii*. Forb species typically present include *Achillea millefolium*, *Antennaria rosea*, *Arenaria congesta*, *Campanula rotundifolia*, *Erigeron corymbosus*, *Eriogonum umbellatum*, *Frasera albicaulis*, *Galium boreale*, *Geum triflorum*, *Hedysarum sulphurescens*, *Lithophragma glabrum* (= *Lithophragma bulbiferum*), *Lomatium bicolor* var. *leptocarpum*, *Lupinus caudatus*, *Lupinus sericeus*, *Phlox hoodii*, *Phlox longifolia*, and *Trifolium macrocephalum*.

ENVIRONMENT & DYNAMICS

Environmental Description: This widespread western dry grassland alliance occurs in the northwestern Great Plains, foothills and montane zones in the central Rocky Mountains from northwestern Montana, extending north into Alberta, west across the interior Pacific Northwest to the foothills of the eastern Cascades, and south to the Grand Teton Mountains of northwestern Wyoming, and ranges in northern Utah, Nevada and northeastern California. It occurs on dry sites on any aspect from 200-2500 m elevation depending on region, becoming restricted to warmer southerly and westerly aspects at higher elevations and northern latitudes. Climate is temperate and mostly continental. Mean annual precipitation ranges from 33-60 cm. Season of precipitation varies geographically. In the Columbia Basin precipitation comes mainly in the winter as snow or rain. This moisture is stored in the soil profile and utilized throughout the typically dry summers. Stands in the Rocky Mountains and northwestern Great Plains may receive up to 75% of the annual precipitation during the growing season. Stands are found on valley bottoms, stream terraces, rolling uplands, canyon benches and slopes, hills, ridges, plateaus and buttes, badlands, foothills, expansive park meadow openings in montane forests, and glacial outwash plains. Sites may be xeric or mesic, on nearly level to steep slopes. The alliance occurs on all aspects, but often on the drier southern and western slopes. Substrates are also variable and range from shallow and lithic soils with a rocky surface of gravel, cobbles or scoria, to moderately deep soils with little rock. Soils are moderately to well-drained, sometimes calcareous, with pH of 6.8-7.7. Soil texture ranges from gravelly, sandy loams to clay. Parent material may include alluvium, colluvium, residuum, glacial deposits or loess derived from lava, basalt, granite, quartz diorite, calcareous sandstone, limestone, acid shale, bentonite, marlstone and other volcanic materials. Litter, moss and lichen are important ground cover in some stands.

Dynamics: Fire has variable effects on *Pseudoroegneria spicata*. Plants usually survive burning, and growth is often stimulated, except when fire occurs in the driest month when the crowns will burn because of low moisture in the vegetation, and the meristems are damaged (Johnson and Simon 1987). Grazing impacts are concentrated on the gentler slopes accessible to livestock. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris* (Mueggler and Stewart 1980). It tolerates dormant-period grazing well, but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. It is particularly sensitive to defoliation in late spring (Comer et al. 1999). The exotic species *Bromus tectorum* occurs in many stands of the alliance and contributes significant cover on sites disturbed by livestock.

DISTRIBUTION

Geographic Range: This widespread dry grassland alliance occurs in the northwestern Great Plains and mountain and foothill slopes on both sides of the Continental Divide in the Central Rockies in northwestern Montana, extending north into the montane zone of Alberta, west into Idaho, and south to the Grand Teton Mountains of northwestern Wyoming. Stands also occur in the Okanogan Highlands of northeastern Washington and southern British Columbia and in the Columbia Basin of south-central Washington and north-central Oregon, extending west into the foothills of the eastern Cascades and east into foothills and canyon slopes of northeastern Oregon and western Idaho. It also occurs in northeastern California.

Nations: CA, US

States/Provinces: AB, BC, CA, ID, MT, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Agropyron spicatum* Series (Tisdale 1986)
- > *Agropyron spicatum* Series (Johnson and Simon 1987)
- > *Agropyron spicatum* Series (Tweit and Houston 1980)
- >< *Festuca idahoensis* (Idaho fescue grassland) Alliance (Sawyer et al. 2009) [41.250.00]
- > *Pseudoroegneria spicata* (Bluebunch wheat grass grassland) Alliance (Sawyer et al. 2009) [41.040.00]
- > *Pseudoroegneria spicata* Grasslands (Chappell et al. 1997)
- > Bluebunch Wheatgrass Series (Sawyer and Keeler-Wolf 1995)
- >< Idaho Fescue Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS**Associations:**

- CEGLO01679 *Pseudoroegneria spicata* - *Hesperostipa comata* Grassland
- CEGLO01665 *Pseudoroegneria spicata* - *Carex filifolia* Grassland
- CEGLO01624 *Festuca idahoensis* - *Pseudoroegneria spicata* Grassland
- CEGLO01619 *Festuca idahoensis* - *Hieracium cynoglossoides* Grassland
- CEGLO01678 *Pseudoroegneria spicata* - *Poa secunda* Lithosolic Grassland
- CEGLO05609 *Pseudoroegneria spicata* - *Crepis acuminata* Grassland
- CEGLO01662 *Pseudoroegneria spicata* - *Balsamorhiza sagittata* - *Poa secunda* Grassland
- CEGLO01782 (*Balsamorhiza serrata*) - *Poa secunda* Grassland
- CEGLO01669 *Pseudoroegneria spicata* - *Festuca idahoensis* Canyon Grassland
- CEGLO05607 *Pseudoroegneria spicata* - *Melica bulbosa* Grassland
- CEGLO01616 *Festuca idahoensis* - *Eriogonum heracleoides* Grassland
- CEGLO01668 *Pseudoroegneria spicata* - *Eriogonum heracleoides* Grassland
- CEGLO01677 *Pseudoroegneria spicata* - *Poa secunda* Grassland
- CEGLO01790 *Lomatium cous* - *Poa secunda* Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Chappell et al. 1997, Faber-Langendoen et al. 2017b, Johnson and Simon 1987, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Tisdale 1986, Tweit and Houston 1980

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland

A3989. *Festuca idahoensis* - *Pseudoroegneria spicata* Palouse Grassland Alliance

Type Concept Sentence: This alliance is characterized by *Pseudoroegneria spicata*, *Festuca idahoensis*, and/or *Hesperostipa comata* dominating the midgrass layer and occurs in remnants of the Palouse Prairie of southeastern Washington, Oregon and Idaho.

OVERVIEW

Scientific Name: *Festuca idahoensis* - *Pseudoroegneria spicata* Palouse Grassland Alliance

Common Name (Translated Scientific Name): Idaho Fescue - Bluebunch Wheatgrass Palouse Grassland Alliance

Colloquial Name: Idaho Fescue - Bluebunch Wheatgrass Palouse Grassland

Type Concept: This alliance is characterized by medium-tall bunchgrasses *Pseudoroegneria spicata*, *Festuca idahoensis*, and/or *Hesperostipa comata* dominating the midgrass layer. Some stands have a short bunchgrass layer of *Poa secunda*. Broad-leaved herbs typically contribute little to the composition of individual sites but may include *Achillea millefolium* var. *occidentalis*, *Eriogonum heracleoides*, and *Lomatium* sp. Scattered *Ericameria* spp. (= *Chrysothamnus* spp.) shrubs can be present to abundant especially on disturbed sites. Annual grasses and forbs are common and can be diverse. In disturbed sites *Bromus tectorum* and *Plantago patagonica* are common. A diverse ground moss and lichen layer can cover much of the space between vascular plants, although it can be displaced with ground disturbance. This alliance occurs in remnants of the Palouse Prairie of southeastern Washington, Oregon and Idaho. Stands occur on ridgetops or on flat to concave surfaces on the middle or upper third of the slope between 1580-

1935 m elevation. Slopes range from flat to 110%, and stands can be found on all aspects. This is an open to closed vegetation type with most of its total cover found in only the medium-tall bunchgrass lifeform.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: This grassland alliance of the Palouse Prairie region is characterized by diagnostic species *Pseudoroegneria spicata*, *Festuca idahoensis*, and/or *Hesperostipa comata* dominating the midgrass layer. Associated species include *Achillea millefolium* var. *occidentalis* and *Eriogonum heracleoides*.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by a moderate to dense cover of graminoids that is dominated by perennial bunch grasses less than 1 m tall. There is also sparse to moderate cover of perennial forbs. Occasional scattered shrubs and dwarf-shrubs may be present. Annual forbs and grasses are seasonally present.

Floristics: This alliance is restricted to remnants of the Palouse Prairie. The vegetation is characterized by a moderately dense to dense graminoid layer dominated by medium-tall bunchgrasses *Pseudoroegneria spicata*, *Festuca idahoensis*, and/or *Hesperostipa comata* dominating the midgrass layer. Some stands have a short bunchgrass layer of *Poa secunda*. Species richness of perennial forbs can be low to high (up to 46 species), but their cover is generally less than 20%. Broad-leaved herbs typically contribute little to the composition of individual sites but may include *Achillea millefolium* var. *occidentalis*, *Calochortus macrocarpus*, *Eriogonum heracleoides*, *Lithophragma glabrum* (= *Lithophragma bulbiferum*), *Lomatium triternatum*, and annual *Plantago patagonica*. Scattered *Ericameria nauseosa* (= *Chrysothamnus nauseosus*) and *Chrysothamnus viscidiflorus* shrubs can be present to abundant especially on disturbed sites. Annual grasses and forbs are common and diverse, but many of them are non-native. Introduced annuals *Bromus tectorum*, *Draba verna*, *Holosteum umbellatum*, and *Sisymbrium altissimum* invade disturbed sites. *Bromus tectorum* can become permanently dominant in severely overgrazed stands. A diverse biological crust of moss and lichen can cover much of the space between vascular plants, although it can be displaced with ground disturbance.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is restricted to remnants of the Palouse Prairie of southeastern Washington, Oregon and Idaho. The region is shrub-steppe, in the rainshadow of the Cascade Range, and too dry to support forest vegetation. The climate is characterized by moderately cold winters and warm to hot summers. Precipitation occurs primarily in the winter as rain and occasional snow. Elevations range from roughly 335-900 m (1100-2950 feet), and the slopes range from gentle to moderate. Stands occur on ridgetops or on flat to concave surfaces on the middle or upper third of the slope between 1580-1935 m elevation. Slopes range from flat to 110%, and stands can be found on all aspects. This is an open to closed vegetation type with most of its total cover found in only the medium-tall bunchgrass lifeform. In the Columbia Basin of southeastern Washington, it is primarily found in the *Pseudoroegneria - Poa* and *Pseudoroegneria - Festuca* zones of Daubenmire (1970). It occurs on sandy or gravelly soils, in some cases derived from strongly weathered volcanic ash. They are deep, coarse-textured and have low fertility. Additionally, sands and gravels have low moisture-holding capacity.

Dynamics: These grasslands are dominated by relatively deep-rooted grasses that use soil moisture below 0.5 m during the typically dry summers. The coarse-textured soils allow for rapid infiltration and storage of winter and summer precipitation (Kleiner 1968, Daubenmire 1970, Kleiner and Harper 1977, Thilenius et al. 1995). Fire has variable effects on *Pseudoroegneria spicata*. Plants usually survive burning, and growth is often stimulated, except when fire occurs in the driest month when the crowns will burn because of low moisture in the vegetation, and the meristems are damaged (Johnson and Simon 1987). However, burning generally kills or severely damages *Hesperostipa comata* plants. After fire, regeneration of this non-rhizomatous bunchgrass is through seed and may take many years to reach prefire densities (FEIS 1998).

Grazing impacts are concentrated on the gentler slopes accessible to livestock. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris* (Mueggler and Stewart 1980). It tolerates dormant-period grazing well, but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. It is particularly sensitive to defoliation in late spring (Comer et al. 1999).

The exotic species *Bromus tectorum*, *Draba verna*, *Lactuca serriola*, and *Tragopogon dubius* occur in many stands of the alliance and contribute significant cover on sites disturbed by livestock (Daubenmire 1970). The cool-season annual grass *Bromus tectorum* can be an effective competitor for winter soil moisture because it can germinate in the fall, overwinter, then begin regrowing in the early spring before it is warm enough for many perennial grasses, completing its lifecycle and depleting soil

moisture before the dry summer weather begins. This annual species also produces abundant fine fuels that carry fire well and increase the frequency of fires (FEIS 1998).

DISTRIBUTION

Geographic Range: This alliance occurs in remnant stands in the Palouse Prairie of southeastern Washington, Oregon and Idaho. Much of the original extent has been converted to wheat fields.

Nations: CA, US

States/Provinces: ID, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Agropyron spicatum* Series (Tisdale 1986)
- >< *Agropyron spicatum* Series (Johnson and Simon 1987)
- >< *Pseudoroegneria spicata* Grasslands (Chappell et al. 1997)
- = Palouse prairie (Daubenmire 1992)

LOWER LEVEL UNITS

Associations:

- CEGLO01670 *Pseudoroegneria spicata* - *Festuca idahoensis* Palouse Grassland
- CEGLO01704 *Hesperostipa comata* - *Poa secunda* Grassland

AUTHORSHIP

Primary Concept Source: R.F. Daubenmire (1992)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Anderson 1956, Chappell et al. 1997, Daubenmire 1970, Daubenmire 1992, FEIS 1998, Faber-Langendoen et al. 2017b, Ganskopp 1979, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Johnson and Simon 1987, Kleiner 1968, Kleiner 1983, Kleiner and Harper 1977, Mueggler and Stewart 1980, Poulton 1955, Price and Brotherson 1987, Producers 1978, Reid et al. 1994, Tisdale 1979, Tisdale 1986, Youtie 1990

M168. Rocky Mountain-Vancouverian Subalpine-High Montane Mesic Meadow

This macrogroup includes montane and subalpine mesic meadows from the Rocky Mountains west to the Sierra Nevada and eastern Cascades, and drier grasslands from the southern Rocky Mountains west in the high plateaus and ranges. Vegetation is composed of low (<1 m) open to dense perennial graminoid layer. Characteristic grassland species include *Danthonia intermedia*, *Danthonia parryi*, *Festuca arizonica*, *Festuca thurberi*, and *Muhlenbergia montana* in montane and subalpine grasslands in the southern Rocky Mountains. Dominant mesic meadow species include *Achillea millefolium*, *Carex spectabilis*, *Chamerion angustifolium*, *Erigeron speciosus*, *Lupinus latifolius*, *Senecio hydrophiloides*, *Senecio serra*, *Solidago canadensis*, *Symphotrichum* spp., *Thalictrum occidentale*, and *Zigadenus elegans*.

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

2.B.2.Na.3.a. M168 Rocky Mountain-Vancouverian Subalpine-High Montane Mesic Meadow

G268. Southern Rocky Mountain Montane-Subalpine Grassland

Type Concept Sentence: This southern Rocky Mountains grassland group typically occurs between 2200 and 3000 m elevation on flat to rolling plains and parks or on lower sideslopes that are dry, and is characterized by an open to dense perennial graminoid layer dominated by *Blepharoneuron tricholepis*, *Danthonia intermedia*, *Danthonia parryi*, *Festuca arizonica*, *Festuca idahoensis*, *Festuca thurberi*, *Muhlenbergia filiculmis*, *Muhlenbergia montana*, *Pascopyrum smithii*, or *Pseudoroegneria spicata*.

OVERVIEW

Scientific Name: *Festuca arizonica* - *Festuca thurberi* - *Muhlenbergia montana* Grassland Group

Common Name (Translated Scientific Name): Arizona Fescue - Thurber's Fescue - Mountain Muhly Grassland Group

Colloquial Name: Southern Rocky Mountain Montane Arizona Fescue - Muhly Grassland

Type Concept: This southern Rocky Mountains group extends west to high plateaus and mountains in the Colorado Plateau. Vegetation is characterized by an open to dense perennial graminoid layer. Larger occurrences usually consist of a mosaic of two or three plant associations with one of the following dominant grasses: *Blepharoneuron tricholepis*, *Danthonia parryi*, *Festuca arizonica*, *Muhlenbergia montana*, *Pascopyrum smithii*, or *Pseudoroegneria spicata* at lower elevation / warmer aspects, or *Danthonia intermedia*, *Festuca idahoensis*, *Festuca thurberi*, or *Muhlenbergia filiculmis* at subalpine elevation / cooler aspects. The common subdominants include *Bouteloua gracilis*, *Hesperostipa comata*, or *Poa secunda*. *Bouteloua gracilis* often dominates sites with warm aspects and heavy grazing history. Forb species such as *Potentilla hippiana* may be present to codominant. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, ponderosa pine, and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus and inter-montane valleys. Stands typically occur between 2200 and 3000 m elevation on flat to rolling plains and parks or on lower sideslopes that are dry, but may extend up to 3350 m on warm aspects. Soils resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well-drained. Small-patch representations of this group do occur at high elevations of the Trans-Pecos where they present as occurrences of *Festuca arizonica* - *Blepharoneuron tricholepis* Grassland (CEGL004508). These occurrences often occupy sites adjacent to Eastern Madrean Chaparral Group (G280).

Classification Comments: Montane grasslands are very similar and intergrade with their montane and subalpine counterparts. The transition of this group to Central Rocky Mountain Montane Grassland Group (G267) probably occurs somewhere in central Colorado or southern Wyoming. This Southern Rockies grassland group may co-occur with patches of the more mesic Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow Group (G271), which is distinguished by dominance of mesic forb and grass species such as *Deschampsia cespitosa* and *Mertensia ciliata*. *Pascopyrum smithii*-dominated grasslands tend to be restricted to mesic swales within drier upland types.

Similar NVC Types:

- G271 Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow
- G267 Central Rocky Mountain Montane Grassland

Diagnostic Characteristics: Vegetation is composed of an open to dense perennial graminoid layer that is generally less than 1 m tall. *Danthonia parryi*, *Festuca arizonica*, and *Muhlenbergia montana* are important species and typically dominate montane grasslands; *Danthonia intermedia* and *Festuca thurberi* are typical of subalpine grasslands in the southern Rocky Mountains. Other characteristic graminoid species that may be present to dominant include *Achnatherum lettermanii*, *Blepharoneuron tricholepis*, *Bouteloua gracilis*, *Carex duriuscula*, *Carex rossii*, *Carex siccata*, *Elymus lanceolatus*, *Festuca calligera*, *Festuca idahoensis*, *Hesperostipa comata*, *Muhlenbergia filiculmis*, *Poa fendleriana*, *Poa nervosa*, *Poa lettermanii*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: Vegetation is composed of an open to dense perennial graminoid layer that is generally less than 1 m tall. Forb cover is variable and may be present to codominant.

Floristics: Vegetation in this group is characterized by an open to dense perennial graminoid layer. Larger occurrences usually consist of a mosaic of two or three plant associations with one of the following dominant grasses: *Blepharoneuron tricholepis*, *Danthonia parryi*, *Festuca arizonica*, *Muhlenbergia montana*, *Pascopyrum smithii*, or *Pseudoroegneria spicata* at lower elevation / warmer aspects, or *Danthonia intermedia*, *Festuca idahoensis*, *Festuca thurberi*, or *Muhlenbergia filiculmis* at subalpine elevation / cooler aspects. Other characteristic graminoid species that may be present to dominant include *Achnatherum lettermanii*, *Blepharoneuron tricholepis*, *Bouteloua gracilis*, *Carex duriuscula*, *Carex rossii*, *Carex siccata*, *Elymus lanceolatus*, *Festuca calligera*, *Hesperostipa comata*, *Poa fendleriana*, *Poa nervosa*, and *Poa lettermanii*. The common subdominants include *Bouteloua gracilis*, *Hesperostipa comata*, or *Poa secunda*. *Bouteloua gracilis* often dominates sites with warm aspects and heavy grazing history. Forb species such as *Achillea millefolium*, *Castilleja* spp., *Erigeron simplex*, *Erigeron ursinus*, *Eriogonum umbellatum*, *Geranium viscosissimum*, *Hymenoxys richardsonii*, *Lathyrus lanszwertii*, *Oxytropis oreophila*, *Penstemon secundiflorus*, *Potentilla hippiana*, *Solidago multiradiata*, and *Symphotrichum foliaceum* (= *Aster foliaceus*) may be present to codominant. In disturbed stands, species such as *Heterotheca villosa* may codominant. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, ponderosa pine, and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus and inter-montane valleys. Small-patch representations of this group do occur at high elevations of the Trans-Pecos where they present as occurrences of *Festuca arizonica* - *Blepharoneuron tricholepis* Grassland (CEGL004508). These occurrences often occupy sites adjacent to Eastern Madrean Chaparral Group (G280).

ENVIRONMENT & DYNAMICS

Environmental Description: This Rocky Mountain grassland group typically occurs between 2200 and 3000 m elevation on flat to rolling plains and inter-montane parks or on lower sideslopes that are dry, but it may extend up to 3350 m on warm aspects. Soils resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well-drained.

Dynamics:**DISTRIBUTION**

Geographic Range: This grassland group occurs between 2200 and 3000 m elevation in the southern Rocky Mountains and extends west to high plateaus and mountains in the Colorado Plateau.

Spatial Scale & Pattern [optional]: Large patch

Nations: US

States/Provinces: AZ, CO, NM, NV, SD, UT, WY

TNC Ecoregions [optional]: 11:C, 18:C, 19:C, 20:C, 21:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313C:CP, 313D:CP, 315A:CC, 315H:CP, 321A:PP, 322A:??, 331B:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341F:CP, 342A:CC, 342E:CC, 342F:CC, 342G:CC, 342J:CC, M313A:CC, M313B:CC, M331A:CP, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M341A:CC, M341B:CC, M341C:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Great Basin)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = Rocky Mountain Alpine and Subalpine Grassland, Bunchgrass Series - 141.41 (Brown et al. 1979)

LOWER LEVEL UNITS**Alliances:**

- A3953 *Festuca arizonica* - *Muhlenbergia montana* - *Poa fendleriana* Southern Rocky Mountain Montane Grassland Alliance
- A3954 *Festuca thurberi* - *Danthonia intermedia* - *Poa lettermanii* Southern Rocky Mountain Subalpine Grassland Alliance

AUTHORSHIP

Primary Concept Source: D.E. Brown, C.H. Lowe, and C.P. Pase (1979)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/09/2015

Classif Resp Region: West

Internal Author: KAS 3-10, 11-15

REFERENCES

References: Bowns and Bagley 1986, Brown 1982a, Brown et al. 1979, Faber-Langendoen et al. 2017a, Hess 1981, Hess and Wasser 1982, Moir 1967, Passey et al. 1982, Shepherd 1975, Stewart 1940, Turner 1975, Turner and Dortignac 1954

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G268. Southern Rocky Mountain Montane-Subalpine Grassland

A3953. *Festuca arizonica* - *Muhlenbergia montana* - *Poa fendleriana* Southern Rocky Mountain Montane Grassland Alliance

Type Concept Sentence: This grassland alliance is characterized by an open to dense perennial graminoid layer composed of bunchgrasses *Festuca arizonica* and *Muhlenbergia montana*, which are widespread dominants. It occurs largely in the southern Rocky Mountains extending west to the mountains and high plateaus of Arizona, Utah and Nevada and northeast to the Black Hills. Stands occur primarily in the montane zone (2440-3050 m [8000-10,000 feet]), but may extend down into the foothills.

OVERVIEW

Scientific Name: *Festuca arizonica* - *Muhlenbergia montana* - *Poa fendleriana* Southern Rocky Mountain Montane Grassland Alliance

Common Name (Translated Scientific Name): Arizona Fescue - Mountain Muhly - Muttongrass Southern Rocky Mountain Montane Grassland Alliance

Colloquial Name: Southern Rocky Mountain Montane Arizona Fescue - Muhly Grassland

Type Concept: Vegetation of this grassland alliance is characterized by an open to dense perennial graminoid layer composed of bunchgrasses *Festuca arizonica* and *Muhlenbergia montana*, which are widespread dominants, with *Achnatherum lettermanii*, *Blepharoneuron tricholepis*, *Carex duriuscula*, *Carex rossii*, *Carex siccata*, *Elymus lanceolatus*, *Hesperostipa comata*, *Muhlenbergia filiculmis*, *Poa fendleriana*, *Pseudoroegneria spicata*, or *Schizachyrium scoparium* often present to codominant. Forb species such as *Potentilla hippiana* may be present to codominant. This alliance occurs largely in the southern Rocky Mountains extending west to the mountains and high plateaus of Arizona, Utah and Nevada and northeast to the Black Hills. It primarily occurs in the montane zone (2440-3050 m [8000-10,000 feet]), but may extend down into the foothills. Stands are typically found in xeric forest openings or parks in the ponderosa pine zone with southern aspects on moderately steep slopes and ridgetops. Occasionally the stands occupy rolling parklands. The xeric nature of sites appears to be an important environmental factor. Soils are moderately deep Mollisols, with high coarse-fragment content, sandy loam textures, and a distinct clay horizon. Parent materials are primarily colluvium derived from granite and gneiss. Bare soil, exposed gravels, and small rocks account for as much as 50% of the ground surface area. These large-patch grasslands are intermixed with matrix stands of ponderosa pine, Douglas-fir and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus and inter-montane valleys.

Classification Comments: Some characteristic species such as *Danthonia parryi* and *Achnatherum lettermanii* have wide ecological amplitudes occurring in subalpine also. Associations are classified as a best fit.

Internal Comments: KAS-1-14: with more time I might find a published Primary Concept Source.

Other Comments:

Similar NVC Types: This alliance has similarities to montane grassland alliances in other groups in the Rocky Mountain region, such as G267, G271, G273, and G274.

- A3954 *Festuca thurberi* - *Danthonia intermedia* - *Poa lettermanii* Southern Rocky Mountain Subalpine Grassland Alliance: is similar but floristic composition is representative of cooler, subalpine grasslands in the southern Rocky Mountains.

Diagnostic Characteristics: Dominant/diagnostic species of this montane grassland alliance are *Festuca arizonica* and *Muhlenbergia montana*. Other species with high fidelity include *Blepharoneuron tricholepis*, *Carex rossii*, *Hesperostipa comata*, *Muhlenbergia filiculmis*, *Poa fendleriana*, or *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a sparse to moderately dense graminoid layer dominated by medium-tall and short, bunch and sod grasses. Forbs usually have sparse cover (<10%), although degraded sites may exhibit higher cover. Lichen ground cover ranges from 2-12%.

Floristics: Vegetation is characterized by an open to dense perennial graminoid layer composed of bunchgrasses *Festuca arizonica* and *Muhlenbergia montana*, which are widespread dominants, with *Achnatherum lettermanii*, *Achnatherum richardsonii*, *Blepharoneuron tricholepis*, *Carex duriuscula*, *Carex rossii*, *Carex siccata*, *Elymus lanceolatus*, *Festuca calligera*, *Geranium caespitosum*, *Hesperostipa comata*, *Muhlenbergia filiculmis*, *Poa fendleriana*, *Pseudoroegneria spicata*, *Schizachyrium scoparium*, or *Sporobolus heterolepis* often present to codominant. Other common graminoids include *Bouteloua curtipendula*, *Bouteloua gracilis*, *Carex inops* ssp. *heliophila*, *Carex obtusata*, *Carex occidentalis*, *Danthonia parryi*, *Festuca brachyphylla*, *Koeleria macrantha*, *Pascopyrum smithii*, *Poa secunda*, and *Schizachyrium scoparium*. The non-native perennial grass *Poa pratensis* is common in some of these stands. The typically sparse forb layer may be diverse with a variety of taxa, such as *Achillea millefolium*, *Agoseris glauca*, *Allium geyeri*, *Antennaria parvifolia*, *Antennaria rosea*, *Arenaria fendleri*, *Castilleja flava*, *Castilleja integra*, *Eriogonum racemosum*, *Eriogonum umbellatum*, *Harbouria trachypleura*, *Heterotheca villosa*, *Hymenoxys richardsonii*, *Hymenoxys subintegra*, *Lupinus argenteus*, *Mertensia lanceolata*, *Opuntia polyacantha*, *Penstemon secundiflorus*, *Phlox diffusa*, *Potentilla concinna*, *Potentilla hippiana*, *Pseudocymopterus montanus*, *Ranunculus cardiophyllus*, *Sphaeralcea coccinea*, *Solidago nana*, and *Vicia americana*. Except for the abundant dwarf-shrub *Artemisia frigida*, scattered *Amelanchier utahensis*, *Artemisia tridentata*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Ericameria parryi*, *Krascheninnikovia lanata*, *Ribes cereum*, *Symphoricarpos oreophilus*, and *Tetradymia canescens* shrubs, or occasional *Pinus ponderosa* trees, woody species are sparse (<10% cover) or absent. *Selaginella densa* is common, and lichens are important on the soil surface, sometimes providing abundant cover (about 25%).

In stands in the Black Hills, *Achnatherum richardsonii*, *Danthonia intermedia*, and *Sporobolus heterolepis* are prominent with a rich diversity of grasses and forbs, including *Astragalus alpinus*, *Balsamorhiza sagittata*, *Delphinium bicolor*, *Hesperostipa curtiseta*, *Hesperostipa spartea*, *Iris missouriensis*, *Lupinus sericeus*, *Nassella viridula*, and *Oryzopsis asperifolia*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance primarily occurs in the montane zone (2440-3050 m [8000-10,000 feet]), but may extend down into the foothills to 1600 m (5250 feet). Stands are typically found in xeric forest openings or parks in the ponderosa pine zone with southern aspects on moderately steep slopes and ridgetops. Occasionally the stands occupy rolling parklands. Climate is cool temperate. Summers are warm and winters are cold with freezing temperatures and often heavy snow. Summer precipitation peaks

during the monsoon in July and August. The mean annual precipitation is 25-90 cm. Sites are gentle to moderately steep (5-30%) slopes with southern and western aspects. Rocks and boulders are common, especially on the steeper slopes. The xeric nature of sites appears to be an important environmental factor in maintaining the grassland. Soils are moderately deep Mollisols, with high coarse-fragment content, sandy loam textures, and a distinct clay horizon. Parent material includes alluvium, colluvium and residuum from a variety of igneous, metamorphic and sedimentary rocks such as andesite, basalt, cinder, gneiss, granite, limestone, rhyolite, sandstone, schist, shale and tuff. Bare soil, exposed gravels, and small rocks account for as much as 50% of the ground surface area. These large-patch grasslands are intermixed with matrix stands of ponderosa pine, Douglas-fir and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus and inter-montane valleys.

Dynamics: Historically, much of the area where this alliance occurs was heavily grazed by livestock, primarily sheep and cattle (Shepherd 1975). Under moderate grazing, the shorter grass *Muhlenbergia filiculmis* may have had a competitive advantage over the taller and more palatable *Festuca arizonica* (West 1992). Season of use is also important. In stands with cool-season *Festuca arizonica* or *Hesperostipa comata* and warm-season *Muhlenbergia montana*, fall grazing will favor the cool-season grasses over the later-blooming, warm-season *Muhlenbergia montana* (Clary 1978). The reverse is true if grazing is always limited to late summer. Overgrazing will reduce or eliminate *Festuca arizonica*, *Hesperostipa comata*, *Muhlenbergia filiculmis*, *Muhlenbergia montana*, and the other palatable species, leaving the more grazing-tolerant *Bouteloua gracilis* and less palatable plants such as *Hymenoxys*, *Artemisia* and *Chrysothamnus* species to dominate the site (West 1992). Clary (1978) reported that complete natural recovery of montane *Festuca arizonica* range may require over 100 years, based on areas where recovery had reached only the "half-shrub" stage after 10 years. Because of the long time needed for recovery, much of the range may be in a seral state. If the range is properly managed, *Muhlenbergia* and *Festuca arizonica* grasslands could potentially become more common.

DISTRIBUTION

Geographic Range: This grassland alliance occurs largely in the southern Rocky Mountains extending west to the mountains and high plateaus of Utah and Arizona and northeast to the Black Hills.

Nations: US

States/Provinces: AZ, CO, MT, NM, NV, SD, TX?, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Festuca arizonica* Series (Johnston 1987)
- > *Muhlenbergia montana* Series (Johnston 1987)
- > *Muhlenbergia montana* Series (Muldavin 1994) [includes *Muhlenbergia montana*/*Trisetum montanum* Plant Association that is not yet included in this alliance.]
- > *Stipa comata*-*Muhlenbergia montana* Habitat Type (Hess 1981)
- = Fescue Series (Dick-Peddie 1993) [includes *Festuca arizonica*-*Muhlenbergia montana* Vegetation Type]
- > Habitat types #13 and #35 (Shepherd 1975)
- > Pine Dropseed-Mountain Muhly Series (Dick-Peddie 1993)

LOWER LEVEL UNITS

Associations:

- CEGLO02240 *Sporobolus heterolepis* - *Achnatherum richardsonii* - *Danthonia intermedia* Grassland
- CEGLO01874 *Carex duriuscula* Grassland
- CEGLO04508 *Festuca arizonica* - *Blepharoneuron tricholepis* Grassland
- CEGLO01647 *Muhlenbergia montana* - *Hesperostipa comata* Grassland
- CEGLO01646 *Muhlenbergia montana* Grassland
- CEGLO01606 *Festuca arizonica* - *Muhlenbergia montana* Grassland
- CEGLO01925 *Poa fendleriana* Grassland
- CEGLO01660 *Pseudoroegneria spicata* Grassland
- CEGLO01780 *Muhlenbergia filiculmis* Grassland
- CEGLO02588 *Elymus lanceolatus* Grassland
- CEGLO05354 *Achnatherum lettermanii* Grassland
- CEGLO05388 *Carex siccata* - *Carex rossii* Grassland
- CEGLO05381 *Muhlenbergia montana* - *Schizachyrium scoparium* Grassland

- CEGLO01605 *Festuca arizonica* - *Muhlenbergia filiculmis* Grassland
- CEGLO05500 *Festuca (calligera, arizonica, brachyphylla)* Grassland
- CEGLO01676 *Pseudoroegneria spicata* - *Poa fendleriana* Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Baumann 1978a, Buttery 1955, Clary 1978, Currie 1975, Dick-Peddie 1993, Faber-Langendoen et al. 2017b, Fish 1966, Hess 1981, Johnson 1953, Johnson 1956a, Johnson and Niederhof 1941, Johnson and Reid 1958, Johnson and Reid 1964, Johnston 1987, Komarkova 1986, Loveless 1963, Loveless 1967, McIntosh 1923, Merkle 1962, Muldavin 1994, Muldavin et al. 1994a, Mutel 1976, Ramaley 1915, Ramaley 1916a, Ramaley 1916b, Reid 1974, Reid et al. 1994, Shepherd 1975, Smith 1967, Soil Conservation Service 1978, Stewart 1940, USFS 1983b, Wasser and Hess 1982, West 1992

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G268. Southern Rocky Mountain Montane-Subalpine Grassland

A3954. *Festuca thurberi* - *Danthonia intermedia* - *Poa lettermanii* Southern Rocky Mountain Subalpine Grassland Alliance

Type Concept Sentence: This grassland alliance is characterized by an open to dense perennial graminoid layer composed of bunchgrasses, especially *Festuca thurberi* and *Danthonia intermedia*, with other diagnostic and sometimes dominant species that include *Festuca idahoensis*, *Poa lettermanii*, and *Poa nervosa*. It occurs largely in the southern Rocky Mountains extending west to the high plateaus and mountains of Arizona, Utah and Nevada primarily in the subalpine zone.

OVERVIEW

Scientific Name: *Festuca thurberi* - *Danthonia intermedia* - *Poa lettermanii* Southern Rocky Mountain Subalpine Grassland Alliance

Common Name (Translated Scientific Name): Thurber's Fescue - Timber Oatgrass - Letterman's Bluegrass Southern Rocky Mountain Subalpine Grassland Alliance

Colloquial Name: Southern Rocky Mountain Subalpine Thurber's Fescue - Timber Oatgrass Grassland

Type Concept: Vegetation of this subalpine grassland alliance is characterized by an open to dense perennial graminoid layer composed of bunchgrasses, especially *Festuca thurberi* and *Danthonia intermedia*. Other diagnostic and sometimes dominant species include *Achnatherum richardsonii*, *Danthonia parryi*, *Festuca idahoensis*, *Geranium viscosissimum*, *Lathyrus lanszwertii* var. *leucanthus*, *Poa lettermanii*, *Poa nervosa*, *Potentilla hippiana*, *Solidago multiradiata*, and *Sporobolus heterolepis*. This alliance occurs largely in the southern Rocky Mountains extending west to the high mountains and plateaus of Arizona, Utah and Nevada. Stands primarily occur in the subalpine and lower alpine slopes in dry meadows and on ridges above subalpine forests in the southern Rocky Mountains, but may extend up into lower alpine and down into montane zones. Elevations range from 2500-3810 m. Climate is temperate with short growing seasons and heavy snowfall in winter. Stands are found on level valley bottoms, expansive park meadow openings in the subalpine forest, and on ridges above subalpine forests. Sites are nearly level to steeply sloping, typically on southern or western exposures. Soils are generally deep, well-drained loams or silt loams with pH of 5.8-7.0, and derived from alluvium and colluvium.

Classification Comments: Some characteristic species such as *Danthonia parryi* and *Achnatherum lettermanii* have wide ecological amplitudes occurring in montane zone also. Associations are classified as a "best fit" into the USNVC alliances.

Internal Comments: KAS-1-14: with more time I might find a published Primary Concept Source.

Other Comments:

Similar NVC Types: This alliance has similarities to subalpine grassland alliances in other groups in the Rocky Mountain region, such as G267 and G271.

- A3953 *Festuca arizonica* - *Muhlenbergia montana* - *Poa fendleriana* Southern Rocky Mountain Montane Grassland Alliance: is similar but floristic composition is representative of warmer, montane grasslands in the southern Rocky Mountains.

Diagnostic Characteristics: These subalpine grasslands are typically dominated or codominated by *Danthonia intermedia*, *Danthonia parryi*, *Festuca idahoensis*, *Festuca thurberi*, *Poa lettermanii*, and *Poa nervosa*.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by a moderate to dense cover of graminoids that is dominated by perennial bunch grasses. There is also a sparse to moderate cover of perennial forbs. Annual forbs and grasses are seasonally present.

Floristics: Vegetation included in this alliance has a moderately sparse to dense herbaceous layer, depending on the amount of rock cover. These grasslands are characterized by an open to dense perennial graminoid layer composed bunchgrasses, especially *Festuca thurberi* and *Danthonia intermedia*. Other diagnostic and sometimes dominant species include *Achnatherum richardsonii*, *Danthonia parryi*, *Festuca idahoensis*, *Geranium viscosissimum*, *Lathyrus lanszwertii* var. *leucanthus*, *Poa lettermanii*, *Poa nervosa*, *Potentilla hippiana*, *Solidago multiradiata* and *Sporobolus heterolepis*. *Muhlenbergia montana* and *Festuca arizonica* may be present to codominant (on warmer/drier sites). These grasslands have high diversity of species. Other characteristic graminoids may include *Agrostis variabilis*, *Bromus* spp., *Carex engelmannii*, *Carex geyeri*, *Carex haydeniana*, *Carex microptera*, *Carex siccata* (= *Carex foenea*), *Carex scirpoidea*, *Danthonia parryi*, *Elymus trachycaulus*, *Festuca brachyphylla*, *Juncus drummondii*, and *Trisetum spicatum*. Forb species are diverse and may codominate the herbaceous layer with species such as *Achillea millefolium*, *Arenaria capillaris*, *Artemisia* spp., *Cerastium beeringianum*, *Erigeron simplex*, *Erigeron speciosus*, *Erigeron ursinus*, *Eriogonum umbellatum* var. *majus* (= *Eriogonum subalpinum*), *Geum rossii* var. *turbinatum*, *Hymenoxys hoopesii*, *Iris missouriensis*, *Lewisia pygmaea*, *Minuartia obtusiloba*, *Polygonum bistortoides*, *Potentilla diversifolia*, *Saxifraga rhomboidea*, *Solidago multiradiata*, *Symphyotrichum foliaceum* (= *Aster foliaceus*), *Vicia americana*, and many others. On moist sites *Veratrum californicum* may be codominant. Grazed stands often have moderate cover of non-native species such as *Poa pratensis* and *Taraxacum officinale*. The ground surface is often covered with nonvascular plants such as lichens, liverworts, and mosses forming a biological crust. Adjacent stands include subalpine conifer woodlands, and herbaceous- or shrub-dominated wetlands.

ENVIRONMENT & DYNAMICS

Environmental Description: This grassland alliance occurs largely in the southern Rocky Mountains extending west to the high plateaus and mountains of Arizona, Utah and Nevada. Stands primarily occur in the subalpine and lower alpine slopes in dry meadows and on ridges above subalpine forests in the southern Rocky Mountains, but extend up into lower alpine and down into montane zones. Elevations range from 2500-3810 m (8200-12500 feet). Climate is temperate with short growing seasons and heavy snowfall in winter, although prevailing winter winds allow only moderate snow accumulations in high-elevation stands. Stands are found on level valley bottoms, expansive park meadow openings in the subalpine forest, and on ridges above subalpine forests. Sites are nearly level to steeply sloping, typically on southern or western exposures. Soils are shallow to deep, well-drained, acidic (pH of 5.8-7.0), nutrient-poor, gravelly loams to silt loams and gravelly clay loams derived from basalt lava, granite, schist and sandstone. The ground surface has a biological crust of lichens, liverworts, and mosses.

Dynamics: *Festuca thurberi* grasslands typically have sharp ecotones with adjacent *Picea engelmannii*- and *Abies lasiocarpa*-dominated subalpine forests. There is rarely any invasion by tree seedlings in the adjacent grasslands. These high-elevation meadows are typically dry with southern or western aspects. The soils are deep and well-developed, typical of sites with long histories of being grassland. They may need catastrophic disturbance, such as forest-destroying crown fire, to be created. It is unclear how these grasslands were maintained in the subalpine forest zone; however, it is thought to be by a combination of factors such as herbivory, fire, deep soils, early summer drought and competition from grass species (Moir 1967, Andrews 1983). In addition, south- and west-facing clearcuts are often difficult to reforest because seedlings are damaged by full sun. The ecotones between stands adjacent to *Populus tremuloides*-dominated subalpine forests are not as sharp because the forest understory consists of the same graminoid and forb species (Anderson 1983).

Where the soil is thinner and rockier in these subalpine parks, *Danthonia parryi* becomes the dominant species with *Festuca thurberi* and *Artemisia* spp. subdominant (Anderson 1983). The spread of the exotic species *Poa pratensis* and *Taraxacum officinale* in subalpine parks is likely from heavy grazing by livestock (Moir 1967, Anderson 1983). These species are more common in heavily grazed bottomlands and near trails in the uplands (Moir 1967).

DISTRIBUTION

Geographic Range: This grassland alliance occurs largely in the southern Rocky Mountains extending west to the high mountains and plateaus of Arizona, Utah and Nevada.

Nations: US

States/Provinces: AZ, CO, NM, NV, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Festuca thurberi* Series (Johnston 1987) [includes five *Festuca thurberi* dominated plant associations.]
- > *Festuca thurberi* Series (Komarkova 1986) [includes seven *Festuca thurberi* dominated habitat types/associations.]
- >> Alpine Dwarf Shrublands, Fellfields, and Sedge Turf (Chappell et al. 1997)

LOWER LEVEL UNITS**Associations:**

- CEG001630 *Festuca thurberi* - (*Lathyrus lanszwertii* var. *leucanthus*, *Potentilla* spp.) Grassland
- CEG001656 *Poa nervosa* - *Achnatherum lettermanii* Grassland
- CEG001927 *Poa lettermanii* Grassland
- CEG001794 *Danthonia intermedia* Grassland
- CEG001618 *Festuca idahoensis* - *Geranium viscosissimum* Grassland
- CEG005377 *Festuca thurberi* - *Danthonia parryi* / *Potentilla hippiana* Grassland
- CEG001631 *Festuca thurberi* Subalpine Grassland
- CEG001879 *Danthonia intermedia* - *Solidago multiradiata* Grassland
- CEG001617 *Festuca idahoensis* - *Festuca thurberi* Grassland
- CEG001795 *Danthonia parryi* Grassland
- CEG002734 *Achnatherum lettermanii* - *Oxytropis oreophila* Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Anderson 1983, Andrews 1983, Baker 1983a, Boyce 1977, Chappell et al. 1997, Eddleman 1967, Faber-Langendoen et al. 2017b, Giese 1975, Hall 1971, Harrington 1978, Hess 1981, Hess and Wasser 1982, Holway 1962a, Johnson 1939, Johnson 1970a, Johnston 1987, Johnston 2001, Keammerer and Stoecker 1980, Klemmedson 1953, Klish 1977, Komarkova 1976, Komarkova 1986, Komarkova and Gordon 1982, Komarkova and Webber 1978, Langenheim 1956, Marr et al. 1974, Miller 1964, Moir 1967, Morgan 1969, Paulsen 1960, Paulsen 1970a, Paulsen 1970b, Ramaley 1942, Rydberg 1915, Turner and Dortignac 1954, Wasser and Hess 1982

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

2.B.2.Na.3.b. M168 Rocky Mountain-Vancouverian Subalpine-High Montane Mesic Meadow

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow

Type Concept Sentence: This Rocky Mountain, northern Vancouverian and Sierran group is typically lush meadow dominated by a diversity of taller forbs, including *Achillea millefolium*, *Agastache urticifolia*, *Balsamorhiza sagittata*, *Geranium viscosissimum*, *Ligusticum* spp., *Rudbeckia occidentalis*, *Thalictrum occidentale*, *Valeriana sitchensis*, and *Xerophyllum tenax*, typically with grasses intermingled in many of them. However, it includes stands dominated by grasses with relatively broad and soft blades and a few mesic Carices, such as *Calamagrostis breweri*, *Carex filifolia*, *Carex stramineiformis*, *Elymus trachycaulus*, *Festuca viridula*, and *Phleum alpinum*.

OVERVIEW

Scientific Name: *Festuca viridula* - *Deschampsia cespitosa* - *Ligusticum* spp. Rocky Mountain-Vancouverian Grassland & Meadow Group

Common Name (Translated Scientific Name): Greenleaf Fescue - Tufted Hairgrass - Licorice-root species Rocky Mountain-Vancouverian Grassland & Meadow Group

Colloquial Name: Montane Nettleleaf Giant-hyssop - Sticky Purple Geranium - Western Brackenfern Mesic Meadow

Type Concept: This Rocky Mountain, northern Vancouverian and Sierran group is restricted to sites from lower montane to subalpine where finely textured soils, snow deposition, rocky substrates, or windswept dry conditions limit tree establishment. Many occurrences are small-patch in spatial character, and are often found in mosaics with woodlands, more dense shrublands, or just below alpine communities. These are typically lush meadows dominated by a diversity of tall forbs, with grasses intermingled in many of them. The vegetation is typically forb-rich, with forbs often contributing more to overall herbaceous cover than graminoids. However, some stands are composed of dense grasslands, these often being taxa with relatively broad and soft blades, such as *Elymus trachycaulus*, *Festuca viridula*, and *Phleum alpinum*, but where the moist habitat promotes a rich forb component. Important taxa includes *Achillea millefolium*, *Balsamorhiza sagittata*, *Rudbeckia occidentalis*, *Thalictrum occidentale*, *Valeriana sitchensis*,

Xerophyllum tenax, and numerous species of Asteraceae, *Campanula*, *Erigeron*, *Ligusticum*, *Lomatium*, *Lupinus*, *Mertensia*, *Phlox*, *Penstemon*, *Solidago*, and *Wyethia*. Important graminoids include *Deschampsia cespitosa*, *Koeleria macrantha*, *Luzula glabrata*, perennial *Bromus* spp., and a number of *Carex* species. In the Cascades, this group includes *Festuca viridula* meadows. *Dasiphora fruticosa* ssp. *floribunda* and *Symphoricarpos* spp. are occasional but not abundant. In the Sierra Nevada *Calamagrostis breweri*, *Carex filifolia*, *Carex stramineiformis*, *Juncus drummondii*, *Oreostemma alpigenum*, *Solidago canadensis*, and *Trisetum spicatum* may dominate stands with diagnostics forbs *Oreostemma alpigenum*, and *Solidago canadensis*. Dwarf-shrubs such as *Vaccinium cespitosum* may have significant cover. Burrowing mammals can increase the forb diversity. This group is typically found above 2000 m in elevation in the southern part of its range and above 600 m in the northern part. These upland communities occur on gentle to moderate-gradient slopes and relatively moist habitats. The soils are typically seasonally moist to saturated in the spring but, if so, will dry out later in the growing season. These sites are not as wet as those found in Vancouverian-Rocky Mountain Subalpine-Alpine Snowbed, Wet Meadow & Dwarf-Shrubland Group (G520) and Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh Group (G521), although some species are certainly shared with wet meadows, such as *Deschampsia*.

Classification Comments: The Rockies and Cascades support a number of forb types found on talus and rocky scree slopes, which are not sparsely vegetated, and which often have little to no grass component, though Carices may be abundant. These types often have heavy snow loading in winter, or are adjacent to snowfields, and subsurface moisture below the rocks/scree is significant throughout the growing season. These forb types are poorly documented; for now they are placed in this group, as many of the taxa are also found in mesic grassy meadows. Splitting them into a separate group would be hard to justify floristically.

Similar NVC Types:

- G267 Central Rocky Mountain Montane Grassland
- G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
- G268 Southern Rocky Mountain Montane-Subalpine Grassland
- G520 Vancouverian-Rocky Mountain Subalpine-Alpine Snowbed, Wet Meadow & Dwarf-shrubland
- G320 North Pacific Alpine-Subalpine Tundra
- G317 North Pacific Alpine-Subalpine Dwarf-shrubland & Heath
- G316 Rocky Mountain-Sierran Alpine Dwarf-shrubland & Krummholz

Diagnostic Characteristics: Herbaceous communities found in the mountains of the Rockies and eastern Cascades, dominated by forbs and graminoids. These are relatively mesic or sometimes seasonally wet communities, and the combination of moisture and soil conditions results in forbs, often tall, being the predominant lifeform. Grasses and sedges are common, typically being taxa with broad and soft blades. Forb communities found on talus and scree slopes with subsurface moisture are included here, in particular when they are not sparsely vegetated.

VEGETATION

Physiognomy and Structure: This group includes herbaceous communities found in the montane and subalpine throughout much of the Rockies, eastern Cascades and Sierra Nevada, dominated by flowering forbs, often tall (but still <1 m in height usually). Grasses with broad, soft blades are common, but these are more typically forb-rich meadows with grasses or other graminoids not the dominant lifeform. Cover is generally dense or can be patchy. Burrowing mammals in places will disrupt the soil.

Floristics: Species composition in this mesic meadow differs some between montane and subalpine elevations, but across its range, this is a very diverse group. Tall forb-dominated mesic meadows are typically composed of a wide diversity of genera and contribute more to overall herbaceous cover than graminoids. At montane elevations, important forbs include *Allium schoenoprasum*, *Angelica arguta*, *Arnica chamissonis*, *Athyrium filix-femina*, *Camassia quamash*, *Campanula rotundifolia*, *Chamerion angustifolium*, *Delphinium x occidentale*, *Erigeron speciosus*, *Eucephalus* spp., *Geum macrophyllum*, *Hackelia* spp., *Heracleum maximum*, *Ligusticum porteri*, *Ligusticum tenuifolium*, *Lupinus parviflorus*, *Mertensia* spp., *Osmorhiza occidentalis*, *Pteridium aquilinum*, *Senecio hydrophiloides*, *Senecio serra*, *Solidago canadensis*, *Symphotrichum* spp., *Thalictrum occidentale*, *Trollius laxus*, *Vicia americana* and *Zigadenus elegans*. Early-successional stages may be dominated by *Achillea millefolium*, *Agastache urticifolia*, *Chamerion angustifolium*, *Urtica dioica*, and small amounts of mesic grasses such as *Bromus carinatus* and *Deschampsia cespitosa*. At montane elevations, graminoids form a minor component and are usually taxa with relatively broad and soft blades such as *Bromus carinatus*, *Bromus sitchensis*, *Carex geyeri*, *Carex hoodii*, *Carex microptera*, *Carex raynoldsii*, *Deschampsia cespitosa*, *Elymus glaucus*, *Festuca rubra*, and *Melica spectabilis*. Broadleaf deciduous shrubs such as *Dasiphora fruticosa* ssp. *floribunda* and *Symphoricarpos* spp. are occasional, but not abundant.

At subalpine elevations, *Angelica* spp., *Arnica latifolia*, *Castilleja miniata*, *Erigeron peregrinus*, *Erythronium grandiflorum*, *Eucephalus ledophyllum*, *Ligusticum* spp., *Lupinus argenteus* var. *laxiflorus*, *Lupinus latifolius*, *Senecio triangularis*, *Valeriana* spp., and *Veratrum viride* are commonly the dominant forbs. Other locally abundant forbs include *Hydrophyllum fendleri*, *Phacelia hastata*, *Phlox diffusa*, *Saussurea americana*, and *Xerophyllum tenax*. Burrowing mammals can increase the forb diversity. Graminoids are typically a minor component of the canopy, with typically less than 20% cover. Common species include *Agrostis variabilis*, *Carex*

microptera, *Carex paysonis*, *Carex spectabilis*, *Deschampsia cespitosa*, *Elymus trachycaulus*, *Juncus drummondii*, *Luzula glabrata*, *Luzula parviflora*, *Phleum alpinum*, *Poa alpina*, and *Vahlodea atropurpurea*. However, this group also includes *Festuca viridula*-dominated meadows in the Cascades. In the Sierra Nevada *Calamagrostis breweri*, *Carex filifolia*, *Carex straminiformis*, *Juncus drummondii*, and *Trisetum spicatum* may dominate stands with diagnostics forbs *Oreostemma alpigenum*, and *Solidago canadensis*. Dwarf-shrubs such as *Vaccinium cespitosum* may have moderate cover in some stands. Early-successional stages may be dominated by *Achillea millefolium*, *Hypericum scouleri*, *Sibbaldia procumbens*, and other forbs, and small amounts of mesic graminoids such as *Carex* spp., *Deschampsia cespitosa*, *Phleum alpinum*, and *Poa alpina*.

ENVIRONMENT & DYNAMICS

Environmental Description: In the Rocky Mountains, these meadows occupy a wide variety of environments, including moderate to steep slopes and glacio-fluvial flats and swales that lose their snow cover relatively late in the season. Generally the group is restricted to sites from lower montane to subalpine where finely textured soils, snow deposition, rocky substrates, or windswept dry conditions limit tree establishment. Many occurrences are small-patch in spatial character, and are often found in mosaics with woodlands, more dense shrublands, or just below alpine communities. This group is typically found above 2000 m to 3700 m in elevation in the southern part of its range and above 600 m in the northern extent. These upland communities occur on gentle to moderate-gradient slopes and relatively moist habitats. The soils are typically seasonally moist to saturated in the spring but, if so, will dry out later in the growing season. At montane elevations, this group occurs within *Pinus-Pseudotsuga* or mixed conifer-dominated forests. At subalpine elevations, these meadows are found below treeline, usually within *Abies lasiocarpa-Picea* species-dominated forests.

Climate: Approximately two-thirds of the region's precipitation occurs in just half the year (October from March), with the remaining third occurring in late spring to early summer. Generally, the east slopes of the Cascades and Sierra Nevada ranges east to the northern Rocky Mountains of Montana and Wyoming receive greater than 100 cm of precipitation annually.

Soil/substrate/hydrology: Soils are typically seasonally moist to saturated during spring and early summer after snowmelt, but will dry out later in the growing season. At montane elevations, soils are usually clays or silt loams with an A horizon greater than 10 cm. Some sites may have inclusions of hydric soils in low, depressional areas within this group. At subalpine elevations, soils are derived from a variety of parent materials, and can be acidic or calcareous. The A horizon is typically less than 10 cm, and soils are usually rocky or gravelly with good aeration and drainage, but with a well-developed organic layer. A third setting includes talus or scree slopes, or colluvial fields of rocks and small boulders, where subsurface moisture is provided by melting snow throughout much of the growing season. Soils are developed from colluvium and more recently alluvium are often derived from limestone, sandstone, shale parent materials (Gregory 1983, Youngblood et al. 1985a), or weathered volcanic extrusives such as basalt, pumice and ash or loess deposits. Soil texture is variable and ranges from coarser-textured sandy loams to finer-textured silt loams, clay or clay loams with an average pH of 6.4 (Gregory 1983). Surface rock averages 46%, but varies from 1-90%. Bare ground cover is usually less than 15%.

Dynamics:

DISTRIBUTION

Geographic Range: This group is very widespread in the Rocky Mountains cordillera from New Mexico (where it is uncommon) and Colorado north into Canada, and west into the eastern Cascades and Sierra Nevada. It also occurs in the mountain ranges of Nevada, northern Utah and Wyoming, and has been observed on the Snake River plain, as well as the "island ranges" of central Montana.

Spatial Scale & Pattern [optional]: Small patch, Large patch

Nations: CA, US

States/Provinces: AB, BC, CA?, CO, ID, MT, NM, NV, OR, WA, WY

TNC Ecoregions [optional]: 3:C, 4:C, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:P, 26:C, 68:C

USFS Ecoregions (2007): 341B:C?, 341E:CP, 341G:CC, 342B:CP, 342C:CC, 342D:CC, 342E:C?, 342H:CC, 342J:CC, M313A:PP, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CP

Omernik Ecoregions:

Federal Lands [optional]: NPS (Great Basin); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. This is a solid group in its core concept, it's more a question of clarifying exactly how it relates to drier predominantly grass-dominated groups, and also the relationship of specific associations to wet meadow groups.

SYNONYMY

- >< Idaho Fescue - Tufted Hairgrass (308) (Shiflet 1994)
- >< Tall Forb (409) (Shiflet 1994)

- >< Tufted Hairgrass - Sedge (313) (Shiflet 1994) [Forb-rich portions of this SRM type overlap with this group.]

LOWER LEVEL UNITS

Alliances:

- A4165 *Poa secunda* - *Muhlenbergia richardsonis* - *Carex douglasii* Moist Meadow Alliance
- A3951 *Ligusticum* spp. - *Lupinus* spp. - *Delphinium* spp. Montane Mesic Meadow Alliance
- A3950 *Agastache urticifolia* - *Geranium viscosissimum* - *Pteridium aquilinum* Montane Mesic Meadow Alliance
- A4119 *Carex straminiformis* - *Solidago canadensis* Meadow Alliance
- A3364 *Calamagrostis breweri* Mesic Grassland Alliance
- A3949 *Phleum alpinum* - *Elymus trachycaulus* - *Agrostis variabilis* Subalpine Mesic Meadow Alliance
- A1257 *Festuca viridula* - *Carex hoodii* - *Lupinus* spp. Subalpine Mesic Meadow Alliance
- A3948 *Valeriana sitchensis* - *Luzula glabrata* var. *hitchcockii* - *Xerophyllum tenax* Subalpine Mesic Meadow Alliance
- A1294 *Carex filifolia* Mesic Grassland Alliance

AUTHORSHIP

Primary Concept Source: T.N. Shiflet (1994)

Author of Description: M.S. Reid, T. Luna, K.A. Schulz

Acknowledgments:

Version Date: 09/29/2016

Classif Resp Region: West

Internal Author: MSR 3-10, 3-11, mod. KAS 5-15, 11-15, mod. GK 9-16

REFERENCES

References: Buckner 1977, Ellison 1954, Faber-Langendoen et al. 2017a, Fritz 1981, Gregory 1983, Hall 1971, Marr 1977a, Meidinger and Pojar 1991, Potkin and Munn 1989, Shiflet 1994, Starr 1974, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow

A3950. *Agastache urticifolia* - *Geranium viscosissimum* - *Pteridium aquilinum* Montane Mesic Meadow Alliance

Type Concept Sentence: Plant associations within this montane mesic meadow alliance are characterized by the dominance of *Agastache urticifolia*, *Geranium viscosissimum*, *Heliomeris multiflora*, *Mertensia ciliata*, *Pteridium aquilinum*, or *Wyethia amplexicaulis* and occur in the central Rocky Mountains of Wyoming, Utah and Idaho extending west to ranges in Nevada.

OVERVIEW

Scientific Name: *Agastache urticifolia* - *Geranium viscosissimum* - *Pteridium aquilinum* Montane Mesic Meadow Alliance

Common Name (Translated Scientific Name): Nettleleaf Giant-hyssop - Sticky Purple Geranium - Western Brackenfern Montane Mesic Meadow Alliance

Colloquial Name: Montane Nettleleaf Giant-hyssop - Sticky Purple Geranium - Western Brackenfern Mesic Meadow

Type Concept: The vegetation of this montane mesic meadow alliance is characterized by an often patchy, moderately dense to dense herbaceous layer dominated by perennial forbs. Diagnostic and dominant species are *Agastache urticifolia*, *Geranium viscosissimum*, *Heliomeris multiflora*, *Mertensia ciliata*, *Pteridium aquilinum*, and/or *Wyethia amplexicaulis*. Associated species are diverse and include widespread forbs such as *Achillea millefolium* or *Senecio triangularis*, and mesic graminoids such as *Bromus carinatus*, *Carex microptera*, and *Elymus trachycaulus*. Scattered clumps of the deciduous shrub *Symphoricarpos oreophilus* are common, and occasional *Populus tremuloides* trees may also be present. Plant associations occur in the central Rocky Mountains of Wyoming, Utah and Idaho extending west to ranges in Nevada. Sites vary from gentle to steep slopes with eastern to southwestern aspects, but are most often moderately steep mid to upper slopes. Stands also occur along small streams, benches near seeps, and on moist toeslopes in narrow valley bottoms. Elevations range from 1970-2835 m. Soils are moderately deep to deep, well-drained loams with a thick mollic horizon. The water table ranges to depths of 20 cm. Soils are developed from colluvium and more recently alluvium and are derived from limestone, sandstone or shale parent materials and have clay or clay loam textures.

Classification Comments: This is a poorly documented alliance and may be more extensive than currently known. Subalpine forb meadow communities are not well-studied anywhere in the West. Possible occurrences of *Mertensia ciliata* communities in Colorado and the Centennial Mountains in Montana need to be investigated (Johnston 1987, Padgett et al. 1989).

Internal Comments:

Other Comments:

Similar NVC Types:

- A1257 *Festuca viridula* - *Carex hoodii* - *Lupinus* spp. Subalpine Mesic Meadow Alliance: is dominated or codominated by *Festuca viridula* in the interior Pacific Northwest and central Rocky Mountains.
- A3948 *Valeriana sitchensis* - *Luzula glabrata* var. *hitchcockii* - *Xerophyllum tenax* Subalpine Mesic Meadow Alliance: is typically dominated by *Valeriana sitchensis* or *Xerophyllum tenax* with *Carex geyeri*, *Carex spectabilis*, *Chamerion angustifolium*, *Luzula glabrata* var. *hitchcockii*, and *Veratrum viride* sometimes abundant.
- A3949 *Phleum alpinum* - *Elymus trachycaulus* - *Agrostis variabilis* Subalpine Mesic Meadow Alliance: is dominated by *Phleum alpinum*, *Elymus trachycaulus*, or *Agrostis variabilis*.
- A3951 *Ligusticum* spp. - *Lupinus* spp. - *Delphinium* spp. Montane Mesic Meadow Alliance: is dominated by *Ligusticum filicinum*, *Ligusticum porteri*, *Ligusticum tenuifolium*, *Lupinus argenteus*, or *Lupinus parviflorus* ssp. *myrianthus*.

Diagnostic Characteristics: These are high-altitude mesic meadows dominated or codominated by forbs; especially diagnostic and often dominant species include *Agastache urticifolia*, *Geranium viscosissimum*, *Heliomeris multiflora*, *Mertensia ciliata*, *Pteridium aquilinum*, or *Wyethia amplexicaulis*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderately dense to dense (40-100% cover), medium-tall (0.4-0.8 m) herbaceous layer that often occurs in patches. It is dominated by perennial forbs with consistent but low perennial graminoid cover. Scattered cold-deciduous shrubs are often present, and occasional cold-deciduous trees may present in these stands.

Floristics: The vegetation is characterized by an often patchy, moderately dense to dense (40-100% cover) herbaceous layer dominated by perennial forbs. Diagnostic and dominant species are *Agastache urticifolia*, *Geranium viscosissimum*, *Heliomeris multiflora*, *Mertensia ciliata*, *Pteridium aquilinum*, and/or *Wyethia amplexicaulis* (Gregory 1983). Associated species include *Achillea millefolium*, *Bromus carinatus*, *Carex microptera*, *Collomia linearis*, *Delphinium x occidentale*, *Eucephalus engelmannii*, *Elymus trachycaulus*, *Geranium richardsonii*, *Heracleum maximum*, *Hymenoxys hoopesii*, *Lupinus argenteus*, *Poa palustris* (exotic), *Rudbeckia occidentalis*, *Saxifraga odontoloma*, *Senecio triangularis*, and *Senecio serra*. Scattered clumps of the deciduous shrub *Symphoricarpos oreophilus* are common, and occasional *Populus tremuloides* trees may also be present.

ENVIRONMENT & DYNAMICS

Environmental Description: Plant associations within this montane mesic meadow alliance occur in the central Rocky Mountains of Wyoming, Utah and Idaho extending west to ranges in Nevada. Elevations range from 1970-2835 m. Sites vary from gentle to steep (5-70%) slopes with eastern to southwestern aspects, but are most often moderately steep (40%) mid to upper slopes. Stands also occur along small streams, benches near seeps, and on moist toeslopes in narrow valley bottoms. The water table ranges to depths of 20 cm. Soils are moderately deep to deep, well-drained loams with a thick mollic horizon. Soils are developed from colluvium and more recently alluvium and are derived from limestone, sandstone or shale parent materials (Gregory 1983, Youngblood et al. 1985a). Soil texture includes silt loams, clay or clay loams with an average pH of 6.4 (Gregory 1983). Surface rock averages 46%, but varies from 1-90%. Bare ground cover is usually less than 15%.

Dynamics: When disturbed by extensive sheep grazing, this community is converted to a *Rudbeckia occidentalis*- or *Veratrum californicum*-dominated community (Padgett et al. 1989). *Pteridium aquilinum* has been associated with recently disturbed, mesic ground on steep slopes in Grand Tetons National Park.

DISTRIBUTION

Geographic Range: This alliance occurs in the subalpine zone in the central Rocky Mountains of Wyoming, Utah and Idaho extending west to ranges in Nevada.

Nations: US

States/Provinces: ID, NV, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Mertensia ciliata* Series (Johnston 1987)

LOWER LEVEL UNITS

Associations:

- CEGLO01944 *Mertensia ciliata* Meadow
- CEGLO01937 *Agastache urticifolia* - *Heliomeris multiflora* Meadow
- CEGLO02544 *Pteridium aquilinum* Meadow
- CEGLO02536 *Geranium viscosissimum* Meadow
- CEGLO01947 *Wyethia amplexicaulis* Meadow

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Damm.

Version Date: 2014/03/14

REFERENCES

References: Bissell 1973, Faber-Langendoen et al. 2017b, Gregory 1983, Johnston 1987, Norton et al. 1981, Padgett et al. 1989, Welsh et al. 1987, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow

A3364. Calamagrostis breweri Mesic Grassland Alliance

Type Concept Sentence: This alliance consists of meadows where *Calamagrostis breweri* or *Calamagrostis muiriana* is the important or dominant grass in the herbaceous layer. This is an alpine and subalpine grassland found in the Sierra Nevada of California at elevations ranging from 1300-1800 m. It occurs on fine-textured soils which are moist for most of the year, often on stream and lake margins.

OVERVIEW

Scientific Name: *Calamagrostis breweri* Mesic Grassland Alliance

Common Name (Translated Scientific Name): Shorthair Reedgrass Mesic Grassland Alliance

Colloquial Name: Shorthair Reedgrass Mesic Grassland

Type Concept: This alliance consists of wet meadows dominated by *Calamagrostis breweri* or *Calamagrostis muiriana*. Other species include *Achillea millefolium* var. *occidentalis* (= *Achillea lanulosa*), *Carex filifolia*, *Deschampsia cespitosa*, *Eriogonum* spp., *Juncus drummondii*, *Juncus mertensianus*, *Oreostemma alpigenum*, *Penstemon heterodoxus*, *Phyllodoce breweri*, *Potentilla* spp., *Ptilagrostis kingii*, *Trisetum spicatum*, and *Vaccinium cespitosum*. Emergent shrubs such as *Kalmia microphylla*, *Salix arctica*, or *Vaccinium cespitosum* may be present at low cover. Herbs are <0.5 m in height, and the canopy cover is intermittent to continuous. This is an alpine and subalpine grassland found in the Sierra Nevada of California at elevations ranging from 1300-1800 m. Habitats are subalpine to alpine seasonally flooded meadows, valley bottoms, flats, and lower slopes which are moist for most of the year, having subsurface moisture.

Classification Comments: Much of the information for this alliance is derived from Sawyer et al. (2009) which follows the treatment of Wilson and Gray (2002), wherein *Calamagrostis breweri* is found north of Carson Pass in the central Sierra Nevada. They differentiated the plants that grow south of Carson Pass as *Calamagrostis muiriana*. The associations listed in Sawyer et al. (2009) under the *Calamagrostis muiriana* Herbaceous Alliance are included here, but currently the USNVC uses *Calamagrostis breweri* in those names. According to Wilson and Gray (2002), the *Calamagrostis muiriana* plants differ in morphology, isozyme patterns, chromosomes number, and ecology from *Calamagrostis breweri* that grows in the northern Sierra Nevada, Klamath Mountains, and Oregon. Unlike *Calamagrostis muiriana*, the northern plants are not community dominants. Under this concept, *Calamagrostis muiriana* associations are restricted to the central and southern Sierra Nevada. Kartesz (1999) does not recognize *Calamagrostis muiriana* but USDA Plants (accessed 20 November 2014) does.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: *Calamagrostis breweri* or *Calamagrostis muiriana* are the indicators, generally dominant, or having >30% relative cover. Shrubs such as *Vaccinium cespitosum* have low to moderate in cover.

VEGETATION

Physiognomy and Structure: This short, alpine or subalpine sod grassland is dominated by graminoids less than 15 cm in height. The herbaceous canopy can be open to continuous. Emergent shrubs (1-2 m) may be present.

Floristics: These wet meadows are dominated by *Calamagrostis breweri* or *Calamagrostis muiriana*. Other species include *Achillea millefolium* var. *occidentalis* (= *Achillea lanulosa*), *Carex filifolia*, *Deschampsia cespitosa*, *Eriogonum* spp., *Juncus drummondii*, *Juncus mertensianus*, *Oreostemma alpigenum*, *Penstemon heterodoxus*, *Phyllodoce breweri*, *Potentilla* spp., *Ptilagrostis kingii*, *Trisetum spicatum*, and *Vaccinium cespitosum*. Emergent shrubs such as *Kalmia microphylla*, *Salix arctica*, or *Vaccinium cespitosum* may be present at low cover. Herbs are >0.5 m in height, and the canopy cover is intermittent to continuous.

ENVIRONMENT & DYNAMICS

Environmental Description: Habitats are subalpine to alpine seasonally flooded meadows, valley bottoms, flats, and lower slopes. This alliance occurs on fine-textured soils which are moist for most of the year, having subsurface moisture. It is also found on stream and lake margins that maintain the proper soil moisture content. The precipitation regime where this alliance occurs is strongly seasonal, with most precipitation falling in the winter months. Most precipitation in the upper elevational range falls as snow. Summers are very dry. Elevation range is 1300-1800 m. This alliance forms large stands, which often intergrade with other meadow, forest and woodland alliances.

Dynamics: Periodic droughts can reduce the extent of this alliance.

DISTRIBUTION

Geographic Range: This alliance is found in the Sierra Nevada of California.

Nations: US

States/Provinces: CA

TNC Ecoregions [optional]: 12:C

USFS Ecoregions (2007): M261E:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Calamagrostis muiriana* (Shorthair reed grass meadows) Alliance (Sawyer et al. 2009) [45.141.00]
- = *Calamagrostis muiriana* Herbaceous Alliance (CNPS 2017) [45.141.00]
- >< Dry Montane Meadow (#45120) (Holland 1986b)
- >< Dry Subalpine or Alpine Meadow (#45220) (Holland 1986b)
- = Shorthair Reed Grass Series (Sawyer and Keeler-Wolf 1995)
- >< Wet Montane Meadow (#45110) (Holland 1986b)
- >< Wet Subalpine or Alpine Meadow (#45210) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- C EGL008657 *Calamagrostis breweri* - *Trisetum spicatum* Grassland
- C EGL008655 *Vaccinium cespitosum* / *Calamagrostis breweri* Dwarf-shrub Grassland
- C EGL008654 *Calamagrostis breweri* - *Oreostemma alpigenum* Grassland
- C EGL008656 *Calamagrostis breweri* - *Juncus drummondii* Grassland

AUTHORSHIP

Primary Concept Source: M.S. Reid after Sawyer et al. (2009)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Allen-Diaz 1994, Benedict 1983, Burke 1982, CNPS 2017, Faber-Langendoen et al. 2017b, Fites-Kaufman et al. 2007, Hickman 1993, Holland 1986b, Kartesz 1999, Keeler-Wolf et al. 2003a, Klikoff 1965, Major and Taylor 1977, Potter 2005, Ratliff 1982, Ratliff 1985, Sawyer and Keeler-Wolf 1995, Sawyer and Keeler-Wolf 2007, Sawyer et al. 2009, Taylor 1984, USDA NRCS n.d., Wilson and Gray 2002

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow

A1294. *Carex filifolia* Mesic Grassland Alliance

Type Concept Sentence: This alliance is dominated by *Carex filifolia* in the herbaceous layer. Plants grow in tight clumps that form closed to open turf. This short grassland of dry subalpine and alpine meadows occurs on slopes and ridges from 1500-3700 m elevation in the Sierra Nevada of California and possibly east into the mountain ranges of western Nevada.

OVERVIEW

Scientific Name: *Carex filifolia* Mesic Grassland Alliance

Common Name (Translated Scientific Name): Threadleaf Sedge Mesic Grassland Alliance

Colloquial Name: Threadleaf Sedge Mesic Grassland

Type Concept: This alliance is dominated by *Carex filifolia* in the herbaceous layer. Plants grow in tight clumps that form closed to open turf. Other herbs may include *Achillea millefolium* var. *occidentalis* (= *Achillea lanulosa*), *Antennaria rosea*, *Calamagrostis muiriana*, *Cistanthe monosperma*, *Cistanthe umbellata*, *Deschampsia cespitosa*, *Dicentra uniflora*, *Erigeron algidus* (= *Erigeron petiolaris*), *Juncus mertensianus*, *Lewisia pygmaea*, *Lupinus breweri*, *Oreostemma alpigenum* (= *Aster alpigenus*), *Penstemon heterodoxus*, *Potentilla* spp., *Saxifraga aprica*, *Solidago multiradiata*, and *Trisetum spicatum*. Emergent *Eriogonum nudum* plants may be present at low cover. This alliance forms large stands. Herbs are <0.3 m in height, and the canopy coverage is open to continuous. This short grassland of dry subalpine and alpine meadows occurs on slopes and ridges, and edges of subalpine meadows and basins from 1500-3700 m elevation in the Sierra Nevada of California and possibly east into the mountain ranges of western Nevada. Stands often grow on the upper margins of meadows, or just beyond the zone of seasonal soil saturation if the stand is adjacent to a lake. Soils are well-drained sands or loams. The precipitation regime where this alliance occurs is strongly seasonal, with most precipitation falling in the winter months. Most precipitation in the upper elevational range falls as snow. Summers are very dry.

Classification Comments: This alliance could possibly be merged with *Calamagrostis breweri* Mesic Grassland Alliance (A3364), but occurs on somewhat drier sites, whereas *Calamagrostis breweri* requires subsurface moisture, and is seasonally flooded. In California, this is apparently *Carex filifolia* var. *erostrata* (Hickman 1993, Ball and Reznicek 2002), which in Kartesz (1999) is synonymous with *Carex exserta*. All of the associations in the USNVC for California should be renamed from *Carex filifolia* to *Carex exserta* or else to *Carex filifolia* var. *erostrata*.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Dominated by *Carex filifolia* in the herbaceous layer. *Carex filifolia* $\geq 50\%$ relative cover or is conspicuous ($\geq 1\%$ absolute cover) if other herbaceous species present. *Calamagrostis muiriana* or other short subalpine grasses and sedges are either subdominant or absent.

VEGETATION

Physiognomy and Structure: This short, alpine or subalpine sod grassland is dominated by forbs less than 30 cm in height. The herbaceous canopy can be open to continuous. Emergent shrubs (1-2 m) may be present.

Floristics: This alliance is dominated by *Carex filifolia* in the herbaceous layer. Plants grow in tight clumps that form closed to open turf. Other herbs may include *Achillea millefolium* var. *occidentalis* (= *Achillea lanulosa*), *Antennaria rosea*, *Calamagrostis muiriana*, *Cistanthe monosperma*, *Cistanthe umbellata*, *Deschampsia cespitosa*, *Dicentra uniflora*, *Erigeron algidus* (= *Erigeron petiolaris*), *Juncus mertensianus*, *Lewisia pygmaea*, *Lupinus breweri*, *Oreostemma alpigenum* (= *Aster alpigenus*), *Penstemon heterodoxus*, *Potentilla* spp., *Saxifraga aprica*, *Solidago multiradiata*, and *Trisetum spicatum*. Emergent *Eriogonum nudum* plants may be present at low cover.

ENVIRONMENT & DYNAMICS

Environmental Description: This short grassland of dry subalpine and alpine meadows occurs on slopes and ridges, and edges of subalpine meadows and basins from 1500-3700 m elevation. Stands often grow on the upper margins of meadows, or just beyond the zone of seasonal soil saturation if the stand is adjacent to a lake. Soils are well-drained sands or loams. The precipitation regime where this alliance occurs is strongly seasonal, with most precipitation falling in the winter months. Most precipitation in the upper elevational range falls as snow. Summers are very dry.

Dynamics: No information available.

DISTRIBUTION

Geographic Range: This alliance occurs in the Sierra Nevada of California and possibly east into the mountain ranges of western Nevada.

Nations: US

States/Provinces: CA, NV?

TNC Ecoregions [optional]: 12:C

USFS Ecoregions (2007): M261E:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Carex filifolia* (Shorthair sedge turf) Alliance (Sawyer et al. 2009) [45.140.00]
- = *Carex filifolia* Herbaceous Alliance (CNPS 2017) [45.140.00]
- >< Dry Subalpine or Alpine Meadow (#45220) (Holland 1986b)
- = Shorthair sedge series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEGLO08653 *Vaccinium cespitosum* / *Carex filifolia* Dwarf-shrubland
- CEGLO08663 *Carex filifolia* - *Trisetum spicatum* Grassland
- CEGLO08660 *Carex filifolia* - *Cistanthe* spp. Grassland
- CEGLO08662 *Carex filifolia* - *Penstemon heterodoxus* Grassland

AUTHORSHIP

Primary Concept Source: M. Schindel, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Allen-Diaz 1994, Ball and Reznicek 2002, Benedict 1983, Bennett 1965, Burke 1982, CNPS 2017, Faber-Langendoen et al. 2017b, Hauser 2006b, Hickman 1993, Holland 1986b, Kartesz 1999, Keeler-Wolf et al. 2003a, Klikoff 1965, Major and Taylor 1977, Paysen et al. 1980, Potter 2005, Ratliff 1979, Ratliff 1982, Ratliff 1985, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Taylor 1984

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow

A4119. *Carex straminiformis* - *Solidago canadensis* Meadow Alliance [Low - Poorly Documented]

Type Concept Sentence:

OVERVIEW

Scientific Name: *Carex straminiformis* - *Solidago canadensis* Meadow Alliance

Common Name (Translated Scientific Name): Shasta Sedge - Canada Goldenrod Meadow Alliance

Colloquial Name: Shasta Sedge - Canada Goldenrod Meadow

Type Concept:

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics:

ENVIRONMENT & DYNAMICS

Environmental Description:

Dynamics:

DISTRIBUTION

Geographic Range:

Nations: US

States/Provinces: CA, NV

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

- > *Carex straminiformis* (Mount Shasta sedge meadows) Provisional Alliance (Sawyer et al. 2009) [45.185.00]
- > *Carex straminiformis* Provisional Herbaceous Alliance (CNPS 2017) [45.185.00]
- > *Solidago canadensis* (Canada goldenrod patches) Provisional Alliance (Sawyer et al. 2009) [45.420.00]
- > *Solidago canadensis* Provisional Herbaceous Alliance (CNPS 2017) [45.420.00]

LOWER LEVEL UNITS

Associations:

- CEG001793 *Carex straminiformis* Grassland
- CEG003161 *Solidago canadensis* - *Achillea millefolium* Grassland

AUTHORSHIP

Primary Concept Source: M.S. Reid

Author of Description:

Acknowledgments:

REFERENCES

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow

A1257. *Festuca viridula* - *Carex hoodii* - *Lupinus* spp. Subalpine Mesic Meadow Alliance

Type Concept Sentence: This high-elevation grassland alliance is dominated or codominated by diagnostic species *Festuca viridula*, which may form dense, continuous stands in pristine situations. It occurs in cold, dry sites throughout the Pacific Northwest extending east to the central Rocky Mountains in northern Idaho and Wyoming.

OVERVIEW

Scientific Name: *Festuca viridula* - *Carex hoodii* - *Lupinus* spp. Subalpine Mesic Meadow Alliance**Common Name (Translated Scientific Name):** Greenleaf Fescue - Hood's Sedge - Lupine species Subalpine Mesic Meadow Alliance**Colloquial Name:** Subalpine Greenleaf Fescue Mesic Meadow

Type Concept: Vegetation of this high-elevation grassland alliance is dominated or codominated by *Festuca viridula* with *Carex hoodii*, *Eucephalus ledophyllus*, *Festuca idahoensis*, *Lupinus argenteus* var. *laxiflorus*, or *Lupinus latifolius*. These diagnostic species form dense, continuous stands in pristine situations. Dwarf-shrub and subshrub species include *Paxistima myrsinites* and *Phlox diffusa*. Adjacent vegetation is often subalpine forests of *Tsuga mertensiana* or *Abies lasiocarpa*, and at wetter sites, *Carex* spp. meadows or *Phyllodoce* - *Cassiope* shrublands are typical. This alliance occurs in cold, dry sites throughout the Pacific Northwest extending east to the central Rocky Mountains in northern Idaho. Stands occur from 1370 m in the northern Cascade Range and Olympic Mountains to 1586-1769 m in northern Idaho to over 2400 m in the mountains of northeastern Oregon. They are typically

associated with south-facing or exposed slopes where snow cover is blown or melted off relatively early. Soils are usually well-drained and vary in texture from coarse colluvium on steep slopes to fine-textured loams in low-gradient subalpine meadows.

Classification Comments: The range of this alliance needs to be reviewed as some associations extend into the Pacific Northwest west of the Cascades and may exceed that of the range of Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow Group (G271). Some *Festuca viridula*-dominated grasslands in the Blue and Wallowa mountains of Oregon (Johnson and Simon 1987, Johnson and Clausnitzer 1992) are described as dense, sod-forming clumps of *Festuca viridula* and nearly forb-free, with much litter and no bare ground or exposed gravel or rock particles, which may be better classified in a grassland group.

Internal Comments: mjr 3-16: *Festuca viridula* does not occur in WY (removed). KAS-1-14: More review of *Festuca viridula* - *Festuca idahoensis* Herbaceous Vegetation (CEGL001633) is needed to verify placement in this alliance in a mesic meadow group as some stands in the Blue and Wallowa mountains of Oregon (Johnson and Simon 1987, Johnson and Clausnitzer 1992) are described as dense, sod-forming *Festuca viridula*-dominated grasslands that are nearly forb-free, with much litter and no bare ground or exposed gravel or rock particles.

Other Comments:

Similar NVC Types: *Festuca idahoensis* - *Calamagrostis rubescens* - *Achnatherum nelsonii* Central Rocky Mountain Montane Mesic Grassland Alliance (A3966) in Central Rocky Mountain Montane Grassland Group (G267) has two *Carex hoodii*-codominated associations that are similar to stands in *Festuca viridula* - *Carex hoodii* Meadow (CEGL001596) in this alliance. Further review of these similar types is needed.

- A3950 *Agastache urticifolia* - *Geranium viscosissimum* - *Pteridium aquilinum* Montane Mesic Meadow Alliance: is dominated by *Agastache urticifolia*, *Geranium viscosissimum*, *Heliomeris multiflora*, *Mertensia ciliata*, *Pteridium aquilinum*, or *Wyethia amplexicaulis*.
- A3948 *Valeriana sitchensis* - *Luzula glabrata* var. *hitchcockii* - *Xerophyllum tenax* Subalpine Mesic Meadow Alliance: is typically dominated by *Valeriana sitchensis* or *Xerophyllum tenax* with *Carex geyeri*, *Carex spectabilis*, *Chamerion angustifolium*, *Luzula glabrata* var. *hitchcockii* and *Veratrum viride* sometimes abundant.
- A3949 *Phleum alpinum* - *Elymus trachycaulus* - *Agrostis variabilis* Subalpine Mesic Meadow Alliance: is dominated by *Phleum alpinum*, *Elymus trachycaulus*, or *Agrostis variabilis*.
- A3951 *Ligusticum* spp. - *Lupinus* spp. - *Delphinium* spp. Montane Mesic Meadow Alliance: is dominated by *Ligusticum filicinum*, *Ligusticum porteri*, *Ligusticum tenuifolium*, *Lupinus argenteus* or *Lupinus parviflorus* ssp. *myrianthus*.

Diagnostic Characteristics: This subalpine mesic meadow is characterized by dominance or codominance of *Festuca viridula* with *Carex hoodii*, *Eucephalus ledophyllus*, *Festuca idahoensis*, *Lupinus argenteus* var. *laxiflorus*, or *Lupinus latifolius*, which are the diagnostic species. Most stands are mixed with several other graminoid or forb species and occasionally with dwarf-shrub and subshrub species.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by a dense layer of caespitose graminoids between 0.5-1 m in height. Forbs are usually scattered through the graminoid matrix and may be abundant in some stands. Evergreen or cold-deciduous shrubs may be scattered through the stand, but are typically very sparse.

Floristics: This alliance is characterized by a moderate to dense herbaceous layer dominated or codominated by *Festuca viridula* with *Carex hoodii*, *Eucephalus ledophyllus*, *Festuca idahoensis*, *Lupinus argenteus* var. *laxiflorus*, or *Lupinus latifolius* the diagnostic species. Most stands are mixed with several other graminoid or forb species and occasionally with dwarf-shrub and subshrub species such as *Paxistima myrsinites* and *Phlox diffusa*. Other associated graminoids include *Achnatherum lettermanii*, *Achnatherum occidentale*, *Carex geyeri*, *Carex spectabilis*, *Elymus elymoides*, *Phleum alpinum*, and *Poa cusickii*. Common forb associates include *Antennaria lanata*, *Arnica parryi*, *Eriogonum heracleoides*, *Erysimum arenicola*, *Hieracium gracile*, *Juncus parryi*, *Ligusticum grayi*, *Lomatium martindalei*, *Luetkea pectinata*, *Lupinus arcticus*, *Lupinus caudatus*, *Nothocalais alpestris*, *Oreostemma alpigenum*, *Penstemon confertus*, *Penstemon globosus*, *Penstemon procerus*, *Polemonium pulcherrimum*, *Polygonum bistortoides*, *Polygonum phytolaccifolium*, and *Potentilla flabellifolia*. In early-seral stands, *Achillea millefolium*, *Hackelia micrantha* (= *Hackelia jessicae*), and *Rudbeckia occidentalis* can provide significant cover. *Festuca viridula*-dominated grasslands in the Blue and Wallowa mountains of Oregon (Johnson and Simon 1987, Johnson and Clausnitzer 1992) are described as dense, sod-forming clumps of this grass with low cover of forbs.

ENVIRONMENT & DYNAMICS

Environmental Description: This high-elevation grassland alliance occurs in cold, dry sites throughout the Pacific Northwest extending east to the central Rocky Mountains in northern Idaho. Elevations range from 1370 m in the northern Cascade Range and Olympic Mountains and 1586-1769 m in northern Idaho to over 2400 m in the mountains of northeastern Oregon. This alliance is typically associated with rainshadow areas of the higher mountains and may extend into lower alpine zones. Stands are typically

associated with moderate (10-30%) south-facing or exposed slopes, plateaus or ridgetops where snow cover is blown or melted off relatively early. However, west of the Cascades some stands occur on moist sites along ridgetops, seepy sideslopes and interforest meadows. Summer lightning is common, and lightning fires may also serve to prevent tree or shrub encroachment. Soils are generally well-drained, fairly shallow (76 cm) and stony and vary in texture from coarse colluvium on steep slopes to fine-textured loams in low-gradient subalpine meadows. Parent materials are usually weathered volcanic extrusives such as basalt, pumice and ash or loess deposits.

Dynamics: These mesic grasslands are associated with sites where soils are too droughty for forest growth. Daubenmire and Daubenmire (1968) noted that these communities tended to occur near the summits of south-facing mountains, where snow was blown off by southerly winds, resulting in severe soil drought in summer. Most of these communities were severely grazed in the early part of the 20th century allowing increases in forbs, needlegrass (*Hesperostipa* spp., *Achnatherum* spp.), and bare ground in these communities. Most stands are now considered disclimax associations which are in various stages of recovery (Johnson and Simon 1987).

DISTRIBUTION

Geographic Range: These high-altitude mesic grasslands occur in cold, dry sites throughout the Pacific Northwest extending east to the central Rocky Mountains in northern Idaho, near the border with Canada, in Kaniksu National Forest in the Selkirk Mountains.

Nations: CA?, US

States/Provinces: CA?, ID, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = V.A.5.N.d. *Festuca viridula* Herbaceous Alliance (A.1257). (Bourgeron and Engelking 1994)

LOWER LEVEL UNITS

Associations:

- C EGL001568 *Festuca rubra* Montane Meadow
- C EGL001633 *Festuca viridula* - *Festuca idahoensis* Meadow
- C EGL001632 *Festuca viridula* - *Eucephalus ledophyllus* Meadow
- C EGL001596 *Festuca viridula* - *Carex hoodii* Meadow
- C EGL001634 *Festuca viridula* - *Lupinus argenteus* var. *laxiflorus* Meadow
- C EGL001635 *Festuca viridula* - *Lupinus latifolius* Meadow

AUTHORSHIP

Primary Concept Source: P.S. Bourgeron and L.D. Engelking (1994)

Author of Description: K.A. Schulz

Acknowledgments: We acknowledge D. Sarr for writing the original alliance description.

Version Date: 2014/03/14

REFERENCES

References: Bourgeron and Engelking 1994, Daubenmire 1981, Daubenmire and Daubenmire 1968, Douglas and Bliss 1977, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Hall 1967, Hamann 1972, Head 1959, Henderson 1973, Henderson and Peter 1982, Johnson and Simon 1985, Johnson and Simon 1987, Kuramoto and Bliss 1970, Laysen 1980, Reid et al. 1980, Tisdale 1986

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow

A3951. *Ligusticum* spp. - *Lupinus* spp. - *Delphinium* spp. Montane Mesic Meadow Alliance

Type Concept Sentence: Plant associations within this typically montane mesic meadow alliance are characterized by the dominance of diagnostic species *Ligusticum filicinum*, *Ligusticum porteri*, *Ligusticum tenuifolium*, *Lupinus argenteus*, or *Lupinus parviflorus* ssp. *myrianthus* and occur in the central Rocky Mountains of Wyoming and Idaho extending south to ranges in Colorado.

OVERVIEW

Scientific Name: *Ligusticum* spp. - *Lupinus* spp. - *Delphinium* spp. Montane Mesic Meadow Alliance

Common Name (Translated Scientific Name): Licorice-root species - Lupine species - Larkspur species Montane Mesic Meadow Alliance

Colloquial Name: Montane Licorice-root - Lupine - Larkspur Mesic Meadow

Type Concept: The vegetation of this montane mesic meadow alliance is characterized by a moderately dense, medium-tall herbaceous layer that is dominated by perennial forbs and composed of diagnostic and dominant species *Ligusticum filicinum*, *Ligusticum porteri*, *Ligusticum tenuifolium*, *Lupinus argenteus*, or *Lupinus parviflorus ssp. myrianthus*. This vegetation has high species richness. Other high frequency taxa include *Delphinium x occidentale*, *Fragaria virginiana*, *Osmorhiza occidentalis*, *Pedicularis bracteosa*, *Senecio crassulus*, *Trollius laxus ssp. albiflorus*, and *Vicia americana*. A few graminoids are frequent such as *Elymus trachycaulus*, *Festuca thurberi*, *Phleum alpinum*, *Poa alpina*, or *Trisetum spicatum*, but have sparse cover. Plant associations occur in the central Rocky Mountains of Wyoming and Idaho extending south to ranges in Colorado. Stands typically occur in montane zones but extend into upper subalpine meadows in swales, depressions and protected areas. Elevation ranges from 2170-3800 m. Sites may be flat to steeply sloped, but all are moist during most of the growing season, and often on lower slopes near snow drifts that are saturated from snowmelt. Aspects are often cooler north- to east-facing. Soils are moderately deep; the upper horizons are well-drained, but stay moist because of a slowly permeable dense clay in the lower horizons.

Classification Comments: One association in this alliance, *Lupinus spp. - Poa spp. Meadow* (CEGL001943), is based on standing crop data from just three small plots (5x5 m) on Carter Mountain in northwestern Wyoming (Thilenius and Brown 1987). Cover data and more information on this type from Carter Mountain are needed to show whether it is a distinct association or simply a patch in a larger alpine vegetation type. These stands were also disturbed by past domestic sheep grazing. Also, Johnston (1987) reported that Bowns and Bagley (1986) described similar stands at 2800 m in southwestern Utah, which are currently outside the range of this alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3950 *Agastache urticifolia - Geranium viscosissimum - Pteridium aquilinum* Montane Mesic Meadow Alliance: is dominated by species such as *Agastache urticifolia*, *Heliomeris multiflora*, *Geranium viscosissimum*, *Mertensia ciliata*, *Pteridium aquilinum*, or *Wyethia amplexicaulis*.
- A3948 *Valeriana sitchensis - Luzula glabrata var. hitchcockii - Xerophyllum tenax* Subalpine Mesic Meadow Alliance: is typically dominated by *Valeriana sitchensis* or *Xerophyllum tenax* with *Carex geyeri*, *Carex spectabilis*, *Chamerion angustifolium*, *Luzula glabrata var. hitchcockii*, and *Veratrum viride* sometimes abundant.
- A3949 *Phleum alpinum - Elymus trachycaulus - Agrostis variabilis* Subalpine Mesic Meadow Alliance: is dominated by *Phleum alpinum*, *Elymus trachycaulus*, or *Agrostis variabilis*.
- A1257 *Festuca viridula - Carex hoodii - Lupinus spp.* Subalpine Mesic Meadow Alliance: is dominated or codominated by *Festuca viridula* in the interior Pacific Northwest and central Rocky Mountains.

Diagnostic Characteristics: These are mesic meadows dominated or codominated by forbs; especially diagnostic and often dominant species are *Ligusticum filicinum*, *Ligusticum porteri*, *Ligusticum tenuifolium*, *Lupinus argenteus*, or *Lupinus parviflorus ssp. myrianthus*. Other high frequency associated species include *Delphinium x occidentale*, *Fragaria virginiana*, *Osmorhiza occidentalis*, *Pedicularis bracteosa*, *Poa spp.*, *Senecio crassulus*, *Trollius laxus ssp. albiflorus*, and *Vicia americana*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderately dense to dense (60-100% cover), medium tall (0.5-0.7 m) herbaceous layer that is dominated by perennial forbs. Perennial graminoids are also a consistent component of the vegetation and may form a short herbaceous layer less than 0.5 m tall, but have typically lower cover than the forb layer.

Floristics: This alliance is characterized by a moderately dense, medium-tall herbaceous layer that is dominated by perennial forbs and composed of diagnostic and dominant species *Ligusticum filicinum*, *Ligusticum porteri*, *Ligusticum tenuifolium*, *Lupinus argenteus*, or *Lupinus parviflorus ssp. myrianthus*. This vegetation has high species richness with an average of 27 species per plot (Gregory 1983). Other associated species include forbs such as *Achillea millefolium*, *Delphinium x occidentale*, *Eurybia integrifolia*, *Geranium viscosissimum var. viscosissimum*, *Helianthella quinquenervis*, *Lathyrus lanszwertii var. leucanthus*, *Osmorhiza occidentalis*, *Pedicularis bracteosa*, *Potentilla gracilis*, *Symphotrichum foliaceum*, and *Vicia americana* from lower elevation stands, and at higher elevations, *Arenaria congesta*, *Geranium viscosissimum var. incisum*, *Geum rossii*, *Polygonum bistortoides*, *Senecio crassulus*, and *Trollius laxus ssp. albiflorus*, sometimes forming an additional short herbaceous layer of cushion plants and short grasses in the upper subalpine/alpine ecotone (Gregory 1983, Thilenius and Brown 1987). A few graminoids are frequent, such as *Bromus carinatus*, *Elymus trachycaulus*, *Festuca idahoensis*, *Festuca thurberi*, *Melica spectabilis*, *Phleum alpinum*, *Poa alpina*, or *Trisetum spicatum*, but have sparse cover.

ENVIRONMENT & DYNAMICS

Environmental Description: Plant associations within this mesic meadow alliance are found in the central Rocky Mountains of Wyoming and Idaho extending south to ranges in Colorado. Sites are typically montane but extend into the upper subalpine to near treeline with elevations ranging from 2170-3800 m. Stands often occur in swales, depressions and protected areas. Sites may be flat to steeply sloped (0-60%), but all are moist during most of the growing season and often on lower slopes near snow drifts that are saturated from snowmelt. Cooler north- to east-facing aspects are prevalent. Soils are variable but are often moderately deep with the upper horizons well-drained, but staying moist because of slowly permeable dense clay in the lower horizons. Soil texture is gravelly loam to silty clay loam. Soil pH is 5.7-6.8. Parent materials may include glacial till, limestone, loess, quartzite, sandstone, siltstone, and shale. Adjacent communities are subalpine forests dominated by *Picea engelmannii* or *Abies lasiocarpa*.

Dynamics: Disturbance by gophers appears to be necessary to maintaining forb dominance in these subalpine meadows. Gregory (1983) reports that the use of herbicides to control *Delphinium x occidentale*, which is poisonous to cattle, may have caused grass species to be more important in these meadows than they would be in untreated situations.

DISTRIBUTION

Geographic Range: This alliance occurs in subalpine zones in the central Rocky Mountains in Wyoming, Utah and Idaho and extends south into the Colorado Rockies.

Nations: US

States/Provinces: CO, ID, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Ligusticum porteri* Series (Johnston 1987)
- > Upland Herb Community Type (Langenheim 1962) [central Colorado?]

LOWER LEVEL UNITS**Associations:**

- CEG003491 *Lupinus latifolius* Meadow
- CEG001917 *Ligusticum tenuifolium* - *Trollius laxus* ssp. *albiflorus* Meadow
- CEG001941 *Ligusticum filicinum* - *Delphinium x occidentale* Meadow
- CEG001915 *Ligusticum porteri* - *Lupinus parviflorus* ssp. *myrianthus* Meadow
- CEG001916 *Ligusticum porteri* - *Vicia americana* Meadow
- CEG001942 *Lupinus argenteus* - *Fragaria virginiana* Meadow
- CEG001943 *Lupinus* spp. - *Poa* spp. Meadow

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Bowns and Bagley 1986, Faber-Langendoen et al. 2017b, Gregory 1983, Hess and Wasser 1982, Johnston 1987, Langenheim 1962, Terwilliger et al. 1979a, Thilenius and Brown 1987

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow

A3949. Phleum alpinum - Elymus trachycaulus - Agrostis variabilis Subalpine Mesic Meadow Alliance

Type Concept Sentence: Plant associations within this upper subalpine to lower alpine mesic meadow alliance are characterized by the dominance of *Phleum alpinum*, *Elymus trachycaulus*, or *Agrostis variabilis* and occur in the central Rocky Mountains of Wyoming, Utah and Idaho extending west to ranges in Nevada.

OVERVIEW

Scientific Name: *Phleum alpinum* - *Elymus trachycaulus* - *Agrostis variabilis* Subalpine Mesic Meadow Alliance

Common Name (Translated Scientific Name): Alpine Timothy - Slender Wheatgrass - Mountain Bentgrass Subalpine Mesic Meadow Alliance

Colloquial Name: Subalpine Alpine Timothy - Slender Wheatgrass - Mountain Bentgrass Mesic Meadow

Type Concept: The vegetation of this upper subalpine to lower alpine mesic meadow alliance is characterized by a mesic herbaceous layer that has moderate to dense cover dominated or codominated by diagnostic perennial grass species *Agrostis variabilis*, *Elymus trachycaulus*, or *Phleum alpinum*. Dominant forb species are *Achillea millefolium* and *Symphytotrichum foliaceum* (= *Aster foliaceus*), with *Antennaria corymbosa*, *Agoseris glauca*, *Epilobium ciliatum* ssp. *glandulosum* (= *Epilobium glandulosum*), and exotic *Taraxacum officinale* frequently present. The ground surface is covered with nonvascular plants such as lichens, liverworts, and mosses forming a cryptogamic crust. Plant associations occur in the central Rocky Mountains including the Yellowstone Plateau, south into the Colorado Plateau west to high ranges in the Great Basin and possibly Sierra Nevada. Elevations range from 2500 to 3900 m. Associations are found in mesic to wet meadows, floodplains, and near seeps and streambanks on medium-textured, mineral soils.

Classification Comments: *Agrostis variabilis* Meadow (CEGL001846) is only known from one location in southern Utah and needs additional survey, description and classification work to understand its expression over its full range. The stands described by Hall (1971) may be the result of disturbance by livestock and may not be an accurate description of "natural" vegetation. Nachlinger (1985) describes *Phleum alpinum* - *Achillea millefolium*-dominated subalpine meadows in the Lake Tahoe region, California and Nevada.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3950 *Agastache urticifolia* - *Geranium viscosissimum* - *Pteridium aquilinum* Montane Mesic Meadow Alliance: is dominated by mesic species such as *Agastache urticifolia*, *Geranium viscosissimum*, *Heliomeris multiflora*, *Mertensia ciliata*, *Pteridium aquilinum*, or *Wyethia amplexicaulis*.
- A3948 *Valeriana sitchensis* - *Luzula glabrata* var. *hitchcockii* - *Xerophyllum tenax* Subalpine Mesic Meadow Alliance: is typically dominated by *Valeriana sitchensis* or *Xerophyllum tenax* with *Carex geyeri*, *Carex spectabilis*, *Chamerion angustifolium*, *Luzula glabrata* var. *hitchcockii*, and *Veratrum viride* sometimes abundant.
- A3951 *Ligusticum* spp. - *Lupinus* spp. - *Delphinium* spp. Montane Mesic Meadow Alliance: is dominated by *Ligusticum filicinum*, *Ligusticum porteri*, *Ligusticum tenuifolium*, *Lupinus argenteus*, or *Lupinus parviflorus* ssp. *myrianthus*.
- A1257 *Festuca viridula* - *Carex hoodii* - *Lupinus* spp. Subalpine Mesic Meadow Alliance: is dominated or codominated by *Festuca viridula* in the interior Pacific Northwest and central Rocky Mountains.

Diagnostic Characteristics: These are high-altitude mesic meadows dominated by diagnostic mesic graminoid species *Phleum alpinum*, *Elymus trachycaulus*, or *Agrostis variabilis*. Dominant forb species are *Achillea millefolium* and *Symphytotrichum foliaceum*. Associated forb species include *Antennaria corymbosa*, *Antennaria parvifolia*, *Agoseris glauca*, *Cerastium beeringianum*, *Epilobium ciliatum* ssp. *glandulosum*, *Erigeron flagellaris*, *Lupinus lepidus*, *Penstemon procerus*, *Veronica serpyllifolia*, and exotic *Taraxacum officinale* (Hall 1971, Mattson 1984). Associated graminoids include *Blepharoneuron tricholepis*, *Carex engelmannii*, *Carex microptera*, *Deschampsia cespitosa*, *Festuca brachyphylla*, and *Poa* spp.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a moderately dense to dense tufted perennial graminoid layer. The forb layer, typically of rhizomatous perennials, codominates. The ground surface has a cryptogamic crust of lichens, liverworts, and mosses (<0.1 m tall).

Floristics: The vegetation included in this subalpine meadow alliance is characterized by a mesic herbaceous layer that has moderate to dense cover depending on the amount of exposed rock. The herbaceous layer is dominated or codominated by diagnostic perennial grass species *Agrostis variabilis*, *Elymus trachycaulus*, or *Phleum alpinum*. Dominant forb species are *Achillea millefolium* and *Symphytotrichum foliaceum* (= *Aster foliaceus*), with *Antennaria corymbosa*, *Agoseris glauca*, *Epilobium ciliatum* ssp. *glandulosum* (= *Epilobium glandulosum*), and exotic *Taraxacum officinale* frequently present (Hall 1971, Mattson 1984). Associated graminoids include *Blepharoneuron tricholepis*, *Carex engelmannii*, *Carex microptera*, *Deschampsia cespitosa*, *Festuca brachyphylla*, and *Poa* spp. Other associated perennial forb species include *Antennaria parvifolia*, *Cerastium beeringianum*, *Erigeron flagellaris*, *Lupinus lepidus*, *Penstemon procerus*, and *Veronica serpyllifolia*. Annual forbs include *Gentianella amarella* ssp. *acuta* (= *Gentiana amarella*), *Gentianella tenella* (= *Gentiana tenella*), *Polygonum polygaloides* ssp. *confertiflorum* (= *Polygonum watsonii*), and *Veronica peregrina* (Hall 1971, Mattson 1984). The ground surface is covered with nonvascular plants such as lichens, liverworts, and mosses forming a cryptogamic crust.

ENVIRONMENT & DYNAMICS

Environmental Description: Plant associations within this upper subalpine to lower alpine mesic meadow alliance occur in the central Rocky Mountains including the Yellowstone Plateau, south into the Colorado Plateau west to high ranges in the Great Basin and possibly Sierra Nevada. Elevations range from 2500 to 3900 m. Climate is temperate. Summers are warm and winters are cold with freezing temperatures and heavy snow. The precipitation has a bimodal distribution, with about 70% of it occurring from October to April and 30% falling during the summer, often as high-intensity convection storms in the southern extent (Hall 1971). Associations are found in mesic to wet meadows, floodplains, and near seeps and streambanks on medium-textured, mineral soils (Hall 1971, Mattson 1984).

Stands on the Aquarius Plateau are located on gentle slopes (7%) on any aspect, midway between temporarily flooded basins and rock outcrops (Hall 1971). They may also occur on other somewhat mesic sites such as below talus slopes and along streams. Soil is a shallow, acidic (pH 5), nutrient-poor clay loam or loam derived from the basaltic lava that caps the plateau (Hall 1971). The ground surface has a cryptogamic crust of lichens, liverworts, and mosses. Although the soil profile is considered relatively shallow (54 cm), it is the deepest soil associated with the six herbaceous communities described in this meadow (Hall 1971). Water relations appear to be the dominant environmental factor that controls species composition (Hall 1971). This community is classified as dry-mesic (21% soil moisture) which is an intermediate grouping in a soil moisture gradient that ranges from hydric to rocky-xeric (51-5%) (Hall 1971).

Nachlinger (1985) did a detailed soil description on stands in the Sierra Nevada where sites were well-drained, typically occurring on gentle slopes ranging from 4-10° with southeast, south or west aspects. The water table generally is greater than 1 m below the surface (Nachlinger 1985). The A horizon averages 34 cm and is very dark brown to dark gray brown. Structure and texture vary from massive or single grain, loamy sand or sandy loam to massive or weak, angular blocky sandy clay loam, clay loam, or clay. She also reports an acid pH (4.7) in the A horizon. The B horizon is thick averaging 53 cm. It is most often dark brown sandy clay loam with a strongly acidic pH of 5.4 (Nachlinger 1985).

Adjacent vegetation on a large scale is subalpine forest dominated by species of *Abies*, *Picea*, or *Populus tremuloides*. On a smaller scale adjacent vegetation described by Hall (1971) includes mesic, wet-mesic or hydric meadows dominated by *Danthonia intermedia*, *Deschampsia cespitosa*, or *Carex aquatilis*, respectively. More xeric sites are dominated by *Festuca brachyphylla*.

Dynamics: Many areas in the western U.S. such as the Aquarius Plateau have had a long history of livestock grazing and may have significant deterioration to the vegetation (Hall 1971). Ranges were once heavily overstocked as evidenced by stocking rate records and reports of continuous sod of lush grasses from early inhabitants (Hall 1971). Currently, the Aquarius Plateau shows signs of past erosion and is dominated by relatively short grasses and an abundance of forbs, including the exotic *Taraxacum officinale* (Hall 1971).

DISTRIBUTION

Geographic Range: This alliance occurs in the subalpine zone in the central Rocky Mountains and extends south into the Colorado Plateau at and west to ranges in the Great Basin and possibly Sierra Nevada.

Nations: US

States/Provinces: CA?, NV, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Agrostis variabilis* Herbaceous Vegetation (Hall 1971)
- > *Phleum alpinum* - *Agropyron caninum* habitat type (Mattson 1984)

LOWER LEVEL UNITS

Associations:

- CEG001920 *Phleum alpinum* - *Achillea millefolium* Meadow
- CEG005427 *Elymus trachycaulus* Meadow
- CEG001923 *Phleum alpinum* - *Elymus trachycaulus* Meadow
- CEG001846 *Agrostis variabilis* Meadow

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by D. Culver.

Version Date: 2014/03/14

REFERENCES

References: Cronquist et al. 1977, Faber-Langendoen et al. 2017b, Hall 1971, Martin and Hutchins 1980, Mattson 1984, Nachlinger 1985, Sawyer and Keeler-Wolf 1995, Welsh et al. 1987

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow

A4165. *Poa secunda* - *Muhlenbergia richardsonis* - *Carex douglasii* Moist Meadow Alliance [Low - Poorly Documented]

Type Concept Sentence: Moist deep-soil meadows dominated by graminoids *Poa secunda*, *Muhlenbergia richardsonis*, *Poa cusickii*, and/or *Carex douglasii*, found at low to high elevations throughout the interior of the western U.S.

OVERVIEW

Scientific Name: *Poa secunda* - *Muhlenbergia richardsonis* - *Carex douglasii* Moist Meadow Alliance

Common Name (Translated Scientific Name): Sandberg Bluegrass - Mat Muhly - Douglas' Sedge Moist Meadow Alliance

Colloquial Name: Bluegrass - Muhly - Sedge Moist Meadow

Type Concept: These moist meadows are dominated by *Poa secunda*, *Poa cusickii*, *Carex douglasii*, or *Muhlenbergia richardsonis*, usually with a diversity of other graminoids and forbs. They are found on gentle slopes of uplands or drainages, between approximately 10 and 3240 m (30-10,630 feet) elevation. Soils are moist to wet in the spring but dry by the end of the growing season. These meadows are found throughout the interior western United States.

Classification Comments:

Internal Comments: MSR 12-15: these communities are not always alkaline and fit well with Mesic herb meadow group.

Other Comments:**Similar NVC Types:**

- A3471 *Deschampsia cespitosa* Serpentine Seep Alliance

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics: The vegetation is characterized by a somewhat open to dense graminoid canopy dominated by the short bunchgrass/graminoid *Poa secunda*, *Poa cusickii*, *Carex douglasii*, or *Muhlenbergia richardsonis*. The herbaceous layer is diverse, with additional graminoids such as *Aristida purpurea*, *Blepharipappus scaber*, *Bromus arvensis* (= *Bromus japonicus*), *Bromus rubens*, *Carex microptera*, *Carex praegracilis*, *Danthonia unispicata*, *Eleocharis palustris*, *Eleocharis quinqueflora* (= *Eleocharis pauciflora*), *Elymus caninus*, *Elymus elymoides*, *Elymus multisetus*, *Hesperostipa comata*, *Hordeum brachyantherum* ssp. *californicum*, *Juncus balticus*, *Koeleria macrantha*, *Leymus simplex*, *Leymus triticoides*, *Pascopyrum smithii*, *Sporobolus cryptandrus*, and *Triteleia hyacinthina*; however, these provide low to moderate cover. Forbs provide moderate cover and include *Achillea millefolium*, *Agoseris glauca*, *Linanthus pungens* (= *Leptodactylon pungens*), *Lomatium bicolor*, *Iris missouriensis*, *Iva axillaris*, *Potentilla gracilis*, *Senecio* sp., and *Trifolium* spp. Shrubs such as *Artemisia arbuscula*, *Artemisia tridentata*, or *Chrysothamnus viscidiflorus* may be present with sparse cover. Introduced species may also be common in some stands, especially *Bromus tectorum*, *Descurainia pinnata*, *Onopordum acanthium*, *Poa pratensis*, and *Sisymbrium altissimum*.

ENVIRONMENT & DYNAMICS

Environmental Description: This widespread grassland association occurs across the intermountain western U.S. Elevation ranges from 10 to 3240 m (32-10,630 feet). Stands occur on relatively flat terrain characterized as valley bottoms with shallow water tables, inactive floodplains, terraces, and dry basins, in swales, on upland gentle slopes and drainage bottoms, often with easterly facing aspects, and sometimes on the dry fringes of wetter meadows. Substrates are deep, well-drained sandy loam and clay loam soils. The soils are moist in spring and tend to be dry by mid-summer, and are often on the dry fringe of wetter areas. This alliance has a wide tolerance of pH conditions and has been documented on serpentine soils, alkaline soils of sand dunes and acidic soils on sandstone and granitic substrates. USFWS wetland Inventory recognizes *Poa secunda* as an FACU.

Dynamics:

DISTRIBUTION

Geographic Range: These meadows are found in the western interior mountains and valleys of the western U.S.

Nations: US

States/Provinces: CA, CO, ID, MT, NV, OR, UT, WA?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

- > *Carex douglasii* Herbaceous Alliance (Evens et al. 2014)
- > *Carex douglasii* Provisional Herbaceous Alliance (CNPS 2017) [45.169.00]
- > *Muhlenbergia richardsonis* (Mat muhly meadows) Provisional Alliance (Sawyer et al. 2009) [41.277.00]
- > *Poa secunda* (Curly blue grass grassland) Alliance (Sawyer et al. 2009) [41.180.00]
- >< Alkali Meadow (#45310) (Holland 1986b)
- >< Cusick Bluegrass Association (Kovalchik 1987)
- >< Dry Meadow (Volland 1976)
- >< Dry Montane Meadow (#45120) (Holland 1986b)
- >< Dry Subalpine or Alpine Meadow (#45220) (Holland 1986b)
- < Sedge series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS**Associations:**

- CEG001602 *Deschampsia cespitosa* - *Carex douglasii* Moist Meadow
- CEG005605 *Poa secunda* - *Linanthus pungens* Moist Meadow
- CEG001768 *Carex douglasii* Moist Meadow
- CEG001655 *Poa cusickii* Moist Meadow
- CEG001657 *Poa secunda* Moist Meadow
- CEG002755 *Poa secunda* - *Muhlenbergia richardsonis* Moist Meadow

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2015)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2016/09/27

REFERENCES

References: CNPS 2017, Evens et al. 2014, Faber-Langendoen et al. 2017b, Holland 1986b, Kovalchik 1987, Manning 1988, Padgett and Manning 1988, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Smith 1998b, Volland 1976

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow

A3948. *Valeriana sitchensis* - *Luzula glabrata* var. *hitchcockii* - *Xerophyllum tenax* Subalpine Mesic Meadow Alliance

Type Concept Sentence: This alliance is characterized by a moderately dense and diverse herbaceous layer with one or more of several diagnostic species present and often abundant such as *Carex geyeri*, *Carex spectabilis*, *Chamerion angustifolium*, *Erythronium grandiflorum*, *Ligusticum grayi*, *Luzula glabrata* var. *hitchcockii*, *Sanguisorba officinalis*, *Valeriana sitchensis*, *Veratrum viride*, and *Xerophyllum tenax*. It is found in subalpine meadows in the central Rocky Mountains and extends west into the Olympic Mountains and Cascade Range.

OVERVIEW

Scientific Name: *Valeriana sitchensis* - *Luzula glabrata* var. *hitchcockii* - *Xerophyllum tenax* Subalpine Mesic Meadow Alliance

Common Name (Translated Scientific Name): Sitka Valerian - Hitchcock's Smooth Woodrush - Common Beargrass Subalpine Mesic Meadow Alliance

Colloquial Name: Subalpine Sitka Valerian - Smooth Woodrush - Beargrass Mesic Meadow

Type Concept: Vegetation is characterized by a moderately dense herbaceous layer with one or more of several diagnostic species present and often abundant, including *Carex geyeri*, *Carex spectabilis*, *Chamerion angustifolium*, *Erythronium grandiflorum*, *Ligusticum grayi*, *Luzula glabrata* var. *hitchcockii*, *Sanguisorba officinalis*, *Valeriana sitchensis*, *Veratrum viride*, and *Xerophyllum tenax*. The herbaceous layer has a fairly diverse flora that averages of 30 species per stand. Associated species include *Arnica latifolia*, *Athyrium filix-femina*, *Carex nigricans*, *Castilleja parviflora*, *Claytonia cordifolia*, *Elymus glaucus*, *Epilobium anagallidifolium*, *Erigeron peregrinus*, *Festuca viridula*, *Lupinus arcticus* ssp. *subalpinus*, *Oxyria digyna*, *Polygonum bistortoides*, *Potentilla flabellifolia*, *Pulsatilla occidentalis*, *Senecio triangularis*, and *Thalictrum occidentale* that are often present with low cover. This alliance is found in subalpine and lower alpine meadows in the central Rocky Mountains and extends west into the Olympic Mountains and Cascade Range. This small-patch alliance occurs from 1350 to 2300 m (5800-7550 feet) elevation. Stands occur on gentle to steep slopes having predominantly southerly exposures. It is a component of a complexly patterned environment representing those positions that accumulate a deep snowload and retain it long into the growing season assuring ample soil moisture well into August. Soils are moderately well- to poorly drained.

Classification Comments: Both *Carex geyeri* and *Chamerion angustifolium* are wide-ranging species in the Rocky Mountains. *Chamerion angustifolium* is particularly abundant following disturbances such as fire. Stands dominated by these species outside the central Rocky Mountains may need to be classified and placed in a different group.

Some associations included in this alliance are have both Cascadian and Rocky Mountain expressions of this type that may be different enough to warrant splitting the associations and placing them in separate alliances. For example, *Xerophyllum tenax* - *Sanguisorba officinalis* Meadow (CEGL003439) is described from the wet meadows in the northern Coast Ranges of Oregon and may not be the best fit for this alliance as its florist composition, other than the dominant species, is quite different from the stands in the central Rocky Mountains. More review is needed.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3950 *Agastache urticifolia* - *Geranium viscosissimum* - *Pteridium aquilinum* Montane Mesic Meadow Alliance: is dominated by mesic species such as *Agastache urticifolia*, *Geranium viscosissimum*, *Heliomeris multiflora*, *Mertensia ciliata*, *Pteridium aquilinum*, or *Wyethia amplexicaulis*.
- A3949 *Phleum alpinum* - *Elymus trachycaulus* - *Agrostis variabilis* Subalpine Mesic Meadow Alliance: is dominated by *Phleum alpinum*, *Elymus trachycaulus*, or *Agrostis variabilis*.
- A3951 *Ligusticum* spp. - *Lupinus* spp. - *Delphinium* spp. Montane Mesic Meadow Alliance: is dominated by *Ligusticum filicinum*, *Ligusticum porteri*, *Ligusticum tenuifolium*, *Lupinus argenteus*, or *Lupinus parviflorus* ssp. *myrianthus*.
- A1257 *Festuca viridula* - *Carex hoodii* - *Lupinus* spp. Subalpine Mesic Meadow Alliance: is dominated or codominated by *Festuca viridula* in the interior Pacific Northwest and central Rocky Mountains.

Diagnostic Characteristics: These are high-altitude mesic meadows dominated or codominated by one or more diagnostic and often dominant species that include *Carex geyeri*, *Carex spectabilis*, *Chamerion angustifolium*, *Erythronium grandiflorum*, *Ligusticum grayi*, *Luzula glabrata* var. *hitchcockii*, *Sanguisorba officinalis*, *Valeriana sitchensis*, *Veratrum viride*, or *Xerophyllum tenax*. Associated species include *Arnica latifolia*, *Athyrium filix-femina*, *Carex nigricans*, *Castilleja parviflora*, *Claytonia cordifolia*, *Elymus glaucus*, *Epilobium anagallidifolium*, *Erigeron peregrinus*, *Festuca viridula*, *Lupinus arcticus* ssp. *subalpinus*, *Oxyria digyna*, *Polygonum bistortoides*, *Potentilla flabellifolia*, *Pulsatilla occidentalis*, *Senecio triangularis*, and *Thalictrum occidentale* that are often present with low cover.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a moderate to dense cover of mainly rhizomatous, perennial forb and graminoid species.

Floristics: Vegetation is characterized by a moderately dense herbaceous layer with one or more of several diagnostic and often abundant species present, including *Carex geyeri*, *Carex spectabilis*, *Chamerion angustifolium*, *Erythronium grandiflorum*, *Ligusticum grayi*, *Luzula glabrata* var. *hitchcockii*, *Sanguisorba officinalis*, *Valeriana sitchensis*, *Veratrum viride*, and *Xerophyllum tenax*. The herbaceous layer has a fairly diverse flora that averages of 30 species per stand. Associated graminoids are indicative of various degrees of snowbed condition and include *Carex nigricans*, *Juncus drummondii*, *Juncus parryi*, and *Vahlodea atropurpurea*. On the more poorly drained sites, a variable suite of forbs associated with mesic to subhygric moisture regimes may exceed the graminoid cover; these forbs include *Arnica x diversifolia*, *Arnica latifolia*, *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Erigeron peregrinus*, *Hieracium gracile*, and *Hypericum scouleri*. Other associated species that may be present with typically low cover include forbs such as *Antennaria rosea*, *Aquilegia flavescens*, *Arenaria capillaris*, *Arnica rydbergii*, *Athyrium filix-femina*, *Balsamorhiza sagittata*, *Campanula rotundifolia*, *Castilleja parviflora*, *Cirsium hookerianum*, *Claytonia cordifolia*, *Eriogonum flavum*, *Eriogonum*

umbellatum, *Galium boreale*, *Hieracium scouleri* var. *albertinum* (= *Hieracium albertinum*), *Lomatium dissectum*, *Lupinus arcticus* ssp. *subalpinus*, *Oxyria digyna*, *Polygonum bistortoides*, *Potentilla diversifolia*, *Potentilla flabellifolia*, *Pulsatilla occidentalis*, *Sedum stenopetalum*, *Senecio megacephalus*, *Senecio triangularis*, *Symphytotrichum foliaceum* (= *Aster foliaceus*), *Thalictrum occidentale*, and graminoids *Elymus elymoides*, *Elymus glaucus*, *Festuca idahoensis*, *Festuca viridula*, *Koeleria macrantha*, *Phleum alpinum*, *Poa cusickii*, and *Pseudoroegneria spicata*. Shrubs may be absent or may include scattered individuals of *Amelanchier alnifolia*, *Artemisia tridentata* ssp. *spiciformis*, *Mahonia repens*, *Rubus parviflorus*, *Spiraea betulifolia*, and *Symphoricarpos oreophilus*, none with more than 5% cover. Both lichen and bryophyte cover are minimal, seldom exceeding 5%.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is found in subalpine meadows in the central Rocky Mountains and extends west into the Cascade Range and Olympic Mountains. This is a small-patch alliance found at lower alpine and mid to upper subalpine zones from 1770 to 2300 m (5800-7550 feet) elevation throughout much of its range and down to 1350 m in the Olympic Mountains on east- to northeast-facing, moderate-gradient slopes that are generally too dry for tree establishment. In the Central Rockies stands occur on gentle to steep slopes having predominantly southerly exposures. It is a component of a complexly patterned environment representing those positions that accumulate a deep snowload and retain it long into the growing season. It generally occupies gently rolling terrain, particularly depressions within, and extends to gentle slopes and even steep slopes if conditions are conducive to snow accumulation and retention. It often occurs as narrow patches between tree-dominated atolls at the highest elevations of tree development. Other stands are found on gully slopes where streambeds are deeply incised in colluvium, resulting in unstable surfaces. In winter these gullies can fill with snow, which persists long into the growing season, assuring ample soil moisture well into August. Though the vegetation pattern can be regular, these sites are most often heterogeneous with patches of vegetation interspersed with bare gravel, scattered talus, as well as exposed bedrock. Because of persistent sheet erosion, soil development is restricted to the clumps or patches of grass and sedge. Parent materials include predominantly calcareous and noncalcareous fine-textured sedimentary rock. Soils are moderately well- to poorly drained. The great majority of the ground surface is covered with litter from the abundant vegetation.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found in subalpine meadows in the central Rocky Mountains in Alberta, Idaho, Montana, and northwestern Wyoming and extends west into the Cascade Range and Olympic Mountains in Oregon, Washington and British Columbia.

Nations: CA, US

States/Provinces: AB, BC, ID, MT, OR, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Valeriana sitchensis* - *Carex spectabilis* Communities (Franklin and Dyrness 1973)
- > Moist *Valeriana* forb type (Kuramoto and Bliss 1970)

LOWER LEVEL UNITS

Associations:

- CEGLO05856 *Chamerion angustifolium* Rocky Mountain Meadow
- CEGLO03439 *Xerophyllum tenax* - *Sanguisorba officinalis* Meadow
- CEGLO01997 *Valeriana sitchensis* - *Ligusticum grayi* Meadow
- CEGLO01996 *Valeriana sitchensis* - *Carex spectabilis* Meadow
- CEGLO05859 *Xerophyllum tenax* Meadow
- CEGLO05864 *Carex geyeri* Meadow
- CEGLO01998 *Valeriana sitchensis* - *Veratrum viride* Meadow
- CEGLO05873 *Luzula glabrata* var. *hitchcockii* - *Erythronium grandiflorum* Meadow

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M.S. Reid and M. Damm.

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Kuramoto and Bliss 1970

M493. Western North American Ruderal Grassland & Shrubland

This upland macrogroup contains ruderal grasslands, meadows and shrublands found on human-disturbed sites, and dominated by non-native and generalist native species that occur in temperate areas throughout the western U.S. (Rockies westward) and southwestern Canada.

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

2.B.2.Na.90.a. M493 Western North American Ruderal Grassland & Shrubland

G624. Western North American Interior Ruderal Grassland & Shrubland

Type Concept Sentence: This group includes grasslands dominated by the non-native grass *Elymus repens* and is known from disturbed valley bottoms, alluvial flats, fans and lower valley wall sites in western Colorado and northwestern Montana.

OVERVIEW

Scientific Name: Western North American Interior Ruderal Grassland & Shrubland Group**Common Name (Translated Scientific Name):** Western North American Interior Ruderal Grassland & Shrubland Group**Colloquial Name:** Western Ruderal Perennial Grassland

Type Concept: This montane, mesic to subhygric herbaceous group has low overall species diversity due to the dominance of *Elymus repens*, an exotic rhizomatous grass. *Elymus repens* is a highly invasive species in mesic areas and tends to exclude other species once established. Overall herbaceous cover ranges from 25-85% with *Elymus repens* clearly dominating with 5-80% cover. This group occurs in western Colorado, northwestern Montana, and southern Idaho. Sites include disturbed valley bottoms, alluvial flats, fans and lower valley wall sites between 1450 and 2300 m in elevation.

Classification Comments:**Similar NVC Types:**

- G678 Californian Ruderal Forest
- G819 North American Warm Desert Ruderal Scrub
- G677 North American Warm Desert Ruderal Grassland
- G600 Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:**Floristics:**

ENVIRONMENT & DYNAMICS

Environmental Description:**Dynamics:**

DISTRIBUTION

Geographic Range:**Spatial Scale & Pattern [optional]:****Nations:** CA, US**States/Provinces:** CA, CO, KS, MT, ND, NE, NV, SD, UT, WY**TNC Ecoregions [optional]:****USFS Ecoregions (2007):****Omernik Ecoregions:****Federal Lands [optional]:**

CONFIDENCE LEVEL**USNVC Confidence Level with Comments:** Moderate.**SYNONYMY****LOWER LEVEL UNITS****Alliances:**

- A4191 *Rumex crispus* - (other FAC & Dryland Forb Species) Ruderal Meadow Alliance
- A2658 *Elymus repens* Ruderal Grassland Alliance
- A3254 *Agropyron cristatum* - *Bromus inermis* - *Poa pratensis* Ruderal Grassland Alliance

AUTHORSHIP**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2011)**Author of Description:** G. Kittel**Acknowledgments:****Version Date:** 11/23/2016**Classif Resp Region:** West**Internal Author:** KAS 9-11; GK 11-16**REFERENCES****References:** Faber-Langendoen et al. 2017a

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G624. Western North American Interior Ruderal Grassland & Shrubland

A3254. *Agropyron cristatum* - *Bromus inermis* - *Poa pratensis* Ruderal Grassland Alliance [Low - Poorly Documented]

Type Concept Sentence: This alliance occurs in disturbed dry to mesic grasslands and meadows found in lowland, montane and subalpine elevations (sea level to 3600 m) throughout the western U.S. and Canada. Vegetation can be a monoculture of a single non-native graminoid species, or a mix of several non-native forbs and graminoids. Graminoids include *Agropyron cristatum* and *Bromus inermis* (which has been purposefully seeded to prevent soil erosion), as well as many introduced forage species, especially in more mesic montane uplands such as *Alopecurus pratensis*, *Dactylis glomerata*, *Phleum pratense*, *Poa pratensis*, and *Psathyrostachys juncea*. Highly invasive and wind- and animal-distributed non-native forb species include *Sisymbrium altissimum*, *Descurainia sophia*, and *Lappula occidentalis*.

OVERVIEW**Scientific Name:** *Agropyron cristatum* - *Bromus inermis* - *Poa pratensis* Ruderal Grassland Alliance**Common Name (Translated Scientific Name):** Crested Wheatgrass - Smooth Brome - Kentucky Bluegrass Ruderal Grassland Alliance**Colloquial Name:** Western Ruderal Perennial Grassland

Type Concept: This alliance occurs in disturbed dry to mesic grasslands and meadows found in lowland, montane and subalpine elevations (sea level to 3600 m) throughout the western U.S. and Canada. Vegetation can be a monoculture of a single non-native graminoid species, or a mix of several non-native forbs and graminoids. Graminoids include *Agropyron cristatum* and *Bromus inermis* (which has been purposefully seeded to prevent soil erosion), as well as many introduced forage species, especially in more mesic montane uplands, such as *Alopecurus pratensis*, *Dactylis glomerata*, *Phleum pratense*, *Poa pratensis*, and *Psathyrostachys juncea* (= *Elymus juncea*). Highly invasive and wind- and animal-distributed non-native forb species include *Sisymbrium altissimum*, *Descurainia sophia*, and *Lappula occidentalis*.

Classification Comments: Successful introductions of non-native forage species have created stands of late-seral grasslands that are difficult to restore to native species.

Internal Comments:**Other Comments:****Similar NVC Types:**

- A4148 *Agropyron cristatum* Western Ruderal Perennial Grassland Alliance

Diagnostic Characteristics: Dominant diagnostic species for this alliance are invasive, perennial grass species such as *Agropyron cristatum*, *Alopecurus pratensis*, *Dactylis glomerata*, *Phleum pratense*, *Poa pratensis*, *Psathyrostachys juncea*, and many others.

VEGETATION**Physiognomy and Structure:****Floristics:****ENVIRONMENT & DYNAMICS****Environmental Description:****Dynamics:****DISTRIBUTION**

Geographic Range: This alliance occurs in lowland, montane and subalpine elevations (sea level to 3600 m) throughout the western U.S. and Canada.

Nations: CA, US

States/Provinces: CO, KS, MT, ND, NE, NV, SD, SK, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY**LOWER LEVEL UNITS****Associations:**

- CEG005266 *Agropyron cristatum* - (*Pascopyrum smithii*, *Hesperostipa comata*) Ruderal Grassland
- CEG005264 *Bromus inermis* - (*Pascopyrum smithii*) Ruderal Grassland
- CEG005471 *Agropyron cristatum* - *Bromus tectorum* Ruderal Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2013/09/27

REFERENCES

References: Faber-Langendoen et al. 2017b

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G624. Western North American Interior Ruderal Grassland & Shrubland

A2658. Elymus repens Ruderal Grassland Alliance

Type Concept Sentence: This alliance is dominated by the non-native grass *Elymus repens* and is known from disturbed valley bottoms, alluvial flats, fans and lower valley wall sites in western Colorado and northwestern Montana.

OVERVIEW

Scientific Name: *Elymus repens* Ruderal Grassland Alliance

Common Name (Translated Scientific Name): Quackgrass Ruderal Grassland Alliance

Colloquial Name: Ruderal Quackgrass Grassland

Type Concept: This montane, mesic to subhygric herbaceous alliance has low overall species diversity due to the dominance of *Elymus repens* (= *Elytrigia repens* var. *repens*), an exotic rhizomatous grass. *Elymus repens* is a highly invasive species in mesic areas and tends to exclude other species once established. Overall herbaceous cover ranges from 25-85% with *Elymus repens* clearly dominating this association with 5-80% cover. This alliance is known western Colorado, northwestern Montana and southern Idaho. Sites include disturbed valley bottoms, alluvial flats, fans and lower valley wall sites between 1450 and 2300 m in elevation.

Classification Comments:

Internal Comments: GK 11-16: ID added for Minidoka.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Temperate semi-natural sod grasslands of disturbed areas characterized by a near monoculture of *Elymus repens*.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a moderate to dense layer of medium-tall (0.5-1 m) perennial graminoids.

Floristics: This montane, mesic to subhygric herbaceous association has low overall species diversity due to the dominance of *Elymus repens* (= *Elytrigia repens* var. *repens*), an exotic rhizomatous grass. *Elymus repens* is a highly invasive species in mesic areas and tends to exclude other species once established. Overall herbaceous cover ranges from 25-85% with *Elymus repens* clearly dominating this association with 5-80% cover. Other species sometimes present with low cover include *Achillea millefolium*, *Cerastium arvense*, *Carex* spp., *Equisetum laevigatum*, *Iva axillaris*, *Poa palustris*, *Penstemon confertus*, *Symphytotrichum laeve* (= *Aster laevis*), and *Taraxacum officinale*.

ENVIRONMENT & DYNAMICS

Environmental Description: It occurs on flat to gently sloping lower slopes, toeslopes and valley bottoms at elevations between 1450 and 1555 m (4750-5100 feet) in Montana and between 1710 and 2285 m (5610-7500 feet) in Colorado. Soils are derived from glacial or fluvial deposits but are variable in soil texture, ranging from moderately well-drained sandy loams to clay loams to poorly drained gravel and rock. Litter dominates the ground surface.

Dynamics: Although characterized as an early-seral dominant (Gross and Werner 1982), *Elymus repens* is a highly invasive species in mesic areas and tends to exclude other species once established. It is tolerant of mildly saline conditions. It hybridizes readily with other wheatgrasses (e.g., *Pascopyrum smithii*, *Pseudoroegneria spicata*) and has fair to good forage value for domestic livestock. Many of the occurrences in the western U.S. can be traced to plantings of *Elymus repens* or hybrids for pasture or hay (Beetle 1955).

DISTRIBUTION

Geographic Range: This alliance is currently known from western Colorado, northwestern Montana, and southern Idaho.

Nations: US

States/Provinces: CO, ID, MT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGLO05868 *Elymus repens* Ruderal Grassland

AUTHORSHIP

Primary Concept Source: J. Coles, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2016/11/23

REFERENCES

References: Beetle 1955, Faber-Langendoen et al. 2017b, Gross and Werner 1982

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G624. Western North American Interior Ruderal Grassland & Shrubland

A4191. *Rumex crispus* - (other FAC & Dryland Forb Species) Ruderal Meadow Alliance [Low - Poorly Documented]

Type Concept Sentence:

OVERVIEW

Scientific Name: *Rumex crispus* - (other FAC & Dryland Forb Species) Ruderal Meadow Alliance

Common Name (Translated Scientific Name): Curly Dock - (and other FAC & Dryland Forb Species) Ruderal Meadow Alliance

Colloquial Name: Ruderal FAC & Dryland Forb Meadow

Type Concept:

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics:

ENVIRONMENT & DYNAMICS

Environmental Description:

Dynamics:

DISTRIBUTION

Geographic Range:

Nations: US

States/Provinces: ID

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG005621 *Rumex crispus* Ruderal Grassland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2015)

Author of Description:

Acknowledgments:

REFERENCES

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

2.B.2.Na.90.b. M493 Western North American Ruderal Grassland & Shrubland

G648. Southern Vancouverian Lowland Ruderal Grassland & Shrubland

Type Concept Sentence: This group is dominated by non-native invasive shrub or herbaceous species, such as *Agrostis capillaris*, *Anthoxanthum odoratum*, *Cytisus scoparius*, *Rubus armeniacus*, or many other introduced species, generally occurring on disturbed land throughout Pacific coastal areas below approximately 1500 m (5000 feet) in elevation.

OVERVIEW

Scientific Name: Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group

Common Name (Translated Scientific Name): Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group

Colloquial Name: Pacific Northwest Ruderal Coastal Grassland

Type Concept: This group is dominated by non-native species, such as introduced and invasive shrubs *Cytisus scoparius*, *Rubus armeniacus*, *Ulex europaeus*, and the introduced grasses *Agrostis capillaris*, *Anthoxanthum odoratum*, *Bromus hordeaceus*, *Holcus lanatus*, and/or *Poa pratensis*. It is abundant in waste areas and disturbed land throughout Pacific coastal areas either as abandoned pastures, roadside margins or other weedy places, below approximately 1500 m (5000 feet) in elevation. Sites are not mowed or otherwise maintained. Generally, these are areas that have been heavily disturbed by heavy equipment, such as old plowed fields, townsites, and abandoned millsites, livestock holding areas, and other once heavily used places that have been left as "waste" places.

Classification Comments: Restoration stands of planted or seeded native grasses such as *Festuca idahoensis* ssp. *roemeri*, *Festuca rubra*, or *Leymus mollis* are considered ruderal due to the fact that the planted species are the only native species present. If long-term restoration efforts succeed in reestablishing composition typical of a native plant associations, then stands could be reclassified into that type.

Similar NVC Types:

- G497 Californian Ruderal Grassland, Meadow & Scrub
- G647 North Pacific Maritime Coastal Ruderal Dune
- G677 North American Warm Desert Ruderal Grassland
- G819 North American Warm Desert Ruderal Scrub
- G600 Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics: Sites are dominated by non-native herbaceous species, or introduced shrubs such as *Cytisus scoparius*, *Rubus armeniacus*, *Ulex europaeus*, and *Lupinus arboreus*, or areas planted/seeded with native grasses undergoing restoration. In some areas, stands may be dominated by native herbaceous species; however, these cases occur on clearly disturbed ground. Non-native graminoids that can be abundant include *Agrostis avenacea*, *Agrostis capillaris*, *Agrostis stolonifera*, *Anthoxanthum odoratum*, *Arrhenatherum elatius*, *Bromus diandrus* ssp. *rigidus* (= *Bromus rigidus*), *Bromus hordeaceus*, *Bromus madritensis*, *Bromus sterilis*, *Cynosurus echinatus*, *Schedonorus arundinaceus* (= *Schedonorus phoenix*), *Lolium perenne*, and *Vulpia bromoides* (= *Festuca bromoides*). Other graminoids that are present to abundant include *Aira caryophyllea*, *Aira praecox*, *Dactylis glomerata*, *Elymus repens*, *Holcus lanatus*, and *Poa pratensis*. Some areas are dominated by non-native forbs such as *Cirsium arvense*, *Hypochaeris radicata*, *Leucanthemum vulgare*, *Medicago lupulina*, *Rumex acetosella*, *Sisymbrium altissimum*, *Taraxacum officinale*, *Teesdalia nudicaulis*, and *Trifolium dubium*.

Of course, some waste areas are a mix of non-native grasses and forbs, or a mix of native and non-native species. Other non-native forbs that may be present include *Centaureum erythraea*, *Cirsium vulgare*, *Trifolium pratense*, *Vicia hirsuta*, and *Vicia sativa*. Native graminoids that may be present include *Carex inops*, *Bromus sitchensis*, *Elymus glaucus*, *Festuca rubra* ssp. *rubra*, and *Leymus mollis*. Stands of planted or seeded areas of native grasses (areas undergoing restoration) are included in this group until they mature into recognizable native plant associations. Native forbs and ferns that can be increasers with disturbance may be present and include *Cerastium arvense*, *Galium aparine*, *Heracleum maximum*, *Marah oreganus*, and *Pteridium aquilinum*. Some native shrubs may be scattered about with low abundance and include *Rubus ursinus*, *Symphoricarpos albus* and *Rosa nutkana*. Some areas have small to extensive patches of the introduced shrub *Rubus armeniacus* that is usually interspersed with the non-native grasses mentioned above.

ENVIRONMENT & DYNAMICS

Environmental Description: This group is widespread throughout the coastal areas of the Pacific Northwest, but has been intensively studied in the Puget Sound specifically. Stands occur on soils that have been disturbed in the past from plowing, grazing or animal

holding areas such as old corrals or rabbit warrens. Soils are mostly shallow and textures range from gravel, sand, sandy loam to loam. These areas are mostly flat or on low slopes and are usually well-drained. Hydrology ranges from very dry south-facing slopes to somewhat mesic north-facing protected sites. This group does not include sand dunes.

Dynamics: This group is generally a product of disturbance or abandonment of human or livestock activity, and once established is a quite permanent part of the landscape.

DISTRIBUTION

Geographic Range: This group occurs in the Pacific Northwest in disturbed sites and waste areas along the coast from California to Washington and possibly elsewhere.

Spatial Scale & Pattern [optional]:

Nations: CA?, US

States/Provinces: BC?, CA, OR, WA

TNC Ecoregions [optional]: 1:C, 2:C, 14:C, 15:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A2063 *Anthoxanthum odoratum* - *Holcus lanatus* Ruderal Coastal Grassland Alliance
- A2062 *Cytisus scoparius* - *Ulex europaeus* Coastal Ruderal Scrub Alliance

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2012)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 05/20/2015

Classif Resp Region: West

Internal Author: GK 5-12, 5-15

REFERENCES

References: Faber-Langendoen et al. 2017a

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

G648. Southern Vancouverian Lowland Ruderal Grassland & Shrubland

2.B.2.Nd. Western North American Interior Chaparral

These chaparral shrublands occur between low-elevation desert landscapes and higher subalpine woodlands of the western U.S. and northern Mexico.

M094. Cool Interior Chaparral

These chaparral shrublands occur between low-elevation desert landscapes and higher subalpine woodlands of the Cascades, Sierra Nevada, and interior mountain ranges of the western U.S., generally among montane forests above 1500 m (4550 feet) elevation.

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

2.B.2.Nd.1.a. M094 Cool Interior Chaparral

G282. Western North American Montane Sclerophyll Scrub

Type Concept Sentence: This western North American group consists of montane chaparral scrublands dominated by a variety of species, including *Arctostaphylos patula*, *Arctostaphylos mewukka*, *Arctostaphylos nevadensis*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus velutinus*, *Ceanothus integerrimus*, *Ceanothus martinii*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus garryana* var. *fruticosa*, *Quercus sadleriana*, and/or *Quercus vacciniifolia*, generally occurring on ridges and rocky slopes often with southerly aspects throughout the West.

OVERVIEW

Scientific Name: *Arctostaphylos patula* - *Arctostaphylos nevadensis* - *Ceanothus velutinus* Montane Sclerophyll Scrub Group

Common Name (Translated Scientific Name): Greenleaf Manzanita - Pinemat Manzanita - Snowbrush Ceanothus Montane Sclerophyll Scrub Group

Colloquial Name: Greenleaf Manzanita - Pinemat Manzanita Shrubland

Type Concept: This group consists of cool, mostly montane chaparral and sclerophyllous scrublands that occur in the western United States from the Sierra Nevada, Klamath-Siskiyou mountains and southern Cascade Range of California, Oregon and Washington east on the ranges of the Great Basin and plateaus of the Colorado Plateau into the Rocky Mountains extending out to the Black Hills. There are also occurrences extending as far west as the inner Coast Ranges in central California and the Peninsular and Transverse ranges. Stands are typically fairly open-canopied shrublands with open interspaces either bare or supporting patchy grasses and forbs. *Arctostaphylos patula* and *Ceanothus velutinus* are the most widespread dominant/diagnostic species. Other dominant/diagnostic species include *Arctostaphylos mewukka*, *Arctostaphylos nevadensis*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus integerrimus*, *Ceanothus martinii*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus garryana* var. *fruticosa* (= var. *breweri*) (shrub form), *Quercus sadleriana*, and *Quercus vacciniifolia*. *Cercocarpus ledifolius* is generally absent. Most of the oaks and other chaparral species occur in the western extent. Understory varies with shrub density but is generally sparse. Occasional emergent conifers may be present. Higher elevation stands typically have higher species diversity. Stands in this group are typically montane shrublands found on the slopes of the Sierra Nevada and Cascades and into the western Great Basin, Colorado Plateau and the Black Hills of South Dakota in summer-dry habitats from 800 to 3000 m elevation. Stands in California are found at higher elevations than most other chaparral ranging from 300 to 3300 m elevation. They occur in the northern Coast Ranges, Klamath Mountains, Modoc Plateau, Sierra Nevada and foothills, and southern Cascades of California, Oregon and Washington. Climate is semi-arid to cool temperate. Yearly precipitation and temperature ranges are quite large. Much of the precipitation comes as winter snow at higher elevations, and summer drought-stress is characteristic. These shrublands occur on ridges and rocky slopes often with southerly aspects. Substrates are thin, well-drained skeletal soils with coarser texture loamy or sandy soils. Parent materials are varied and range from limestone and sandstone to granitics, mafic, and ultramafic substrates. These shrub communities established after stand-replacing fires or clearcut logging in *Pinus ponderosa* or *Pseudotsuga menziesii* forests or pinyon-juniper woodlands, and are seral to forest after several decades. Excessively rocky or droughty, fire-prone sites in the forest may support relatively persistent stands of this group. In the Rocky Mountains, stands are found within a matrix of montane conifer forest and woodland in limited, small-patch occurrences forming post-fire shrublands in areas previously dominated by woodlands. Typical fire regime in this group varies with the amount of organic accumulation. All characteristic species are fire-adapted.

Classification Comments: This cool, mostly montane chaparral and sclerophyllous scrublands group occurs in the western United States and is frequently characterized by dominance of *Arctostaphylos patula* and *Ceanothus velutinus*. Other dominant/diagnostic species include *Arctostaphylos mewukka*, *Arctostaphylos nevadensis*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus integerrimus*, *Ceanothus martinii*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus garryana* var. *fruticosa* (shrub form), *Quercus sadleriana*, and *Quercus vacciniifolia*. *Cercocarpus ledifolius* is generally absent.

Similar NVC Types:

- G261 Californian Mesic & Pre-montane Chaparral

Diagnostic Characteristics: Open-canopied broad-leaved evergreen shrublands dominated by diagnostic species *Arctostaphylos mewukka*, *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus integerrimus*, *Ceanothus martinii*, *Ceanothus velutinus*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus garryana* var. *fruticosa* (shrub form), *Quercus sadleriana*, and *Quercus vacciniifolia*. *Cercocarpus ledifolius* is generally absent and herbaceous layer is typically sparse.

VEGETATION

Physiognomy and Structure: Broad-leaved evergreen shrubland with open canopy and little to no undergrowth. Shrubs are typically 1-3 m tall.

Floristics: Stands in this wide-ranging group are typically fairly open-canopied shrublands with open interspaces either bare or supporting patchy grasses and forbs. *Arctostaphylos patula* and *Ceanothus velutinus* are the most widespread dominant/diagnostic species. Other dominant/diagnostic species include *Arctostaphylos mewukka*, *Arctostaphylos nevadensis*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus integerrimus*, *Ceanothus martinii*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus garryana* var. *fruticosa* (= var. *breweri*) (shrub form), *Quercus sadleriana*, and *Quercus vacciniifolia*. *Cercocarpus ledifolius* is generally absent. Most of the oaks and other chaparral species occur in the western extent. Other shrubs may include *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Cercis canadensis* var. *texensis*, *Cercocarpus montanus*, *Garrya fremontii*, *Quercus berberidifolia*, *Prunus subcordata*, *Purshia stansburiana*, *Symphoricarpos* spp., and *Toxicodendron diversilobum*. Emergent conifers may be present, such as *Abies concolor*, *Pinus lambertiana*, *Pinus ponderosa*, *Pinus sabiniana*, *Pseudotsuga menziesii*, and tree oaks such as *Quercus chrysolepis*, *Quercus kelloggii*, or *Quercus wislizeni* may be present at sparse cover. Understory varies with shrub density but is generally sparse with *Elymus glaucus*, *Elymus elymoides*, *Eriogonum nudum*, *Festuca californica*, *Pyrola picta*, and *Stephanomeria lactucina* sometimes present in the herbaceous layer. Higher elevation stands typically have higher species diversity.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands in this group are typically montane shrublands found on the slopes of the Sierra Nevada and Cascades and into the western Great Basin, Colorado Plateau and Black Hills of South Dakota in summer-dry habitats from 800 to 3000 m elevation. Stands in California are found at higher elevations than most other chaparral ranging from 300 to 3300 m elevation. They occur in the northern Coast Ranges, Klamath Mountains, Modoc Plateau, Sierra Nevada and foothills, and southern Cascades of California and southern Oregon. Climate is semi-arid to cool temperate. Yearly precipitation and temperature ranges are quite large. The northern portion of the Sierra Nevada and Klamath-Siskiyou mountains can receive 200 cm of rain per year, while southern stands may receive only 40 cm per year. These sclerophyllous shrubs are adapted to freezing temperatures and cold winters. However, lower elevation stands may never see freezing temperatures, while northern, high-elevation and northern stands may only have a 4-month growing season. Much of the precipitation comes as winter snow, and summer drought-stress is characteristic.

These shrublands occur on ridges and rocky slopes often with southerly aspects. Substrates are thin, well-drained skeletal soils with coarser texture loamy or sandy soils. Parent materials are varied and range from limestone and sandstone to granitics, mafic, and ultramafic substrates. These shrub communities are typically zonal disclimax or, occasionally, edaphic climax brushfields which occur in association with dry needle-leaved evergreen forests or woodlands. They typically established after stand-replacing fires or clear-cut logging in *Pinus ponderosa* or *Pseudotsuga menziesii* forests or pinyon-juniper woodlands, and are seral to forest after several decades. Excessively rocky or droughty, fire-prone sites in the forest may support relatively persistent stands of this group. In the Rocky Mountains, stands are found within a matrix of montane conifer forest and woodland in limited, small-patch occurrences forming post-fire shrublands in areas previously dominated by woodlands. Typical fire regime in this group varies with the amount of organic accumulation. All characteristic species are fire-adapted.

Dynamics: Stands commonly occur post disturbance after fire or logging along ridges and upper slopes.

DISTRIBUTION

Geographic Range: This chaparral group occurs across much of the western United States from the Sierra Nevada, Klamath-Siskiyou mountains and southern Cascade Range of California, Oregon and Washington east across the ranges of the Great Basin and plateaus of the Colorado Plateau into the Rocky Mountains extending out to the Black Hills. There are occurrences extending as far west as the inner Coast Ranges in central California, the northern Coast Ranges in southeastern Oregon and the Peninsular and Transverse ranges in southern California.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA?, US

States/Provinces: AB?, AZ, BC?, CA, CO, ID, MT, NM, NV, OR, SD, UT, WA?, WY

TNC Ecoregions [optional]: 3:C, 4:C, 7:P, 8:C, 9:C, 11:C, 12:C, 15:P, 18:C, 19:C, 20:P, 21:P

USFS Ecoregions (2007): 313A:??, 341A:CP, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342J:CP, M261E:CC, M341A:CC, M341D:CP

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. This group is very uncertain as a type.

SYNONYMY

- >< Littleleaf Mountain-Mahogany (417) (Shiflet 1994)
- >< Snowbush (420) (Shiflet 1994)

LOWER LEVEL UNITS

Alliances:

- A4117 *Quercus sadleriana* - *Notholithocarpus densiflorus* var. *echinoides* Shrubland Alliance
- A3918 *Prunus emarginata* - *Holodiscus discolor* Shrubland Alliance
- A3919 *Quercus garryana* var. *fruticosa* Shrubland Alliance
- A3916 *Quercus vacciniifolia* - *Chrysolepis sempervirens* Shrubland Alliance
- A3917 *Ceanothus cordulatus* - *Ceanothus integerrimus* Shrubland Alliance
- A0788 *Arctostaphylos patula* - *Arctostaphylos nevadensis* Shrubland Alliance
- A3936 *Ceanothus velutinus* Shrubland Alliance

AUTHORSHIP

Primary Concept Source: T.N. Shiflet (1994)

Author of Description: K.A. Schulz and M.S. Reid

Acknowledgments:

Version Date: 08/06/2015

Classif Resp Region: West

Internal Author: KAS/MSR 3-10, 9-13, mod. KAS 4-15, mod. GK 8-15, 12-15

REFERENCES

References: Barbour and Major 1977, Brown 1982a, Faber-Langendoen et al. 2017a, Sawyer et al. 2009, Shiflet 1994

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G282. Western North American Montane Sclerophyll Scrub

A0788. *Arctostaphylos patula* - *Arctostaphylos nevadensis* Shrubland Alliance

Type Concept Sentence: This alliance consists of shrublands strongly dominated by *Arctostaphylos patula* or *Arctostaphylos nevadensis*. They are often monotypic stands with few other shrubs. These montane shrublands occur on the eastern slope of the Sierra Nevada and into the western Great Basin and Colorado Plateau and are found mostly on steep, usually south-facing slopes, where soils are rocky and well-drained.

OVERVIEW

Scientific Name: *Arctostaphylos patula* - *Arctostaphylos nevadensis* Shrubland Alliance

Common Name (Translated Scientific Name): Greenleaf Manzanita - Pinemat Manzanita Shrubland Alliance

Colloquial Name: Greenleaf Manzanita - Pinemat Manzanita Shrubland

Type Concept: This alliance consists of shrublands strongly dominated by *Arctostaphylos patula* or *Arctostaphylos nevadensis*. They are often monotypic stands with few other shrubs. Common shrub associates include *Arctostaphylos nevadensis*, *Ceanothus cordulatus*, *Ceanothus velutinus*, *Cercocarpus montanus*, *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), and *Ribes* spp. Eastward, steppe species such as *Artemisia tridentata*, *Purshia tridentata*, and *Cercocarpus ledifolius* become common associates. Herbaceous vegetation is typically sparse and poorly described across the range of this alliance. Reported associates in northern California include *Elymus elymoides*, *Pyrola picta*, and *Stephanomeria lactucina*. This alliance occurs on the eastern slope of the Sierra Nevada and into the western Great Basin and Colorado Plateau. Stands occur on steep, usually south-facing slopes, where soils are rocky and well-drained from 800 to 3300 m in elevation. Much of the annual precipitation comes as winter snow, and summer drought stress is characteristic. These shrublands typically establish after stand-replacing fires and will succeed to forests after several decades. Excessively rocky or droughty, fire-prone sites within forested areas may support relatively persistent stands of this alliance. They are an important component of the Sierra Nevada/southern Cascade montane chaparral and may form large inclusions in dry pine forests following disturbance.

Classification Comments: This alliance may prove to be more widespread than currently known. More information/inventory is needed to confirm that shrublands of *Arctostaphylos nevadensis* also belong in this alliance. In California, many of the other alliances defined in Western North American Montane Sclerophyll Scrub Group (G282) occur adjacent to stands of this alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Shrublands dominated or with a significant component of *Arctostaphylos patula* or *Arctostaphylos nevadensis*.

VEGETATION

Physiognomy and Structure: These are dense brushfields of sclerophyllous shrubs up to 2 m in height. Needle-leaved evergreen trees are often associated with these communities and may form a sparse emergent layer (20-35 m tall). Herbaceous vegetation is typically sparse and composed of scattered xerophytic graminoids and forbs.

Floristics: These shrublands are strongly dominated by *Arctostaphylos patula* or *Arctostaphylos nevadensis* and may be almost monotypic. They are an important component of the Sierra Nevada/southern Cascade montane chaparral and may form large inclusions in dry pine forests following disturbance. Common shrub associates include *Arctostaphylos nevadensis*, *Ceanothus cordulatus*, *Ceanothus velutinus*, *Cercocarpus montanus*, *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), and *Ribes* spp. Eastward, steppe species such as *Artemisia tridentata*, *Purshia tridentata*, and *Cercocarpus ledifolius* become common associates. Herbaceous vegetation is typically sparse and poorly described across the range of this alliance. Reported associates in northern California include *Elymus elymoides*, *Pyrola picta*, and *Stephanomeria lactucina*.

ENVIRONMENT & DYNAMICS

Environmental Description: These are montane shrublands found on the eastern slope of the Sierra Nevada and into the western Great Basin and Colorado Plateau in summer-dry habitats from 800 to 3000 m elevation. Much of the precipitation comes as winter snow, but summer drought-stress is characteristic. These shrublands are mostly found on steep, usually south-facing slopes, where soils are rocky and well-drained. These are typically zonal disclimax or, occasionally, edaphic climax brushfields which occur in association with dry needle-leaved evergreen forests or woodlands. These shrublands are typically established after stand-replacing fires or clearcut logging in *Pinus ponderosa* or *Pseudotsuga menziesii* forest, and are seral to forest after several decades. Excessively rocky or droughty, fire-prone sites in the forest may support relatively persistent stands of this alliance.

Dynamics: *Arctostaphylos patula* is a rapidly colonizing, light-intolerant species which is disturbance-dependent in most environmental settings where it occurs (Mozingo 1987). Fire has also been shown to enhance germination of *Arctostaphylos* seeds. These communities often form dense patches in disturbed conifer forests which are strongly dominant and may inhibit conifer re-establishment and early growth (Conard and Radosevich 1982).

DISTRIBUTION

Geographic Range: These shrublands are reported from the eastern slope of the Sierra Nevada in Nevada and California and from the Colorado Plateau in southwestern Utah and western Colorado. *Arctostaphylos patula* is reported to form dense shrublands from southern Oregon and east across the Great Basin in montane habitats to Montana, northwestern Colorado, and northern Arizona (Mozingo 1987). The alliance likely occurs in these areas as well.

Nations: US

States/Provinces: AZ, CA, CO, NV, OR?, UT, WA?

TNC Ecoregions [optional]: 6:C, 9:C, 11:C, 12:C, 18:C, 19:C, 20:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: BLM (Uncompahgre Plateau); NPS (Bryce Canyon, Cedar Breaks, Colorado, Dinosaur, Grand Canyon, Great Basin, Yosemite, Zion)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Arctostaphylos patula* (Green leaf manzanita chaparral) Alliance (Sawyer et al. 2009) [37.303.00]

LOWER LEVEL UNITS

Associations:

- CEG005820 *Arctostaphylos patula* Sierran Chaparral Shrubland
- CEG002694 *Arctostaphylos patula* - *Artemisia tridentata* (ssp. *vaseyana*, ssp. *wyomingensis*) Shrubland
- CEG005422 *Arctostaphylos patula* / *Ceanothus martinii* Shrubland
- CEG002696 *Arctostaphylos patula* Shrubland
- CEG000957 *Arctostaphylos patula* / *Ceanothus velutinus* - *Ceanothus prostratus* Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid and D. Sarr, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid, D. Sarr, K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Barbour and Major 1977, Conard and Radosevich 1982, Faber-Langendoen et al. 2017b, Mozingo 1987, Reid et al. 1999, Sawyer et al. 2009, Townsend 1966

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G282. Western North American Montane Sclerophyll Scrub

A3917. *Ceanothus cordulatus* - *Ceanothus integerrimus* Shrubland Alliance

Type Concept Sentence: This alliance consists of shrublands dominated by either *Ceanothus cordulatus* or *Ceanothus integerrimus*, with other montane chaparral shrubs. This alliance occurs in cismontane California and mountains of southern Oregon. Stands occur on well-drained soils and are best developed on dry, exposed sites such as along ridges and upper slopes, between 300 and 2100 m elevation.

OVERVIEW

Scientific Name: *Ceanothus cordulatus* - *Ceanothus integerrimus* Shrubland Alliance

Common Name (Translated Scientific Name): Mountain Whitethorn - Deerbrush Shrubland Alliance

Colloquial Name: Californian Montane Whitethorn - Deerbrush Chaparral

Type Concept: This chaparral shrubland alliance is dominated by either *Ceanothus cordulatus* or *Ceanothus integerrimus*, with other montane chaparral shrubs, including *Arctostaphylos manzanita*, *Arctostaphylos patula*, *Arctostaphylos viscida*, *Ceanothus cuneatus*, *Ceanothus sanguineus* (in Oregon), *Ceanothus velutinus*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Notholithocarpus densiflorus* (= *Lithocarpus densiflorus*), *Prunus emarginata*, *Quercus berberidifolia*, *Quercus chrysolepis*, *Quercus vacciniifolia*, and *Symphoricarpos mollis*. Emergent trees may be present and can include *Pseudotsuga menziesii*, *Arbutus menziesii*, and *Quercus wislizeni*. The herbaceous layer is sparse and typically includes *Elymus glaucus*. These are generally short-lived shrublands (on the order of decades), succeeding to conifer woodlands or forest. Stands establish from seed banks post-fire or after other disturbance such as logging; too frequent fires can deplete the seed bank. This chaparral shrubland of cismontane California and mountains of southern Oregon is found between 300 and 2100 m elevation. This is a region with strong seasonal precipitation patterns: long, dry summers and cool, moist winters. Precipitation varies from 30 cm per year in the southern portions of the range to 200 cm per year in the northern. Stands occur on well-drained soils and are best developed on dry, exposed sites such as along ridges and upper slopes.

Classification Comments: While one of these dominants is evergreen and the other is semi-deciduous or deciduous, they share many floristic characteristics, dynamics, and environmental setting, so they are placed in a single alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure: This sclerophyllous, temperate, broad-leaved evergreen shrubland forms a continuous to intermittent shrub canopy with a sparse herbaceous layer. Emergent conifers (10-15 m tall) may be present.

Floristics: This chaparral shrubland alliance is dominated by either *Ceanothus cordulatus* or *Ceanothus integerrimus*, with other montane chaparral shrubs, including *Arctostaphylos manzanita*, *Arctostaphylos patula*, *Arctostaphylos viscida*, *Ceanothus cuneatus*, *Ceanothus sanguineus* (in Oregon), *Ceanothus velutinus*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Notholithocarpus densiflorus* (= *Lithocarpus densiflorus*), *Prunus emarginata*, *Quercus berberidifolia*, *Quercus chrysolepis*, *Quercus vacciniifolia*, and *Symphoricarpos mollis*. Emergent trees may be present and can include *Pseudotsuga menziesii*, *Arbutus menziesii*, and *Quercus wislizeni*. The herbaceous layer is sparse and typically includes *Elymus glaucus*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs along ridges and upper slopes between 900 and 2900 m in elevation. Stands occur on well-drained soils and are best developed on dry, exposed sites. This alliance grows in a climate with long, dry summers and wet winters. Average yearly precipitation totals vary from roughly 62 cm in the northern end of the range to 30 cm in the southern extremes.

Dynamics: This alliance is not normally self-perpetuating. It is transitional to other forest vegetation types, and requires disturbances such as logging and fire to provide openings within suitable habitat.

DISTRIBUTION

Geographic Range: This alliance occurs from Oregon to southern California. Stands are found in the Klamath Mountains, Coast and Cascade ranges, Sierra Nevada, and Transverse and Peninsular ranges.

Nations: US

States/Provinces: CA, OR

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Ceanothus cordulatus* (Mountain white thorn chaparral) Alliance (Sawyer et al. 2009) [37.209.00]
- > *Ceanothus integerrimus* (Deer brush chaparral) Alliance (Sawyer et al. 2009) [37.206.00]
- > *Ceanothus integerrimus* Shrubland Alliance (Keeler-Wolf et al. 2012)
- = Deer Brush Chaparral (#37531) (Holland 1986b)
- = Whitethorn Chaparral (#37532) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEGLO05821 *Ceanothus cordulatus* / Sparse Understory Sierran Shrubland
- CEGLO03023 *Ceanothus cordulatus* Shrubland
- CEGLO03027 *Ceanothus integerrimus* Shrubland
- CEGLO05818 *Ceanothus integerrimus* - *Arctostaphylos viscida* - (*Arctostaphylos mewukka*) Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Faber-Langendoen et al. 2017b, Holland 1986b, Keeler-Wolf et al. 2012, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G282. Western North American Montane Sclerophyll Scrub

A3936. *Ceanothus velutinus* Shrubland Alliance

Type Concept Sentence: This alliance consists of shrublands where *Ceanothus velutinus* is the major dominant. Mature stands have a uniform layer of tall shrubs 1-2 m in height. It occurs on montane slopes in the western U.S., including the Black Hills of South Dakota.

OVERVIEW

Scientific Name: *Ceanothus velutinus* Shrubland Alliance

Common Name (Translated Scientific Name): Snowbrush *Ceanothus* Shrubland Alliance

Colloquial Name: Snowbrush *Ceanothus* Chaparral

Type Concept: This alliance consists of stands dominated by *Ceanothus velutinus*. The vegetation in mature stands is dominated by a uniform layer of tall shrubs 1-2 m in height. There may be a few scattered *Amelanchier* sp., *Artemisia tridentata*, *Cercocarpus* spp., *Mahonia repens*, *Prunus virginiana*, *Rosa* spp., *Spiraea betulifolia*, and /or *Symphoricarpos* spp. In California, associated species can include *Arctostaphylos patula*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus sadleriana*, *Quercus vaccinifolia*, and *Symphoricarpos mollis*. This alliance occurs throughout the western U.S., including the Black Hills of South Dakota. Typical occurrences are an acre or two in size and are somewhat isolated, as they are usually part of a mosaic of post-burn vegetation types. Sites range from moderate to steep (14-73%

slope) and tend to prefer cooler north or east aspects. Parent materials are variable, and soils are well-drained, rocky and generally coarse in texture.

Classification Comments: *Ceanothus velutinus* grows throughout much of the western U.S., where it is associated with many forest types from South Dakota to the Pacific coast. Stands develop along mountain slopes after disturbances such as fire or logging. The two varieties, the inland *var. velutinus* with velvety leaves and the coastal, taller *var. hookeri*, have similar ecologies (Fross and Wilken 2006), so we include both in the alliance. Most of the major habitat typing studies in the western U.S. do not characterize seral types, so it should not be any surprise that this type is poorly described and sampled. The alliance concept remains somewhat tentative and needs review as more data become available. This type is likely to be widespread in the Rocky Mountains of Colorado, Wyoming and Montana, west into areas of the Sierra Nevada, Great Basin mountains, and the Cascades. Communities of *Ceanothus fendleri* should probably be included in this group and alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Shrublands dominated by *Ceanothus velutinus*.

VEGETATION

Physiognomy and Structure:

Floristics: This alliance consists of stands dominated by *Ceanothus velutinus*. There may be a few scattered *Amelanchier* sp., *Artemisia tridentata*, *Cercocarpus* spp., *Mahonia repens*, *Prunus virginiana*, *Rosa* spp., *Spiraea betulifolia*, and /or *Symphoricarpos* spp. In California, associated species can include *Arctostaphylos patula*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus sadleriana*, *Quercus vacciniifolia*, and *Symphoricarpos mollis*. A variety of herbaceous species may be present and may occur in the looser "openings" in the shrub layer, but *Ceanothus velutinus* can form a dense canopy and shade out the ground layer.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands of this alliance occur on dry hillsides, often with thin soil.

Dynamics: Most stands are known to respond to fire by prolific reseedling, in some cases germinating from soils after many years post-fire. It is considered an early-seral shrubland for this reason. *Ceanothus velutinus* is a slow-growing shrub; it may take 20 years following fire before the shrub will dominate a stand.

DISTRIBUTION

Geographic Range: This alliances occurs in the western U.S., possibly into Alberta and British Columbia, and is currently known from South Dakota (Black Hills) west to California. It has not been reported from Washington, Oregon, Nevada, Idaho, Montana, or Utah but probably occurs in those states.

Nations: CA?, US

States/Provinces: AB?, BC?, CA, CO, SD, WY

TNC Ecoregions [optional]: 4:C, 5:C, 11:C, 12:C

USFS Ecoregions (2007): 263A:CC, 341D:CC, 342B:CC, M261A:CC, M261B:CC, M261D:CC, M261E:CC, M261G:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Ceanothus velutinus* (Tobacco brush or snow bush chaparral) Alliance (Sawyer et al. 2009) [37.210.00]
- = *Ceanothus velutinus* Shrubland Alliance (CNPS 2017) [37.210.00]
- >< Mixed Montane Chaparral (#37510) (Holland 1986b)
- >< Tobacco Brush Chaparral (#37533) (Holland 1986b)
- = Tobacco brush series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEGLO03144 *Ceanothus velutinus* - *Prunus emarginata* - *Artemisia tridentata* Shrubland

- C EGL002167 *Ceanothus velutinus* Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Anderson 2001a, Bolsinger 1989, CNPS 2017, Cheng 2004, Conard and Radosevich 1982, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Fross and Wilken 2006, Hanes 1977, Holland 1986b, Keeler-Wolf et al. 2003a, Riser and Fry 1994, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Winward 1994

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G282. Western North American Montane Sclerophyll Scrub

A3918. *Prunus emarginata* - *Holodiscus discolor* Shrubland Alliance

Type Concept Sentence: This alliance consists of shrublands dominated by *Prunus emarginata* or *Holodiscus discolor*. It is widespread at montane to subalpine altitudes of California generally found between 700 and 2800 m elevation, but more common at higher elevations. It occurs on ridges, montane slopes, rocky chutes, moraines, and talus. Soils are skeletal and may be rocky, loamy, or sandy.

OVERVIEW

Scientific Name: *Prunus emarginata* - *Holodiscus discolor* Shrubland Alliance

Common Name (Translated Scientific Name): Bitter Cherry - Oceanspray Shrubland Alliance

Colloquial Name: Californian Montane Bitter Cherry - Oceanspray Shrubland

Type Concept: This alliance consists of shrublands where *Prunus emarginata* or *Holodiscus discolor* characteristically are dominant or the important species in the canopy. Other shrubs may include *Achnatherum occidentale* (= *Stipa occidentalis*), *Amelanchier alnifolia*, *Arctostaphylos patula*, *Artemisia tridentata*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Ceanothus integerrimus*, *Ceanothus velutinus*, *Cercocarpus ledifolius*, *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Eriogonum nudum*, *Garrya fremontii*, *Keckiella corymbosa*, *Mimulus suksdorfii*, *Prunus andersonii*, *Quercus sadleriana*, *Quercus vacciniifolia*, *Ribes* spp., *Symphoricarpos mollis*, and *Symphoricarpos rotundifolius*. Emergent conifers may be present. This is a widespread montane to subalpine shrubland alliance of California, occurring on ridges, montane slopes, rocky chutes, moraines, and talus. It is generally found between 700 and 2800 m elevation, but more common at higher elevations. Stands occur on concave or northerly facing slopes, or in rocky areas that accumulate more surface run-off than surrounding areas, or with rock outcrops and steep talus where shrubs establish in rock crevices and other openings between rocks. Soils are skeletal and may be rocky, loamy, or sandy. Unlike most chaparral types, this alliance can form self-perpetuating stands, which can be of continuous shrub cover or have an intermittent canopy.

Classification Comments: This alliance is a tentative combination of two Sawyer et al. (2009) alliances, based on dominance of these two deciduous species combined with the additional floristic component of the montane chaparrals, such as the *Ceanothus* and *Arctostaphylos* taxa. Although it probably works as an alliance, it may belong in a different group altogether.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure: This temperate cold-deciduous shrubland forms an intermittent canopy. Emergent conifers may be present. The herbaceous layer is sparse.

Floristics: This alliance consists of shrublands where *Prunus emarginata* or *Holodiscus discolor* characteristically are dominant or the important species in the canopy. Other shrubs may include *Achnatherum occidentale* (= *Stipa occidentalis*), *Amelanchier alnifolia*, *Arctostaphylos patula*, *Artemisia tridentata*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Ceanothus integerrimus*, *Ceanothus velutinus*, *Cercocarpus ledifolius*, *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), *Chrysothamnus viscidiflorus*, *Ericameria*

nauseosa, *Eriogonum nudum*, *Garrya fremontii*, *Keckiella corymbosa*, *Mimulus suksdorfii*, *Prunus andersonii*, *Quercus sadleriana*, *Quercus vaccinifolia*, *Ribes* spp., *Symphoricarpos mollis*, and *Symphoricarpos rotundifolius*. Emergent conifers may be present.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands of this montane to subalpine shrubland alliance occur on ridges and slopes with thin soils. Soils are skeletal and may be rocky, loamy, or sandy. Stands are found between 700 and 2800 m elevation. The widespread range of this alliance includes a large variety of habitats, and yearly precipitation and temperature ranges are quite large. The northern portion of the range can receive 200 cm of rain per year, while southern stands may receive only 40 cm per year. Lower elevation, southern stands may never see freezing temperatures, while northern, high-elevation stands may only have a five-month growing season. Unlike most chaparral types, this alliance forms self-perpetuating stands.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance of the mountains of California occurs in the northern and central Coast Ranges, the Klamath Mountains, south through the Cascades and Sierra Nevada, into the Peninsular and Transverse ranges. It may also occur in adjacent areas of southern Oregon.

Nations: US

States/Provinces: CA, OR?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Holodiscus discolor* (Ocean spray brush) Alliance (Sawyer et al. 2009) [39.100.00]
- > *Prunus emarginata* (Bitter cherry thickets) Provisional Alliance (Sawyer et al. 2009) [37.900.00]
- > *Holodiscus* Series (Sawyer and Keeler-Wolf 1995)
- >< Mixed Montane Chaparral (#37510) (Holland 1986b)
- >< Northern North Slope Chaparral (#37E10) (Holland 1986b)
- >< Tobacco Brush Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEG005822 *Prunus emarginata* Sierran Chaparral Shrubland
- CEG003129 *Holodiscus discolor* / *Sedum obtusatum* ssp. *boreale* - *Cryptogramma acrostichoides* Shrubland
- CEG003130 *Holodiscus discolor* - *Sambucus racemosa* Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid after Sawyer et al. (2009)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Faber-Langendoen et al. 2017b, Hickman 1993, Holland 1986b, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G282. Western North American Montane Sclerophyll Scrub

A3919. *Quercus garryana* var. *fruticosa* Shrubland Alliance [Low - Poorly Documented]

Type Concept Sentence: This alliance consists of the shrub forms of *Quercus garryana* where they are dominant or codominant with several other shrub species such as *Amelanchier*, *Arctostaphylos*, *Ceanothus*, *Cercocarpus*, *Fraxinus*, *Prunus*, and/or shrubby forms of *Quercus*. It occurs in the northern Coast Ranges, Klamath Mountains, Modoc Plateau, Sierra Nevada and foothills, and southern Cascades of California, and is likely to occur in Oregon.

OVERVIEW

Scientific Name: *Quercus garryana* var. *fruticosa* Shrubland Alliance

Common Name (Translated Scientific Name): Oregon White Oak Shrubland Alliance

Colloquial Name: Californian Montane Oregon White Oak Shrubland

Type Concept: This alliance consists of stands of the shrub form of *Quercus garryana* var. *fruticosa* where it is dominant or codominant with *Amelanchier utahensis*, *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Ceanothus integerrimus*, *Ceanothus velutinus*, *Cercis canadensis* var. *texensis* (= *Cercis occidentalis*), *Cercocarpus montanus*, *Clematis lasiantha*, *Fraxinus dipetala*, *Prunus emarginata*, *Prunus subcordata*, *Quercus berberidifolia*, *Quercus vacciniifolia*, and *Toxicodendron diversilobum*. Emergent *Quercus chrysolepis*, *Quercus kelloggii*, *Quercus wislizeni*, or *Pinus sabiniana* trees may be present at sparse cover. Shrubs are <5 m in height, and the canopy is intermittent to continuous. The herbaceous layer is usually open and grassy. This alliance occurs in the northern Coast Ranges, Klamath Mountains, Modoc Plateau, Sierra Nevada and foothills, and southern Cascades of California, and is likely to occur in Oregon. Habitats are ridges and upper slopes, and may be steep and rocky. Elevation is 450-1800 m. Since most stands are on thin soils, they tend to be invaded slowly by conifers, if at all.

Classification Comments: This concept follows the *Quercus garryana* var. *fruticosa* shrubland alliance of Sawyer et al. (2009). This alliance is tentative; although it probably works as an alliance, it may belong in a different group altogether. The dominant taxa are deciduous oaks, although the overall floristics contain elements of montane chaparrals, such as the *Ceanothus* and *Arctostaphylos* species, as well as evergreen oaks such as *Quercus vacciniifolia*.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure: This temperate or cold-deciduous shrubland forms an intermittent to continuous canopy less than 5 m in height. Emergent trees (15-20 m tall) may be present. The herbaceous layer is variable; it may be dominated by graminoids.

Floristics: Stands dominated by *Quercus garryana* var. *fruticosa* (= var. *breweri*) or *Quercus garryana* var. *garryana*. Other codominant shrubs include *Amelanchier utahensis*, *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Ceanothus integerrimus*, *Ceanothus velutinus*, *Cercis canadensis* var. *texensis* (= *Cercis occidentalis*), *Cercocarpus montanus*, *Clematis lasiantha*, *Fraxinus dipetala*, *Prunus emarginata*, *Prunus subcordata*, *Quercus berberidifolia*, *Quercus vacciniifolia*, and *Toxicodendron diversilobum*. Emergent *Quercus chrysolepis*, *Quercus kelloggii*, *Quercus wislizeni*, or *Pinus sabiniana* trees may be present at sparse cover. *Festuca californica* may be present in the herbaceous layer.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands of this California shrubland alliance are found at higher elevations than most other chaparrals. Elevations range from 450 to 1800 m. Sites tend to be cooler and moister due to these higher elevations. Annual precipitation is quite seasonal, with the bulk falling between November and April. Yearly precipitation totals vary from 60 cm in the south to over 120 cm in the north. Summers are very warm and dry; winters are cool and moist. Stands are usually found on upper slopes; often these are steep. Soils are thin.

Dynamics: This alliance is much more fire-resistant than other chaparrals. This is possibly due to its fidelity to moister sites.

DISTRIBUTION

Geographic Range: This alliance occurs in the northern Coast Ranges, Klamath Mountains, Modoc Plateau, Sierra Nevada and foothills, and southern Cascades of California, and is likely to occur in Oregon.

Nations: US

States/Provinces: CA, OR?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

- = *Quercus garryana* (Brewer oak scrub) Alliance (Sawyer et al. 2009) [37.411.00]

NBR alliances

- = *Quercus garryana* var. *breweri* Shrubland Alliance (Keeler-Wolf et al. 2012)
- = *Quercus garryana* (*shrub*) Shrubland Alliance (CNPS 2017) [37.411.00]
- = Brewer Oak Series (Sawyer and Keeler-Wolf 1995)
- = Shin Oak Brush (#37541) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEGL003091 *Quercus garryana* var. *fruticosa* Shrubland [Placeholder]

AUTHORSHIP

Primary Concept Source: M.S. Reid after Sawyer et al. (2009)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: CNPS 2017, Faber-Langendoen et al. 2017b, Hickman 1993, Holland 1986b, Keeler-Wolf et al. 2012, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G282. Western North American Montane Sclerophyll Scrub

A4117. *Quercus sadleriana* - *Notholithocarpus densiflorus* var. *echinoides* Shrubland Alliance [Low - Poorly Documented]

Type Concept Sentence: This alliance consists of shrublands dominated by *Quercus sadleriana* and/or *Notholithocarpus densiflorus* var. *echinoides*. It is found in the Klamath-Siskiyou mountains of southern Oregon and California, as well as along the foothills of the central Sierra Nevada. Stands commonly occur after disturbance from fire or logging along ridges and upper slopes between 600 and 3300 m elevation.

OVERVIEW

Scientific Name: *Quercus sadleriana* - *Notholithocarpus densiflorus* var. *echinoides* Shrubland Alliance

Common Name (Translated Scientific Name): Deer Oak - Tanoak Shrubland Alliance

Colloquial Name: Californian Disturbance-Driven Montane Scrub Oak Chaparral

Type Concept: This alliance consists of shrublands dominated by *Quercus sadleriana* and/or *Notholithocarpus densiflorus* var. *echinoides* (= *Lithocarpus densiflorus* var. *echinoides*). Other shrubs may include *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Ceanothus velutinus*, *Holodiscus discolor*, *Prunus emarginata*, and *Symphoricarpos mollis*. Emergent conifers such as *Abies concolor*, *Pinus lambertiana*, *Pinus ponderosa*, or *Pseudotsuga menziesii* may be present at low cover. The herbaceous layer is sparse. This alliance is found in the Klamath-Siskiyou mountains of southern Oregon and California, as well as along the foothills of the central Sierra Nevada. Topography and substrates are varied but tend towards skeletal, thin, rocky soils derived from granitics, mafic, and ultramafic. Most stands establish after fire or in areas with a history of logging. Climate has long, dry summers and wet winters. Average yearly precipitation totals vary from roughly 200 cm in the northern end of the range to 40 cm in the southern Sierra Nevada.

Classification Comments: This alliance includes two Sawyer et al. (2009) alliances because they occur in similar ecological settings, and respond to disturbance in similar ways.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Dominance of *Quercus sadleriana* or *Notholithocarpus densiflorus* var. *echinoides*, singularly or mixed with other montane chaparral shrubs such as *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Ceanothus velutinus*, *Holodiscus discolor*, *Prunus emarginata*, and *Symphoricarpos mollis*.

VEGETATION

Physiognomy and Structure: This hemi-sclerophyllous, temperate, broad-leaved evergreen shrubland forms an intermittent to continuous canopy up to 2 m in height. Emergent conifers (10-15 m tall) may be present. The herbaceous layer is sparse.

Floristics: This shrubland of montane and subalpine zones in northern California and Oregon is dominated by *Quercus sadleriana* or *Notholithocarpus densiflorus* var. *echinoides* (= *Lithocarpus densiflorus* var. *echinoides*), singularly or mixed with other montane chaparral shrubs such as *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Ceanothus velutinus*, *Holodiscus discolor*, *Prunus emarginata*, and *Symphoricarpos mollis*. Emergent conifers may be present. The herbaceous layer is sparse.

ENVIRONMENT & DYNAMICS

Environmental Description: Habitat is on rocky exposed ridges and steep slopes of all aspects at montane and subalpine (600-2200 m) elevations. The climactic regime where this alliance grows is largely Mediterranean, though not as strongly as in more southerly parts of California. Winters are cool and very wet, with annual precipitation totals often in excess of 200 cm. Average yearly precipitation totals vary from roughly 200 cm in the northern end of the range to 40 cm in the southern Sierra Nevada. Summers are warm and fairly dry.

Dynamics: This alliance is probably not self-perpetuating. Most stands are established after fire or logging and are transitional to forest.

DISTRIBUTION

Geographic Range: This alliance occurs from the Klamath Mountains of Oregon to southern California. Stands are also found in the Coast Ranges, Sierra Nevada, and Transverse and Peninsular ranges.

Nations: US

States/Provinces: CA, OR

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

- > *Lithocarpus densiflorus* var. *echinoides* (Shrub tanoak chaparral) Alliance (Sawyer et al. 2009) [73.110.00]
- > *Quercus sadleriana* (Sadler oak or deer oak brush fields) Alliance (Sawyer et al. 2009) [37.412.00]

LOWER LEVEL UNITS

Associations:

- CEG003093 *Quercus sadleriana* Shrubland [Placeholder]

AUTHORSHIP

Primary Concept Source: M.S. Reid after Sawyer et al. (2009)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Faber-Langendoen et al. 2017b, Holland 1986b, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G282. Western North American Montane Sclerophyll Scrub

A3916. *Quercus vacciniifolia* - *Chrysolepis sempervirens* Shrubland Alliance

Type Concept Sentence: This alliance consists of shrublands dominated by *Quercus vacciniifolia* and/or *Chrysolepis sempervirens*.

This alliance occurs from Oregon to the southern Sierra Nevada of California along ridges and upper slopes between 700 and 3300 m in elevation.

OVERVIEW

Scientific Name: *Quercus vacciniifolia* - *Chrysolepis sempervirens* Shrubland Alliance

Common Name (Translated Scientific Name): Huckleberry Oak - Bush Chinquapin Shrubland Alliance

Colloquial Name: Californian Montane Scrub Oak Chaparral

Type Concept: This alliance consists of shrublands dominated by *Quercus vacciniifolia* and/or *Chrysolepis sempervirens* occurring either in mixed stands together or as the sole dominant. Other shrubs may include *Amelanchier alnifolia*, *Arctostaphylos nevadensis*,

Arctostaphylos patula, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Ceanothus velutinus*, *Garrya fremontii*, *Holodiscus discolor*, *Prunus emarginata*, and *Symphoricarpos mollis*. Emergent conifers such as *Abies concolor*, *Abies magnifica*, *Pinus jeffreyi*, *Pinus lambertiana*, *Pinus monticola*, *Pinus ponderosa*, or *Pseudotsuga menziesii* may be present at low cover. The herbaceous layer is sparse. Stands occur in the northern Coast Ranges, Klamath-Siskiyou mountains and throughout much of the Sierra Nevada. Topography and substrates are varied but tend towards skeletal, thin, rocky soils derived from granitics, mafic, and ultramafic. They occur on dry rocky and nutrient-poor soils at montane to subalpine elevations (700-3300 m). Climate has long, dry summers and wet winters. Average yearly precipitation totals vary from roughly 200 cm in the northern end of the range to 40 cm in the southern Sierra Nevada.

Classification Comments: This alliance includes two Sawyer et al. (2009) alliances because they occur in similar ecological settings, have very similar floristics and can occur as mixed stands together. The dominants are evergreen, often referred to as "montane scrub oak chaparral."

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Dominance of *Quercus vacciniifolia* and *Chrysolepis sempervirens*, singularly or mixed with other montane chaparral shrubs such as *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Ceanothus cordulatus*, *Ceanothus cuneatus*, *Ceanothus velutinus*, *Garrya fremontii*, *Holodiscus discolor*, *Prunus emarginata*, and *Symphoricarpos mollis*.

VEGETATION

Physiognomy and Structure: This sclerophyllous, temperate, broad-leaved evergreen shrubland forms a continuous to intermittent shrub canopy with a sparse herbaceous layer. Emergent conifers (10-15 m tall) may be present.

Floristics: *Chrysolepis sempervirens* (= *Castanopsis sempervirens*) and/or *Quercus vacciniifolia* is the sole or dominant plant in the shrub canopy. Other shrubs may include *Amelanchier alnifolia*, *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Ceanothus cordulatus*, *Ceanothus velutinus*, *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), *Garrya fremontii*, *Prunus emarginata*, *Quercus sadleriana*, *Quercus vacciniifolia*, and *Symphoricarpos mollis*. Emergent conifers may be present. The herbaceous layer is sparse.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs along ridges and upper slopes between 700 and 3300 m elevation. Stands are normally found on thin, rocky soils. This alliance grows in a climate with long, dry summers and wet winters. Average yearly precipitation totals vary from roughly 62 cm in the northern end of the range to 30 cm in the southern extremes.

Dynamics: Stands of this alliance are self-perpetuating on shallow soils. Stands on deeper soils are usually the result of disturbance and are transitional to forests.

DISTRIBUTION

Geographic Range: This alliance of montane slopes and ridges occurs from Oregon to the southern Sierra Nevada of California. Stands are found in the Coast and Cascade ranges, Klamath Mountains, and south into the Sierra Nevada.

Nations: US

States/Provinces: CA, OR

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Chrysolepis sempervirens* (Bush chinquapin chaparral) Alliance (Sawyer et al. 2009) [37.700.00]
- > *Quercus vaccinifolia* Shrubland Alliance (Keeler-Wolf et al. 2012)
- > *Quercus vacciniifolia* (Huckleberry oak chaparral) Alliance (Sawyer et al. 2009) [37.414.00]
- = Bush Chinquapin Chaparral (#37550) (Holland 1986b)
- = Huckleberry Oak Chaparral (#37542) (Holland 1986b)
- >< Mixed Montane Chaparral (#37510) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEGLO03039 *Chrysolepis sempervirens* Shrubland
- CEGLO08697 *Quercus vaccinifolia* - *Arctostaphylos patula* Shrubland
- CEGLO08696 *Quercus vaccinifolia* - *Chrysolepis sempervirens* Shrubland
- CEGLO08695 *Chrysolepis sempervirens* / Sparse Understory Sierran Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid after Sawyer et al. (2009)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Faber-Langendoen et al. 2017b, Holland 1986b, Keeler-Wolf et al. 2012, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009

M091. Warm Interior Chaparral

This macrogroup includes all the interior chaparral in the southwestern U.S. and northern Mexico and is composed of a very diverse list of diagnostic, mostly evergreen shrubs such as *Arctostaphylos pungens*, *Ceanothus greggii*, *Garrya wrightii*, and *Quercus turbinella* which dominate large areas on foothills, xeric mountain slopes and canyons.

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

2.B.2.Nd.2.a. M091 Warm Interior Chaparral

G280. Eastern Madrean Chaparral

Type Concept Sentence: This chaparral group occurs in the Madrean Oriental in northern Mexico and desert mountains across Trans-Pecos Texas and is characterized by a moderate to dense shrub canopy dominated by evergreen shrub oak species *Quercus intricata*, *Quercus laceyi*, *Quercus pringlei*, *Quercus pungens*, *Quercus vaseyana*, and other chaparral species, such as *Acacia roemeriana*, *Ceanothus greggii*, *Cercocarpus montanus*, *Fallugia paradoxa*, *Fendlera rigida*, *Fraxinus greggii*, *Garrya ovata*, *Garrya wrightii*, *Juniperus pinchotii*, *Purshia mexicana*, *Rhus virens* var. *choriophylla*, *Salvia lycioides*, *Salvia regla*, *Salvia roemeriana*, and *Sophora secundiflora* that occur on foothills, mountain slopes and canyons.

OVERVIEW

Scientific Name: *Quercus intricata* - *Quercus laceyi* - *Quercus pungens* Chaparral Group

Common Name (Translated Scientific Name): Dwarf Oak - Lacey Oak - Pungent Oak Chaparral Group

Colloquial Name: Pinchot's Juniper Chaparral

Type Concept: This chaparral group is found in mid-elevation sites in the Madrean Oriental in northern Mexico and desert mountains across Trans-Pecos Texas extending to the Guadalupe Mountains. It is characterized by a moderate to dense shrub canopy dominated by evergreen shrub oak species, such as *Quercus intricata*, *Quercus laceyi*, *Quercus pringlei*, *Quercus pungens*, and *Quercus vaseyana*, and several chaparral species, such as *Acacia roemeriana*, *Ceanothus greggii*, *Cercocarpus montanus*, *Dasyllirion leiophyllum*, *Fallugia paradoxa*, and *Garrya wrightii*. Other Madrean species characteristic of this group include *Acacia roemeriana*, *Fendlera rigida* (= *Fendlera linearis*), *Fraxinus greggii*, *Garrya ovata*, *Juniperus pinchotii*, *Purshia mexicana*, *Rhus virens* var. *choriophylla* (= *Rhus choriophylla*), *Salvia lycioides* (= *Salvia ramosissima*), *Salvia regla*, *Salvia roemeriana*, and *Sophora secundiflora*. Stands occur on foothills, mountain slopes and canyons in drier habitats below the encinal and pine woodlands. Sites are often associated with more xeric and coarse-textured substrates such as limestone, basalt or alluvium, especially in higher-elevation transition areas with more mesic woodlands. In the Trans-Pecos of Texas, disjunct *Quercus gambelii* may occur as a significant component of this shrubland. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires. Grass cover may be significant. Dominant grasses often include *Bouteloua curtipendula*, *Bouteloua hirsuta*, and *Muhlenbergia emersleyi*.

Classification Comments: Similar Western Madrean Chaparral Group (G281) has floristics mostly derived from the Sierra Madre Occidentale, whereas floristics of this group are derived from the Sierra Madre Oriental. However, this group is not matorral (thornscrub) as it is typically dominated by shrubby evergreen oaks and chaparral species, not thornscrub species. More survey is needed to determine if *Quercus turbinella*, common in Western Madrean Chaparral Group (G281), also occurs in this group.

Similar NVC Types:

- G281 Western Madrean Chaparral

Diagnostic Characteristics: This upland shrubland is characterized by Sierra Madre Oriental shrub indicator species that may be present to dominate. These diagnostic species include shrubby evergreen oaks such as *Quercus intricata*, *Quercus invaginata*, *Quercus laceyi*, *Quercus pringlei*, *Quercus pungens*, and *Quercus vaseyana*, and many other species such as *Acacia roemeriana*, *Arbutus xalapensis*, *Fendlera rigida*, *Fraxinus greggii*, *Garrya ovata*, *Purshia mexicana*, *Rhus virens* var. *choriophylla*, *Salvia lycioides*, *Salvia roemeriana*, *Salvia regla* and *Sophora secundiflora*. Widespread shrub species such as *Arctostaphylos pungens*, *Ceanothus greggii*, *Cercocarpus montanus*, *Dasyllirion leiophyllum*, *Fallugia paradoxa*, *Garrya wrightii*, and *Quercus gambelii* may dominate or codominate, but are not diagnostic. Stands dominated by shrubby evergreen oaks such as *Quercus emoryi* and *Quercus grisea* are included in Madrean Encinal Group (G201).

VEGETATION

Physiognomy and Structure: This upland shrubland is typically dominated by a moderate to dense evergreen sclerophyllous shrub canopy usually less than 3 m tall. Herbaceous layers may be present and are typically dominated by perennial graminoids.

Floristics: Vegetation is characterized by a moderate to dense sclerophyllous shrub canopy, usually less than 3 m tall, dominated by evergreen shrub oak species, such as *Quercus intricata*, *Quercus invaginata*, *Quercus laceyi*, *Quercus pringlei*, *Quercus pungens*, and *Quercus vaseyana*, and several widespread chaparral species, such as *Arctostaphylos pungens*, *Ceanothus greggii*, *Cercocarpus montanus*, *Dasyllirion leiophyllum*, *Fallugia paradoxa*, and *Garrya wrightii*. Other Madrean species characteristic of this group include *Acacia roemeriana*, *Arbutus xalapensis* (= *Arbutus texana*), *Fraxinus greggii*, *Fendlera rigida* (= *Fendlera linearis*), *Garrya ovata*, *Juniperus pinchotii*, *Purshia mexicana*, *Rhus virens* var. *choriophylla* (= *Rhus choriophylla*), *Salvia lycioides* (= *Salvia ramosissima*), *Salvia roemeriana*, and *Salvia regla*. In the Trans-Pecos of Texas, disjunct *Quercus gambelii* may occur as a significant component of this shrubland. The widespread shrub species such as *Arctostaphylos pungens*, *Ceanothus greggii*, *Cercocarpus montanus*, *Dasyllirion leiophyllum*, *Fallugia paradoxa*, *Garrya wrightii*, and *Quercus gambelii* may dominate or codominate, but are not diagnostic. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires. Grass cover may be significant. Dominant grasses often include *Bouteloua curtipendula*, *Bouteloua hirsuta*, and *Muhlenbergia emersleyi*.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands often dominate along the mid-elevation transition zone from the Chihuahuan Desert into mountains (1700-2500 m). It occurs on foothills, mountain slopes and canyons in drier habitats below the encinal and pine woodlands, and is often associated with more xeric and coarse-textured substrates such as limestone, basalt or alluvium, especially in transition areas with more mesic woodlands.

Dynamics:

DISTRIBUTION

Geographic Range: This group is found in the Madrean Oriental in northern Mexico, in mountains across Trans-Pecos Texas, such as the Chisos and Davis mountains, and extends into southeastern New Mexico in the Guadalupe Mountains. Stands often dominate along the mid-elevation transition from the Chihuahuan Desert into mountains (1700-2500 m elevation).

Spatial Scale & Pattern [optional]: Large patch

Nations: MX, US

States/Provinces: MXCH, MXCO, NM, TX

TNC Ecoregions [optional]: 21:P, 22:P, 24:P

USFS Ecoregions (2007): 315A:PP, 321A:CC, M313B:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = "Coahuilan" Chaparral (Brown 1982a)

LOWER LEVEL UNITS

Alliances:

- A3972 *Sophora secundiflora* - *Acacia roemeriana* - *Cercocarpus montanus* var. *paucidentatus* Chaparral Alliance
- A0505 *Juniperus pinchotii* Chaparral Alliance
- A3971 *Quercus pungens* - *Quercus intricata* - *Quercus vaseyana* Chaparral Alliance

AUTHORSHIP

Primary Concept Source: D.E. Brown (1982a)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/05/2015

Classif Resp Region: West

Internal Author: KAS 1-10, 9-13, 11-15

REFERENCES

References: Brown 1982a, Brown et al. 1979, Dick-Peddie 1993, Faber-Langendoen et al. 2017a, Muldavin et al. 1994a, Muldavin et al. 2000b, Muldavin et al. 2003a, Shiflet 1994

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G280. Eastern Madrean Chaparral

G281. Western Madrean Chaparral

Type Concept Sentence: This interior chaparral group is found across the southwestern U.S. from central New Mexico and southern Utah west to California and is characterized by a moderate to dense evergreen shrub layer dominated by sclerophyllous shrubs, especially *Adenostoma sparsifolium*, *Arctostaphylos pungens*, *Ceanothus greggii*, *Cercocarpus montanus*, *Garrya wrightii*, *Mortonia utahensis*, *Quercus cornelius-mulleri*, *Quercus john-tuckeri*, and *Quercus turbinella*, that occurs in foothills, xeric mountain slopes and canyons.

OVERVIEW

Scientific Name: *Quercus turbinella* - *Ceanothus greggii* - *Arctostaphylos pungens* Chaparral Group

Common Name (Translated Scientific Name): Sonoran Scrub Oak - Desert Ceanothus - Mexican Manzanita Chaparral Group

Colloquial Name: Manzanita - Ceanothus Chaparral

Type Concept: This interior chaparral group is found across the southwestern U.S. from central New Mexico and southern Utah west to California. The moderate to dense evergreen shrub layer is dominated by sclerophyllous shrubs, especially *Ceanothus greggii* and *Quercus turbinella*. Other common shrubs from the eastern portion of its range (Arizona and New Mexico) include *Arctostaphylos pringlei* (higher elevations), *Arctostaphylos pungens*, *Cercocarpus montanus*, *Garrya wrightii*, *Purshia stansburiana*, *Quercus toumeyii*, and *Rhus trilobata*. In desert chaparral stands in the western extent *Arctostaphylos patula* (not dominant), *Arctostaphylos glauca*, *Cercocarpus montanus* var. *glaber* (= *Cercocarpus betuloides*), *Garrya flavescens*, *Juniperus californica*, *Nolina parryi*, *Quercus john-tuckeri*, *Quercus cornelius-mulleri*, *Quercus berberidifolia*, and *Rhus ovata* characterize this shrubland. Scattered remnant pinyon and juniper trees may be present; however, in the western Mojave, *Juniperus californica* sometimes forms an open, shrubby tree layer with the evergreen oaks and other shrubs. Stands occur prominently across central Arizona (Mogollon Rim) and western New Mexico, south into mountains in the northwestern Chihuahuan region and Madrean Occidentale in northern Mexico, and north into extreme southwestern Utah and southern Nevada. It also occurs in mountains in the Sonora and western Mojave deserts, and extends from northeast Kern County, California, and south into Baja Norte, Mexico. Stands are found on foothills, xeric mountain slopes and canyons in hotter and drier habitats and often dominate along the mid-elevation transition zone between desert scrub and montane woodlands (1000-2200 m). Sites are often steep and rocky. Parent materials are varied and include basalt, diabases, gneiss, schist, shales, slates, sandstones and, more commonly, limestone and coarse-textured granitic substrates. Occasional desert scrub species may be present in drier, rockier, more open transition sites. Most chaparral species are fire-adapted, sprouting vigorously after burning or producing abundant fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.

The similar Eastern Madrean Chaparral Group (G280) has floristics mostly derived from the Sierra Madre Oriental, whereas floristics of this group are derived from the Sierra Madre Occidentale. However, this group is not matorral (thornscrub) as it is typically dominated by shrubby evergreen oaks and chaparral species, not thornscrub species. More survey is needed to determine if *Quercus turbinella*, common in this group, also codominates in Eastern Madrean Chaparral Group (G280).

Classification Comments: The similar Eastern Madrean Chaparral Group (G280) has floristics mostly derived from the Sierra Madre Oriental, whereas floristics of this group are derived from the Sierra Madre Occidentale. For now, this group includes warm-desert interior chaparrals found in the western Mojave and western Sonoran regions of southern California, but review may suggest splitting it into two groups. Relatively little is known of the "Mogollon Rim" or "Arizona" chaparral types (Carmichael et al. 1978, Brown 1982), so that it's hard to ascertain the floristic patterns adequately. While the main oaks are different in California, the important associated species are more widely distributed, from California east into New Mexico.

Similar NVC Types:

NBR alliances

- G261 Californian Mesic & Pre-montane Chaparral
- G280 Eastern Madrean Chaparral

Diagnostic Characteristics: This upland shrubland is characterized by Sierra Madre Occidentale evergreen sclerophyllous indicator species that may be present to dominant. These diagnostic species include evergreen shrubby oaks such as *Quercus turbinella*, *Quercus toumeyi* and, in western Mojave stands, *Quercus cornelius-mulleri* and *Quercus john-tuckeri*, as well as many other diagnostic species, including *Arctostaphylos glauca*, *Arctostaphylos pringlei*, *Cercocarpus montanus var. glaber*, *Cercocarpus montanus var. paucidentatus*, *Ceanothus greggii*, *Garrya flavescens*, *Garrya wrightii*, and *Rhus ovata*. Additional characteristic species include *Arctostaphylos patula*, *Juniperus californica*, *Nolina parryi*, and *Rhus trilobata*.

VEGETATION

Physiognomy and Structure: This upland shrubland is typically dominated by a moderate to dense evergreen sclerophyllous shrub canopy usually less than 3 m tall. Herbaceous layers may be present and are typically dominated by perennial graminoids.

Floristics: The vegetation is characterized by a moderate to dense evergreen shrub layer dominated by sclerophyllous shrubs such as *Quercus turbinella* and *Ceanothus greggii*. Other common shrubs from the eastern portion of its range (Arizona and New Mexico) include *Cercocarpus montanus var. paucidentatus*, *Garrya wrightii*, *Purshia stansburiana*, *Quercus toumeyi*, *Rhus trilobata* with *Arctostaphylos pringlei* and *Arctostaphylos pungens* at higher elevations. In desert chaparral stands in the western extent, *Adenostoma sparsifolium*, *Arctostaphylos glauca*, *Cercocarpus montanus var. glaber* (= *Cercocarpus betuloides*), *Fremontodendron californicum*, *Garrya flavescens*, *Juniperus californica*, *Quercus berberidifolia*, *Quercus cornelius-mulleri*, *Quercus john-tuckeri*, *Rhus virens var. choriophylla*, and *Rhus ovata* characterize this shrubland. Scattered remnant pinyon and juniper trees may be present; however, in the western Mojave, *Juniperus californica* sometimes forms an open, shrubby tree layer over the evergreen oaks and other shrubs. Occasional desert scrub species may be present in drier, rockier, more open transition sites. The herbaceous layer is generally composed of grasses, such as *Bouteloua curtipendula*, *Bouteloua hirsuta*, *Bothriochloa barbinodis*, *Eragrostis intermedia*, *Lycurus phleoides*, *Muhlenbergia emersleyi*, *Muhlenbergia pauciflora*, and several species of *Aristida*, which are largely restricted to rocky, protected areas because of past heavy livestock grazing (Brown 1982a).

ENVIRONMENT & DYNAMICS

Environmental Description: Stands are found on foothills, xeric mountain slopes and canyons in hotter and drier habitats and often dominate along the mid-elevation (1000-2200 m) transition zone between desert scrub and montane woodlands (encinal, pine-oak, and ponderosa pine). Sites are variable but often steep and rocky. Sometimes this group occurs in thickets along upper canyon watercourses and northerly upland slopes within the pinyon-juniper woodland zone. **Climate:** This is a group of warm semi-desert regions in the southwestern U.S. The climate is hot and may have a somewhat bi-modal precipitation regime with spring rains and warm-season monsoonal rains as well. Frosts occur in winter, and even sometime snows, which will melt rapidly.

Soil/substrate/hydrology: Parent materials are varied and include basalt, diabases, gneiss, schist, shales, slates, sandstones and, more commonly, limestone and coarse-textured granitic substrates.

Dynamics: Many of the communities in this group are dominated by fire-adapted shrubs. *Quercus cornelius-mulleri* sprouts vigorously from root crowns after fire. Since *Quercus cornelius-mulleri* chaparral occurs in areas of lower rainfall and sparser vegetation cover, it typically has less frequent fire and slower recovery rates than typical cismontane chaparral types elsewhere in California. *Quercus turbinella* in Arizona and New Mexico is a fire-type; it sprouts vigorously from the root crown and rhizomes. Typical fire intervals in Arizona exceed 74 years (Reid et al. 1999, Tirmenstein 1999d). Plants in the New York Mountains of California are treelike, suggesting that fires have been absent for perhaps greater than 100 years. Instead, flooding has initiated stem breakage and sprouting of some canyon bottom stands.

DISTRIBUTION

Geographic Range: This group occurs prominently across central Arizona (Mogollon Rim) and western New Mexico, south into mountains in the northwestern Chihuahuan region and Madrean Occidentale in northern Mexico. It also occurs in mountains in the Sonora and western Mojave deserts, extends from northeast Kern County, California, into Baja Norte, Mexico, and often dominates along the mid-elevation (1000-2200 m) transition zone between desert scrub and montane woodlands.

Spatial Scale & Pattern [optional]: Large patch

Nations: MX, US

States/Provinces: AZ, CA, MXBC, MXSO, NM, NV, TX, UT

TNC Ecoregions [optional]: 17:C, 19:C, 21:C, 22:C, 23:C, 24:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 322A:CC, 322B:CC, 322C:CC, 341A:CP, 341F:CC, M261E:CC, M313A:CC, M341C:??

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low. This group may be too broad and floristically diverse. Review comments will help to understand its diversity.

SYNONYMY

- = "Arizona" Chaparral (Brown 1982a)
- = Arizona Chaparral (503) (Shiflet 1994)

LOWER LEVEL UNITS**Alliances:**

- A3791 *Cercocarpus montanus* Madrean Montane Chaparral Alliance
- A3790 *Arctostaphylos pungens* - *Arctostaphylos pringlei* - *Ceanothus greggii* Chaparral Alliance
- A0793 *Quercus turbinella* Chaparral Alliance
- A3793 *Quercus john-tuckeri* - *Quercus cornelius-mulleri* - *Fremontodendron californicum* Chaparral Alliance
- A3792 *Cercocarpus montanus* - *Eriogonum fasciculatum* - *Adenostoma sparsifolium* Western Mojave Desert Chaparral Alliance

AUTHORSHIP

Primary Concept Source: D.E. Brown (1982a)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/05/2015

Classif Resp Region: West

Internal Author: KAS 1-10, 4-15, 11-15

REFERENCES

References: Barbour and Major 1988, Brown 1982a, Brown et al. 1979, Cable 1975a, Carmichael et al. 1978, DeBano 1999, Dick-Peddie 1993, Faber-Langendoen et al. 2017a, Holland and Keil 1995, MacMahon 1988, Muldavin et al. 1994a, Muldavin et al. 2000b, Reid et al. 1999, Shiflet 1994, Stout et al. 2013, Thomas et al. 2004, Tirmenstein 1999d

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G281. Western Madrean Chaparral

A3790. *Arctostaphylos pungens* - *Arctostaphylos pringlei* - *Ceanothus greggii* Chaparral Alliance

Type Concept Sentence: This alliance includes evergreen shrublands dominated or codominated by *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, and *Mortonia utahensis*. This chaparral occurs from Nevada to New Mexico on dry mountain slopes ranging from 980-2470 m elevation depending on aspect.

OVERVIEW

Scientific Name: *Arctostaphylos pungens* - *Arctostaphylos pringlei* - *Ceanothus greggii* Chaparral Alliance

Common Name (Translated Scientific Name): Pointleaf Manzanita - Pringle's Manzanita - Desert Ceanothus Chaparral Alliance

Colloquial Name: Manzanita - Ceanothus Chaparral

Type Concept: Stands of this alliance have a moderately dense canopy dominated or codominated by the sclerophyllous evergreen shrubs *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, *Mortonia scabrella*, or *Mortonia utahensis*. Other characteristic shrubs include *Amelanchier utahensis*, *Cercocarpus montanus* var. *paucidentatus*, *Dasyllirion wheeleri*, *Ephedra viridis*, *Garrya flavescens*, *Mahonia fremontii* (= *Berberis fremontii*), and *Robinia neomexicana*. Scattered oaks such as *Quercus arizonica*, *Quercus pungens*, or *Quercus turbinella* may be present, but not codominant. Herbaceous cover is typically low (<15% cover). Common grasses include *Bouteloua curtipendula*, *Bouteloua eriopoda*, and *Muhlenbergia emersleyi*. Frequent forbs include *Astrolepis sinuata*, *Bahia absinthifolia*, and *Macroptilium gibbosifolium*. This alliance occurs in southeastern Nevada, southwestern Utah, Arizona, and southwestern New Mexico. This chaparral occurs on dry mountain slopes ranging from 980-2470 m elevation depending on aspect. The climate is arid to semi-arid with temperatures rarely falling below freezing. Annual precipitation has a bimodal distribution with about a third to two-thirds of the highly variable annual precipitation occurring in July through September during the late summer monsoon, and most of the rest falling during the winter months. Mean annual precipitation is approximately 40 cm. Soils are gravelly with rocks. Parent material includes limestone, rhyolite, granite and quartzite. Adjacent vegetation includes desert grasslands dominated by *Elionurus barbiculmis*, *Heteropogon contortus*, and *Bouteloua* spp. at lower elevations and desert scrub stands dominated by *Acacia neovernicosa* or *Parthenium incanum*.

Classification Comments: Alliances are based in part by fire adaptations of dominant species. For example *Arctostaphylos pungens*, *Arctostaphylos pringlei*, and *Ceanothus greggii* primarily reproduce from seeds that require heat scarification to germinate in contrast to *Quercus turbinella* which strongly sprouts after being burned so it becomes the predominant species over obligate with

repeated fires or fire suppression. *Mortonia sempervirens* and *Mortonia utahensis* occur on rocky slopes that rarely burn. Stands describe by Carmichael et al. (1978) in Arizona need to be included in the range of this alliance.

Internal Comments: mjr 12-14: CA added for MOJN.

Other Comments:

Similar NVC Types: Other alliances within Eastern Madrean Chaparral Group (G280), Western Madrean Chaparral Group (G281), and Western North American Montane Sclerophyll Scrub Group (G282) may have some shared associated species with this alliance.

Diagnostic Characteristics: This alliance is characterized by dominance of *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, *Mortonia scabrella*, or *Mortonia utahensis* in the shrub canopy. Oaks such as *Quercus turbinella* are absent or have relatively low cover (i.e., not codominant). Herbaceous cover is typically low (<15% cover).

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderately dense to dense cover dominated by sclerophyllous and microphyllous, evergreen broad-leaved shrubs ranging from 0.5-3 m tall. Scattered needle-leaved and broad-leaved evergreen trees, 2-5 m tall, are often present. The herbaceous layer is typically sparse and dominated by perennial graminoids, with annual forbs and grasses present seasonally.

Floristics: Stands have a moderately dense canopy dominated or codominated by the sclerophyllous evergreen shrubs *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, *Mortonia scabrella*, or *Mortonia utahensis*. Other characteristic shrubs include *Amelanchier utahensis*, *Cercocarpus montanus* var. *paucidentatus*, *Dasyllirion wheeleri*, *Ephedra viridis*, *Garrya flavescens*, *Mahonia fremontii* (= *Berberis fremontii*), *Nolina microcarpa*, *Rhus virens* var. *choriophylla*, and *Robinia neomexicana*. Scattered oaks such as *Quercus arizonica*, *Quercus pungens*, or *Quercus turbinella* may be present, but not codominant. Herbaceous cover is typically low (<15% cover). Common grasses include *Achnatherum eminens* (= *Stipa eminens*), *Aristida purpurea* var. *nealleyi* (= *Aristida glauca*), *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Muhlenbergia emersleyi*, and *Tridens muticus*. Frequent forbs include *Astrolepis sinuata*, *Bahia absinthifolia*, *Calochortus flexuosus*, *Castilleja* sp., *Delphinium parishii*, *Eriogonum wrightii*, *Lomatium foeniculaceum* ssp. *macdougallii*, and *Macroptilium gibbosifolium*.

ENVIRONMENT & DYNAMICS

Environmental Description: Shrublands included in this alliance occur in foothill to montane elevations from southeastern Nevada across southern Utah, Arizona and southeastern New Mexico often growing on cooler north- and east-facing slopes. Elevation ranges from 1050-2300 m depending on aspect. Climate is generally semi-arid with warm summers and cool winters. Annual precipitation has a bimodal distribution with a third to two-thirds of the approximately 40 cm mean annual precipitation falling during the summer and early fall. The winter precipitation has high year-to-year variation. Soils are gravelly with rocks. Parent material includes limestone, rhyolite, granite and quartzite.

Dynamics: *Arctostaphylos pungens* is a fire-adapted species that reproduces prolifically from heat-scarified seeds after fires (Carmichael et al. 1978). Armstrong (1969) considers these shrublands a fire disclimax. Prior to a fire, the *Arctostaphylos pungens* shrubland he described was a *Pinus monophylla* / *Juniperus osteosperma* woodland because of the numerous stumps present. He believed the lack of tree regeneration was caused by the low rainfall and re-occurring fires. Bourgeron et al. (1993b) suggest that this a seral phase of *Pinus discolor* / *Quercus hypoleucoides* woodland.

DISTRIBUTION

Geographic Range: Shrublands included in this alliance occur on mountain slopes and high plateaus from the Virgin Mountains in southeastern Nevada, across the Colorado Plateau in Utah south along the Mogollon Rim and the Sky Island ranges of southeastern Arizona and southwestern New Mexico. It likely occurs in adjacent Chihuahua and Sonora, Mexico.

Nations: MX?, US

States/Provinces: AZ, CA, MXCH?, MXSO?, NM, NV, UT

TNC Ecoregions [optional]: 11:C

USFS Ecoregions (2007): 341Fe:CCC, 341Ff:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Ceanothus greggii* (Cup leaf ceanothus chaparral) Alliance (Sawyer et al. 2009) [37.212.00]
- > *Ceanothus greggii* Shrubland Alliance (Evens et al. 2014)

NBR alliances

- ? Chihuahuan Desertscrub, mesic phase (Wentworth 1982)
- >< Pointleaf Manzanita Plant Association (Carmichael et al. 1978)

LOWER LEVEL UNITS

Associations:

- CEPP005938 *Ceanothus greggii* var. *vestitus* Shrubland
- CEGLO00958 *Arctostaphylos pungens* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Armstrong 1969, Bourgeron et al. 1993b, Carmichael et al. 1978, Evens et al. 2014, Faber-Langendoen et al. 2017b, Keeler-Wolf et al. 1998a, Sawyer et al. 2009, VegCAMP and AIS 2013, Wentworth 1982

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G281. Western Madrean Chaparral

A3792. *Cercocarpus montanus* - *Eriogonum fasciculatum* - *Adenostoma sparsifolium* Western Mojave Desert Chaparral Alliance [Low - Poorly Documented]

Type Concept Sentence: Stands are characterized by the co-importance of *Cercocarpus montanus* var. *glaber* and *Eriogonum fasciculatum*. This shrubland of California's southern mountains and the western margins of the Mojave and Colorado deserts and Baja California occurs in a wide variety of habitats.

OVERVIEW

Scientific Name: *Cercocarpus montanus* - *Eriogonum fasciculatum* - *Adenostoma sparsifolium* Western Mojave Desert Chaparral Alliance

Common Name (Translated Scientific Name): Alderleaf Mountain-mahogany - Eastern Mojave Buckwheat - Redshank Western Mojave Desert Chaparral Alliance

Colloquial Name: Western Mojave Desert Chaparral

Type Concept: Stands are characterized by the co-importance of *Cercocarpus montanus* var. *glaber* and *Eriogonum fasciculatum*. *Adenostoma sparsifolium* also may dominate. Other shrubs may include *Adenostoma fasciculatum*, *Ceanothus megacarpus*, *Fremontodendron californicum*, *Garrya flavescens*, *Prunus ilicifolia* ssp. *ilicifolia*, *Quercus dumosa*, *Salvia apiana*, and *Hesperoyucca whipplei* (= *Yucca whipplei*). The herbaceous layer is sparse. This shrubland of California's southern mountains and the western margins of the Mojave and Colorado deserts and Baja California, occurs in a wide variety of habitats. Elevations range from 300-2000 m. Stands are found on all slopes. Soils are usually derived from alluvium, and may be deep, shallow or, on steep slopes, completely absent.

Classification Comments: The placement of this alliance in the USNVC group level needs review.

Internal Comments:

Other Comments:

Similar NVC Types: Other alliances within Eastern Madrean Chaparral Group (G280), Western Madrean Chaparral Group (G281), and Western North American Montane Sclerophyll Scrub Group (G282) may have some shared associated species with this alliance.

Diagnostic Characteristics: Dominance of *Cercocarpus montanus* var. *glaber*, *Eriogonum fasciculatum*, or *Adenostoma sparsifolium* is diagnostic of this chaparral alliance.

VEGETATION

Physiognomy and Structure: This sclerophyllous, broad-leaved and microphyllous, evergreen, extremely xeromorphic shrubland forms a continuous canopy less than 4 m in height. The herbaceous layer is sparse.

Floristics: Stands are characterized by the co-importance of *Cercocarpus montanus* var. *glaber* and *Eriogonum fasciculatum*. *Adenostoma sparsifolium* also may dominate. Other shrubs may include *Adenostoma fasciculatum*, *Ceanothus megacarpus*,

Fremontodendron californicum, *Garrya flavescens*, *Prunus ilicifolia* ssp. *ilicifolia*, *Quercus dumosa*, *Salvia apiana*, and *Hesperoyucca whipplei* (= *Yucca whipplei*). The herbaceous layer is sparse.

ENVIRONMENT & DYNAMICS

Environmental Description: This shrubland of California's southern mountains and the western margins of the Mojave and Colorado deserts and Baja California occurs in a wide variety of habitats. Elevations range from 300-2000 m. Stands are found on all slopes. Soils are usually derived from alluvium, and may be deep, shallow or, on steep slopes, completely absent. This alliance is probably winter-dormant due to cold temperatures. Precipitation totals are low, ranging from 25 to 50 cm per year. Summers are dry and winters are relatively cool and moist.

Dynamics: This alliance is less fire-prone than other types of chaparral due to lower fuel loads. Plants are dormant much of the year due to intense heat in the late summer and fall, and cold in the winter. Stands are often found on previously burned sites.

DISTRIBUTION

Geographic Range: This alliance occurs in California's inner, southern Coast Ranges, the Transverse and Peninsular ranges, and west to the margins of the Mojave and Colorado deserts.

Nations: MX?, US

States/Provinces: CA, MXBC?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

- >< *Adenostoma sparsifolium* (Redshank chaparral) Alliance (Sawyer et al. 2009) [37.501.00]
- >< *Cercocarpus montanus* (Birch leaf mountain mahogany chaparral) Alliance (Sawyer et al. 2009) [76.100.00]
- >< *Eriogonum fasciculatum* (California buckwheat scrub) Alliance (Sawyer et al. 2009) [32.040.00]
- >< Flannel Bush Chaparral (#37J00) (Holland 1986b)
- >< Red Shank Chaparral (#37300) (Holland 1986b)
- >< Semi-Desert Chaparral (#37400) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEG003003 *Adenostoma sparsifolium* Shrubland [Placeholder]
- CEG003036 *Cercocarpus montanus* var. *glaber* - *Eriogonum fasciculatum* Shrubland [Placeholder]

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Schindel.

Version Date: 2014/12/18

REFERENCES

References: Faber-Langendoen et al. 2017b, Hickman 1993, Holland 1986b, Marion 1943, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G281. Western Madrean Chaparral

A3791. *Cercocarpus montanus* Madrean Montane Chaparral Alliance

Type Concept Sentence: This alliance includes shrublands dominated by *Cercocarpus montanus* in the Chihuahuan Desert of New Mexico, Arizona, and northern Mexico. Stands occur from foothill to lower montane elevational zones in desert mountain ranges and along the Mogollon Rim.

OVERVIEW

Scientific Name: *Cercocarpus montanus* Madrean Montane Chaparral Alliance

Common Name (Translated Scientific Name): Alderleaf Mountain-mahogany Madrean Montane Chaparral Alliance

Colloquial Name: Madrean Montane Alderleaf Mountain-mahogany Chaparral

Type Concept: This alliance includes shrublands dominated by *Cercocarpus montanus* in the Chihuahuan Desert of New Mexico, Arizona, and northern Mexico. Vegetation is characterized by an open to moderately dense shrub canopy dominated or codominated by *Cercocarpus montanus* with other shrubs common in interior chaparral such as *Ericameria laricifolia*, *Garrya flavescens*, *Mimosa aculeaticarpa* var. *biuncifera*, *Rhus virens* var. *choriophylla*, *Robinia neomexicana*, and stem succulents such as *Agave parryi*, *Dasyllirion wheeleri*, *Nolina microcarpa*, *Opuntia engelmannii*, *Cylindropuntia imbricata* (= *Opuntia imbricata*), and *Yucca baccata*. Chaparral species *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, and *Quercus turbinella* are absent or present with low cover (not codominant). Scattered trees may also be present with low cover, including *Pinus edulis*, *Juniperus monosperma*, and *Juniperus osteosperma*. Open stands may have an abundant herbaceous layer characterized by Madrean perennial grasses such as *Muhlenbergia pauciflora* and *Muhlenbergia emersleyi*, although many other herbaceous species may be present to abundant. Shrublands included in this alliance are found on breaks and foothill, mountain and canyon slopes throughout much of the southwestern U.S. Elevations range from 1500-2500 m. Sites are variable but are generally xeric and rocky with moderate to very steep slopes. Substrate is typically thin, well-drained, poorly developed lithic soils with abundant rock outcrops. Parent material is variable and includes alluvium, colluvium and residuum from igneous, metamorphic or sedimentary rocks.

Classification Comments: *Cercocarpus montanus* is a wide-ranging species. This alliance is associated with warm semi-desert interior chaparral stands, not the more temperate foothill to montane zones in the Rocky Mountains. The varieties of *Cercocarpus montanus* typical in this alliance are *Cercocarpus montanus* var. *paucidentatus*, *Cercocarpus montanus* var. *montanus*, and *Cercocarpus montanus* var. *glaber* (western). *Rhus virens* var. *choriophylla* / *Cercocarpus montanus* var. *paucidentatus* Shrubland (CEGL001123) was moved from Eastern Madrean Chaparral Group (G280) to this alliance because it was sampled in the Mule Mountains of southeastern Arizona and is more typical of Western Madrean Chaparral Group (G281) in the Sierra Occidentale and Mogollon Rim. This alliance (A3791) is included in G281 as a best fit. However, the alliance is widespread, occurring in central and southeastern Arizona, extending east across southern New Mexico to the Organ, Oscura, Mockingbird, San Andres, San Augustine and Sacramento mountains. One association described from the San Andres and Oscura mountains, i.e., *Cercocarpus montanus* / *Muhlenbergia pauciflora* Shrubland (CEGL001089), is included in this alliance although it was also described from the Guadalupe Mountains of Texas and New Mexico, which is the northwestern extent of Eastern Madrean Chaparral Group (G280). More classification review is needed to better understand the transition zone between Eastern Madrean Chaparral Group (G280) and Western Madrean Chaparral Group (G281). Additionally, there are several other *Cercocarpus montanus* plant associations described in Muldavin et al. (2000b, 2003) that need to be reviewed for inclusion in this alliance.

Internal Comments:

Other Comments:

Similar NVC Types: Other alliances within Eastern Madrean Chaparral Group (G280), Western Madrean Chaparral Group (G281), and Western North American Montane Sclerophyll Scrub Group (G282) may have some shared associated species with this alliance.

- A3733 *Cercocarpus montanus* - *Quercus x pauciloba* Shrubland Alliance

Diagnostic Characteristics: This alliance is characterized by dominance or codominance of diagnostic species *Cercocarpus montanus* with shrubs common in chaparral such as *Garrya flavescens*, *Rhus virens* var. *choriophylla*, and *Robinia neomexicana*. *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, and *Quercus turbinella* are absent or present with low cover (not codominant). Open stands may have an abundant herbaceous layer characterized by perennial grasses such as *Muhlenbergia emersleyi*, *Muhlenbergia pauciflora*, and *Muhlenbergia setifolia*, although many other herbaceous species may be present to abundant.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderately sparse to moderately dense cover of broad-leaved deciduous/evergreen shrubs 2 m tall. The sparse to moderately dense herbaceous layer is usually less than 1 m tall and dominated by graminoids. Some stands have herbaceous layers dominated by perennial forbs, but generally forb cover is sparse. Annuals are seasonally present.

Floristics: This alliance includes shrublands dominated by *Cercocarpus montanus* in the Chihuahuan Desert. Vegetation is characterized by an open to moderately dense shrub canopy dominated or codominated by *Agave parryi* and *Cercocarpus montanus* with other shrubs common in interior chaparral such as *Ericameria laricifolia*, *Garrya flavescens*, *Mimosa aculeaticarpa* var. *biuncifera*, *Rhus virens* var. *choriophylla*, *Robinia neomexicana*, and stem succulents such as *Agave parryi*, *Dasyllirion wheeleri*, *Nolina microcarpa*, *Opuntia engelmannii*, *Cylindropuntia imbricata* (= *Opuntia imbricata*), and *Yucca baccata*. Chaparral species *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, and *Quercus turbinella* are absent or present with low cover (not codominant). Scattered trees may also be present with low cover, including *Pinus edulis*, *Juniperus monosperma*, and *Juniperus deppeana*. Open stands may have an abundant herbaceous layer characterized by Madrean perennial grasses such as *Bothriochloa barbinodis*, *Bouteloua eriopoda*, *Muhlenbergia emersleyi*, *Muhlenbergia pauciflora*, *Muhlenbergia setifolia*, *Muhlenbergia tenuifolia*,

and *Schizachyrium cirratum*, although many other herbaceous species may be present to abundant, including *Bouteloua curtipendula*, *Bouteloua gracilis*, *Eragrostis intermedia*, *Hesperostipa neomexicana*, and *Schizachyrium cirratum* (Muldavin et al. 2000b). Forbs may be diverse and include *Artemisia carruthii*, *Artemisia ludoviciana*, *Eriogonum jamesii*, *Eriogonum wrightii*, *Hedeoma plicata*, *Heliomeris longifolia*, *Heliomeris multiflora*, *Mirabilis multiflora*, *Mirabilis oxybaphoides*, and *Viguiera dentata*.

ENVIRONMENT & DYNAMICS

Environmental Description: Shrublands included in this alliance are found on breaks and foothill, mountain and canyon slopes throughout much of the southwestern U.S. Elevations range from 1500-2500 m. Climate is semi-arid. Summers are hot and winters are mild. Mean annual precipitation is approximately 24 cm with precipitation occurring bimodally during the winter and late summer with a droughty period in late spring/early summer. The late summer rain often occurs as high-intensity thunderstorms. Sites are variable but are generally xeric and rocky with moderate to very steep slopes. Stands are usually found on southerly aspects. Substrate is typically thin, well-drained, poorly developed lithic soils with abundant rock outcrops. Soils textures are variable and range from sandy loam to clay. Parent material includes alluvium, colluvium and residuum from igneous, metamorphic or sedimentary rocks such as granite, gneiss, limestone, quartz monzonite, rhyolite, sandstone, schist and shale.

Dynamics: Ecological factors that control shrub densities such as fire and drought need more investigation. Unlike other species of *Cercocarpus*, *Cercocarpus montanus* is a fire-resistant species because it can resprout from the base after a fire has killed the top (Cronquist et al. 1997). In the southern portion of its range *Cercocarpus montanus* functions as an evergreen shrub by retaining leaves during mild winters and losing them during cold winters (Dick-Peddie 1993).

DISTRIBUTION

Geographic Range: These shrublands occur from Utah to Texas in breaks, canyons, foothills and mesas, mountains in the southern Colorado Plateau, Chihuahuan Desert and Mogollon Rim south into Mexico especially on desert mountain ranges.

Nations: MX, US

States/Provinces: AZ, NM, TX, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Cercocarpus montanus* (Mountain Mahogany) Series (Muldavin et al. 1998b)
- = *Cercocarpus montanus* Shrubland Alliance (Wood et al. 1998)
- = *Cercocarpus montanus* Shrubland Alliance (Bourgeron et al. 1995a)
- = *Cercocarpus montanus* Shrubland Alliance (Muldavin et al. 1998a)
- = *Cercocarpus montanus* Shrubland Alliance (Muldavin et al. 2000b)
- = *Cercocarpus montanus* Shrubland Alliance (Muldavin et al. 2003a)
- = *Cercocarpus montanus* Shrubland Alliance (Muldavin 1994)
- ? Mountain Mahogany-Mixed Shrub Series (Dick-Peddie 1993) [included within the Montane Scrubland Vegetation Type]
- ? Mountain mahogany Series (133.34) (Brown 1982a) [included within Interior Chaparral]

LOWER LEVEL UNITS

Associations:

- CEGLO01123 *Rhus virens* var. *choriophylla* / *Cercocarpus montanus* var. *paucidentatus* Shrubland
- CEGLO01089 *Cercocarpus montanus* / *Muhlenbergia pauciflora* Shrubland
- CEGLO01500 *Cercocarpus montanus* / *Muhlenbergia emersleyi* Scrub
- CEGLO01088 *Cercocarpus montanus* / *Garrya flavescens* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Bourgeron et al. 1993b, Bourgeron et al. 1995a, Brown 1982a, Cronquist et al. 1997, Diamond 1993, Dick-Peddie 1993, Faber-Langendoen et al. 2017b, Muldavin 1994, Muldavin and Mehlhop 1992, Muldavin et al. 1998a, Muldavin et al. 1998b, Muldavin et al. 2000b, Muldavin et al. 2003a, Nixon 1977, Wood et al. 1998

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G281. Western Madrean Chaparral

A3793. *Quercus john-tuckeri* - *Quercus cornelius-mulleri* - *Fremontodendron californicum* Chaparral Alliance

Type Concept Sentence: This chaparral alliance is characterized by evergreen scrub oak species and other sclerophyllous shrubs with dominant diagnostic species such as *Ceanothus greggii*, *Fremontodendron californicum*, *Juniperus californica*, *Quercus cornelius-mulleri*, or *Quercus john-tuckeri*. It occurs from arid, interior southern California and adjacent Mojave and Colorado deserts to the east.

OVERVIEW

Scientific Name: *Quercus john-tuckeri* - *Quercus cornelius-mulleri* - *Fremontodendron californicum* Chaparral Alliance

Common Name (Translated Scientific Name): Tucker Oak - Muller Oak - California Flannelbush Chaparral Alliance

Colloquial Name: Tucker Oak - Muller Oak - California Flannelbush Chaparral

Type Concept: This chaparral alliance is characterized by evergreen scrub oak species and other sclerophyllous shrubs. Dominant diagnostic species include *Ceanothus greggii*, *Fremontodendron californicum*, *Juniperus californica*, *Quercus cornelius-mulleri*, or *Quercus john-tuckeri*. Many other chaparral species may be present. Some emergent trees may be present, but they are not common. This vegetation type generally intergrades with other chaparral types or pinyon-juniper woodlands. This alliance occurs from arid, interior southern California and adjacent Mojave and Colorado deserts to the east. Stands occur primarily on upper slopes and ridgetops with shallow, well-drained soils. The elevation ranges from 300-1700 m, and yearly precipitation totals are generally less than 30 cm. Droughts are common.

Classification Comments: Placement of this alliance in the USNVC needs further review. The southern California associations in the western interior chaparral group are problematic. If primarily western Mojave then perhaps Mojave mid-elevation scrub groups, but they also occur in cismontane California, so likely could be included in one of the many California chaparral groups. The three component old alliances have a similar range and habitats. *Ceanothus greggii* is a widespread chaparral shrub the may codominant with chaparral from other groups.

Internal Comments: KAS 11-14: Julie Evens requests moving this alliance to G261 "This *Quercus john-tuckeri* alliance is more closely related to *Quercus berberidifolia* and *Q. douglasii* (in which it hybridizes with both of these species) and also to other chaparral oaks like *Quercus wislizeni* shrub oaks. It is found on mesic slopes and in the lower montane zone just like QUBE in the inner Coast Range of California including Fresno to San Luis Obispo Cos, and just reaches into the western Mojave."

Other Comments:

Similar NVC Types: Other alliances within Eastern Madrean Chaparral Group (G280), Western Madrean Chaparral Group (G281), and Western North American Montane Sclerophyll Scrub Group (G282) may have some shared associated species with this alliance.

Diagnostic Characteristics: Shrublands dominated by diagnostic species *Ceanothus greggii*, *Fremontodendron californicum*, *Juniperus californica*, *Quercus cornelius-mulleri*, or *Quercus john-tuckeri*.

VEGETATION

Physiognomy and Structure: This broad-leaved evergreen shrubland is characterized by an intermittent canopy of shrubs less than 3 m in height. Occasional emergent trees (5-10 m tall) may be present. The herbaceous layer is sparse.

Floristics: This chaparral alliance is characterized by evergreen scrub oak species and other sclerophyllous shrubs. Dominant diagnostic species include *Ceanothus greggii*, *Fremontodendron californicum*, *Juniperus californica*, *Quercus cornelius-mulleri*, and *Quercus john-tuckeri*. Many other shrub species may be present to codominant such as *Adenostoma fasciculatum*, *Adenostoma sparsifolium*, *Arctostaphylos glauca*, *Ceanothus cuneatus*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Ericameria linearifolia*, *Eriogonum fasciculatum*, and *Garrya flavescens*. Emergent trees such as *Quercus chrysolepis*, *Quercus douglasii*, *Pinus coulteri*, *Pinus monophylla*, *Pinus quadrifolia* and *Pinus sabiniana* may be occasionally present. The herbaceous layer is sparse.

ENVIRONMENT & DYNAMICS

Environmental Description: This chaparral alliance occurs from arid, interior southern California and adjacent Mojave and Colorado deserts to the east. Stands occur primarily on upper slopes and ridgetops with shallow, well-drained soils. The elevation ranges from 300-1700 m, and yearly precipitation totals are generally less than 30 cm. Droughts are common. This vegetation type generally intergrades with other chaparral types or pinyon-juniper woodlands.

Dynamics: This chaparral alliance occurs in drier and colder regions than other types. This alliance is found often on recently burned sites. It is not as prone to fire as other chaparral vegetation types due to lighter fuel loads. *Quercus cornelius-mulleri* or *Quercus john-tuckeri* vigorously sprouts from root crowns after fire (Sawyer et al. 2009).

DISTRIBUTION

Geographic Range: This alliance occurs in the western Mojave and Colorado deserts and throughout the interior of southern California. It may also be found in Baja California, Mexico.

Nations: MX?, US

States/Provinces: CA, MXBC?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: BLM (Carrizo Plain); NPS (Joshua Tree)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Ceanothus greggii* (Cup leaf ceanothus chaparral) Alliance (Sawyer et al. 2009) [37.212.00]
- > *Quercus cornelius-mulleri* (Muller oak chaparral) Alliance (Sawyer et al. 2009) [37.415.00]
- > *Quercus cornelius-mulleri* Shrubland Alliance (Evens et al. 2012)
- > *Quercus john-tuckeri* (Tucker oak chaparral) Alliance (Sawyer et al. 2009) [37.418.00]
- ? Semi-Desert Chaparral (#37400) (Holland 1986b)
- ? Semi-desert chaparral (Cheatham and Haller 1975)

LOWER LEVEL UNITS

Associations:

- CEG003026 *Ceanothus greggii* - *Fremontodendron californicum* Shrubland [Placeholder]
- CEG002727 *Quercus john-tuckeri* - *Juniperus californica* Shrubland
- CEG002726 *Quercus cornelius-mulleri* Shrubland [Placeholder]

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Schindel.

Version Date: 2014/12/18

REFERENCES

References: Cheatham and Haller 1975, Evens et al. 2012, Faber-Langendoen et al. 2017b, Holland 1986b, Keeler-Wolf 1997, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Stout et al. 2013

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Chaparral

G281. Western Madrean Chaparral

A0793. *Quercus turbinella* Chaparral Alliance

Type Concept Sentence: This alliance includes evergreen shrublands dominated or codominated by *Quercus turbinella* that typically forms thickets with other shrubs. *Quercus turbinella* shrublands are typically found on steep, rocky slopes, often sheltered slopes in limestone canyons, in the mountains of Nevada, Arizona, New Mexico, and western Texas.

OVERVIEW

Scientific Name: *Quercus turbinella* Chaparral Alliance

Common Name (Translated Scientific Name): Sonoran Scrub Oak Chaparral Alliance

Colloquial Name: Sonoran Scrub Oak Chaparral

Type Concept: This alliance includes evergreen shrublands dominated or codominated by *Quercus turbinella* that typically forms thickets with other shrubs. Important shrub associates can include *Arctostaphylos* spp., *Ceanothus greggii*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Ephedra viridis*, *Fraxinus greggii*, *Garrya wrightii*, *Juniperus osteosperma*, *Rhus virens*, *Rhus trilobata*, *Rhus microphylla*, and a shrub form of *Quercus grisea*. Ground cover is typically sparse with scattered grasses, forbs and ferns. Some typical herbaceous components include *Aristida* spp., *Astrolepis sinuata* (= *Notholaena sinuata*), *Bouteloua curtipendula*, *Bouteloua eriopoda*, and *Notholaena standleyi*. Shrublands in this alliance are small in extent and occur in a matrix of succulent desert scrub

and semi-desert grassland. *Quercus turbinella* shrublands are typically found on steep, rocky slopes, often sheltered slopes in limestone canyons, in the mountains of Nevada, Arizona, New Mexico, and western Texas.

Classification Comments: *Quercus turbinella* is a widespread interior chaparral species whose distribution is centered in Arizona. Therefore, this alliance is included in Western Madrean Chaparral Group (G281), but stands extend west into the Mojave and Great Basin and east into western Texas. Alliances are based in part by the fire adaptations of dominant species; for example, *Quercus turbinella* strongly sprouts after being burned so it becomes the predominant species with repeated fires or fire suppression over species such as *Arctostaphylos pungens*, *Arctostaphylos pringlei*, and *Ceanothus greggii* that primarily reproduce from seeds that require heat scarification to germinate (Carmichael et al. 1978).

Internal Comments: mjr 3-16: *Quercus turbinella* does not occur in WY (removed). mjr 12-14: CA added for MOJN.

Other Comments:

Similar NVC Types: Some stands in alliances in Eastern Madrean Chaparral Group (G280) may be codominated by *Quercus turbinella* but will have diagnostic species from that group present. Other alliances within Eastern Madrean Chaparral Group (G280), Western Madrean Chaparral Group (G281), and Western North American Montane Sclerophyll Scrub Group (G282) may have some shared associated species with this alliance.

- A3971 *Quercus pungens* - *Quercus intricata* - *Quercus vaseyana* Chaparral Alliance: may be codominated by *Quercus turbinella*, but will have diagnostic species from Eastern Madrean Chaparral Group (G280) present.

Diagnostic Characteristics: This alliance is characterized by dominance of *Quercus turbinella* or codominance with a variety of other species such as *Amelanchier utahensis*, *Arctostaphylos pungens*, *Artemisia tridentata*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Ephedra viridis*, *Fraxinus anomala*, *Garrya flavescens*, *Juniperus osteosperma*, *Ptelea trifoliata*, or *Rhus trilobata*. The herbaceous layer is usually sparse because of shading from shrubs, but open stands may have an herbaceous layer dominated by grasses such as *Bouteloua curtipendula* and *Bouteloua eriopoda*.

VEGETATION

Physiognomy and Structure: Vegetation in this shrubland alliance is dominated by a moderately dense cover of broad-leaved evergreen shrubs typically about 2 m tall, but can reach 5 m. The graminoid layer is sparse to moderately dense and dominated by medium-tall, warm-season bunchgrasses. The forb layer is generally sparse but may have high species diversity. Cacti or rosette shrub succulents are commonly present.

Floristics: This alliance includes evergreen shrublands dominated or codominated by *Quercus turbinella* that typically forms thickets with other shrubs. Important shrub associates can include *Arctostaphylos* spp., *Ceanothus greggii*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Ephedra viridis*, *Fraxinus greggii*, *Garrya wrightii*, *Juniperus osteosperma*, *Rhus virens*, *Rhus trilobata*, *Rhus microphylla*, and a shrub form of *Quercus grisea*. Cacti or rosette shrub succulents such as *Agave palmeri*, *Dasyilirion wheeleri*, *Nolina microcarpa*, *Opuntia* spp., and *Yucca baccata* are commonly present. The herbaceous layer is sparse to moderately dense, ranging from 5-40% cover. Perennial grasses are the most abundant species, particularly *Aristida* spp., *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Eragrostis* spp., *Leptochloa dubia*, and *Muhlenbergia* spp. Many forb and fern species can occur, but have little cover. Common forbs include *Artemisia ludoviciana*, *Croton fruticulosus*, *Datura* spp., and *Eriogonum wrightii*. Ferns include species of *Cheilanthes*, *Pellaea*, and *Astroblepis*. Annual grasses and forbs are seasonally present and often include the exotic species *Bromus rubens* and *Bromus tectorum*.

ENVIRONMENT & DYNAMICS

Environmental Description: Shrublands included in this alliance occur in the foothills and lower slopes of isolated desert mountain ranges and canyons from Nevada to western Texas, but distribution is centered in Arizona below the Mogollon Rim. Elevations range from 850-1800 m. Climate is semi-arid. From one-half to two-thirds of the 40-65 cm mean annual precipitation occurs during July-September as the result of convectional thunderstorms. The balance occurs during winter as occasional rains. Late spring and early summer are typically dry. Summers are hot and winters can have periods of cold weather and occasional snows. Stands occur on nearly level to steep (to 80%), rocky slopes on all aspects. Soils are typically deep, coarse-textured, and poorly developed. Textures vary from cobbly and gravelly loamy sand to gravelly loam. Parent materials are varied and include weathered granite, schist, diabase, sandstone, shale, limestone, slate, gneiss, quartzite, monzonite and basalt. Occasionally stands occur on fine-textured soil that may be too warm for *Juniperus* (Carmichael et al. 1987). Leaf litter occasionally accumulates 2-8 cm deep (Warren and Treadwell 1980). Litter layers affect soil development, rates of erosion, and fire regimes and behavior (Kemp 1965). Vegetation at higher elevations is often woodlands dominated by species of *Quercus*, *Pinus*, or *Juniperus*. At lower elevations there is desert scrub dominated by species of *Acacia*, *Mimosa*, *Prosopis*, or *Encelia*.

Dynamics: Most of the species in these chaparral stands have some adaptation to fire. The root systems are well-developed and draw moisture from a large volume of soil allowing for rapid sprouting after fire. Non-sprouting species, such as species of

Ceanothus and *Arctostaphylos*, require fire to scarify the numerous seeds in the seed bank before they will germinate (Carmichael et al. 1978). Recovery after fire can occur in as little as 5-11 years, and some stands are fire-induced climax and need fire to maintain them (Carmichael et al. 1978). Altered fire regimes, fuelwood harvest, and grazing by livestock have significant impacts on the quality of sites. More study is needed to understand and manage these shrublands.

DISTRIBUTION

Geographic Range: The distribution of shrublands included in this alliance is centered in Arizona below the Mogollon Rim, extending north and west into Utah, Nevada, and east into southern New Mexico, western Texas. It also likely occurs in northern Mexico.

Nations: MX?, US

States/Provinces: AZ, CA, NM, NV, TX, UT

TNC Ecoregions [optional]: 17:C

USFS Ecoregions (2007): 322Al:CCC, 322Am:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Lake Mead, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Quercus turbinella* (Sonoran live oak scrub) Alliance (Sawyer et al. 2009) [71.095.00]
- = *Quercus turbinella* Series (Muldavin et al. 1994a) [includes the *Quercus turbinella/Bouteloua curtipendula* Plant Association within the Broadleaf Evergreen Interior Chaparral Group]
- = *Quercus turbinella* Shrubland Alliance (Evens et al. 2014)
- = *Quercus turbinella* Shrubland Alliance (CNPS 2017) [71.095.00]
- < Mojavean Piñon Woodland (#72210) (Holland 1986b)
- < Scrub Oak Mahogany Series - 133.31 (Brown et al. 1979)
- < Singleleaf pinyon series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEG000977 *Quercus turbinella* - *Garrya flavescens* - *Arctostaphylos pungens* Shrubland
- CEG000980 *Quercus turbinella* - *Ephedra viridis* Shrubland
- CEG000979 *Quercus turbinella* - *Cercocarpus montanus* Shrubland
- CEG000978 *Quercus turbinella* / *Bouteloua eriopoda* Shrubland
- CEG002950 *Quercus turbinella* - (*Amelanchier utahensis*) Colluvial Shrubland
- CEPP006752 *Quercus turbinella* - *Juniperus californica* - *Eriogonum* spp. Shrubland
- CEG000981 *Quercus turbinella* - *Juniperus osteosperma* Shrubland
- CEG005160 *Quercus turbinella* - *Ptelea trifoliata* - *Fraxinus anomala* Mesic Shrubland
- CEG005168 *Quercus turbinella* - (*Rhus trilobata*, *Artemisia tridentata*) Shrubland
- CEPP006751 *Quercus turbinella* - *Baccharis sergiloides* Shrubland
- CEG000982 *Quercus turbinella* - *Coleogyne ramosissima* Shrubland

AUTHORSHIP

Primary Concept Source: E. Muldavin, P. Mehlhop, and E. DeBruin (1994a)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Brown 1978, Brown 1982a, Brown et al. 1979, CNPS 2017, Carmichael et al. 1978, Diamond 1993, Dick-Peddie 1993, Evens 2000, Evens et al. 2014, Faber-Langendoen et al. 2017b, Holland 1986b, Kemp 1965, Muldavin and Mehlhop 1992, Muldavin et al. 1994a, Nixon 2002, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, TPWD 1990a, Thomas et al. 2004, Tirmenstein 1999d, Warren and Treadwell 1980, Warren et al. 1982, Wells 1960

2.C. Shrub & Herb Wetland

Shrub & Herb Wetland includes open bogs, fens, fresh and saltwater marshes, wet meadows and wet shrublands. The vegetation occurs from tropical to polar regions.

2.C.2. Temperate to Polar Bog & Fen

Temperate to Polar Bog & Fen includes temperate bogs and fens dominated by *Sphagnum* or brown mosses with ericaceous shrubs, graminoids, and low scrub tree growth forms, across the mid-latitudes of the Northern Hemisphere from 23° to 70°N, but is much less common in the southern mid-latitudes.

2.C.2.Na. North American Bog & Fen

This division includes open and treed bogs and fens throughout much of North America from the boreal zone in Canada south to northern California, montane areas in the western United States, the northern Great Plains, and much of the midwestern and northeastern United States and southeastern Canada.

M877. North American Boreal & Subboreal Alkaline Fen

This alkaline fen macrogroup occurs on peatlands across the boreal regions of North America, extending south into subboreal regions of the Rocky Mountains, Great Lakes, and northeastern and north-central U.S. *Sphagnum* peatmoss and ericaceous shrubs are patchy to absent and brown mosses, broad-leaved non-ericaceous shrubs, and thin-leaved graminoids are common.

2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

2.C.2.Na.2.c. M877 North American Boreal & Subboreal Alkaline Fen

G516. Rocky Mountain Alkaline Fen

Type Concept Sentence: This group occurs throughout the Rocky Mountains from Colorado north into Canada, where it is confined to fens with groundwater discharge, soil chemistry (neutral to alkaline), and peat accumulation of at least 40 cm. Vegetation is dominated by graminoids and low shrubs and includes *Carex buxbaumii*, *Carex cusickii*, *Carex limosa*, *Carex saxatilis*, *Carex utriculata*, *Kobresia myosuroides*, and *Kobresia simpliciuscula*. Shrubs include *Betula glandulosa* and several *Salix* spp.

OVERVIEW

Scientific Name: *Kobresia myosuroides* - *Carex buxbaumii* Alkaline Fen Group

Common Name (Translated Scientific Name): Bellardi Bog Sedge - Buxbaum's Sedge Alkaline Fen Group

Colloquial Name: Dwarf Birch Alkaline Shrub Fen

Type Concept: This group occurs infrequently throughout the Rocky Mountains from Colorado north into Canada. It is confined to specific environments defined by groundwater discharge, soil chemistry (neutral to alkaline), and peat accumulation of at least 40 cm. Vegetation is dominated by graminoids and low shrubs and includes *Carex buxbaumii*, *Carex cusickii*, *Carex limosa*, *Carex saxatilis*, *Carex utriculata*, *Kobresia myosuroides*, and *Kobresia simpliciuscula*. Shrubs include *Betula glandulosa* and several *Salix* spp. Fens form at low points in the landscape or on slopes where groundwater intercepts the soil surface. Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels and cold winter temperatures lead to accumulation of organic material. In addition to peat accumulation and perennially saturated soils, soil chemistry is alkaline to neutral with nutrients high in base cations. Nitrogen (N) and potassium (K) are usually still limiting plant growth in rich fens. Rich fens are strongly influenced by geology and occur where limestone, dolostone, marble or where glacially-derived materials are calcareous. The surrounding landscape may be ringed with other wetland systems, e.g., riparian shrublands, or a variety of upland systems from grasslands to forests.

Classification Comments: This group contains alkaline and neutral fens. Acidic and poor fens are classified in Rocky Mountain Acidic Fen Group (G515). Some associations occur across the pH gradient, making placement into either an acidic group or neutral-alkaline group problematic. It may prove more useful to have all fens in one group and use the alliance level to tease out poor versus rich fens. Alkaline fens in Alaska are placed into either Western North American Boreal Alkaline Fen Group (G361) or North Pacific Alkaline Open Fen Group (G285).

Similar NVC Types:

- G361 Western North American Boreal Alkaline Fen
- G285 North Pacific Alkaline Open Fen: covers calcareous and other alkaline fens but with Pacific Northwest species such as *Myrica gale*.
- G284 North Pacific Acidic Open Bog & Fen: covers poor fens in the Pacific Northwest with species such as *Callitropsis nootkatensis*, *Pinus contorta* var. *contorta*, *Picea sitchensis*, and *Tsuga heterophylla*.
- G515 Rocky Mountain Acidic Fen: includes wet peatlands that have deep peat and are therefore less influenced by groundwater, or occur in non-calcareous bedrock; mineral influences are much less and pH of soil water is more neutral than in the alkaline fens.

Diagnostic Characteristics: Saturated year-round organic soils with >40 cm peat, bathed in mineral-rich groundwater discharge (pH neutral to alkaline) and dominated by wetland indicator plants, and the ground cover is dominated by *Sphagnum* mosses.

VEGETATION

Physiognomy and Structure: Wet peatlands with heavy moss ground cover, low-statured graminoid species, short and dwarf-shrubs that often occur in a mosaic of these types all adjacent to each other.

Floristics: Vegetation is dominated by graminoids and low shrubs and includes *Carex buxbaumii*, *Carex cusickii*, *Carex limosa*, *Carex saxatilis*, *Carex utriculata*, *Kobresia myosuroides*, and *Kobresia simpliciuscula*. Shrubs include *Betula glandulosa* and several *Salix* spp. Rare plants found in calcareous fens include *Salix candida*, *Salix myrtilifolia*, *Salix serissima*, *Primula egalikensis*, *Eriophorum altaicum* var. *neogaeum*, *Carex viridula*, *Carex tenuiflora*, *Carex leptalea*, *Trichophorum pumilum*, and *Sisyrinchium pallidum* (Cooper 1986b, Windell et al. 1986, Cooper and Sanderson 1997, Steen and Coupe 1997).

ENVIRONMENT & DYNAMICS

Environmental Description: It is confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm. Fens form at low points in the landscape or on slopes where groundwater intercepts the soil surface. Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels and cold winter temperatures lead to accumulation of organic material. In addition to peat accumulation and perennially saturated soils, soil chemistry is alkaline to neutral and nutrients high in base cations. Nitrogen (N) and potassium (K) are usually still limiting plant growth in rich fens. Rich fens are strongly influenced by geology and occur where limestone, dolostone, marble or where glacially-derived materials are calcareous (Cooper 1986b, Windell et al. 1986, Cooper and Sanderson 1997, Steen and Coupe 1997, Bedford and Godwin 2003).

Dynamics: Mountain fens act as natural filters cleaning ground and surface water. Fens also act as sponges by absorbing heavy precipitation, slowly releasing it downstream, minimizing erosion and recharging groundwater systems (Windell et al. 1986). The persistent groundwater and cold temperatures allow organic matter to accumulate (forming peat) which allows classification of wetlands within this group as fens. Fens produce peat that accumulates at the rate of 20 to 30 cm (8-11 inches) per 1000 years, making peatlands a repository of 10,000 years of post glacial history (Windell et al. 1986).

DISTRIBUTION

Geographic Range: This group occurs infrequently throughout the mountains of the interior west, the Sky Islands of Arizona and high mountains and plateaus of Nevada and Utah, and the Rocky Mountains of Utah, Colorado, Wyoming, Montana, Idaho, the Black Hills of South Dakota, and north into Canada.

Spatial Scale & Pattern [optional]: Small patch

Nations: CA, US

States/Provinces: AB, AZ, BC, CA, CO, ID, MT, NV, OR, SD, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A3436 *Kobresia myosuroides* - *Kobresia simpliciuscula* Alkaline Graminoid Fen Alliance
- A3434 *Betula nana* Alkaline Shrub Fen Alliance
- A3435 *Carex limosa* - *Carex buxbaumii* - *Triglochin maritima* Alkaline Graminoid Fen Alliance

AUTHORSHIP

Primary Concept Source: J. Rocchio, D. Cooper, B. Bedford, in Faber-Langendoen et al. (2011)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 11/23/2015

Classif Resp Region: West

Internal Author: GK 11-10, 5-13, 11-15, mod. MSR 3-17

REFERENCES

References: Bedford and Godwin 2003, Cooper 1986b, Cooper and Sanderson 1997, Faber-Langendoen et al. 2017a, Rondeau 2001, Steen and Coupé 1997, Windell et al. 1986

2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

G516. Rocky Mountain Alkaline Fen

A3434. *Betula nana* Alkaline Shrub Fen Alliance

Type Concept Sentence: This alliance covers shrub-dominated neutral to alkaline pH fens (organic soil wetlands) found at elevations of 1500-3350 m (5000-11,000 feet) within the Rocky Mountains. *Betula nana* is an indicator for the shrubby growth form on these fens; however, other shrub species may be dominant. There is usually herbaceous cover, and dense mosses cover the ground.

OVERVIEW

Scientific Name: *Betula nana* Alkaline Shrub Fen Alliance

Common Name (Translated Scientific Name): Dwarf Birch Alkaline Shrub Fen Alliance

Colloquial Name: Dwarf Birch Alkaline Shrub Fen

Type Concept: This alliance consists of shrubby wetlands dominated by several different shrub species, often represented by *Betula nana*. These wetlands are neutral to alkaline pH fens found at elevations of 1500-3350 m (5000-11,000 feet) within the Rocky Mountains. *Betula nana* is an indicator for the shrubby growth form on these fens; however, other shrub species may be dominant. There is usually herbaceous cover, and dense mosses cover the ground.

Classification Comments: Fens are neutral to alkaline pH, with shrubby growth.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Shrub cover is at least 25% over the shorter canopy of herbaceous growth.

VEGETATION

Physiognomy and Structure: The shrub layer is dominated by a broad-leaved deciduous, low, spreading erect shrub mostly 1-3 m tall. The canopy cover is sparse to moderate while the herbaceous layer cover is high. The fern layer is prominent, with up to 80% cover.

Floristics: Vegetation types within this alliance are described as seasonally flooded, cold-deciduous shrublands. *Betula glandulosa* dominates the canopy. Other shrubs present include *Alnus incana*, *Cornus sericea*, *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Rhamnus alnifolia*, *Salix planifolia*, *Salix monticola*, and *Salix wolfii*. The herbaceous undergrowth is found on small hummocks and is usually dominated by a dense mixture of mesic forbs and mesic graminoids. Mesic graminoids include *Calamagrostis canadensis*, *Calamagrostis stricta*, *Carex aquatilis*, *Carex utriculata*, *Carex livida*, and *Deschampsia cespitosa*. Forb cover is sparse and may include *Caltha leptosepala*, *Epilobium ciliatum*, *Ligusticum filicinum*, *Ranunculus sceleratus*, *Sparganium natans* (= *Sparganium minimum*), and *Thalictrum alpinum*. Fern allies present may include *Equisetum laevigatum*.

ENVIRONMENT & DYNAMICS

Environmental Description: Elevations range from 900 to 3000 m in the Rocky Mountains. Communities occur on peat soils in seeps, swales, and wet alluvial terraces adjacent to low-gradient meandering streams. They are found in areas where soils are saturated from seeps and springs. Soils are Histosols saturated all year. Quaking mats are typical of many stands.

Dynamics: As peatland hummocks develop (become more pronounced), they may become more heavily dominated by *Salix* species (Wendell et al. 1986, as cited in Kittel et al. 1999b). Due to cold temperatures and a short growing season, this process may take several decades to occur (Phillips 1977).

DISTRIBUTION

Geographic Range: Stands of this alliance are found in the Rocky Mountains of Idaho, Montana, Wyoming, and Colorado. These are likely to occur in Alberta and British Columbia as well.

Nations: CA?, US

States/Provinces: AB?, BC?, CO, ID, MT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Betula glandulosa* Series (Johnston 1987)

LOWER LEVEL UNITS

Associations:

- CEG001188 *Salix candida* / *Carex utriculata* Shrub Fen
- CEG002899 *Betula glandulosa* / *Sphagnum* spp. Shrub Fen
- CEG002700 *Betula glandulosa* / *Carex lasiocarpa* Shrub Fen
- CEG000229 *Salix farriarum* / *Eleocharis quinqueflora* Shrub Fen

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Carsey et al. 2003a, Carsey et al. 2003b, Faber-Langendoen et al. 2017b, Hansen et al. 1991, Hansen et al. 1995, Hitchcock et al. 1964, Johnston 1987, Kartesz 1994a, Kettler and McMullen 1996, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Phillips 1977, Sanderson and Kettler 1996

2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

G516. Rocky Mountain Alkaline Fen

A3435. *Carex limosa* - *Carex buxbaumii* - *Triglochin maritima* Alkaline Graminoid Fen Alliance

Type Concept Sentence: This alliance covers neutral to alkaline herbaceous fens dominated by one or more *Carex* species. Some well-documented species include *Carex buxbaumii*, *Carex cusickii*, *Carex limosa*, and *Carex saxatilis*. *Carex aquatilis* and *Carex utriculata* may be present as well. This alliance occurs in the Rocky Mountains. Fens are seasonally or permanently saturated wetlands with an organic substrate that is at least 30 cm thick.

OVERVIEW

Scientific Name: *Carex limosa* - *Carex buxbaumii* - *Triglochin maritima* Alkaline Graminoid Fen Alliance

Common Name (Translated Scientific Name): Mud Sedge - Buxbaum's Sedge - Seaside Arrow-grass Alkaline Graminoid Fen Alliance

Colloquial Name: Rocky Mountain Alkaline Sedge Graminoid Fen

Type Concept: This alliance consists of neutral to alkaline herbaceous fens dominated by one or more *Carex* species. Some well-documented species include *Carex buxbaumii*, *Carex cusickii*, *Carex limosa*, and *Carex saxatilis*. *Carex aquatilis* and *Carex utriculata* may be present as well. Additional species may include *Caltha leptosepala*, *Deschampsia cespitosa*, *Drosera* spp., *Eleocharis quinqueflora*, *Eriophorum* spp., *Menyanthes trifoliata*, *Pedicularis groenlandica*, and *Trichophorum cespitosum* (= *Scirpus cespitosus*). The source and quality of groundwater determine the nutrient content and pH of these fens, which most often occur as basin or depressional wetlands, but can also occur as slope and alluvial wetlands in terms of their hydrogeomorphic setting. These fens are seasonally or permanently saturated wetlands with an organic substrate that is at least 30 cm thick, and occur in the Rocky Mountains.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: These are herbaceous-dominated, neutral to alkaline pH fens with herbaceous cover as the dominant vegetation, usually with a high moss ground cover, but this may be submerged under water during part of the year.

VEGETATION

Physiognomy and Structure: This alliance is characterized by turf-forming, perennial graminoids. The graminoid stratum is dominated by one or two sedge species. The forb layer is typically present.

Floristics: Dominant species are *Carex buxbaumii*, *Carex cusickii*, *Carex limosa*, and *Carex saxatilis*, either singly or in various mixes. Common co-associates are *Carex aquatilis*, *Carex canescens*, *Carex lasiocarpa*, *Carex livida*, *Carex utriculata*, and *Deschampsia cespitosa*. Forbs are often present and can have high cover, but stands are usually dominated by their graminoid components. Forb species include *Caltha leptosepala*, *Drosera linearis*, *Ligusticum tenuifolium*, *Menyanthes trifoliata*, *Pedicularis groenlandica*, and *Pedicularis groenlandica*. Other species present may include *Scheuchzeria palustris*. A dense layer of *Sphagnum* spp. or other moss genera is typically the ground cover.

ENVIRONMENT & DYNAMICS

Environmental Description: Fens occur from 2400-3900 m in elevation and are located in narrow to broad mountain valleys, on organic substrates, with smooth to concave surface topography. Soils are commonly Histosols consisting of deep, fibric peat and are persistently saturated with standing water in the spring. Saturated conditions retard plant decomposition and favor organic matter accumulation.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found in the mountains of Utah, Idaho, Montana, Wyoming, Colorado and New Mexico, and likely extends into Alberta and British Columbia, Canada.

Nations: CA?, US

States/Provinces: AB?, BC?, CO, ID, MT, NM, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Carex buxbaumii*-*Carex aquatilis* (Mattson 1984)
- ? *Carex buxbaumii*-*Carex saxatilis* (Tuhy 1981)

LOWER LEVEL UNITS

Associations:

- C EGL001806 *Carex buxbaumii* Fen
- C EGL002549 *Carex diandra* Wet Meadow Fen
- C EGL002922 *Carex utriculata* Perched Wetland Fen
- C EGL000230 *Carex cusickii* Fen
- C EGL001811 *Carex limosa* Fen
- C EGL001769 *Carex saxatilis* Fen
- C EGL001995 *Triglochin maritima* Fen
- C EGL001877 *Carex microglochin* Fen

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Cronquist et al. 1977, Cronquist et al. 1997, Faber-Langendoen et al. 2017b, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Hermann 1970, Kettler and McMullen 1996, Lewis 1970, Mattson 1984, Moseley et al. 1991, Moseley et al. 1994, Padgett et al. 1989, Pierce 1986, Pierce and Johnson 1986, Sanderson and Kettler 1996, Sawyer and Keeler-Wolf 1995, Tuhy 1981

2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

G516. Rocky Mountain Alkaline Fen

A3436. Kobresia myosuroides - Kobresia simpliciuscula Alkaline Graminoid Fen Alliance

Type Concept Sentence: This Rocky Mountain alliance contains strongly alkaline fens dominated by herbaceous species; indicators include *Kobresia myosuroides* and *Kobresia simpliciuscula*, the later indicating extremely rich conditions. The water chemistry is distinct in that it contains high levels of calcium and magnesium.

OVERVIEW

Scientific Name: *Kobresia myosuroides* - *Kobresia simpliciuscula* Alkaline Graminoid Fen Alliance

Common Name (Translated Scientific Name): Simple Bog Sedge - Bellardi Bog Sedge Alkaline Graminoid Fen Alliance

Colloquial Name: Bog Sedge Alkaline Graminoid Fen

Type Concept: This alliance consists of strongly alkaline fens dominated by herbaceous species; indicators include *Kobresia myosuroides* and *Kobresia simpliciuscula*, the later indicating extremely rich conditions. Other species present may include *Carex aquatilis*, *Carex simulata*, *Eleocharis quinqueflora*, *Juncus arcticus*, *Ptilagrostis porteri* (= *Ptilagrostis mongholica* ssp. *porteri*), *Salix brachycarpa*, *Salix candida*, *Thalictrum alpinum*, and *Trichophorum pumilum* (= *Scirpus pumilus*). The water chemistry is distinct in that it contains high levels of calcium and magnesium. It is documented to occur in the Rocky Mountains of Colorado, but is likely to occur in Wyoming, Montana, Idaho, Utah, New Mexico, Alberta and British Columbia

Classification Comments: Shrub cover, if present, is <25%.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Alkaline pH herbaceous-dominated fens with *Kobresia myosuroides* or *Kobresia simpliciuscula* present to dominant.

VEGETATION

Physiognomy and Structure: Low cold-deciduous shrub cover of at least 25%.

Floristics: Indicators of this alliance include *Kobresia myosuroides* and *Kobresia simpliciuscula*, the later indicating extremely rich conditions. Other species present may include *Carex aquatilis*, *Carex simulata*, *Eleocharis quinqueflora*, *Juncus arcticus*, *Ptilagrostis porteri* (= *Ptilagrostis mongholica* ssp. *porteri*), *Salix brachycarpa*, *Salix candida*, *Thalictrum alpinum*, and *Trichophorum pumilum* (= *Scirpus pumilus*).

ENVIRONMENT & DYNAMICS

Environmental Description: The water chemistry is distinct in that it contains high levels of calcium and magnesium.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is documented to occur in the Rocky Mountains of Colorado, but is likely to occur in Wyoming, Montana, Idaho, Utah, New Mexico, Alberta and British Columbia.

Nations: CA?, US

States/Provinces: AB?, BC?, CO, ID?, MT?, NM?, UT?, WY?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY**LOWER LEVEL UNITS**

Associations:

- CEG002900 *Kobresia myosuroides* - *Thalictrum alpinum* Fen
- CEG005661 *Glaux maritima* - *Poa secunda* Rich Fen
- CEG002901 *Kobresia simpliciuscula* - *Trichophorum pumilum* Fen

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Cooper n.d., Faber-Langendoen et al. 2017b

2.C.4. Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland

Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland includes wet riparian and swamp shrublands, wet meadows, wet prairies, and shallow and deep emergent marshes. The vegetation comprises seasonal green emergent, hydrophytic shrubs and herbs with at least 10% cover, on mucky, inundated or saturated soils across the mid-latitudes of the Northern and Southern hemispheres from 23° to 70°.

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

This division contains marshes, wet meadows and shrublands, singly and in mosaics, along riparian corridors, around vernal pools, depressions, seeps and springs on mineral soils or shallow organic layers over mineral substrates in temperate (and possibly southern boreal) latitudes of western North America.

M888. Arid West Interior Freshwater Marsh

These arid west freshwater marshes are found at all elevations below alpine throughout the interior basins and mountains of western North America, with dominant species such *Carex pellita*, *Carex praegracilis*, *Eleocharis palustris*, *Juncus arcticus ssp. littoralis*, *Paspalum distichum*, *Schoenoplectus americanus*, *Schoenoplectus pungens*, *Typha domingensis*, *Typha latifolia*, and species of *Bidens*, *Cicuta*, *Cyperus*, *Mimulus*, and *Phalaris*.

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

2.C.4.Nb.1.a. M888 Arid West Interior Freshwater Marsh

G531. Arid West Interior Freshwater Marsh

Type Concept Sentence: These arid west freshwater marshes are found at all elevations below alpine throughout the western interior basins and mountains of western North America, with dominant species such as *Carex pellita*, *Carex praegracilis*, *Eleocharis palustris*, *Juncus arcticus ssp. littoralis*, *Paspalum distichum*, *Schoenoplectus americanus*, *Schoenoplectus pungens*, *Typha domingensis*, *Typha latifolia*, and species of *Bidens*, *Cicuta*, *Cyperus*, *Mimulus*, and *Phalaris*.

OVERVIEW

Scientific Name: *Schoenoplectus* spp. - *Typha* spp. Interior Freshwater Marsh Group

Common Name (Translated Scientific Name): Clubrush species - Cattail species Interior Freshwater Marsh Group

Colloquial Name: Common Spikerush - Pale Spikerush Marsh

Type Concept: These arid west freshwater marshes are found at all elevations below timberline throughout the western interior basins and mountains of western North America. Vegetation is characterized by a lush, dense herbaceous layer with low diversity, sometimes occurring as a monoculture. Structure varies from emergent forbs which barely reach the water surface to tall graminoids that reach as tall as 4 m high. Dominant species include *Carex pellita* (= *Carex lanuginosa*), *Carex praegracilis*, *Eleocharis palustris*, *Juncus arcticus ssp. littoralis* (= *Juncus balticus*), *Paspalum distichum*, *Schoenoplectus americanus*, *Schoenoplectus pungens*, *Typha domingensis*, *Typha latifolia*, and species of *Bidens*, *Cicuta*, *Cyperus*, *Mimulus*, and *Phalaris*. This group includes shallow freshwater to brackish waterbodies found in bottomlands along drainages, in river floodplain depressions, cienegas, oxbow lakes, below seeps, frequently flooded gravel bars, low-lying sidebars, in-fill side channels, small ponds, stockponds, ditches and slow-moving streams, perennial streams in valleys and mountain foothills, as well as in small depressions gouged into basalt by Pleistocene floods, channeled scablands of the Columbia Plateau and within dune fields in the intermountain western U.S. These wetlands are mostly small-patch, confined to limited areas in suitable floodplain or basin topography. They are mostly semipermanently flooded, but some marshes have seasonal hydrologic flooding. Water is on or above the surface for most of the growing season. A consistent source of freshwater is essential to the function of these communities. Soils are muck or mineral or muck over a mineral soil, and water is high-nutrient. It is often found along the borders of ponds, lakes or reservoirs that have more

open water. Some occurrences are interdunal wetlands in wind deflation areas, where sands are scoured down to the water table. The water table may be perched over an impermeable layer of caliche or clay or, in the case of the Great Sand Dunes of Colorado, a geologic dike that creates a closed basin that traps water.

Classification Comments: This group does not include oceanic saline-influenced tidal areas (coastal saline marshes and brackish marshes) which belong to Temperate Pacific Salt Marsh Group (G499). Marshes in saline waters located at the edge of the Great Salt Lake are included in North American Desert Alkaline-Saline Marsh & Playa Group (G538).

Similar NVC Types:

- G521 Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh
- G524 Western North American Ruderal Marsh, Wet Meadow & Shrubland
- G538 North American Desert Alkaline-Saline Marsh & Playa
- G544 Western North American Temperate Freshwater Aquatic Vegetation

Diagnostic Characteristics: Temperate continental, permanently saturated to seasonally flooded wetlands, often with standing water for much of the year, dominated by emergent graminoid herbaceous vegetation. Characteristic dominant species include *Typha* spp., *Schoenoplectus* spp., *Eleocharis palustris*, *Carex praegracilis*, *Carex pellita*, and *Cyperus* spp.

VEGETATION

Physiognomy and Structure: Vegetation is characterized by a lush, dense to open emergent herbaceous layer. The emergent vegetation is characterized by graminoids, annual or perennial forbs or a mixture of all three. Heights varies from low forbs that barely breaking the water surface to tall graminoids up to 4 m high. Sites are permanently or seasonally inundated which prevents the establishment of woody species. Ponds typically have concentric rings or zones of vegetation.

Floristics: These arid west interior marshes are dominated by emergent herbaceous species, mostly graminoids (*Carex*, *Scirpus* and/or *Schoenoplectus*, *Eleocharis*, *Juncus*, *Typha*,) but also some forbs. Stands vary in diversity, with some stands occurring as a monoculture of one of the dominant genera. Dominant species include *Carex pellita* (= *Carex lanuginosa*), *Carex praegracilis*, *Eleocharis palustris*, *Juncus arcticus* ssp. *littoralis* (= *Juncus balticus*), *Paspalum distichum*, *Schoenoplectus americanus*, *Schoenoplectus pungens*, *Typha domingensis*, *Typha latifolia*, and species of *Bidens*, *Cicuta*, *Cyperus*, *Mimulus*, and *Phalaris*.

ENVIRONMENT & DYNAMICS

Environmental Description: *Climate:* Temperate Continental climate. Environmental settings include bottomlands along drainages, in river floodplain depressions, cienegas, oxbow lakes, below seeps, frequently flooded gravel bars, low-lying sidebars, infilled side channels, small ponds, stockponds, ditches and slow-moving streams, perennial streams in valleys and mountain foothills. Elevations range from 890 to 1560 m (2930-5120 feet). *Soil/substrate/hydrology:* Substrates are variable but are generally fine-textured, alkaline, alluvial soil, coarse loam, sandy loam, sand, silt or peat. Hydrologic regimes vary from seasonal inundation followed by complete soil desiccation to year-round standing water. Water may be poorly oxygenated and nitrogen-rich. They are mostly semipermanently flooded, but some marshes have seasonal hydrologic flooding. Water is at or above the surface for most of the growing season. A consistent source of freshwater is essential to the function of these systems. Soils are muck or mineral or muck over a mineral soil, and water is high-nutrient. Environmental information compiled from Bowers (1982, 1984, 1986), Banner et al. (1986, 1993), Lloyd et al. (1990), MacKinnon et al. (1990), Cooper and Severn (1992), Viereck et al. (1992), Shiflet (1994), Holland and Keil (1995), Shephard (1995), Steen and Coupe (1997), Hammond (1998), Pineada et al. (1999), Boggs (2000), Pineda (2000), Rondeau (2001), Brand and Sanderson (2002), and Chappell and Christy (2004).

Dynamics: Sites are depressions, ponds, springs, and riparian areas that are heavily inundated for at least part of the growing season which impedes the establishment of woody species. Isolated marshes in dune systems are subject to changes in size and location of the wet swales as the sand dunes shift, due to active dune migration. Dune "blowouts" and subsequent stabilization through succession are characteristic processes of the active dunes which surround the interdunal swales.

DISTRIBUTION

Geographic Range: This group is found throughout the temperate western North America interior (Columbia Basin, Great Basin, Colorado Plateau, and higher intermountain basins of western North America). It is also known to occur in dune fields across the intermountain western U.S., including the Great Sand Dunes in southern Colorado and the Pink Coral Dunes in Utah, and may also occur in dune fields in northeastern Arizona and the Great Basin, as well as in southwestern Wyoming in the Killpecker Dunes and Ferris Dunes, and southern Idaho.

Spatial Scale & Pattern [optional]: Small patch

Nations: CA, MX, US

States/Provinces: AZ, BC, CA, CO, ID, KS, NM, NV, OK, OR, SD, TX, UT, WA, WY

TNC Ecoregions [optional]: 1:C, 2:C, 3:C, 4:C, 6:C, 10:C, 11:C, 12:C, 13:C, 14:C, 15:C, 16:C, 19:C, 20:C, 22:C, 23:C, 24:C, 28:C, 68:C, 69:C, 70:C, 81:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- < III.A.3.d - Fresh sedge marsh (Viereck et al. 1992)
- < III.B.3.a - Fresh herb marsh (Viereck et al. 1992)
- < Wetlands (217) (Shiflet 1994)

LOWER LEVEL UNITS

Alliances:

- A3891 *Eleocharis palustris* - *Eleocharis macrostachya* Marsh Alliance
- A3894 *Paspalum distichum* Marsh Alliance
- A3895 *Schoenoplectus americanus* - *Schoenoplectus acutus* - *Schoenoplectus californicus* Marsh Alliance
- A3896 *Typha domingensis* - *Typha latifolia* - *Phragmites australis* ssp. *americanus* Western Marsh Alliance
- A3892 *Equisetum fluviatile* - *Equisetum x ferrissii* Marsh Alliance

AUTHORSHIP

Primary Concept Source: C. Chappell, R. Crawford, K.A. Schulz, in D. Faber-Langendoen et al. (2011)

Author of Description: M.E. Hall, G. Kittel and J. Christy

Acknowledgments: J. Christy

Version Date: 12/02/2015

Classif Resp Region: West

Internal Author: MEH 10-10, mod. GK 9-13, 12-15

REFERENCES

References: Banner et al. 1986, Banner et al. 1993, Bezanson 2000, Boggs 2000, Bowers 1982, Bowers 1984, Bowers 1986, Brand and Sanderson 2002, Brown 1982a, Carr 1991, Carr 2004, Chappell and Christy 2004, Comer et al. 2003, Cooper and Severn 1992, Crowe et al. 2004, Dick-Peddie 1993, El-Hage and Moulton 1998, Faber-Langendoen et al. 2017a, Hammond 1998, Hendrickson and Minckley 1984, Holland and Keil 1995, Jahrsdoerfer and Leslie 1988, Lloyd et al. 1990, MacKinnon et al. 1990, Muldavin et al. 1994b, Muldavin et al. 2000a, Muldavin et al. 2000b, Pineda 2000, Pineda et al. 1999, Rodriguez et al. 2017, Rondeau 2001, Shephard 1995, Shiflet 1994, Steen and Coupé 1997, Szaro 1989, TPWD 1989d, Ungar 1965, Ungar 1972, Viereck et al. 1992

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G531. Arid West Interior Freshwater Marsh

A3891. *Eleocharis palustris* - *Eleocharis macrostachya* Marsh Alliance

Type Concept Sentence: This herbaceous wetland alliance is dominated or codominated by *Eleocharis palustris* and/or *Eleocharis macrostachya*, and occurs in shallow, mostly still water throughout much of the western United States and into northern Mexico, from sea level to upper montane altitudes. Stands occur on a variety of landforms, including lake margins, stream terraces, floodplains, gravel bars, and around springs or wet basins (cieneegas).

OVERVIEW

Scientific Name: *Eleocharis palustris* - *Eleocharis macrostachya* Marsh Alliance

Common Name (Translated Scientific Name): Common Spikerush - Pale Spikerush Marsh Alliance

Colloquial Name: Common Spikerush - Pale Spikerush Marsh

Type Concept: This herbaceous wetland alliance is characterized by an herbaceous layer that is dominated or codominated by *Eleocharis palustris* and/or *Eleocharis macrostachya*. Associates include *Carex praegracilis*, *Deschampsia cespitosa*, *Distichlis spicata*, *Juncus arcticus* ssp. *littoralis* (= *Juncus balticus*), *Muhlenbergia asperifolia*, *Panicum virgatum*, *Phalaris arundinacea* (= *Phalaroides arundinacea*), and *Spartina pectinata*. Forb cover is also variable and may include *Berula erecta*, *Caltha leptosepala*, *Iris missouriensis*, *Lemna* spp., *Mentha arvensis*, *Pedicularis groenlandica*, *Potamogeton* spp., *Ranunculus cymbalaria*, *Rhodiola integrifolia*, *Nasturtium officinale* (= *Rorippa nasturtium-aquaticum*), *Rumex crispus*, and *Sparganium angustifolium*. Stands occur in shallow, mostly still water throughout much of the western United States and into northern Mexico, from sea level to upper montane altitudes. Stands occur on a variety of landforms, including lake margins, stream terraces, floodplains, gravel bars, and around springs or wet basins (cieneegas).

Classification Comments: This alliance is primarily a freshwater alliance, although some stands may become brackish as ponds dry.

Internal Comments:

Other Comments:

Similar NVC Types:

- A4177 *Eleocharis macrostachya* Vernal Pool Alliance

Diagnostic Characteristics: Diagnostic of this herbaceous wetland alliance is the dominance or codominance of *Eleocharis palustris* and/or *Eleocharis macrostachya* and the presence of surface water for extended periods during the growing season.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a rhizomatous perennial that dominates the graminoid stratum (up to 70% cover). The forb layer is sparse (0-20%) and contains both aquatic and terrestrial species.

Floristics: Associations within this alliance are dominated by *Eleocharis palustris* and/or *Eleocharis macrostachya*. Cover ranges from sparse to quite dense (10-80%). *Distichlis spicata* and *Muhlenbergia asperifolia* codominate the graminoid layer in cienegas (Arizona and New Mexico). Forb cover is composed of *Berula erecta* and *Nasturtium officinale* (= *Rorippa nasturtium-aquaticum*), especially in stands with deep water (Cross 1991). At higher montane elevations, other graminoids present include *Carex aquatilis*, *Carex buxbaumii*, *Carex utriculata*, *Deschampsia cespitosa*, and *Eleocharis rostellata*. Forb cover is typically low, but can be up to 25% in some stands. Common forb species include *Caltha leptosepala*, *Pedicularis groenlandica*, and *Rhodiola integrifolia* (Hansen et al. 1995, Kittel et al. 1999a). Crowe and Clausnitzer (1997) state that *Eleocharis palustris* is an aggressive species, typically excluding other species from establishing. In Oregon stands, associated forbs include *Iris missouriensis*, *Mentha arvensis*, *Ranunculus cymbalaria*, and *Rumex crispus*.

In California, forb cover can be quite high, and a mixture of forbs will infrequently dominate the community. However, it is the cover of *Eleocharis*, which typically exceeds 50%, that distinguishes this community from others with high forb cover. Forbs present include *Berula erecta*, *Centaurea solstitialis*, *Euthamia occidentalis*, *Hydrocotyle umbellata*, *Melilotus indicus*, *Mentha arvensis*, *Mimulus guttatus*, *Perideridia parishii*, *Polygonum bistortoides*, *Pseudognaphalium canescens ssp. beneolens* (= *Gnaphalium canescens ssp. beneolens*), *Ranunculus californicus*, *Nasturtium officinale*, *Sonchus asper* (= *ssp. asper*), *Stachys pycnantha*, *Symphytotrichum spathulatum* (= *Aster occidentalis*), *Trifolium wormskioldii*, and *Urtica dioica ssp. holosericea*. In vernal pools and other seasonally flooded wetlands, other forbs include *Eryngium castrense* and/or *Eryngium vaseyi*, *Juncus sp.*, *Plagiobothrys stipitatus var. micranthus*, and *Psilocarphus brevissimus var. brevissimus*. Graminoids present include the characteristic *Eleocharis macrostachya*, with *Aira caryophyllea*, *Bromus arenarius*, *Bromus hordeaceus*, *Carex barbarae*, *Carex nebrascensis*, *Carex spp.*, *Eleocharis acicularis*, *Eleocharis rostellata*, *Juncus bufonius*, *Juncus effusus var. pacificus*, *Juncus nevadensis*, *Lemna minor*, *Lolium perenne ssp. multiflorum* (= *Lolium multiflorum*), *Polypogon monspeliensis*, *Schoenoplectus americanus* (= *Scirpus americanus*), and *Vulpia myuros*.

ENVIRONMENT & DYNAMICS

Environmental Description: Elevation ranges from sea level in California to 3050 m in Colorado. Stands occur on a variety of landforms, including lake margins, stream terraces, floodplains, gravel bars, and wet basins (cienegas) or meadows. Stands occur on sites that are flat, 1% slope with all aspects (Crowe and Clausnitzer 1997). Most sites are permanently flooded or permanently saturated, but occasionally they can be seasonally saturated or seasonally flooded. Water is characteristically supplied from surface sheeting or subsurface flows originating upstream or upslope from the site. Soils vary from Histosols to Entisols. High-elevation stands consistently occur on organic (highly sapric) soils, or on a thick organic horizon that overlays fine to coarse alluvial material. Lower elevation stands occur on fresh alluvial deposits of fine-textured loamy sands, clays, and sandy clays (Kittel et al. 1999a). Soil reaction is often alkaline (Hansen et al. 1988). All sites are saturated throughout much of the growing season. Oregon stands are located on soils derived from volcanic (andesite, basalt) or sedimentary parent materials (Crowe and Clausnitzer 1997).

At higher elevation, *Carex aquatilis* or *Carex utriculata* meadows and *Salix wolfii* or *Salix planifolia* shrublands occur within the riparian mosaic. At lower elevation, *Schoenoplectus pungens* often occurs within the stream channel while wet meadow prairies of *Panicum virgatum* and *Sorghastrum nutans* occupy the immediate streambanks and low floodplains.

Dynamics: At lower elevation, *Eleocharis palustris* plant associations occur well within the active channel and are inundated annually. These early-seral communities colonize backwater eddies and shallow edges of slow-moving reaches of small and larger rivers. The stands are probably ephemeral, as the eddies and river edges are scoured out each year during high spring flows (Kittel et al. 1999a). These communities have also been described as early-seral stages by Padgett et al. (1989), who describe light-colored soils for the sites, indicating an early phase of soil development. Kovalchik (1987) reports that the lower elevation plant associations within this alliance frequently form seral communities in ponded sites between stream rehabilitation structures such as loose rock check dams. In the montane zone, associations within this alliance occur in ponded sites on faster moving streams. If siltation occurs,

sites may become dominated by *Carex utriculata*. At higher elevations, the associations appear to be stable. Stands occur near seeps on soils with deep organic layers, often sapric, and are saturated throughout the growing season.

Crowe and Clausnitzer (1997) state that *Eleocharis palustris* is of little to no forage value to livestock and wild ungulates. On seasonally drier sites, ungulate trampling may cause this species to increase (Snyder 1992 as cited in Crowe and Clausnitzer 1997). However, this species does provide seed forage and cover to ducks and geese (Kovalchik 1987).

DISTRIBUTION

Geographic Range: This alliance is found in eastern Oregon and Washington, northeastern California, in the Sierra Nevada, Nevada, Idaho, Montana, Wyoming, Colorado, Utah, Arizona and New Mexico, and into northern Mexico.

Nations: MX, US

States/Provinces: AZ, CA, CO, ID, MT, MXSO, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Carex* spp. Series (Johnston 1987)
- ? *Eleocharis macrostachya* (Pale spike rush marshes) Alliance (Sawyer et al. 2009) [45.230.00]
- ? *Eleocharis macrostachya* Herbaceous Alliance (CNPS 2017) [45.230.00]
- ? Montane, Plains, and Great Basin Marshlands (Brown 1982a)

LOWER LEVEL UNITS

Associations:

- CEGLO02634 *Eleocharis palustris* - *Carex praegracilis* - *Berula erecta* Marsh
- CEGLO05662 *Carex atherodes* Interior West Wet Meadow

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel, D. Culver, and M.J. Russo

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Baker 1983c, Baker and Kennedy 1985, Brotherson 1987, Brotherson and Barnes 1984, Brown 1982a, Bunin 1985, CNPS 2017, Cronquist et al. 1977, Cross 1991, Crowe and Clausnitzer 1997, Durkin et al. 1995a, Ellis et al. 1979, Faber-Langendoen et al. 2017b, Flowers 1962, Hall and Hansen 1997, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Hendrickson and Minckley 1984, Johnston 1987, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1999a, Kovalchik 1987, Kovalchik 1993, Manning and Padgett 1995, Muldavin et al. 2000a, Mutel 1973, Mutel and Marr 1973, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1919a, Ramaley 1942, Reid et al. 1994, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shupe et al. 1986, Stearns-Roger, Inc. 1978, Stewart 1940, Sturges 1968, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G531. Arid West Interior Freshwater Marsh

A3892. *Equisetum fluviatile* - *Equisetum x ferrissii* Marsh Alliance

Type Concept Sentence: This alliance contains marshes dominated by emergent *Equisetum fluviatile*, *Equisetum laevigatum*, and/or *Equisetum x ferrissii* all of which can form monotypic stands. The water is shallow (<1 m) over mineral soils, usually sand/or silt, along wave-washed shores and stream channels of the western U.S. and Canada.

OVERVIEW

Scientific Name: *Equisetum fluviatile* - *Equisetum x ferrissii* Marsh Alliance

Common Name (Translated Scientific Name): Water Horsetail - Ferriss' Horsetail Marsh Alliance

Colloquial Name: Western Horsetail Marsh

Type Concept: This herbaceous alliance of shallow emergent marshes is dominated by *Equisetum fluviatile*, *Equisetum laevigatum*, and/or *Equisetum x ferrissii* as the most abundant species, which can form monotypic stands. In mixed stands, the graminoids

Agrostis gigantea, *Alopecurus aequalis*, *Carex aquatilis*, *Carex rostrata*, *Carex utriculata*, *Eleocharis palustris* (= *Eleocharis smallii*), *Glyceria grandis*, *Juncus arcticus* ssp. *littoralis* (= *Juncus balticus*), *Muhlenbergia asperifolia*, *Scirpus* and/or *Schoenoplectus* spp., and the forbs *Bidens cernua*, *Epilobium leptophyllum*, *Galium trifidum*, *Mentha arvensis*, and *Scutellaria galericulata* may be present. Ponds are shallow (<1 m in depth), over mineral soils, usually sand or silt, located along wave-washed shores or lakes or stream channels, including the tidal reaches of the Columbia River. The water is nearly fresh with a very low salt content. In Montana, British Columbia and Alberta, stands occur in still water and on wet ground along the margins of ponds or protected bays in lakes and backwater areas of streams.

Classification Comments:

Internal Comments: MSR 1-17: AK removed. One of the associations in this alliance is probably very broad, and needs splitting.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Stands dominated by *Equisetum fluviatile*, *Equisetum laevigatum*, and/or *Equisetum x ferrissii*.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a moderate to dense cover of emergent graminoids. The graminoids are rhizomatous perennials and the majority are less than 1 m in height. Few forb species are present.

Floristics: This herbaceous alliance contains stands dominated by *Equisetum fluviatile*, *Equisetum laevigatum*, and/or *Equisetum x ferrissii* as the most abundant species, which may form monotypic stands. In mixed stands, the graminoids *Agrostis gigantea*, *Alopecurus aequalis*, *Carex aquatilis*, *Carex rostrata*, *Carex utriculata*, *Eleocharis palustris* (= *Eleocharis smallii*), *Glyceria grandis*, *Juncus balticus*, *Muhlenbergia asperifolia*, *Scirpus* and/or *Schoenoplectus* spp., and the forbs *Bidens cernua*, *Cirsium arvense*, *Epilobium leptophyllum*, *Galium trifidum*, *Mentha arvensis*, *Plantago lanceolata*, *Scutellaria galericulata*, and *Tragopogon dubius* may be present.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands are typically found in shallow (<1 m) water over mineral soils, usually sand or silt. Stands are often located along wave-washed shores and stream channels (Harris et al. 1996), along the tidal reaches of the Columbia River, in still water and wet ground along the margins of ponds or protected bays in lakes and backwater areas of streams (Hansen et al. 1995), or within narrow valley floors and low alluvial terraces of small perennial streams subject to periodic scouring from flooding. Elevations range from sea level to 1785 m (0-5855 feet), slopes generally do not exceed 8%, and aspect varies. Soils are alluvium derived from shales, sandstones or igneous rocks. The soil surface may be bare if flooding has occurred recently, or covered by a mat of older *Equisetum* stems. The water is nearly fresh with a very low salt content (Kunze 1994).

Dynamics: Clonal growth by means of rhizomes is a feature of the genus *Equisetum* and is very important to its ability to utilize groundwater and tolerate disturbance. A single rhizome system may cover hundreds of square feet (Hauke 1993). The rhizomes can penetrate to soil depths of 4 m in some circumstances (Page 1997). This deep rhizome growth gives the plants the ability to survive environmental disturbances such as plowing, burial, flooding, fire, and drought. *Equisetum* species have a remarkable ability to reproduce vegetatively. An extensive rhizome system allows *Equisetum* species to rapidly colonize disturbed areas (Hauke 1993). This ability gives *Equisetum* a distinct advantage over species requiring seed establishment or which have slow-growing rhizomes. The ability of *Equisetum* to survive and spread in areas of heavy sediment accumulation was dramatically demonstrated after the eruption of Mount St. Helens in 1980 when *Equisetum* formed almost monotypic stands in the newly deposited tephra (Rothwell 1996). The deep rhizome system of *Equisetum* also allows these plants to survive fire and rapidly recolonize burned-over sites (Sullivan 1993). It is probable that the vigorous and extensive rhizomatous habit of *Equisetum* has been very important to the long-term survival and spread of the genus (Hauke 1993). Fragmentation of rhizomes and stems allows *Equisetum* to disperse readily in suitable habitats where there is sufficient moisture. Even the aerial stem fragments can sprout and form new colonies (Wagner and Hammitt 1970). Hence, vegetative reproduction allows *Equisetum* clones to persist and spread even in the absence of sexual reproduction (Hauke 1993).

DISTRIBUTION

Geographic Range: This alliance occurs throughout the western U.S. and Canada.

Nations: CA, US

States/Provinces: AB, AZ, BC, ID, MT, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? Herbaceous and Sedge Wetlands (Chappell et al. 1997)
- >< Marsh: Spikerush - Water Horsetail: Mineral Substrate type (W6) (Harris et al. 1996)

LOWER LEVEL UNITS

Associations:

- C EGL002746 *Equisetum fluviatile* Marsh
- C EGL005394 *Equisetum x ferrissii* Marsh

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel, M. Damm, L. Allen, J. Coles, M. Reid

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Bursik and Moseley 1995, Chappell et al. 1997, Christy 1991, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Hansen et al. 1991, Hansen et al. 1995, Harris et al. 1996, Hauke 1993, Hitchcock et al. 1977a, Kovalchik 1993, Kunze 1994, MacKenzie and Moran 2004, Page 1977, Rothwell 1996, Sullivan 1993a, Wagner and Hammitt 1970, Willoughby et al. 2004

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G531. Arid West Interior Freshwater Marsh

A3894. *Paspalum distichum* Marsh Alliance

Type Concept Sentence: This alliance consists of dense, nearly monotypic stands dominated by *Paspalum distichum*. These stands are found on mud or sand flats, moist places, marshes and ditches of low valleys of Oregon, Washington, Nevada and California.

OVERVIEW

Scientific Name: *Paspalum distichum* Marsh Alliance

Common Name (Translated Scientific Name): Knotgrass Marsh Alliance

Colloquial Name: Knotgrass Marsh

Type Concept: This alliance consists of dense, nearly monotypic stands dominated by *Paspalum distichum*. Sites are on mud or sand flats, moist places, marshes and ditches that are flooded seasonally but dry out in summer while water tables are not far below the soil surface. Most occurrences are known from the Willamette Valley, the Columbia River floodplain and lowlands of California and Nevada.

Classification Comments:

Internal Comments: GK 4-14: Should this be in G525 Temperate Pacific Freshwater Wet Mudflat? It seems to occur in more than just mudflat situations. In addition, more information is needed on this alliance, especially about its diversity and where this association occurs.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Concentric rings of wet to drying vegetation around ponds and marshes dominated by *Paspalum distichum*.

VEGETATION

Physiognomy and Structure: Rhizomatous perennial graminoid growing in dense mats from 0.2 to 0.6 m (7-20 inches) tall.

Floristics: This alliance consists of dense, nearly monotypic stands dominated by *Paspalum distichum*.

ENVIRONMENT & DYNAMICS

Environmental Description: Sites are on mud or sand flats, moist places, marshes and ditches that are flooded seasonally but dry out in summer while water tables are not far below the soil surface.

Dynamics:

DISTRIBUTION

Geographic Range: Most occurrences are known from the Willamette Valley of Oregon, the Columbia River floodplain of Washington, and lowlands of California and Nevada.

Nations: US

States/Provinces: CA, NV?, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGL003320 *Paspalum distichum* Marsh

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Faber-Langendoen et al. 2017b

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G531. Arid West Interior Freshwater Marsh

A3895. *Schoenoplectus americanus* - *Schoenoplectus acutus* - *Schoenoplectus californicus* Marsh Alliance

Type Concept Sentence: This alliance covers western freshwater marshes where the most abundant species are *Schoenoplectus acutus*, *Schoenoplectus americanus*, *Schoenoplectus californicus*, *Bolboschoenus fluviatilis*, *Bolboschoenus maritimus*, *Schoenoplectus pungens*, *Schoenoplectus tabernaemontani*, and/or *Scirpus microcarpus*. Stands are found throughout the central midwestern and western U.S. and Canada on sites flooded (on average 1 m deep) for most of the growing season.

OVERVIEW

Scientific Name: *Schoenoplectus americanus* - *Schoenoplectus acutus* - *Schoenoplectus californicus* Marsh Alliance

Common Name (Translated Scientific Name): Chairmaker's Bulrush - Hardstem Bulrush - California Bulrush Marsh Alliance

Colloquial Name: Western Emergent Bulrush Marsh

Type Concept: This alliance contains freshwater marshes dominated by one or two species of *Schoenoplectus*, *Scirpus*, and/or *Bolboschoenus*, such as *Schoenoplectus acutus* (= *Scirpus acutus*), *Schoenoplectus americanus*, *Bolboschoenus fluviatilis* (= *Scirpus fluviatilis*), *Bolboschoenus maritimus* (= *Scirpus maritimus*), *Schoenoplectus pungens* (= *Scirpus pungens*), *Schoenoplectus tabernaemontani* (= *Scirpus tabernaemontani*), and/or *Scirpus microcarpus*. *Phragmites australis* may be present. This alliance occurs throughout the central midwestern and western U.S. and Canada. Stands are flooded for most of the growing season up to 1.5 m deep and often drain completely in the winter, exposing bare ground.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

- A3896 *Typha domingensis* - *Typha latifolia* - *Phragmites australis* ssp. *americanus* Western Marsh Alliance: can have stands codominated with *Schoenoplectus* or *Scirpus*, but the characteristic dominant is *Typha*.

NBR alliances

- A3903 *Bolboschoenus maritimus* - *Schoenoplectus californicus* Salt Marsh Alliance: includes tidal coastal salt marshes of the western Pacific coast.

Diagnostic Characteristics: Stands of emergent vegetation in shallow water (<2 m) dominated by *Bolboschoenus*, *Scirpus* spp. and/or *Schoenoplectus* spp.

VEGETATION

Physiognomy and Structure: Vegetation is characterized by medium to tall perennial graminoids which typically range from 1 m to over 2 m.

Floristics: The vegetation is moderately dense to dense. Stands are typically dominated by one or two species of *Bolboschoenus*, *Schoenoplectus*, and/or *Scirpus*, and often have several other species of graminoids and forbs that are much shorter in stature. Abundant species include *Phragmites australis*, *Schoenoplectus acutus* (= *Scirpus acutus*), *Schoenoplectus americanus*, *Bolboschoenus fluviatilis* (= *Scirpus fluviatilis*), *Bolboschoenus maritimus* (= *Scirpus maritimus*), *Schoenoplectus pungens* (= *Scirpus pungens*), *Schoenoplectus tabernaemontani* (= *Scirpus tabernaemontani*), and/or *Scirpus microcarpus*. Lower stature (and generally less abundant) species may include *Chenopodium incanum*, *Distichlis spicata* (on drier margins), *Monolepis nuttalliana*, *Picradeniopsis oppositifolia*, *Ruppia maritima*, *Suaeda calceoliformis*, amongst many others. Species composition and abundance can vary from year to year depending mostly on water level fluctuations and degree of salinity (which is generally mild). Floating aquatic species may also be present, such as *Lemna* spp. and *Utricularia macrorhiza*.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands of this alliance are flooded for most or all of the growing season and can have water levels from completely drained (exposed soil) to approximately 1.5 m deep, but are usually is less than 1 m. Within a stand, water levels can vary by up to 1 m during the year. The water is fresh to mildly saline. Some species are quite tolerant of saline conditions, but generally the salinity is mild or if strong than only seasonally so. Soils are deep, poorly drained muck, peat, or mineral.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance occurs throughout the central midwestern and western U.S. and Canada.

Nations: CA, US

States/Provinces: AB, AZ, BC, CA, CO, ID, KS, MT, ND, NM, NV, OK, OR, SD, TX, UT, WA, WY

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007): 322Ab:CCC, 341Fc:CCC, 341Fd:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Schoenoplectus acutus* (Hardstem bulrush marsh) Alliance (Sawyer et al. 2009) [52.122.00]
- > *Schoenoplectus acutus* Alliance (Hardstem bulrush marsh) (Buck-Diaz et al. 2012)
- > *Schoenoplectus americanus* Alliance (American bulrush marsh) (Buck-Diaz et al. 2012)
- > *Schoenoplectus americanus* Herbaceous Alliance (Evens et al. 2014)
- >< *Schoenoplectus californicus* (California bulrush marsh) Alliance (Sawyer et al. 2009) [52.114.00]
- > *Schoenoplectus californicus* Alliance (California bulrush marsh) (Buck-Diaz et al. 2012)
- > *Scirpus acutus-Scirpus californicus* Herbaceous Alliance (Keeler-Wolf and Evens 2006)
- >< *Scirpus microcarpus* (Small-fruited bulrush marsh) Alliance (Sawyer et al. 2009) [52.113.00]

LOWER LEVEL UNITS

Associations:

- CEG001587 *Schoenoplectus pungens* Marsh
- CEG001843 *Bolboschoenus maritimus* Marsh
- CEG001840 *Schoenoplectus acutus* Marsh
- CEG003469 *Schoenoplectus californicus* - *Typha latifolia* Salt Marsh
- CEG005988 *Schoenoplectus pungens* - *Distichlis spicata* Marsh
- CEG004592 *Schoenoplectus americanus* - *Flaveria chlorifolia* - (*Helianthus paradoxus*) Marsh
- CEG002623 *Schoenoplectus tabernaemontani* Temperate Marsh
- CEG005989 *Schoenoplectus pungens* - *Paspalum distichum* Marsh

- CEGLO01841 *Schoenoplectus americanus* Western Marsh
- CEGLO01585 *Schoenoplectus americanus* - *Eleocharis palustris* Marsh

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel and M.S. Reid

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Bradley 1970, Buck-Diaz et al. 2012, Evens et al. 2014, Faber-Langendoen et al. 2017b, Keeler-Wolf and Evens 2006, Keeler-Wolf and Vaghti 2000, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Sproul et al. 2011, VegCAMP and AIS 2013

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G531. Arid West Interior Freshwater Marsh

A3896. *Typha domingensis* - *Typha latifolia* - *Phragmites australis* ssp. *americanus* Western Marsh Alliance

Type Concept Sentence: This native alliance contains freshwater cattail marshes dominated by *Typha domingensis*, *Typha latifolia*, and/or *Phragmites australis* ssp. *americanus*, which can be monotypic stands or codominated by bulrush species such as *Schoenoplectus acutus*, *Schoenoplectus americanus*, or *Schoenoplectus pungens*. It is found most commonly along lake margins and in shallow basins, and occasionally in river backwaters in the semi-arid western U.S., including the semi-arid western Great Plains, and adjacent Canada, and possibly Mexico.

OVERVIEW

Scientific Name: *Typha domingensis* - *Typha latifolia* - *Phragmites australis* ssp. *americanus* Western Marsh Alliance

Common Name (Translated Scientific Name): Southern Cattail - Broadleaf Cattail - American Common Reed Western Marsh Alliance

Colloquial Name: Western Emergent Cattail - Common Reed Marsh

Type Concept: This alliance contains stands dominated by native species *Typha angustifolia*, *Typha domingensis*, and/or *Phragmites australis* ssp. *americanus* either alone as monotypic stands or in combination with other tall emergent freshwater marsh species. Associated species vary widely; they include many sedges such as *Carex aquatilis*, *Carex pellita* (= *Carex lanuginosa*), *Carex rostrata*, bulrushes such as *Schoenoplectus acutus* (= *Scirpus acutus*), *Schoenoplectus americanus* (= *Scirpus americanus*), and *Schoenoplectus heterochaetus* (= *Scirpus heterochaetus*), and broad-leaved herbs such as *Asclepias incarnata*, *Impatiens capensis*, *Sagittaria latifolia*, *Scutellaria lateriflora*, *Sparganium eurycarpum*, and *Verbena hastata*. It is found most commonly along lake margins and in shallow basins, and occasionally in river backwaters and other deep water habitats of the semi-arid western U.S., including the semi-arid western Great Plains, and adjacent Canada and possibly Mexico.

Classification Comments: This association is limited to the western U.S. and adjacent Mexico and Canada and is intended to cover the native stands of *Typha* and/or *Phragmites australis* ssp. *americanus*. Compare with similar monotypic stands in central Great Plains and eastern U.S. alliances. *Typha angustifolia* is considered to be non-native in the western U.S. and was removed as a nominal species from this alliance and placed into a ruderal marsh alliance. Disturbed stands may have *Typha angustifolia* present to codominant; monotypic stands of *Typha angustifolia* would indicate conversion to a ruderal vegetation type.

Internal Comments: KAS 8-17: The distributions and concepts of this alliance and its group G531 *Schoenoplectus* spp. - *Typha* spp. Interior Freshwater Marsh Group need to be better distinguished between A3487 *Typha angustifolia* - *Typha latifolia* - *Schoenoplectus* spp. Marsh Alliance and group G325 *Typha* spp. - *Schoenoplectus americanus* - *Scolochloa festucacea* Great Plains Freshwater Marsh Group. Cascading effect on associations also needs to be addressed. MX? added. mjr 1-17: CNPS recommends a rank of G5/S5.

Other Comments:

Similar NVC Types:

- A3895 *Schoenoplectus americanus* - *Schoenoplectus acutus* - *Schoenoplectus californicus* Marsh Alliance: can have bulrush - cattail marshes, but bulrushes are the dominant taxa.

Diagnostic Characteristics: Stands of emergent vegetation in shallow water (<2 m) dominated by native *Phragmites australis* ssp. *americanus* and/or native *Typha domingensis* or *Typha latifolia*.

VEGETATION

Physiognomy and Structure: Tall, emergent graminoid species, with cover usually dense, and averaging over 2 m, but <3 m in height. Shorter graminoids and forbs may be present, but typically are not abundant due to the dense cover of the taller species. When there is standing water during the growing season, floating and submerged aquatic species may be present.

Floristics: This alliance is characterized by the dominance of *Phragmites australis* ssp. *americanus*, *Typha domingensis*, and/or *Typha latifolia*, either alone or in combination with other tall emergent marsh species. Other graminoids commonly present can include *Carex aquatilis*, *Carex pellita* (= *Carex lanuginosa*), *Carex rostrata*, *Cyperus* spp., *Distichlis spicata*, *Eleocharis* spp., *Glyceria* spp., *Juncus* spp., *Schoenoplectus acutus* (= *Scirpus acutus*), *Schoenoplectus americanus* (= *Scirpus americanus*), *Schoenoplectus heterochaetus* (= *Scirpus heterochaetus*), *Schoenoplectus pungens* (= *Scirpus pungens*), *Schoenoplectus tabernaemontani* (= *Scirpus tabernaemontani*), and *Setaria magna*. Forbs may include *Ambrosia psilostachya*, *Anemopsis californica*, *Asclepias incarnata*, *Epilobium ciliatum*, *Glycyrrhiza lepidota*, *Hibiscus moscheutos*, *Impatiens capensis*, *Iva axillaris*, *Mentha arvensis*, *Polygonum amphibium*, *Sagittaria latifolia*, *Scutellaria lateriflora*, *Sparganium eurycarpum*, *Thelypteris palustris*, *Verbena hastata*, and many others. Aquatic species such as *Bacopa eisenii*, *Lemna minor*, *Potamogeton* spp., and *Sagittaria* spp. may be present and dominate the water surface (Anderson 1982, MNNHP 1993, Hansen et al. 1995).

Vegetative diversity and density are highly variable in response to water depth, water chemistry, and natural forces. Vegetation in this alliance may be natural or semi-natural and includes mixed stands of the nominal species, as well as essentially monospecific stands. *Typha* often occurs in pure stands, and can colonize areas recently exposed by either natural or human causes. These monospecific stands occur especially in artificial wetlands, such as borrow pits or ponds.

ENVIRONMENT & DYNAMICS

Environmental Description: These are palustrine and lacustrine non-tidal cattail marshes. Elevations range from near sea level to around 2000 m. Many have a muck-bottom zone bordering the shoreline, where cattails are rooted in the bottom substrate, and a floating mat zone, where the roots grow suspended in a buoyant peaty mat. This alliance occurs on hydric soils in wetlands, ditches, ponds, lakes, and rivers, as well as on shorelines and streambanks. Inundation is commonly 3-6 dm (1-2 feet) in depth but can be as deep as 1.5 m for a significant part of the growing season. Occurrences may display areas of open water, but emergent vegetation dominates (80% cover). Seasonal flooding during winter and spring or flooding during heavy rains help maintain these marshes by causing water exchange which replenishes freshwater and circulates nutrients and organic debris. Soils which support this community can be mineral or organic but are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. Sites can be inter-dune ponds, mainland ponds, impoundments and tanks with brackish water from storm flooding, storm tides, or island overwash, adjacent to shallow lakes or ponds (Bundy et al. 1996), in areas of standing water or subirrigation along major stream bottoms (Baker 1982b), or in old oxbows (Haase 1972). Running water is uncommon, except during periods of extensive irrigation runoff or because of high precipitation. Usually if the water table is below the surface, capillary action will keep the soil saturated to the surface. In Nevada, soils were described by Bundy et al. (1996) to be very deep, somewhat poorly drained and composed of fine-grained alluvium. They may be slightly saline, but not strongly so. *Typha domingensis* is more tolerant of alkaline conditions than *Typha latifolia*. Soils are characterized by accumulations of organic matter over deposits of fine silt and clay (Hansen et al. 1995), or loams, sandy loams, or coarse sand (Jones and Walford 1995, Bundy et al. 1996). *Typha* often occurs in pure stands, and can colonize areas recently exposed by either natural or human causes.

Dynamics: *Typha* species are prolific seed producers, spreading rapidly to become the early colonizers of wet mineral soil and will persist under wet conditions (Hansen et al. 1995). Roots and lower stems are well-adapted to prolonged submergence, but periods of draw-down are required for seed germination to occur (Hansen et al. 1995). Haase (1972) reported that *Typha domingensis* communities have expanded their distribution in the lower Gila River basin, due to increased irrigation runoff. *Typha angustifolia* occupies inundated and disturbed ground and can tolerate deeper water and higher alkalinity levels than *Typha latifolia* (Great Plains Flora Association 1986). These are important wetland communities for many species of birds and waterfowl. Hansen et al. (1995) report that in Montana heavy livestock use may convert stands to *Carex nebrascensis*-dominated communities.

DISTRIBUTION

Geographic Range: This alliance occurs throughout interior non-tidal marshes of the western U.S., including the semi-arid western Great Plains, and adjacent Canada, and possibly Mexico.

Nations: CA, MX?, US

States/Provinces: AB, AZ, BC, CA, CO, ID, MT, NE, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 4:C, 5:C, 6:C, 11:C, 12:C, 13:C, 14:C, 15:C, 16:C, 17:C, 23:C

USFS Ecoregions (2007): 261A:CC, 261B:CC, 262A:CC, 263A:CC, 322Ab:CCC, 322Al:CCC, 322B:CC, 322C:CC, 341D:CC, 341Fc:CCC, 342B:CC, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC, M262A:CC, M262B:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Channel Islands, Death Valley, Mojave); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Typha (angustifolia, domingensis, latifolia)* (Cattail marshes) Alliance (Sawyer et al. 2009) [52.050.00]
- = *Typha (angustifolia, domingensis, latifolia)* Alliance (Cattail marshes) (Buck-Diaz et al. 2012)
- = *Typha (angustifolia, domingensis, latifolia)* Herbaceous Alliance (Evens et al. 2014)
- = *Typha (angustifolia, latifolia) - (Scirpus spp.)* Semipermanently Flooded Herbaceous Alliance [Provisional] (Keeler-Wolf et al. 2012)
- = *Typha domingensis - Typha latifolia - Typha angustifolia* Western Herbaceous Emergent Alliance (Rodriguez et al. 2017)
- ? *Typha latifolia* Habitat Type (Hansen et al. 1995)
- = *Typha (angustifolia, domingensis, latifolia)* Herbaceous Alliance (CNPS 2017) [52.050.00]
- >> Bulrush-Cattail Series (Sawyer and Keeler-Wolf 1995)
- >> Cattail Series (Sawyer and Keeler-Wolf 1995)
- >> Cismontane Alkali Marsh (#52310) (Holland 1986b)
- >> Coastal Brackish Marsh (#52200) (Holland 1986b)
- >> Coastal and Valley Freshwater Marsh (#52410) (Holland 1986b)
- >> Montane Freshwater Marsh (#52430) (Holland 1986b)
- >> Transmontane Alkali Marsh (#52320) (Holland 1986b)
- >> Transmontane Freshwater Marsh (#52420) (Holland 1986b)

LOWER LEVEL UNITS**Associations:**

- CEGLO02010 *Typha (latifolia, angustifolia)* Western Marsh
- CEGLO06866 *Phragmites australis ssp. americanus* Native Western Marsh
- CEGLO01845 *Typha domingensis* Western Marsh

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel, M.S. Reid and K.A. Schulz

Acknowledgments:

Version Date: 2017/08/14

REFERENCES

References: Apfelbaum 1985, Baker 1982b, Baker and Kennedy 1985, Buck-Diaz et al. 2012, Bundy et al. 1996, Bunin 1985, CNPS 2017, Christy 1973, Cronquist et al. 1977, DiTomaso and Healy 2007, Dilts and Weisberg 2010, Evens and Kentner 2006, Evens and San 2006, Evens et al. 2014, Faber-Langendoen et al. 2017b, Ferren et al. 1996b, Grace and Wetzel 1981, Great Plains Flora Association 1986, Haase 1972, Hansen et al. 1991, Hansen et al. 1995, Hickson and Keeler-Wolf 2007, Holland 1986b, Jones and Walford 1995, Junak et al. 2007, Keeler-Wolf and Evens 2006, Keeler-Wolf and Vaghti 2000, Keeler-Wolf et al. 2012, Kittel et al. 1996, Kittel et al. 1999a, Klein et al. 2007, Komarkova 1976, Komarkova 1986, Kovalchik 1993, Lambert et al. 2016, Lambertini 2016, Lindauer 1978, Lindauer and Christy 1972, MacDonald 1988, Masek 1979, McEachern 1979, Mitsch and Gosselink 1993, Muldavin et al. 1993b, Muldavin et al. 2000a, Padgett et al. 1989, Pickart 2006, Rocchio pers. comm., Rodriguez et al. 2017, Sada and Cooper 2012, Saltonstall 2002, Saltonstall et al. 2004, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Simkins 1931, Smith and Allred 2016, Sproul et al. 2011, TNC 1995b, Thorne 1982, VegCAMP and AIS 2013, Youngblood et al. 1985a, Zedler 1982

M075. Western North American Montane-Subalpine-Boreal Marsh, Wet Meadow & Shrubland

This macrogroup contains montane to subalpine and alpine wet meadows, marshes and wet shrublands throughout the Rocky Mountains of the U.S. and Canada, the Sierra Nevada, and Intermountain cordillera. Dominant species include graminoids such as *Calamagrostis canadensis*, *Carex scopulorum*, *Carex utriculata*, *Glyceria striata*, forbs such as *Caltha leptosepala*, *Dodecatheon jeffreyi*, *Sibbaldia procumbens*, and shrub species such as, but not limited to, *Alnus incana*, *Betula occidentalis*, *Betula glandulosa*, and many *Salix* species.

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

2.C.4.Nb.2.a. M075 Western North American Montane-Subalpine-Boreal Marsh, Wet Meadow & Shrubland

G526. Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland

Type Concept Sentence: This group consists of riparian shrublands dominated by low to tall shrubs such as *Acer glabrum*, *Artemisia* spp., *Cornus sericea*, *Crataegus* spp., *Dasiphora fruticosa* ssp. *floribunda*, *Forestiera pubescens*, *Oplopanax horridus*, *Philadelphus lewisii*, *Prunus virginiana*, *Rhus trilobata*, *Rosa* spp., *Salix* spp., *Shepherdia argentea*, and *Symphoricarpos* spp. They do not occur up in the mountains, but rather in between mountain valleys and lowlands of the Interior West.

OVERVIEW

Scientific Name: *Salix exigua* - *Crataegus* spp. - *Forestiera pubescens* Rocky Mountain-Great Basin Riparian Shrubland Group

Common Name (Translated Scientific Name): Narrowleaf Willow - Hawthorn species - Stretchberry Rocky Mountain-Great Basin Riparian Shrubland Group

Colloquial Name: Silver Sagebrush Wet Shrubland

Type Concept: These short to tall shrublands (0.5-5 m in height) occur along streams at and below lower treeline, that is, not up in the mountains, but in between mountain valleys and lowlands of the Interior West. Dominant shrubs include *Acer glabrum*, *Artemisia cana*, *Artemisia cana* ssp. *bolanderi*, *Artemisia cana* ssp. *viscidula*, *Artemisia tridentata* ssp. *tridentata*, *Cornus sericea*, *Crataegus douglasii*, *Crataegus rivularis*, *Dasiphora fruticosa* ssp. *floribunda*, *Forestiera pubescens*, *Oplopanax horridus*, *Philadelphus lewisii*, *Prunus virginiana*, *Rhus trilobata*, *Rosa nutkana*, *Rosa woodsii*, *Salix exigua*, *Salix irrorata*, *Salix melanopsis*, *Shepherdia argentea*, and *Symphoricarpos* spp. Herbaceous layers are often dominated by *Athyrium filix-femina*, *Carex flava* (= *Carex nevadensis*), *Carex* spp., *Elymus trachycaulus*, *Equisetum arvense*, *Deschampsia cespitosa*, *Festuca idahoensis*, *Galium triflorum*, *Glyceria striata*, *Gymnocarpium dryopteris*, *Heracleum maximum*, *Iris missouriensis*, *Juncus arcticus* ssp. *littoralis* (= *Juncus balticus*), *Juncus* spp., *Leymus cinereus*, *Maianthemum stellatum*, *Muhlenbergia filiformis*, *Muhlenbergia richardsonis*, *Pascopyrum smithii*, *Poa cusickii*, and *Poa secunda* (= *Poa nevadensis*). Introduced forage species such as *Agrostis stolonifera*, *Poa pratensis*, *Phleum pratense*, and the invasive annual *Bromus tectorum* are often present in disturbed stands. Streams are permanent, intermittent and ephemeral. Stands occur in steep-sided canyons or in broad flat valleys. They can be large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. They also are typically found in backwater channels and other perennially wet but less scoured sites, such as floodplain swales and irrigation ditches, and they can occur in depressional wetlands and non-alkaline playas. Stands may also occur on upper benches away from active channel movement. Willow-dominated shrublands require flooding and bare gravels for reestablishment. Stands are maintained by annual flooding and hydric soils throughout the growing season. Sites are subject to temporary flooding during spring runoff. The water table is often just below the ground surface. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks and upper benches, and occasionally on hillslope springs. This group occurs throughout the Rocky Mountain and Colorado Plateau regions from approximately 780 to 1850 m (2560-6000 feet) in elevation, around the edges and between the mountain ranges of the Great Basin and along the lower eastern slope of the Sierra Nevada at about 1220 m (4000 feet) in elevation, at lowland and montane elevations in the Columbia Plateau, on the periphery of the mountains surrounding the Columbia River Basin, and along major tributaries and the main stem of the Columbia at relatively low elevations. It also occurs in the foothills of the northern Rocky Mountains and the east slopes of the Cascades in the lower montane and foothill zones. Climate is generally semi-arid.

Classification Comments: This group represents a range of short to tall shrubs (0.5-5 m in height). This group also represents lower elevation and foothill elevations shrublands. Higher elevation shrublands belong to Western Montane-Subalpine Riparian & Seep Shrubland Group (G527).

Similar NVC Types:

- G322 Vancouverian Wet Shrubland
- G527 Western Montane-Subalpine Riparian & Seep Shrubland: includes riparian shrublands that occur at high elevations and are dominated by more montane species, for example *Salix monticola*.
- G545 Colorado Plateau Hanging Garden Seep
- G568 Great Plains Riverscour Vegetation
- G337 Great Plains Riparian Wet Meadow & Shrubland

Diagnostic Characteristics: Short to tall (0.5-5 m) riparian and wetland shrublands at foothill and lower elevations of the temperate interior West.

VEGETATION

Physiognomy and Structure: Wetland and mesic shrublands dominated by short to tall shrubs (0.5-5 m).

Floristics: Dominant shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia cana* ssp. *bolanderi*, *Artemisia cana* ssp. *viscidula*, *Artemisia cana*, *Artemisia tridentata* ssp. *tridentata*, *Cornus sericea*, *Crataegus douglasii*, *Crataegus rivularis*, *Dasiphora fruticosa* ssp.

floribunda, *Forestiera pubescens*, *Oplopanax horridus*, *Philadelphus lewisii*, *Prunus virginiana*, *Rhus trilobata*, *Rosa nutkana*, *Rosa woodsii*, *Salix exigua* (= *ssp. exigua*), *Salix irrorata*, *Salix melanopsis*, *Shepherdia argentea*, and *Symphoricarpos* spp. Herbaceous layers are often dominated by *Athyrium filix-femina*, *Carex flava* (= *Carex nevadensis*), *Carex* spp., *Elymus trachycaulus*, *Equisetum arvense*, *Deschampsia cespitosa*, *Festuca idahoensis*, *Galium triflorum*, *Glyceria striata*, *Gymnocarpium dryopteris*, *Heracleum maximum*, *Iris missouriensis*, *Juncus arcticus ssp. littoralis* (= *Juncus balticus*), *Juncus* spp., *Leymus cinereus*, *Maianthemum stellatum*, *Muhlenbergia filiformis*, *Muhlenbergia richardsonis*, *Pascopyrum smithii*, *Poa cusickii*, and *Poa secunda* (= *Poa nevadensis*).

Introduced forage species such as *Agrostis stolonifera*, *Poa pratensis*, *Phleum pratense*, and the invasive annual *Bromus tectorum* are often present in disturbed stands. Floristic information was compiled from the following sources: Daubenmire (1952), Johnson and Simon (1985), Kovalchik (1987, 1992), Hansen et al. (1989), Manning and Padgett (1989, 1995), Padgett et al. (1989), Szaro (1989), MacKinnon et al. (1990), Banner et al. (1993), Delong et al. (1993), Sawyer and Keeler-Wolf (1995), Walford (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), Walford et al. (1997, 2001), Kittel et al. (1999b), Muldavin et al. (2000a), Delong (2003), MacKenzie and Moran (2004), and Sawyer et al. (2009).

ENVIRONMENT & DYNAMICS

Environmental Description: *Climate:* Climate is generally semi-arid continental with typically cold winters and hot summers.

Soil/substrate/hydrology: These shrublands occur along all streams at and below lower treeline, that is, not up in the mountains, but in the between- mountain valleys and lowlands of the interior west. Streams are permanent, intermittent and ephemeral. Stands occur in steep-sided canyons or in broad flat valleys. They can be large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. They also are typically found in backwater channels and other perennially wet but less scoured sites, such as floodplain swales and irrigation ditches, and they can occur in depressional wetlands and non-alkaline playas, on hillside seeps and springs. These shrublands require flooding and bare gravels for reestablishment. Willow-dominated stands are maintained by annual flooding and hydric soils throughout the growing season. Sites are subject to temporary flooding during spring runoff. The water table is often just below the ground surface. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, immediate streambanks and upper benches. Soils are typically alluvial deposits of sand, clays, silts and cobbles that are highly stratified with depth due to flood scour and deposition. Highly stratified profiles consist of alternating layers of clay loam and organic material with coarser sand or thin layers of sandy loam over very coarse alluvium. Soils are fine-textured with organic material over coarser alluvium. Some soils are more developed due to a slightly more stable environment and greater input of organic matter. Environmental information was compiled from the following sources: Daubenmire (1952), Johnson and Simon (1985), Kovalchik (1987, 1992), Hansen et al. (1989), Manning and Padgett (1989, 1995), Padgett et al. (1989), Szaro (1989), MacKinnon et al. (1990), Banner et al. (1993), Delong et al. (1993), Sawyer and Keeler-Wolf (1995), Walford (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), Walford et al. (1997, 2001), Kittel et al. (1999b), Muldavin et al. (2000a), Delong (2003), MacKenzie and Moran (2004), and Sawyer et al. (2009).

Dynamics: Willow-dominated associations are disturbance-driven systems that require flooding, scour and deposition for germination and maintenance. Livestock grazing is a major influence in altering structure, composition, and function of the community (Baker 1988, 1989a, Padgett et al. 1989).

DISTRIBUTION

Geographic Range: This group is found throughout the Rocky Mountain and Colorado Plateau regions from approximately 900 to 1850 m (3000-6000 feet) in elevation, in the mountain ranges of the Great Basin and along the eastern slope of the Sierra Nevada from about 1220 m (4000 feet) in elevation, at lowland and montane elevations in the Columbia Plateau, on the periphery of the mountains surrounding the Columbia River Basin, and along major tributaries and the main stem of the Columbia at relatively low elevations. It also occurs in the northern Rocky Mountains and the east slopes of the Cascades in the lower montane and foothill zones.

Spatial Scale & Pattern [optional]: Linear, Small patch

Nations: CA, US

States/Provinces: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 6:C, 7:C, 8:C, 9:C, 11:C, 12:C, 18:C, 19:C, 20:C, 25:C, 26:C, 68:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 322A:CC, 331A:CC, 331B:CC, 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 331K:C?, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CP, M261D:CC, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< Other Sagebrush Types (408) (Shiflet 1994) [*Artemisia cana* ssp. *viscidula* shrublands are included.]
- < Riparian (422) (Shiflet 1994)

LOWER LEVEL UNITS**Alliances:**

- A3800 *Salix exigua* - *Salix irrorata* Shrubland Alliance
- A2557 *Artemisia cana* Wet Shrubland Alliance
- A3799 *Rhus trilobata* - *Crataegus rivularis* - *Forestiera pubescens* Shrubland Alliance

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2011)

Author of Description: G. Kittel

Acknowledgments: J. Nachlinger, K. Schulz, J. Kagan, M.S. Reid

Version Date: 12/02/2015

Classif Resp Region: West

Internal Author: GK 12-10, 9-13, 12-15, 7-16

REFERENCES

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Banner et al. 1993, Barbour and Billings 1988, Carsey et al. 2003a, Crowe and Clausnitzer 1997, Daubenmire 1952, DeLong 2003, DeLong et al. 1993, Eyre 1980, Faber-Langendoen et al. 2017a, Hansen et al. 1988b, Hansen et al. 1989, Johnson and Simon 1985, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, MacKenzie and Moran 2004, MacKinnon et al. 1990, Manning and Padgett 1989, Manning and Padgett 1995, Muldavin et al. 2000a, Padgett et al. 1989, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shiflet 1994, Steen and Coupé 1997, Szaro 1989, Walford 1996, Walford et al. 1997, Walford et al. 2001

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G526. Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland

A2557. *Artemisia cana* Wet Shrubland Alliance

Type Concept Sentence: This alliance consists of stands dominated by *Artemisia cana* ssp. *viscidula* or *Artemisia cana* ssp. *bolanderi*. It occurs in relatively moist environments, including riparian areas, alkaline or saline playa lakes, and is found throughout the northern half of the Intermountain West.

OVERVIEW

Scientific Name: *Artemisia cana* Wet Shrubland Alliance

Common Name (Translated Scientific Name): Silver Sagebrush Wet Shrubland Alliance

Colloquial Name: Silver Sagebrush Wet Shrubland

Type Concept: This is an alliance of shrublands dominated by *Artemisia cana* ssp. *viscidula* or *Artemisia cana* ssp. *bolanderi* where the shrub layer ranges from 0.5-1.5 m tall and the canopy cover ranges from 10-60%. In most stands, *Artemisia cana* ssp. *viscidula* or *Artemisia cana* ssp. *bolanderi* is the only dominant shrub, although other shrubs can be present. Herbaceous cover can be abundant to very sparse, but perennial graminoids generally total less than 20% cover. Species include *Danthonia intermedia*, *Deschampsia cespitosa*, *Eleocharis palustris*, *Elymus elymoides*, *Festuca idahoensis*, *Festuca ovina*, *Festuca thurberi*, *Leymus cinereus*, *Muhlenbergia richardsonis*, *Poa cusickii*, and *Poa secunda* (= *Poa nevadensis*). It occurs in relatively moist environments, including riparian areas, alkaline or saline playa lakes. This alliance occurs throughout the northern half of the Intermountain West.

Classification Comments: Sites are subirrigated and are not always considered wet or riparian, but they are more moist than other upland sage types.

There are taxonomic problems with the subspecies of *Artemisia cana*. For example, according to Kartesz (1999), the subspecies *bolanderi* is not reported to occur in Oregon, but is reported to occur by the Oregon Natural Heritage Program. Thus, the distribution of this alliance is subject to change as updated information becomes available.

The relationship of this alliance to others dominated by *Artemisia cana* is unclear. The hydrological divisions in the *Artemisia cana* group are poorly distinguished, particularly in the literature. In montane and subalpine meadows and along riparian stringers of western mountain ranges, *Artemisia cana* communities are often the driest of the recognizable riparian habitats. This transitional position and the broad floodplains where these shrublands typically occur blur wetland/upland distinctions. Most of these riparian stands have been placed in the temporarily flooded alliance. Although these sites generally have seasonally saturated soils and shallow water tables, the frequency of flooding is probably highly variable.

Internal Comments:

Other Comments:**Similar NVC Types:**

- A3200 *Artemisia cana* ssp. *bolanderi* - *Artemisia cana* ssp. *viscidula* Steppe & Shrubland Alliance

Diagnostic Characteristics: Valley bottom stands dominated by *Artemisia cana* ssp. *viscidula* or *Artemisia cana* ssp. *bolanderi*.

VEGETATION

Physiognomy and Structure: These are microphyllous evergreen shrublands, often with a well-developed graminoid layer. Shrubs can be widely spaced or close together. When widely spaced, robust bunch or rhizomatous grasses can dominate the understory. The graminoids may exceed the shrubs in height and total cover in the open stands.

Floristics: In most stands, *Artemisia cana* ssp. *viscidula* or *Artemisia cana* ssp. *bolanderi* will be the only dominant shrub. *Artemisia tridentata* is the most consistent associate shrub species across the range of this alliance. Other shrubs may be common, including *Artemisia frigida*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Gutierrezia sarothrae*, *Purshia tridentata*, *Rosa woodsii*, *Symphoricarpos occidentalis*, or *Symphoricarpos oreophilus*. At higher elevations *Artemisia tridentata* ssp. *vaseyana* occasionally occurs, and in alkaline areas *Atriplex canescens*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), or *Sarcobatus vermiculatus* may be present. The herbaceous layer is usually well-represented, but bare ground may be common in particularly arid or disturbed stands. Important understory associates include *Achnatherum occidentale*, *Carex praegracilis*, *Danthonia intermedia*, *Deschampsia cespitosa*, *Distichlis spicata*, *Eleocharis palustris*, *Elymus caninus*, *Elymus elymoides*, *Elymus elymoides*, *Elymus trachycaulus*, *Festuca idahoensis*, *Festuca ovina*, *Festuca thurberi*, *Hesperostipa comata* (= *Stipa comata*), *Koeleria macrantha* (= *Koeleria nitida*), *Leymus cinereus*, *Muhlenbergia richardsonis*, *Nassella viridula*, *Pascopyrum smithii*, *Poa cusickii*, *Poa fendleriana* ssp. *fendleriana*, and *Poa secunda* (= *Poa nevadensis*). Common exotic associates include *Poa pratensis*, *Taraxacum officinale*, and *Agrostis stolonifera*. Among the forbs that are typically found are *Achillea millefolium*, *Arnica* spp., *Artemisia ludoviciana*, *Astragalus lentiginosus*, *Astragalus* spp., *Camissonia tanacetifolia*, *Cirsium foliosum*, *Conyza canadensis*, *Epilobium brachycarpum*, *Fragaria virginiana*, *Gnaphalium palustre*, *Hymenoxys hoopesii* (= *Helenium hoopesii*), *Linum perenne*, *Lupinus argenteus*, *Madia gracilis*, *Navarretia intertexta*, *Orthocarpus* ssp., *Perideridia gairdneri* ssp. *borealis* (= *Perideridia montana*), *Polycytenium fremontii*, *Potentilla gracilis*, *Rorippa* spp., *Symphotrichum campestre* var. *bloomeri* (= *Aster campestris* var. *bloomeri*), *Trifolium gymnocarpon*, and/or *Trifolium* spp.

ENVIRONMENT & DYNAMICS

Environmental Description: These shrublands are found between 1000 and 3300 m (3280-10,800 feet) in elevation. Stands occur on soils with a seasonally high table along low-gradient streams, in broad valleys, and in and around playas (internally drained basins with seasonal flooding). At its highest elevations, this alliance can be found in upland situations where more favorable soil conditions exist. Precipitation varies across the range, from less than 25 cm in semi-arid basins of southeastern Oregon, to over 90 cm in moist meadow habitats of the northern Rocky Mountains. The alliance occurs as an upper terrace community along mountain streams, where soils are saturated in spring and water tables remain within 0.5 m (2 feet) of the soil surface in May and June, dropping to 1.2-1.6 m (4-5.5 feet) below the soil surface in July through September. Other stands occur in valley bottoms without an active surface stream, but with subsurface irrigation. They can also occur in perennially moist, semi-alkaline playa lakebeds above 1065 m. Playas can be flooded for several months during the winter and early spring but rapidly dry up as the weather warms. Topography is usually mild, soils are fine to somewhat coarse alluvial soils, and some source of subsurface moisture is often present. Available water-holding capacity is moderately high. Some stands occur on well-drained, often sandy, glacial drift and sandy alluvium (Comer et al. 1999). Where herbaceous growth is vigorous and decomposition rates are low due to a high water table, soils may develop organic profiles.

Dynamics: This alliance is often grazed by domestic livestock and is strongly preferred during the growing season. Prolonged livestock use can decrease the abundance of native bunchgrasses and increase the cover of shrubs and non-native species, such as *Poa pratensis* and *Taraxacum officinale*. Unlike other *Artemisia* spp., *Artemisia cana* resprouts vigorously following spring fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance. Comparisons of grazed and protected (ungrazed) floodplain sites showed a tendency for *Artemisia cana* to occur more commonly in grazed than ungrazed sites with similar groundwater hydrology.

DISTRIBUTION

Geographic Range: This alliance is found west of the Continental Divide from the Rocky Mountains across the Great Basin to the Sierra Nevada and Cascade Range.

Nations: US

States/Provinces: CA, CO, ID, MT, NV, OR, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Artemisia cana* (Silver sagebrush scrub) Alliance (Sawyer et al. 2009) [35.150.00]
- = *Artemisia cana* Shrubland Alliance (CNPS 2017) [35.150.00]
- < SRM Cover Type #408 - Other Sagebrush Types (Shiflet 1994)

LOWER LEVEL UNITS

Associations:

- CEGLO01552 *Artemisia cana ssp. viscidula* / *Festuca idahoensis* Shrub Wet Meadow
- CEGLO01074 *Artemisia cana ssp. viscidula* / *Deschampsia cespitosa* Wet Shrubland
- CEGLO01076 *Artemisia cana ssp. viscidula* / *Festuca ovina* Wet Shrubland
- CEGLO01075 *Artemisia cana ssp. viscidula* - (*Salix* spp.) / *Festuca idahoensis* Wet Shrubland
- CEGLO05998 *Artemisia cana* / *Juncus arcticus ssp. littoralis* Wet Shrubland
- CEGLO01460 *Artemisia cana (ssp. bolanderi, ssp. viscidula)* / *Leymus cinereus* Wet Shrubland
- CEGLO02987 *Artemisia cana ssp. bolanderi* / *Eleocharis palustris* Wet Shrubland
- CEGLO01743 *Artemisia cana ssp. bolanderi* / *Muhlenbergia richardsonis* Wet Shrub Meadow
- CEGLO03475 *Artemisia cana ssp. bolanderi* / *Iris missouriensis* - *Juncus arcticus ssp. littoralis* Wet Shrubland
- CEGLO01548 *Artemisia cana (ssp. bolanderi, ssp. viscidula)* / *Poa secunda* Wet Shrubland

AUTHORSHIP

Primary Concept Source: S. Rust, D. Tart, D. Sarr, J. Tuhy, M.S. Reid, R.J. Rondeau, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Bramble-Brodahl 1978, CNPS 2017, Chappell et al. 1997, Comer et al. 1999, Cunningham 1971, Daubenmire 1970, Dealy 1971, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Francis 1983, Franklin and Dyrness 1973, Hansen et al. 1984, Hansen et al. 1991, Hansen et al. 1995, Hanson and Whitman 1938, Hess 1981, Hironaka et al. 1983, Jankovsky-Jones et al. 2001, Johnston 1987, Kartesz 1999, Kovalchik 1987, Manning and Padgett 1991, Manning and Padgett 1995, Mueggler and Stewart 1980, Mutz and Graham 1982, Mutz and Queiroz 1983, ORNHP unpubl. data, Padgett 1982, Padgett et al. 1988b, Padgett et al. 1989, Reid et al. 1994, Sarr 1995, Sawyer et al. 2009, Schlatterer 1972, Shiflet 1994, Soil Conservation Service 1978, Tiedemann et al. 1987, Tuhy 1981, Tuhy and Jensen 1982, Turner 1969, USFS 1992, Winward 1980b, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G526. Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland

A3799. *Rhus trilobata* - *Crataegus rivularis* - *Forestiera pubescens* Shrubland Alliance

Type Concept Sentence: This shrubland alliance is dominated by *Corylus cornuta*, *Crataegus rivularis*, *Elaeagnus commutata*, *Forestiera pubescens*, *Rhamnus alnifolia*, *Shepherdia argentea*, and/or *Rhus trilobata*. Usually these are single-species shrublands, but all occupy similar environments. It is an eclectic mix of mesic shrubs that form small, narrow stands at the base of steep hills and cliffs and along washes and upper benches and terraces of riparian areas in the Rocky Mountains and throughout the cool interior western U.S. These are "fringe" riparian shrublands that occur on upper benches and terraces, dry washes and areas near but not necessarily in the wettest part of riparian areas, but receive more moisture than surrounding upland slopes.

OVERVIEW

Scientific Name: *Rhus trilobata* - *Crataegus rivularis* - *Forestiera pubescens* Shrubland Alliance**Common Name (Translated Scientific Name):** Skunkbush Sumac - River Hawthorn - Stretchberry Shrubland Alliance**Colloquial Name:** Skunkbush Sumac - River Hawthorn - Stretchberry Shrubland

Type Concept: This semi-riparian shrubland alliance is dominated by *Corylus cornuta*, *Crataegus rivularis*, *Elaeagnus commutata*, *Forestiera pubescens*, *Rhamnus alnifolia*, *Shepherdia argentea*, and/or *Rhus trilobata*, generally in monotypic stands, but they can be mixed as well. Other shrub associates may include *Prunus virginiana*. It is an eclectic mix of mesic shrubs that form small, narrow stands at the base of steep hills and cliffs and along washes and upper benches and terraces of riparian areas. These are "fringe" riparian shrublands that occur on upper benches and terraces, dry washes and areas near but not necessarily in the wettest part of riparian areas, but which receive more moisture than surrounding upland slopes. Often these are single-species shrublands, but all

NBR alliances

occupy similar environments. The alliance has a broad north to south range in the Rocky Mountains and throughout the cool interior western U.S.

Classification Comments: Includes shrub species that generally do not form large stands in upland environments.

Internal Comments: mjr 12-14: CA added for MOJN.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Greater than 30% relative cover of *Corylus cornuta*, *Crataegus rivularis*, *Elaeagnus commutata*, *Forestiera pubescens*, *Rhamnus alnifolia*, and/or *Rhus trilobata*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a typically dense, cold-deciduous shrub layer (approximately 70% cover). The herbaceous layer is also dense and is dominated by perennial graminoids (80%). Forbs have relatively sparse cover (<20%), but have high diversity. Moss has high cover in some stands (70%).

Floristics: Stands have a dense layer of cold-deciduous shrubs (<2 m) that are dominated by *Amelanchier alnifolia*, *Elaeagnus commutata*, *Lonicera involucrata*, *Prunus virginiana*, *Rhamnus alnifolia*, *Ribes lacustre*, *Rosa woodsii*, and/or *Symphoricarpos albus*. A few other shrubs species, such as *Salix bebbiana* or *Salix exigua*, may be co-associates, but these are not abundant and do not characterize the stand. The herbaceous layer is typically dense with graminoids such as *Calamagrostis canadensis*, *Elymus glaucus*, *Elymus lanceolatus*, *Hesperostipa comata* (= *Stipa comata*), and *Koeleria macrantha*. Dominant forbs include *Dryas drummondii*, *Galium triflorum*, *Geum macrophyllum*, *Heracleum maximum* (= *Heracleum lanatum*), and *Maianthemum stellatum*. The spikemoss *Selaginella densa* can be abundant in some stands. Introduced grasses such as *Bromus inermis*, *Poa pratensis*, and *Phleum pratense* can also be abundant.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands are generally found on elevated benches along streams, on floodplains, adjacent to seeps and can form narrow stringers on stream terraces. Elevations range from approximately 700 to 2400 m. Sites are gently sloping and are temporarily flooded during spring runoff and high-intensity rainstorms. Soils are alluvial or may be well-developed Mollisols.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found throughout the Rocky Mountains and other areas of the cool interior western U.S. and is documented from eastern Oregon and Washington, Idaho, Alberta, Montana, Wyoming, Colorado, New Mexico, Utah and the highlands of northern Arizona.

Nations: CA, US

States/Provinces: AB, AZ, CA, CO, ID, MT, NM, OR, UT, WA, WY

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Mojave); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Forestiera pubescens* (Desert olive patches) Alliance (Sawyer et al. 2009) [61.580.00]
- > *Forestiera pubescens* Alliance (Desert olive patches) (Buck-Diaz et al. 2012)
- > *Forestiera pubescens* Shrubland Alliance (Evens et al. 2014)
- ? *Rhus trilobata* (Basket bush thickets) Provisional Alliance (Sawyer et al. 2009) [37.802.00]

LOWER LEVEL UNITS

Associations:

- CEG001098 *Elaeagnus commutata* Wet Shrubland
- CEG001132 *Rhamnus alnifolia* Riparian Wet Shrubland
- CEG001168 *Forestiera pubescens* Wet Shrubland
- CEG002889 *Crataegus rivularis* Wet Shrubland

- CEGLO02903 *Corylus cornuta* Wet Shrubland
- CEGLO01121 *Rhus trilobata* Moist Wet Shrubland
- CEGLO01108 *Prunus virginiana* - (*Prunus americana*) Wet Shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2016/10/17

REFERENCES

References: Buck-Diaz et al. 2012, Bursik and Moseley 1995, DeVelice et al. 1995, Evens et al. 2014, Faber-Langendoen et al. 2017b, Hansen and Hoffman 1988, Hansen et al. 1995, Harvey 1980, Jones 1992b, Sawyer et al. 2009, Thompson and Hansen 2002, VegCAMP and AIS 2013, Welsh et al. 1987, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G526. Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland

A3800. *Salix exigua* - *Salix irrorata* Shrubland Alliance

Type Concept Sentence: This riparian shrubland alliance is dominated by *Salix exigua*, *Salix irrorata*, and/or *Salix melanopsis*. The canopy is tall (2-5 m), and typically many-branched with continuous cover of 60-100%. Communities occur along streams throughout the western U.S. They are found in streambanks, marshes and wet ditches.

OVERVIEW

Scientific Name: *Salix exigua* - *Salix irrorata* Shrubland Alliance

Common Name (Translated Scientific Name): Narrowleaf Willow - Dewystem Willow Shrubland Alliance

Colloquial Name: Narrowleaf Willow - Dewystem Willow Shrubland

Type Concept: Dominant species are *Salix exigua*, *Salix interior*, *Salix irrorata*, and/or *Salix melanopsis*. It is typically a monotypic stand with some herbaceous understory; however, other shrubs and trees can be present. The herbaceous stratum can have sparse to moderate cover, including a variety of pioneer species. Other codominants may include *Populus fremontii*, *Populus deltoides*, *Populus angustifolia*, and *Acer negundo*. Other shrubs within this alliance consist of *Alnus incana*, *Cornus sericea*, *Rosa* spp., *Rubus idaeus* ssp. *strigosus* (= *Rubus strigosus*), *Ribes aureum*, *Ribes inerme*, and other *Salix* species. Common herbaceous species include *Artemisia ludoviciana*, *Epilobium* spp., *Equisetum* spp., *Fragaria virginiana* ssp. *glauca* (= *Fragaria ovalis*), *Geranium* spp., *Hackelia* spp., *Maianthemum stellatum*, *Mertensia ciliata*, *Osmorhiza occidentalis*, *Thalictrum fendleri*, and *Urtica dioica*. Non-native species can be abundant, such as *Poa pratensis*, *Bromus inermis*, *Taraxacum officinale*, and *Cirsium arvense*. Elevation ranges from 0 to 2950 m (0-9680 feet). These shrublands are found on open sand and gravel bars without tree canopy shading, on a wide variety of streams and rivers and even ditches. *Salix exigua* is one of the most common willows found throughout the western U.S. *Salix irrorata* has similar habitat, but a much more limited range of distribution. Stands are associated with annual flooding and inundation and will grow well into the active stream channel, where it is flooded, even in drier years. Even though flooding is frequent, surface water may not be present for much of the growing season, and the water table is well below the surface, especially in the warmer and hotter parts of the western U.S. Some stands form large, wide stands on mid-channel islands on larger rivers, or narrow stringer bands on small, rocky tributaries. Streams range widely from moderately sinuous and moderate-gradient reaches to broad, meandering rivers with wide floodplains or broad, braided channels. Many stands also occur within highly entrenched or eroding gullies.

Classification Comments: *Salix interior* Rowlee has been recently raised to species level and was formerly *Salix exigua* Nutt. subsp. *interior* (Rowlee) Cronquist. Stands west of the 100th meridian are included in the concept of this alliance, including those stands in eastern Wyoming, Montana, Colorado and New Mexico.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3646 *Salix interior* Riverscour Shrubland Alliance: occurs in the Great Plains, midwestern and eastern U.S.

Diagnostic Characteristics: Greater than 5% relative cover of *Salix exigua*, *Salix interior*, *Salix irrorata*, and/or *Salix melanopsis*.

VEGETATION

Physiognomy and Structure: The canopy is dominated by a tall (2-5 m), broad-leaved deciduous shrub that is typically many-branched with continuous cover of 60-100%. The herbaceous stratum is sparse to moderate cover, including a variety of pioneer species.

Floristics: Plant associations within this alliance are characterized as temporarily flooded cold-deciduous shrublands dominated by *Salix exigua*, *Salix irrorata*, *Salix melanopsis*, and/or *Salix interior*. The tall-shrub layer has 15-90% cover, ranging in height between 2-5 m. Other shrubs can occur in the canopy, including *Salix eriocephala*, *Salix lasiolepis*, *Salix ligulifolia*, *Salix lutea*, and/or *Salix monticola*. Occasionally, taller *Acer negundo*, *Alnus rhombifolia*, *Juglans hindsii*, *Populus angustifolia*, *Populus deltoides*, *Populus balsamifera*, *Populus fremontii*, *Salix gooddingii*, *Salix laevigata*, *Salix lucida*, *Salix amygdaloides*, or *Tamarix* spp. occur within the tree subcanopy. The herbaceous layer varies greatly over the broad range of the alliance. It may have as much as 20-35% cover of various graminoid species, including *Carex nebrascensis*, *Carex pellita* (= *Carex lanuginosa*), *Equisetum arvense*, *Muhlenbergia rigens*, *Panicum bulbosum*, *Phalaris arundinacea*, and *Spartina pectinata*. Other common herbaceous species include *Artemisia ludoviciana*, *Epilobium* spp., *Equisetum* spp., *Fragaria virginiana* ssp. *glauca* (= *Fragaria ovalis*), *Geranium* spp., *Hackelia* spp., *Maianthemum stellatum*, *Mertensia ciliata*, *Osmorhiza occidentalis*, *Glycyrrhiza lepidota*, *Thalictrum fendleri*, and *Urtica dioica*. Non-native species can be abundant, such as *Medicago sativa*, *Agrostis gigantea*, *Agrostis stolonifera*, *Poa pratensis*, *Bromus inermis*, *Melilotus officinalis*, *Taraxacum officinale*, *Cirsium arvense*, and/or *Trifolium repens*. The understory can also have no herbaceous growth at all and be completely barren ground, gravels or other alluvium.

ENVIRONMENT & DYNAMICS

Environmental Description: Plant associations within this alliance are located on floodplains and gravel bars at an elevational range between 0 and 2950 m (0-9680 feet) in the western U.S. These shrublands are found on open sandbars without canopy shading on large or small streams and rivers with sandy or cobble substrates. They are associated with annual flooding and inundation and will grow well into the active river channel, where it is flooded even in drier years. Even though flooding is frequent, surface water is not present for much of the growing season, and the water table is well below the surface, especially in warmer and drier parts of the western U.S. Some stands form large, wide stands on mid-channel islands on larger rivers, or narrow stringer bands on small, rocky tributaries. Stream reaches range widely from moderately sinuous and moderate-gradient reaches to broad, meandering rivers with wide floodplains or broad, braided channels. Many stands also occur within highly entrenched or eroding gullies. It can be found along wet ditches as well.

Soils of this alliance are typically coarse alluvial deposits of sand, silt and cobbles that are highly stratified with depth from flooding scour and deposition. The stratified profiles consist of alternating layers of clay loam and organic material with coarser sand or thin layers of sandy loam over very coarse alluvium. Occasionally, stands may occur on deep pockets of sand. The pH of the substrate ranges from 6.0-6.8 (Johnston 1987).

Dynamics: This alliance represents an early-seral primary successional stage on newly deposited sediments that may persist under a regime of repeated fluvial disturbance. *Salix exigua*, *Salix interior*, and *Salix irrorata* are highly adapted to most forms of disturbance, are prolific sprouters, and will re-establish themselves on sites dominated by other disturbance-associated species, e.g., *Glycyrrhiza lepidota* and *Pascopyrum smithii*.

DISTRIBUTION

Geographic Range: This alliance is found throughout the lower elevations of the Interior West from Arizona to Alberta west to California and Washington.

Nations: CA, US

States/Provinces: AB, AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Salix* spp. Series (Johnston 1987)
- ? Plains and Great Basin Riparian Wetlands (Brown 1982a)

LOWER LEVEL UNITS

Associations:

- CEGLO01198 *Salix exigua* / *Elymus x pseudorepens* Wet Shrubland
- CEGLO01214 *Salix irrorata* Wet Shrubland

- CEG001197 *Salix exigua* Riparian Wet Shrubland
- CEG002655 *Salix exigua* - *Salix ligulifolia* Wet Shrubland
- CEG001202 *Salix exigua* / Mesic Forbs Wet Shrubland
- CEG001204 *Salix exigua* - *Salix lucida* ssp. *caudata* Wet Shrubland
- CEG005656 *Salix exigua* / Gravel Bar Wet Shrubland
- CEG001201 *Salix exigua* / *Equisetum arvense* Wet Shrubland
- CEG005986 *Salix irrorata* / *Carex rostrata* Wet Shrubland
- CEG005987 *Salix irrorata* / *Eleocharis palustris* Wet Shrubland
- CEG005984 *Salix irrorata* - *Salix exigua* Wet Shrubland
- CEG005983 *Salix irrorata* - *Cornus sericea* ssp. *sericea* Wet Shrubland
- CEG005985 *Salix irrorata* - *Salix lucida* ssp. *lasiandra* Wet Shrubland
- CEG001203 *Salix exigua* / Mesic Graminoids Western Wet Shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2016/10/17

REFERENCES

References: Borchert et al. 2004, Brown 1982a, Brown et al. 1979, Christy 1973, Cooper and Cottrell 1990, Dale and Kuroda 1979, Dick-Peddie 1993, Dick-Peddie et al. 1984, Dorn 1997, Evenden 1990, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Hansen et al. 1989, Hansen et al. 1991, Hansen et al. 1995, Johnston 1987, Jones and Walford 1995, Kagan 1997, Kearney et al. 1969, Kittel 1994, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Kovalchik 1987, Martin and Hutchins 1980, Muldavin et al. 1993a, Muldavin et al. 1994a, Muldavin et al. 2000a, Myhre and Clements 1972, Padgett et al. 1988b, Padgett et al. 1989, Phillips 1977, Sawyer and Keeler-Wolf 1995, Shelford 1954, Szaro 1989, Thompson and Hansen 2002, Tuhy and Jensen 1982, Vaghti 2003, Weber 1990, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

2.C.4.Nb.2.b. M075 Western North American Montane-Subalpine-Boreal Marsh, Wet Meadow & Shrubland

G521. Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh

Type Concept Sentence: This group consists of wet meadows dominated by graminoids such as *Calamagrostis canadensis*, *Carex aquatilis*, *Carex utriculata*, and *Eleocharis palustris* or forbs such as *Camassia quamash*, *Cardamine cordifolia*, *Dodecatheon jeffreyi*, *Phippsia algida*, *Rorippa alpina*, *Senecio triangularis*, and *Veratrum californicum* found throughout low and high montane altitudes of the western U.S. and Canada.

OVERVIEW

Scientific Name: *Carex* spp. - *Calamagrostis* spp. Montane Wet Meadow & Marsh Group

Common Name (Translated Scientific Name): Sedge species - Reedgrass species Montane Wet Meadow & Marsh Group

Colloquial Name: Western Glaucous Bluegrass Wet Meadow

Type Concept: This group contains the wet meadows found in low and high montane and subalpine elevations, occasionally reaching into the lower edges of the alpine elevations (about 1000-3600 m), from California's Transverse and Peninsular ranges north to British Columbia's Coastal Mountains and from throughout the Rocky Mountains of Canada and the U.S. (including the Black Hills of South Dakota) and mountain ranges of the intermountain Interior West. Varying dominant herbaceous species include graminoids *Calamagrostis canadensis*, *Calamagrostis stricta*, *Carex bolanderi*, *Carex exsiccata*, *Carex illota*, *Carex microptera*, *Carex scopulorum*, *Carex utriculata*, *Carex vernacula*, *Deschampsia cespitosa*, *Eleocharis quinqueflora*, *Glyceria striata* (= *Glyceria elata*), *Juncus drummondii*, *Juncus nevadensis*, and *Scirpus* and/or *Schoenoplectus* spp. Forb species include *Camassia quamash*, *Cardamine cordifolia*, *Dodecatheon jeffreyi*, *Phippsia algida*, *Rorippa alpina*, *Senecio triangularis*, *Trifolium parryi*, and *Veratrum californicum*. Common but sparse shrubs may include *Betula glandulosa*, *Salix* spp., *Vaccinium macrocarpon*, and *Vaccinium uliginosum*. Wet meadows occur in open wet depressions, basins and flats with low-velocity surface and subsurface flows. They can be large meadows in montane or subalpine valleys, or occur as narrow strips bordering ponds, lakes and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Wet meadows can be tightly associated with snowmelt and typically are not subjected to high velocity disturbance, but can be

flooded by slow-moving waters. Soils are mostly mineral and show typical hydric soil characteristics such as low chroma and redoximorphic features; some areas may have high organic content as inclusions or pockets. Vegetation of this group can manifest as a mosaic of several plant associations, or be a monotypic stand of a single association which is dominated by graminoids or forbs.

Classification Comments:

Similar NVC Types:

- G520 Vancouverian-Rocky Mountain Subalpine-Alpine Snowbed, Wet Meadow & Dwarf-shrubland: is more or less a strictly alpine group that occurs at higher elevations with different dominant species, and is restricted to alpine or upper subalpine environments; however, it may be adjacent to or even overlap with G521 in some areas.
- G517 Vancouverian Freshwater Wet Meadow & Marsh: occurs at lower elevations within 2 miles of coast.
- G524 Western North American Ruderal Marsh, Wet Meadow & Shrubland
- G531 Arid West Interior Freshwater Marsh
- G545 Colorado Plateau Hanging Garden Seep

Diagnostic Characteristics: Perennial herbaceous wet meadows found in the montane, subalpine and lower alpine elevations (about 1000-3600 m) of western mountain ranges. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles.

VEGETATION

Physiognomy and Structure: Open wet meadows dominated by perennial cold-dormant graminoids or forbs, usually less than 1 m in height, often a pocket surrounded by forests. Wet meadows may be large and carpet an entire valley floor, or they can be very small patches or narrow linear strips. They can also occur in complex mosaics of meadows intermixed with patches of dwarf- or tall shrublands.

Floristics: Vegetation of this group can manifest as a mosaic of several plant associations, or be a monotypic stand of a single association which is dominated by graminoids or forbs. Varying dominant herbaceous species include graminoids *Calamagrostis canadensis*, *Calamagrostis stricta*, *Carex bolanderi*, *Carex utriculata*, *Carex illota*, *Carex exsiccata*, *Carex nigricans*, *Carex microptera*, *Carex scopulorum*, *Carex vernacula*, *Deschampsia cespitosa*, *Eleocharis quinqueflora*, *Glyceria striata* (= *Glyceria elata*), *Juncus drummondii*, *Juncus nevadensis*, and *Scirpus* and/or *Schoenoplectus* spp. Forb species may include *Camassia quamash*, *Cardamine cordifolia*, *Caltha leptosepala*, *Dodecatheon jeffreyi*, *Phippsia algida*, *Rorippa alpina*, *Senecio triangularis*, *Trifolium parryi*, *Trollius laxus*, and *Veratrum californicum*. Common but sparse shrubs may include *Salix* spp., *Vaccinium uliginosum*, *Betula glandulosa*, and *Vaccinium macrocarpon*. Floristic information compiled from Komarkova (1976, 1986), Nachlinger (1985), Kovalchik (1987, 1993), Barbour and Major (1988), Meidinger et al. (1988), Padgett et al. (1988a), Lloyd et al. (1990), Banner et al. (1993), DeLong et al. (1993), Manning and Padgett (1995), Sawyer and Keeler-Wolf (1995), Sanderson and Kettler (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), Kittel et al. (1999b), and MacKenzie and Moran (2004).

ENVIRONMENT & DYNAMICS

Environmental Description: Soil/substrate/hydrology: Wet meadows are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Wet meadows can be tightly associated with snowmelt and typically are not subjected to high velocity disturbance, but can be flooded by slow-moving waters. Moisture for these wet meadow community types is acquired from groundwater, stream discharge, overland flow, overbank flow, and on-site precipitation. Salinity and alkalinity are generally low due to the frequent flushing of moisture through the meadow. Depending on the slope, topography, hydrology, soils and substrate, intermittent, ephemeral, or permanent pools may be present.

These areas may support species more representative of purely aquatic environments. Standing water may be present during some or all of the growing season, with water tables typically remaining at or near the soil surface. Fluctuations of the water table throughout the growing season are not uncommon, however. On drier sites supporting the less mesic types, the late-season water table may be 1 m or more below the surface.

Soils are mostly mineral and show typical hydric soil characteristics such as low chroma and redoximorphic features; some areas may have high organic content as inclusions or pockets. Soils may have organic soils inclusions. The presence and amount of organic matter may vary considerably depending on the frequency and magnitude of alluvial deposition (Kittel et al. 1999b). Organic composition of the soil may include a thin layer near the soil surface or accumulations of highly sapric material of up to 120 cm thick. Soils may exhibit gleying and/or mottling throughout the profile. Wet meadows provide important water filtration, flow attenuation, and wildlife habitat functions. Environmental information compiled from Komarkova (1976, 1986), Nachlinger (1985), Kovalchik (1987, 1993), Barbour and Major (1988), Meidinger et al. (1988), Padgett et al. (1988a), Lloyd et al. (1990), Banner et al. (1993),

DeLong et al. (1993), Manning and Padgett (1995), Sawyer and Keeler-Wolf (1995), Sanderson and Kettler (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), Kittel et al. (1999b), and MacKenzie and Moran (2004).

Dynamics: This group has soils that may be flooded or saturated throughout the growing season. It may also occur on areas with soils that are only saturated early in the growing season, or intermittently. Typically these associations are tolerant of moderate-intensity surface fires and late-season livestock grazing (Kovalchik 1987). Most appear to be relatively stable types, although in some areas these may be impacted by intensive livestock grazing.

DISTRIBUTION

Geographic Range: This group occurs in the mountains in California's Transverse and Peninsular ranges north to British Columbia's coastal ranges and is found throughout the Rocky Mountains (including the Black Hills of South Dakota) of the U.S. and Canada as well as the intermountain ranges of the interior west, ranging in elevation from montane to alpine (1000-3600 m).

Spatial Scale & Pattern [optional]: Small patch

Nations: CA, MX?, US

States/Provinces: AB, AK?, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

TNC Ecoregions [optional]: 3:C, 4:C, 5:C, 7:C, 8:C, 9:C, 11:C, 12:C, 16:C, 18:C, 19:C, 20:C, 21:C, 22:P, 25:C, 68:C, 69:C, 81:C

USFS Ecoregions (2007): 262A:PP, 263A:PP, 313A:CP, 313B:CC, 313D:C?, 315A:C?, 315B:C?, 315H:CC, 321A:??, 322A:CC, 331A:CP, 331H:CP, 331I:CP, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341F:CP, 341G:CP, 342B:CC, 342C:CC, 342D:C?, 342E:CC, 342F:CP, 342G:CC, 342H:CC, 342I:CP, 342J:CP, M242A:CC, M242B:CC, M242C:CC, M242D:CP, M261A:CC, M261B:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:PP, M341A:CP, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Great Basin); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: High.

SYNONYMY

- < Alpine Grassland (213) (Shiflet 1994) [SRM type 213 includes all alpine communities in Sierra, Klamath and California Cascades, both herbaceous and shrub-dominated, and wet meadows.]
- > Alpine Rangeland (410) (Shiflet 1994) [Alpine wet meadows are included in this SRM type.]
- < Montane Meadows (216) (Shiflet 1994)
- > Tall Forb (409) (Shiflet 1994) [Forb-dominated wet meadows are included in this group.]
- > Tufted Hairgrass - Sedge (313) (Shiflet 1994) [Wetter portions of this SRM type overlap with this group.]

LOWER LEVEL UNITS

Alliances:

- A2584 *Carex amplifolia* - *Carex interior* - *Carex sheldonii* Wet Meadow Alliance
- A2564 *Elymus glaucus* - *Carex pellita* - *Carex feta* Wet Meadow Alliance
- A3815 *Calamagrostis canadensis* - *Calamagrostis stricta* - *Poa palustris* Wet Meadow Alliance
- A3810 *Saxifraga odontoloma* - *Senecio triangularis* - *Mertensia ciliata* Wet Meadow Alliance
- A3806 *Carex praegracilis* - *Carex scopulorum* - *Eleocharis quinqueflora* Wet Meadow Alliance
- A3807 *Eleocharis palustris* - *Eleocharis acicularis* Marsh Alliance
- A3809 *Heracleum maximum* - *Veratrum californicum* - *Rorippa* spp. Wet Meadow Alliance
- A3812 *Mimulus* spp. - *Primula parryi* - *Dodecatheon redolens* Wet Meadow Alliance
- A3814 *Danthonia* spp. - *Camassia* spp. Wet Meadow Alliance
- A3813 *Carex densa* Wet Meadow Alliance
- A2642 *Argentina anserina* Wet Meadow Alliance
- A3539 *Equisetum arvense* - *Equisetum hyemale* - *Equisetum variegatum* Wet Meadow Alliance
- A3804 *Carex aquatilis* - *Carex utriculata* - *Deschampsia cespitosa* Wet Meadow Alliance
- A1374 *Juncus arcticus* ssp. *littoralis* - *Juncus mexicanus* Wet Meadow Alliance
- A1361 *Poa glauca* Wet Meadow Alliance
- A3805 *Carex nebrascensis* - *Carex vesicaria* - *Carex pellita* Wet Meadow Alliance
- A3808 *Glyceria grandis* - *Glyceria striata* - *Glyceria borealis* Wet Meadow Alliance

AUTHORSHIP

Primary Concept Source: P. Comer and G. Kittel, in Faber-Langendoen et al. (2011)

Author of Description: P. Comer, G. Kittel and C. Chappell

Acknowledgments:

Version Date: 12/02/2015

Classif Resp Region: West

Internal Author: GK 12-10, 12-15, 10-16

REFERENCES

References: Banner et al. 1993, Barbour and Major 1988, Cooper 1986b, Crowe and Clausnitzer 1997, DeLong 2003, DeLong et al. 1990, DeLong et al. 1993, Faber-Langendoen et al. 2017a, Holland and Keil 1995, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1987, Kovalchik 1993, Lloyd et al. 1990, MacKenzie and Moran 2004, MacKinnon et al. 1990, Manning and Padgett 1995, Meidinger and Pojar 1991, Meidinger et al. 1988, Nachlinger 1985, Padgett et al. 1988a, Reed 1988, Rodriguez et al. 2017, Sanderson and Kettler 1996, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Steen and Coupé 1997, Stout et al. 2013

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G521. Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh

G520. Vancouverian-Rocky Mountain Subalpine-Alpine Snowbed, Wet Meadow & Dwarf-shrubland

Type Concept Sentence: These alpine herbaceous and dwarf-shrub communities are found on wet sites throughout the western U.S. and Canada in high mountainous regions. They are dominated by graminoids such as *Carex illota*, *Carex lachenalii*, *Carex nigricans*, *Carex vernacula*, *Deschampsia cespitosa*, *Juncus drummondii*, or forbs *Caltha leptosepala*, *Trollius laxus*, *Phippsia algida*, *Rorippa alpina*, *Sibbaldia procumbens*, and *Trifolium parryi*, as well as dwarf-shrubs that may also be scattered to moderately dense, including *Dasiphora*, *Kalmia*, *Salix* or *Vaccinium* species.

OVERVIEW

Scientific Name: *Caltha leptosepala* - *Carex nigricans* - *Kalmia microphylla* Subalpine-Alpine Snowbed, Wet Meadow & Dwarf-shrubland Group

Common Name (Translated Scientific Name): White Marsh-marigold - Black Alpine Sedge - Alpine Laurel Subalpine-Alpine Snowbed, Wet Meadow & Dwarf-shrubland Group

Colloquial Name: Rocky Mountain Shrubby-cinquefoil Wet Shrubland

Type Concept: These are high-elevation communities found throughout the Rocky Mountains, Pacific Northwest and Intermountain West regions, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. They range in elevation from upper subalpine to alpine (1500-3600 m) depending on latitude. These types occur as large meadows in subalpine valleys, as narrow strips bordering ponds, lakes and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches or on snowbeds. Soils of this group are mineral or with a thin (<40 cm) organic layer over mineral layers (aka not peatland). Soils show hydric soil characteristics, including high organic content and/or low chroma and redoximorphic features. This group often occurs as a mosaic of several plant associations, often dominated by graminoids such as *Carex illota*, *Carex lachenalii*, *Carex nigricans*, *Carex vernacula*, *Deschampsia cespitosa*, *Juncus drummondii*, and forbs *Caltha leptosepala*, *Trollius laxus*, *Phippsia algida*, *Rorippa alpina*, *Sibbaldia procumbens*, and *Trifolium parryi*. Often scattered to moderately dense dwarf-shrubs are present, especially *Dasiphora*, *Kalmia*, *Salix* or *Vaccinium*, which when present form alpine dwarf-shrublands. Wet meadows are tightly associated with snowmelt and typically not subjected to high disturbance events such as flooding.

Classification Comments: This group includes sparsely vegetated alpine areas that nonetheless have lush wet meadows and dwarf-shrublands are included together in one group because the alpine mesic floristic composition is more diagnostic than vegetation structure. This might be confusing with Rocky Mountain-Sierran Alpine Dwarf-shrubland & Krummholz Group (G316) because it includes mesic dwarf-shrublands; however, this group includes the true wetland associations.

Similar NVC Types:

- G271 Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow
- G521 Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh: is lower in elevation (montane to subalpine) and may overlap slightly but has a different suite of dominant species than G520.
- G320 North Pacific Alpine-Subalpine Tundra: is similar in structure but does not contain wetland associations.
- G316 Rocky Mountain-Sierran Alpine Dwarf-shrubland & Krummholz: is similar in structure but does not contain wetland associations.
- G317 North Pacific Alpine-Subalpine Dwarf-shrubland & Heath: is similar in structure but does not contain wetland associations.

Diagnostic Characteristics: This group includes open to closed-canopy herbaceous stands dominated by Rocky Mountain alpine wetland species as well as open to closed dwarf-shrublands. Wetland graminoids may include *Carex illota*, *Carex lachenalii*, *Carex*

nigricans, *Carex vernacula*, *Deschampsia cespitosa*, *Juncus drummondii*, and *Juncus mertensianus*; forbs include *Caltha leptosepala*, *Trollius laxus*, *Parnassia fimbriata*, *Phippsia algida*, *Polygonum bistortoides*, *Rorippa alpina*, *Sibbaldia procumbens*, and *Trifolium parryi*. Scattered to moderately dense dwarf-shrubs may also be present, especially *Dasiphora fruticosa ssp. floribunda* and *Kalmia microphylla*, which form alpine dwarf-shrublands.

VEGETATION

Physiognomy and Structure: This group is variable structurally and includes open to closed-canopy, graminoid- and forb-dominated herbaceous stands as well as stands dominated by dwarf-shrublands. Sometimes rings of different plant communities form around a late-melting snowbed because of different soil moisture requirements (drier turf species on outside edges, wetland species near the middle and sometimes a sparsely vegetated center because of the extremely short growing season).

Floristics: This group often occurs as a mosaic of several plant associations, often dominated by graminoids, including *Carex illota*, *Carex lachenalii*, *Carex nigricans*, *Carex vernacula*, *Deschampsia cespitosa*, *Juncus drummondii*, *Juncus mertensianus*, and forbs *Caltha leptosepala*, *Trollius laxus*, *Parnassia fimbriata*, *Phippsia algida*, *Polygonum bistortoides*, *Rorippa alpina*, *Sibbaldia procumbens*, and *Trifolium parryi*. Often scattered to moderately dense dwarf-shrubs are present, especially *Dasiphora fruticosa ssp. floribunda*, *Kalmia microphylla*, or *Vaccinium uliginosum*, which form alpine dwarf-shrublands. Wet meadows are tightly associated with snowmelt and typically not subjected to high disturbance events such as flooding. Floristic information was compiled from Willard (1963), Komarkova (1976, 1986), Nachlinger (1985), Cooper (1986b), Kovalchik (1987, 1993), Padgett et al. (1988a), Reed (1988), Meidinger and Pojar (1991), Shiflet (1994), Manning and Padgett (1995), Sanderson and Kettler (1996), Zwinger and Willard (1996), Cooper et al. (1997), Crowe and Clausnitzer (1997), and Kittel et al. (1999b).

ENVIRONMENT & DYNAMICS

Environmental Description: These are high-elevation communities found throughout the Rocky Mountains, Pacific Northwest and Intermountain West regions, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. They range in elevation from upper subalpine to alpine (1500-3600 m) depending on latitude. These types occur as large meadows in subalpine valleys, as narrow strips bordering ponds, lakes and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches or on snowbeds. Soils of this group are mineral or with a thin (<40 cm) organic layer over mineral layers (aka not peatland).

Moisture for these wet meadow community types is acquired from groundwater, stream discharge, overland flow, overbank flow, and on-site precipitation. Salinity and alkalinity are generally low due to the frequent flushing of moisture through the meadow. Depending on the slope, topography, hydrology, soils and substrate, intermittent, ephemeral or permanent pools may be present. These areas may support species more representative of purely aquatic environments. Standing water may be present during some or all of the growing season, with water tables typically remaining at or near the soil surface. Fluctuations of the water table throughout the growing season are not uncommon, however. On drier sites supporting the less mesic types, the late-season water table may be 1 m or more below the surface.

Soil/substrate/hydrology: Soils typically possess a high proportion of organic matter, but this may vary considerably depending on the frequency and magnitude of alluvial deposition (Kittel et al. 1999b). Organic composition of the soil may include a thin layer near the soil surface or accumulations of highly sapric material up to 30 cm thick (aka not peatland). Soils may exhibit gleying and/or mottling throughout the profile. Wet meadow ecological systems provide important water filtration, flow attenuation, and wildlife habitat functions. Environmental information was compiled from Willard (1963), Komarkova (1976, 1986), Nachlinger (1985), Cooper (1986b), Kovalchik (1987, 1993), Padgett et al. (1988a), Reed (1988), Meidinger and Pojar (1991), Shiflet (1994), Manning and Padgett (1995), Sanderson and Kettler (1996), Zwinger and Willard (1996), Cooper et al. (1997), Crowe and Clausnitzer (1997), and Kittel et al. (1999b).

Dynamics: Associations in this group are adapted to soils that may be flooded or saturated throughout the growing season. They may also occur on areas with soils that are only saturated early in the growing season or intermittently. Typically these associations are tolerant of moderate-intensity surface fires and late-season livestock grazing (Kovalchik 1987). Most appear to be relatively stable types, although in some areas these may be impacted by intensive livestock grazing.

DISTRIBUTION

Geographic Range: This group is found throughout the Rocky Mountains, Pacific Northwest and Intermountain West regions, ranging in elevation from upper subalpine to alpine (1500-3600 m) depending on latitude.

Spatial Scale & Pattern [optional]: Small patch

Nations: CA, US

States/Provinces: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

TNC Ecoregions [optional]: 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 22:P, 25:C, 68:C

USFS Ecoregions (2007): 313A:CP, 313B:CC, 313D:C?, 315A:C?, 315B:C?, 315H:CC, 321A:??, 322A:CC, 331H:CP, 331I:CP, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341F:CP, 341G:CP, 342B:CC, 342C:CC, 342D:C?, 342E:CC, 342F:CP, 342G:CC, 342H:CC, 342J:CP, M242D:PP, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:PP, M341A:CP, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: High.

SYNONYMY

- >< Alpine Rangeland (410) (Shiflet 1994) [Alpine wet meadows are included in this SRM type.]
- >< Tall Forb (409) (Shiflet 1994) [Forb-dominated wet meadows are included in this group.]
- >< Tufted Hairgrass - Sedge (313) (Shiflet 1994) [Wetter portions of this SRM type overlap with this group.]

LOWER LEVEL UNITS

Alliances:

- A3831 *Kalmia microphylla* - *Cassiope mertensiana* - *Dryas drummondii* Wet Dwarf-shrubland Alliance
- A3832 *Carex nigricans* - *Sibbaldia procumbens* - *Trollius laxus* Wet Meadow Alliance
- A1309 *Carex vernacula* - *Phippsia algida* - *Ptilagrostis kingii* Wet Meadow Alliance
- A0958 *Dasiphora fruticosa* ssp. *floribunda* Wet Shrubland Alliance
- A1424 *Carex lachenalii* - *Carex capillaris* - *Carex illota* Wet Meadow Alliance
- A1698 *Caltha leptosepala* - *Rhodiola rhodantha* Wet Meadow Alliance

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2011)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 12/02/2015

Classif Resp Region: West

Internal Author: KAS 12-10, 3-11, mod. GK 9-13, 12-15

REFERENCES

References: Cooper 1986b, Cooper et al. 1997, Crowe and Clausnitzer 1997, Faber-Langendoen et al. 2017a, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1987, Kovalchik 1993, Manning and Padgett 1995, Meidinger and Pojar 1991, Nachlinger 1985, Padgett et al. 1988a, Reed 1988, Sanderson and Kettler 1996, Shiflet 1994, Willard 1963, Zwinger and Willard 1996

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G520. Vancouverian-Rocky Mountain Subalpine-Alpine Snowbed, Wet Meadow & Dwarf-shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

Type Concept Sentence: These are montane to subalpine riparian shrublands ranging from short to tall (0.5-15 m) that occur in steep and narrow to wide, low-gradient valley bottoms and floodplains as well as steep moist avalanche chutes. They are generally dominated by any or a mix of the following: *Alnus incana*, *Alnus oblongifolia*, *Alnus viridis*, *Betula occidentalis*, *Betula glandulosa*, *Betula occidentalis*, *Cornus sericea*, *Salix bebbiana*, *Salix boothii*, *Salix brachycarpa*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*, *Salix monticola*, *Salix planifolia*, and/or *Salix wolfii*.

OVERVIEW

Scientific Name: *Salix* spp. - *Alnus* spp. - *Betula occidentalis* Riparian & Seep Shrubland Group

Common Name (Translated Scientific Name): Willow species - Alder species - Water Birch Riparian & Seep Shrubland Group

Colloquial Name: Western Alder Wet Shrubland

Type Concept: These are montane to subalpine riparian shrublands occurring as narrow bands or broad shrublands and are found throughout the Rocky Mountain cordillera from New Mexico north into Montana and northwestern Alberta. They also occur in mountainous areas of the interior Intermountain West and on the Colorado Plateau. This group often occurs as part of a mosaic of multiple communities that are shrub- and herb-dominated and includes above-treeline, willow-dominated, snowmelt-fed basins that feed into streams. Shrubs range from short to tall (0.5-15 m). The shrub species that can be dominant reflect the large elevational gradient of this group and include *Alnus incana*, *Alnus oblongifolia*, *Alnus viridis*, *Betula occidentalis*, *Betula glandulosa*, *Betula occidentalis*, *Cornus sericea*, *Salix bebbiana*, *Salix boothii*, *Salix brachycarpa*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*,

Salix monticola, *Salix planifolia*, and *Salix wolfii*. Generally the upland vegetation surrounding these wet shrublands is either conifer or aspen forest. Stands occur on streambanks, stream benches and alluvial terraces in steep narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels, as well as steep moist avalanche chutes. This group is generally found at higher elevations, but can be found anywhere from 1500-3475 m, and may occur at even lower elevations in the Canadian Rockies. Occurrences can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. Many of the plant associations found within this group are associated with beaver activity.

Classification Comments:

Similar NVC Types:

- G507 North Pacific Montane Riparian Woodland
- G322 Vancouverian Wet Shrubland: occurs at lower elevations along the Pacific Northwest coast.
- G526 Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland: occurs at lower elevations and may overlap with G527.

Diagnostic Characteristics: Montane wet shrublands of the Rocky Mountains of Canada and the U.S., and mountain ranges in the Intermountain West. These shrublands line streams and valley bottoms and are often associated with beaver activity.

VEGETATION

Physiognomy and Structure: Montane wetlands dominated by short to tall (0.5-15 m) cold-deciduous shrubs with multiple stems, occurring as narrow bands of shrubs lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels.

Floristics: The dominant shrubs reflect the large elevational gradient and include *Alnus incana*, *Betula glandulosa*, *Betula occidentalis*, *Cornus sericea*, *Salix bebbiana*, *Salix boothii*, *Salix brachycarpa*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*, *Salix monticola*, *Salix planifolia*, and *Salix wolfii*. Generally the upland vegetation surrounding these riparian systems is either conifer or aspen forest. Floristic information was compiled from Padgett (1982), Kovalchik (1987, 1993, 2001), Baker (1988, 1989a, 1989b, 1990), Padgett et al. (1988a, 1988b), Kittel (1993, 1994), Manning and Padgett (1995), Kittel et al. (1996, 1999a, 1999b), Walford (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), and Muldavin et al. (2000a).

ENVIRONMENT & DYNAMICS

Environmental Description: *Soil/substrate/hydrology:* These are montane to subalpine riparian shrublands occurring as narrow bands lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels. Generally, the group is found at higher elevations, but can be found anywhere from 1500-3475 m, and may occur at even lower elevations in the Canadian Rockies. Occurrences can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. They occur on mineral soils or, if on organic soil, these are not deep (not >30-40 cm). Environmental information was compiled from Padgett (1982), Kovalchik (1987, 1993, 2001), Baker (1988, 1989a, 1989b, 1990), Padgett et al. (1988a, 1988b), Kittel (1993, 1994), Manning and Padgett (1995), Kittel et al. (1996, 1999a, 1999b), Walford (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), and Muldavin et al. (2000a).

Dynamics: These shrublands are very tolerant of soil saturation, flooding and flooding disturbance. They require moist to saturated soils throughout the growing season, and regrow quickly after damage to tissue from flood and debris flows or avalanches.

DISTRIBUTION

Geographic Range: This group is found throughout the Rocky Mountain cordillera from New Mexico north into Montana and the Canadian Rockies of Alberta and British Columbia (including the isolated "island" mountain ranges of central and eastern Montana), and in mountainous areas of the Intermountain West and on the Colorado Plateau.

Spatial Scale & Pattern [optional]: Linear, Small patch

Nations: CA, US

States/Provinces: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 6:P, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C, 68:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313D:CC, 315A:P?, 315H:PP, 321A:PP, 331A:C?, 331B:C?, 331J:CC, 341A:CP, 341B:CP, 341C:CP, 341D:CP, 341F:CC, 342A:CC, 342B:CP, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342J:CC, M242C:CP, M242D:CC, M261E:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341B:CC, M341C:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Great Basin)

CONFIDENCE LEVEL**USNVC Confidence Level with Comments:** High.**SYNONYMY**

- < Riparian (422) (Shiflet 1994)

LOWER LEVEL UNITS**Alliances:**

- A0977 *Salix lasiolepis* Wet Shrubland Alliance
- A1003 *Salix commutata* Wet Shrubland Alliance
- A3774 *Salix eastwoodiae* - *Salix lemmonii* Wet Shrubland Alliance
- A0981 *Salix monticola* Wet Shrubland Alliance
- A3770 *Salix wolfii* - *Salix brachycarpa* - *Betula glandulosa* Wet Shrubland Alliance
- A2563 *Salix orestera* Wet Shrubland Alliance
- A3974 *Crataegus douglasii* / *Symphoricarpos albus* Wet Shrubland Alliance
- A3973 *Celtis laevigata* var. *reticulata* / *Philadelphus lewisii* Wet Scrub Alliance
- A3771 *Alnus incana* - *Alnus viridis* Wet Shrubland Alliance
- A3769 *Salix boothii* - *Salix geeyeriana* - *Salix lutea* Montane Wet Shrubland Alliance
- A3773 *Cornus sericea* - *Dasiphora fruticosa* ssp. *floribunda* - *Ribes* spp. Wet Shrubland Alliance
- A3772 *Betula occidentalis* Wet Shrubland Alliance

AUTHORSHIP**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)**Author of Description:** G. Kittel**Acknowledgments:****Version Date:** 12/02/2015**Classif Resp Region:** West**Internal Author:** GK 12-10, 9-13, 12-15**REFERENCES**

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Crowe and Clausnitzer 1997, Faber-Langendoen et al. 2017a, Kittel 1993, Kittel 1994, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Manning and Padgett 1995, Muldavin et al. 2000a, Padgett 1982, Padgett et al. 1988a, Padgett et al. 1988b, Shiflet 1994, Steen and Coupé 1997, Szaro 1989, Walford 1996, Willoughby 2007

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

A3771. *Alnus incana* - *Alnus viridis* Wet Shrubland Alliance

Type Concept Sentence: Vegetation types within this riparian tall (>1.5 m) shrubland alliance typically occur adjacent to streams and in mountain meadows at moderate to high-elevation (1200-3000 m) riparian habitats of the northern Rocky Mountains and Cascade Range where deep snow accumulations are common. Landforms associated with this alliance are streambanks, alluvial bars, and floodplains. *Alnus incana* or *Alnus viridis* ssp. *sinuata* forms a dense canopy with at least 90% cover. *Acer circinatum* may be codominant in the tall-shrub layer in some stands.

OVERVIEW**Scientific Name:** *Alnus incana* - *Alnus viridis* Wet Shrubland Alliance**Common Name (Translated Scientific Name):** Gray Alder - Green Alder Wet Shrubland Alliance**Colloquial Name:** Western Alder Wet Shrubland

Type Concept: *Alnus incana* or *Alnus viridis* ssp. *sinuata* forms a dense canopy with at least 90% cover. *Acer circinatum* may be codominant in the tall-shrub layer in some stands. The diverse understory shrub layer may include *Acer glabrum*, *Ribes lacustre*, and *Sorbus scopulina*. In the northern Rocky Mountains, *Abies lasiocarpa* colonizes these communities, and scattered seedlings or saplings may be present. Low cold-deciduous or ericaceous shrubs may be abundant, including *Betula occidentalis*, *Cornus sericea*, *Oplopanax horridus*, *Paxistima myrsinites*, *Ribes hudsonianum*, *Rubus parviflorus*, *Rubus spectabilis*, *Salix drummondiana*, *Sambucus racemosa*, *Symphoricarpos albus*, and *Vaccinium* spp. The forb layer is sparse and may include *Achillea millefolium*, *Aconitum columbianum*, *Canadanthus modestus* (= *Aster modestus*), *Galium triflorum*, *Heracleum maximum* (= *Heracleum lanatum*), *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Polystichum munitum*, *Senecio triangularis*, *Symphotrichum spathulatum* (= *Aster occidentalis*), *Thalictrum occidentale*, *Urtica dioica*, and *Veratrum viride*. The graminoid layer is usually dominated by 1 or 2 species that include *Agrostis stolonifera* and *Calamagrostis canadensis*. The fern and fern allies layer is generally dense with at least 40%

cover. The dominant species typically are *Gymnocarpium dryopteris* and *Athyrium filix-femina*. This alliance is found in the Rocky Mountains, the highlands of Arizona, intermountain ranges of Nevada, and montane areas of California. Stands occur adjacent to streams and in mountain meadows at moderate to high-elevation (1200-3000 m) riparian habitats. Landforms associated with this alliance are streambanks, alluvial bars, and floodplains. Soils are shallow, skeletal alluvium over water-worked cobbles and gravels.

Classification Comments: Alder- and maple-dominated riparian and wetland shrublands.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Tall (>1.5 m) shrublands dominated by *Alnus incana*, *Alnus viridis ssp. sinuata*, *Alnus oblongifolia*, and/or *Acer glabrum*.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance is dominated by a relatively dense tall-shrub layer that is 2-15 m tall, that may or may not have a short-shrub layer that is <2 m tall. The herbaceous layer is dominated by perennial forbs with some perennial graminoids.

Floristics: *Alnus incana*, *Alnus viridis ssp. sinuata*, *Alnus oblongifolia*, and/or *Acer glabrum* form a dense canopy layer. *Acer circinatum* may be codominant in the tall-shrub layer in some stands. The diverse understory shrub layer may include *Ribes lacustre*, and *Sorbus scopulina*. In the northern Rocky Mountains, *Abies lasiocarpa* may colonize these communities, and scattered seedlings or saplings may be present. Low cold-deciduous or ericaceous shrubs may be abundant, including *Cornus sericea*, *Betula occidentalis*, *Oplopanax horridus*, *Paxistima myrsinites*, *Ribes hudsonianum*, *Rubus parviflorus*, *Rubus spectabilis*, *Sambucus racemosa*, *Salix drummondiana*, *Symphoricarpos albus*, and *Vaccinium* spp. The forb layer is sparse and may include *Achillea millefolium*, *Aconitum columbianum*, *Canadanthus modestus* (= *Aster modestus*), *Galium triflorum*, *Heracleum maximum* (= *Heracleum lanatum*), *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Polystichum munitum*, *Senecio triangularis*, *Symphyotrichum spathulatum* (= *Aster occidentalis*), *Thalictrum occidentale*, *Urtica dioica*, and *Veratrum viride*. The graminoid layer is usually dominated by 1 or 2 species that include *Agrostis stolonifera* and *Calamagrostis canadensis*. The fern and fern allies layer is generally dense with at least 40% cover. The dominant species typically are *Gymnocarpium dryopteris* and *Athyrium filix-femina*.

ENVIRONMENT & DYNAMICS

Environmental Description: Vegetation types within this riparian tall (>1.5 m) shrubland alliance typically occur adjacent to streams and in mountain meadows at moderate to high-elevation (1200-3000 m) riparian habitats of the northern Rocky Mountains and Cascade Range where deep snow accumulations are common. Landforms associated with this alliance are streambanks, alluvial bars, and floodplains. Sites are young, active channel shelves that lie between active and flood-stage streambanks along second-order and larger streams in moderately graded (3-5%) valleys. Soils are shallow, skeletal alluvium over water-worked cobbles and gravels. Active channel shelves have surface soil textures that are loamy sands, while older sites are silts and loam. Available water-holding capacity is low; surface water is present briefly during the growing season. The water table usually lies well below the ground surface.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found in the Rocky Mountains of eastern Oregon, Washington, Idaho, Montana, British Columbia, Alberta, Wyoming, Colorado, Utah, and New Mexico, the highlands of Arizona, intermountain ranges of Nevada, and montane areas of California.

Nations: CA, US

States/Provinces: AB, AZ, BC, CA, CO, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Alnus incana* (Mountain alder thicket) Alliance (Sawyer et al. 2009) [63.210.00]

- ? *Alnus viridis* (Sitka alder thickets) Provisional Alliance (Sawyer et al. 2009) [63.220.00]

LOWER LEVEL UNITS

Associations:

- CEGLO01158 *Alnus* spp. Avalanche Chute Wet Shrubland
- CEGLO02633 *Alnus viridis* ssp. *sinuata* / Mesic Forbs Wet Shrubland
- CEGLO01146 *Alnus incana* / *Equisetum arvense* Wet Shrubland
- CEGLO01156 *Alnus viridis* ssp. *sinuata* / *Athyrium filix-femina* - *Cinna latifolia* Wet Shrubland
- CEGLO01153 *Alnus incana* / *Symphoricarpos albus* Wet Shrubland
- CEGLO01144 *Alnus incana* / *Carex* (*aquatilis*, *lenticularis*, *luzulina*, *pellita*) Wet Shrubland
- CEGLO02602 *Alnus viridis* ssp. *sinuata* / *Rubus* (*lasiococcus*, *parviflorus*) Wet Shrubland
- CEGLO02628 *Alnus incana* / *Athyrium filix-femina* Wet Shrubland
- CEGLO01141 *Alnus incana* Wet Shrubland
- CEGLO00481 *Alnus incana* / *Scirpus microcarpus* Wet Shrubland
- CEGLO01145 *Alnus incana* / *Cornus sericea* Wet Shrubland
- CEGLO02652 *Alnus incana* - *Salix drummondiana* Wet Shrubland
- CEGLO01142 *Alnus incana* - *Betula occidentalis* Wet Shrubland
- CEGLO01148 *Alnus incana* / Mesic Graminoids Wet Shrubland
- CEGLO00122 *Alnus incana* / *Carex scopulorum* var. *prionophylla* Wet Shrubland
- CEGLO01152 *Alnus incana* / *Spiraea douglasii* Wet Shrubland
- CEGLO01143 *Alnus incana* / *Calamagrostis canadensis* Wet Shrubland
- CEGLO02629 *Alnus incana* / *Lysichiton americanus* Wet Shrubland
- CEGLO02651 *Alnus incana* - *Salix* (*monticola*, *lucida*, *ligulifolia*) Wet Shrubland
- CEGLO01151 *Alnus incana* / *Ribes* (*inermis*, *hudsonianum*, *lacustre*) Wet Shrubland
- CEGLO01147 *Alnus incana* / Mesic Forbs Wet Shrubland
- CEGLO00228 *Alnus incana* / *Glyceria striata* Wet Shrubland
- CEGLO02687 *Alnus incana* ssp. *tenuifolia* - *Salix irrorata* Wet Shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Faber-Langendoen et al. 2017b, Sawyer et al. 2009

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

A3772. *Betula occidentalis* Wet Shrubland Alliance

Type Concept Sentence: This riparian shrubland alliance occurs on moderately wide stream benches and floodplains. It may also occur on hillside seeps in the mountains and foothills. Sites are relatively flat (1-5% slope) stream benches and often extend away from the channel edge. The substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. *Betula occidentalis* forms a dense, closed canopy with cover up to 95%. It occurs in the Rocky Mountains, intermountain ranges of Nevada and Sierra Nevada of California.

OVERVIEW

Scientific Name: *Betula occidentalis* Wet Shrubland Alliance

Common Name (Translated Scientific Name): Water Birch Wet Shrubland Alliance

Colloquial Name: Western Water Birch Wet Shrubland

Type Concept: In this alliance, *Betula occidentalis* forms a dense, closed canopy with cover up to 95%. The shrub layer may also include *Alnus incana*, *Artemisia tridentata* ssp. *vaseyana*, *Cornus sericea*, *Crataegus douglasii*, *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Juniperus horizontalis*, *Purshia tridentata*, *Purshia tridentata*, *Rosa woodsii*, and *Salix* spp. Due to the dense shrub canopy, herbaceous undergrowth is usually limited. Forb species include *Aquilegia formosa*, *Maianthemum stellatum* (= *Smilacina stellata*), and *Urtica dioica*. Graminoid cover is usually low and is typically composed of introduced hay grasses. This riparian shrubland alliance occurs in the Rocky Mountains, intermountain ranges of Nevada and Sierra Nevada of California on moderately wide stream benches and floodplains. It may also occur on hillside seeps in the mountains and foothills. Sites are relatively flat (1-5% slope) stream benches and often extend away from the channel edge. The substrate is usually exposed, but

surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rainstorms (e.g., summer thunderstorms in eastern Oregon and Idaho). Soils are derived from alluvium and are fairly shallow, ranging from 30 cm to greater than 60 cm. Substrates are typically alluvial and range from fairly shallow, finer-textured soils to gravel and boulders. Soils usually have signs of saturation (mottles).

Classification Comments: Tall riparian shrublands may be mixed with other tall riparian shrubland alliances such as *Alnus*- and *Salix*-dominated communities.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Tall (>1.5 m) shrubland dominated by *Betula occidentalis*.

VEGETATION

Physiognomy and Structure: The tall-shrub layer is dominated by broad-leaved deciduous shrubs or small trees reaching heights of up to 8-9 m. The tree canopy is dominated by conifers of variable density. The tall-shrub stratum is dense with up to 98% cover. The short-shrub layer (1-2 m tall) is sparse to dense with 25-60% cover. The graminoid layer consists of mainly introduced hay grasses and constitutes up to 35% cover. The forb layer has 0-40% cover depending on the overstory canopy cover.

Floristics: Plant associations within this alliance are classified as intermittently flooded, cold-deciduous shrublands. *Betula occidentalis* forms a dense, closed canopy with cover up to 95%. The shrub layer may also include *Alnus incana*, *Artemisia tridentata* ssp. *vaseyana*, *Cornus sericea*, *Crataegus douglasii*, *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Juniperus horizontalis*, *Purshia tridentata*, *Rosa woodsii*, and *Salix* spp. The tree canopy has a moderate cover and includes any of the following species: *Abies lasiocarpa*, *Acer negundo*, *Alnus rhombifolia*, *Picea pungens*, *Populus angustifolia*, *Populus tremuloides*, *Pseudotsuga menziesii*, and *Thuja occidentalis*. Due to the dense shrub canopy, herbaceous undergrowth is usually limited. Forb species include *Aquilegia formosa*, *Maianthemum stellatum* (= *Smilacina stellata*), and *Urtica dioica*. Graminoid cover is usually low and includes *Carex utriculata*, *Carex pellita* (= *Carex lanuginosa*), *Carex microptera*, *Carex nebrascensis*, *Glyceria* spp., *Juncus balticus*, and introduced hay grasses.

ENVIRONMENT & DYNAMICS

Environmental Description: Plant associations within this alliance occupy moderately wide stream benches and floodplains in moderately wide valleys and on hillside seeps in the mountains and foothills. Sites are relatively flat (1-5% slope) stream benches and often extend away from the channel edge. Elevation ranges up to 2700 m in Idaho. The substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rainstorms e.g., summer thunderstorms in eastern Oregon and Idaho. Soils derived from alluvium are fairly shallow, ranging from 30 to greater than 60 cm.

Dynamics: *Betula occidentalis* is highly adapted to most forms of disturbance. However, heavy grazing may eliminate the more palatable native graminoids, thereby replacing them with introduced species or nonpalatable native species in the understory (Hansen et al. 1995).

DISTRIBUTION

Geographic Range: This alliance is found in the Rocky Mountains of eastern Oregon and Washington, Idaho, British Columbia, Alberta, Montana, Wyoming, Colorado, New Mexico, and Utah, as well as intermountain ranges of Nevada and Sierra Nevada of California.

Nations: CA, US

States/Provinces: AB, BC, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Betula occidentalis* (Water birch thicket) Alliance (Sawyer et al. 2009) [63.610.00]

LOWER LEVEL UNITS

Associations:

- CEGLO03450 *Betula occidentalis* - *Celtis laevigata* var. *reticulata* Wet Shrubland
- CEGLO00489 *Betula occidentalis* / *Philadelphus lewisii* - *Symphoricarpos albus* Wet Shrubland
- CEGLO01083 *Betula occidentalis* - *Dasiphora fruticosa* ssp. *floribunda* Wet Shrubland
- CEGLO01080 *Betula occidentalis* Wet Shrubland
- CEGLO02668 *Betula occidentalis* / *Philadelphus lewisii* Wet Shrubland
- CEGLO01084 *Betula occidentalis* / *Purshia tridentata* / *Hesperostipa comata* Wet Shrubland
- CEGLO01162 *Betula occidentalis* / *Maianthemum stellatum* Wet Shrubland
- CEGLO01081 *Betula occidentalis* / *Crataegus douglasii* Wet Shrubland
- CEGLO01161 *Betula occidentalis* / *Cornus sericea* Wet Shrubland
- CEPP009680 *Betula occidentalis* Desert Spring Shrubland
- CEGLO02654 *Betula occidentalis* / Mesic Graminoids Wet Shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Faber-Langendoen et al. 2017b, Hansen et al. 1995, Sawyer et al. 2009

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

A3973. *Celtis laevigata* var. *reticulata* / *Philadelphus lewisii* Wet Scrub Alliance

Type Concept Sentence: This *Celtis laevigata* var. *reticulata*- and/or *Philadelphus lewisii*-dominated scrub woodland and shrubland alliance is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Central Rockies in Idaho and northwestern Wyoming where it occurs as numerous relatively small stands, dispersed and clustered in valley bottoms along riparian margins, on lower slopes of river terraces near seepage lines, and on scree slopes.

OVERVIEW

Scientific Name: *Celtis laevigata* var. *reticulata* / *Philadelphus lewisii* Wet Scrub Alliance

Common Name (Translated Scientific Name): Nettleleaf Hackberry / Lewis' Mock Orange Wet Scrub Alliance

Colloquial Name: Valley Bottom Nettleleaf Hackberry / Lewis' Mock Orange Wet Scrub

Type Concept: The upper canopy of this scrub woodland and shrubland alliance is dominated by *Celtis laevigata* var. *reticulata* and/or *Philadelphus lewisii*, often forming dense thickets. *Celtis laevigata* var. *reticulata* occurs either as a short tree or tall shrub between 3-6 m in height. *Philadelphus lewisii* occurs as a tall shrub between 2-5 m in height. The short-shrub layer often contains *Rosa woodsii*, *Rosa nutkana*, or *Sambucus nigra* ssp. *cerulea* with other riparian shrubs such as *Holodiscus discolor* or occasionally *Symphoricarpos albus* and *Toxicodendron rydbergii* on moist sites. If present, the herbaceous layer may be dominated by the perennial bunchgrass *Pseudoroegneria spicata*. *Poa secunda* and *Aristida purpurea* var. *longiseta* are often present also. This alliance is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Central Rockies in Idaho and northwestern Wyoming, and south into canyons in the Colorado Plateau and in riparian areas in the southeastern Colorado plains. Stands occur as numerous relatively small stands, dispersed and clustered in valley bottoms along riparian margins, on lower slopes of river terraces near seepage lines, and on scree slopes. It can also occur in the active floodplain of intermittent streams and deep canyon bottoms of the Snake and Salmon rivers. Elevations range from 250-550 m in the Columbia Basin and 1400-1700 m in Colorado. Although sites are predominately on hot, dry southeastern to southwestern aspects, these trees access additional soil moisture that accumulates at the base of the colluvial slopes, or are riparian. Soils are poorly developed, well-drained alluvial or colluvial sands that often have a high percentage of rock fragments.

Classification Comments: Stands included in this alliance from riparian areas in the southeastern Colorado plains and canyons in the Colorado Plateau (Carsey et al. 2003a) need further review as they may be more appropriately placed in a plains riparian alliance or Colorado Plateau seep alliance.

Internal Comments: KAS 2-14: This is a messy alliance with some associations occurring as both upland seep associations and riparian stands in the PNW. More review is needed to clarify if this is the appropriate group for some of these associations or if they need to be split into riparian and upland types. In addition, stands of *Celtis laevigata* var. *reticulata* / *Pseudoroegneria spicata* Woodland

(CEGL001085) attributed to Colorado is a long way from the Columbia Basin. Carsey et al. (2003a) describe two occurrences in Colorado. The Colorado Plateau stands are likely *Celtis laevigata* var. *reticulata* Slickrock Canyon Woodland (CEGL002359) and possibly the one in a riparian area in the southeastern Colorado plains.

Other Comments:

Similar NVC Types: Western Interior Riparian Forest & Woodland Group (G797) is a western group that also has stands dominated by *Celtis laevigata* var. *reticulata* included in it and may be more appropriate for stands of this alliance described in Colorado.

Diagnostic Characteristics: This scrub woodland and shrubland alliance is dominated by diagnostic species *Celtis laevigata* var. *reticulata* and/or *Philadelphus lewisii*, often forming dense thickets. *Celtis laevigata* var. *reticulata* occurs either as a short tree or tall shrub between 3-6 m in height. *Philadelphus lewisii* occurs as a tall shrub between 2-5 m in height.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance has an open to moderately dense layer of broad-leaved deciduous small trees or shrubs forming a scrub woodland or tall shrubland less than 6 m tall.

Floristics: This scrub woodland and shrubland alliance has an upper canopy dominated by *Celtis laevigata* var. *reticulata* and/or *Philadelphus lewisii*, often forming dense thickets. *Celtis laevigata* var. *reticulata* occurs either as a short tree or tall shrub between 3-6 m in height. *Philadelphus lewisii* occurs as a tall shrub between 2-5 m in height. The short-shrub layer often contains *Rosa woodsii*, *Rosa nutkana*, or *Sambucus nigra* ssp. *cerulea* with other riparian shrubs such as *Holodiscus discolor* or occasionally *Amelanchier alnifolia*, *Crataegus douglasii*, *Cornus sericea*, *Frangula purshiana* (= *Rhamnus purshiana*), *Prunus virginiana*, and *Symphoricarpos albus*. *Toxicodendron rydbergii* is more abundant on moist sites. If present, the herbaceous layer has sparse to moderate cover. It is dominated by the perennial bunchgrass *Pseudoroegneria spicata* with smaller amounts of *Aristida purpurea* var. *longiseta* and *Poa secunda*. Other species include forbs such as *Achillea millefolium*, *Erigeron pumilus*, *Galium aparine*, *Heterotheca villosa*, *Lotus unifoliolatus* (= *Lotus purshianus*), *Scutellaria angustifolia*, *Stellaria nitens*, and the cactus *Opuntia polyacantha*. Mosses and lichens are usually present and average about 20% cover. Litter cover is relatively high. Exotic species may dominate these often disturbed stands, particularly the annual grass *Bromus tectorum*, but also *Bromus arvensis* (= *Bromus japonicus*), *Hypericum perforatum*, *Melilotus officinalis*, *Verbascum* spp., and others.

ENVIRONMENT & DYNAMICS

Environmental Description: This scrub woodland and shrubland alliance is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Central Rockies in Idaho and northwestern Wyoming and south into canyons in the Colorado Plateau and in riparian areas in the southeastern Colorado plains. It can occur in the active floodplain of intermittent streams and deep canyon bottoms of the Snake and Salmon rivers. Elevations range from 250-550 m in the Columbia Basin (Tisdale 1986) and 1400-1700 m in Colorado (Carsey et al. 2003a). The climate is temperate, continental with a mean annual precipitation of approximately 25-30 cm. Precipitation primarily occurs in the winter as snow or rain. This moisture is stored in the soil and utilized during the typically dry summers. Stands are typically found on moderately steep footslopes and toeslopes in canyons where gravel and boulder-sized colluvium accumulate; near the seepage lines on river terraces; on riparian margins and river bars; and forest openings in the mountains. Although sites are predominately on hot, dry southeastern to southwestern aspects, these trees access additional soil moisture that accumulates at the base of the colluvial slopes, or are riparian. Soils are poorly developed, well-drained alluvial or colluvial sands that often have a high percentage of rock fragments. There are reports of this alliance occurring on colluvial talus cones (Daubenmire 1970), but generally sites are more stable than adjacent *Rhus glabra* stands. On lowland sites surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rainstorms. Other adjacent stands may include other riparian vegetation and xeric grasslands dominated by *Pseudoroegneria spicata* or *Poa secunda* on the upper slopes.

Dynamics: *Celtis laevigata* var. *reticulata* tolerates fires. It is rarely killed when burned and sprouts vigorously from underground rhizomes following a fire (FEIS 1998). However, the sprouts and seedlings may not compete well with grassland vegetation, and frequent fire is thought to exclude *Celtis laevigata* var. *reticulata* from grasslands (Johnson and Simon 1987). These stands occur on rocky slopes that are likely to have few fires (Johnson and Simon 1987). The biggest threat is exotic plants that have invaded many stands. Common exotics include annual grasses such as *Bromus tectorum*, *Bromus arvensis*, and *Bromus briziformis*, and the perennial forbs *Hypericum perforatum* and *Conyza canadensis*.

DISTRIBUTION

Geographic Range: This scrub woodland and shrubland alliance is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Central Rockies in Idaho and northwestern Wyoming and south into canyons in the Colorado Plateau and in riparian areas in the southeastern Colorado plains.

Nations: US

States/Provinces: CA?, CO, ID, OR, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Celtis reticulata* Series (Tisdale 1986)

LOWER LEVEL UNITS

Associations:

- CEGL001085 *Celtis laevigata* var. *reticulata* / *Pseudoroegneria spicata* Wet Scrub
- CEGL000792 *Celtis laevigata* var. *reticulata* / *Philadelphus lewisii* Wet Scrub
- CEGL000875 *Philadelphus lewisii* / *Symphoricarpos albus* Wet Shrubland
- CEGL003451 *Celtis laevigata* var. *reticulata* / *Toxicodendron rydbergii* Wet Scrub
- CEGL001170 *Philadelphus lewisii* Wet Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by D. Culver.

Version Date: 2014/03/14

REFERENCES

References: Carsey et al. 2003a, Daubenmire 1970, Evans 1989a, FEIS 1998, Faber-Langendoen et al. 2017b, Johnson and Simon 1987, Moseley 1987a, Tisdale 1986

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

A3773. *Cornus sericea* - *Dasiphora fruticosa* ssp. *floribunda* - *Ribes* spp. Wet Shrubland Alliance

Type Concept Sentence: This western alliance comprises short-statured to medium-tall (usually <1.5 m, but can be up to 3 m) shrublands dominated by *Cornus sericea*, *Dasiphora fruticosa* ssp. *floribunda*, *Rosa woodsii*, *Ribes lacustre*, and/or *Ribes hudsonianum*. Understories are graminoid- or forb-dominated. Environments are riparian areas, wet valley bottoms and lower slopes that have seasonal subirrigation.

OVERVIEW

Scientific Name: *Cornus sericea* - *Dasiphora fruticosa* ssp. *floribunda* - *Ribes* spp. Wet Shrubland Alliance

Common Name (Translated Scientific Name): Red-osier Dogwood - Shrubby-cinquefoil - Currant species Wet Shrubland Alliance

Colloquial Name: Western Non-willow Wet Shrubland

Type Concept: This western alliance comprises short-statured to medium-tall (usually <1.5 m, but can be up to 3 m) shrublands dominated by *Cornus sericea*, *Dasiphora fruticosa* ssp. *floribunda*, *Rosa woodsii*, *Ribes lacustre*, and/or *Ribes hudsonianum*. Understories are graminoid- or forb-dominated. Environments are riparian areas, wet valley bottoms and lower slopes that have seasonal subirrigation.

Classification Comments: These are riparian shrublands that are not wet enough to support *Salix* or *Alnus* species.

Internal Comments: mjr 8-15: CA? added based on member distribution. mjr 2-15: NV added for MOJN.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Riparian shrublands dominated by *Cornus sericea*, *Dasiphora fruticosa* ssp. *floribunda*, *Rosa woodsii*, *Ribes lacustre*, and/or *Ribes hudsonianum*.

VEGETATION

Physiognomy and Structure: The short-shrub stratum is dominated by broad-leaved deciduous shrubs that typically are 1 m tall or less. The open canopy cover ranges from 10-90%. The herbaceous layer can be sparse with heavy overstory or dense graminoid

cover formed by rhizomatous sedges and bunch grasses. The forb layer is usually dominated by perennial forbs and can be sparse to nonexistent in some stands.

Floristics: Plant associations within this alliance are classified as temporarily flooded, cold-deciduous shrublands. *Cornus sericea*, *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), or *Ribes lacustre* dominates the overstory. Other shrub species may include *Acer glabrum*, *Alnus incana*, *Artemisia cana*, *Artemisia tridentata* ssp. *vaseyana*, *Betula occidentalis*, *Cornus sericea* (= *Cornus stolonifera*), *Juniperus communis*, *Lonicera involucrata*, *Ribes inerme*, *Rosa woodsii*, *Rubus idaeus*, *Salix bebbiana*, and other *Salix* species. The herbaceous understory is sparse to moderate cover that may include graminoids *Andropogon gerardii*, *Bromus ciliatus*, *Carex aquatilis*, *Carex buxbaumii*, *Carex microptera*, *Carex pachystachya*, *Festuca campestris*, *Festuca idahoensis*, *Festuca rubra*, *Juncus arcticus* ssp. *littoralis* (= *Juncus balticus*), *Muhlenbergia filiformis*, *Phalaris arundinacea*, *Poa palustris*, *Poa secunda*, and/or *Schizachyrium scoparium*, and/or forbs such as *Galium triflorum*, *Heracleum maximum* (= *Heracleum lanatum*), *Maianthemum stellatum*, *Mertensia ciliata*, *Saxifraga odontoloma*, and/or *Trifolium longipes*. Exotic forage species such as *Phleum pratense*, *Poa pratensis*, and the annual forb *Taraxacum officinale* may be present in disturbed stands.

ENVIRONMENT & DYNAMICS

Environmental Description: Plant associations within this alliance occur adjacent to glacial depressions, terraces along meandering streams, slopes near springs and seeps, steep scree slopes, or broad mountain meadows. They may occur in foothill canyons, on intermittent streams with beds of limestone cobbles and boulders, or near springs at the base of limestone talus or limestone bedrock. They typically occur on alluvial terraces adjacent to stream channels and near seeps on moist toeslopes (slope 0-10%) of canyon walls. They also occur on narrow stream benches in ravines and on narrow terraces of wider valleys. They range in elevation from 860 to 3000 m. Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface. Parent materials for sites supporting stands of this alliance are either alluvial-glacial or organic. The soils are typically sandy loams over sand and gravel layers.

Dynamics: Heavily grazed sites may support *Dasiphora*-dominated communities (Komarkova 1986, Padgett et al. 1989). With continuous heavy grazing, *Dasiphora fruticosa* ssp. *floribunda* will increase in abundance because it is unpalatable to livestock. Other species that increase with grazing are *Poa pratensis*, *Juncus arcticus* ssp. *littoralis* and *Taraxacum officinale* (Padgett et al. 1989). Stands dominated by *Cornus sericea* forms a relatively stable community because of its strong rhizomes and stolons (Hansen et al. 1988b).

DISTRIBUTION

Geographic Range: This western alliance is found in eastern Oregon and Washington, Idaho, Montana, Wyoming, Colorado, Nevada and Utah.

Nations: CA?, US

States/Provinces: CO, ID, MT, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 11:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Rosa woodsii* (Interior rose thickets) Provisional Alliance (Sawyer et al. 2009) [63.320.00]
- > *Rosa woodsii* Shrubland Alliance (Evens et al. 2014)

LOWER LEVEL UNITS

Associations:

- CEGLO01107 *Dasiphora fruticosa* ssp. *floribunda* / *Deschampsia cespitosa* Wet Shrubland
- CEGLO01167 *Cornus sericea* / *Heracleum maximum* Wet Shrubland
- CEGLO01165 *Cornus sericea* Rocky Mountain Wet Shrubland
- CEGLO01172 *Ribes lacustre* / *Mertensia ciliata* Wet Shrubland
- CEGLO03445 *Ribes lacustre* - *Ribes hudsonianum* / *Cinna latifolia* Wet Shrubland
- CEGLO01126 *Rosa woodsii* Wet Shrubland
- CEGLO03446 *Ribes lacustre* - *Ribes hudsonianum* / *Glyceria striata* Wet Shrubland
- CEGLO01166 *Cornus sericea* / *Galium triflorum* Wet Shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Evens et al. 2014, Faber-Langendoen et al. 2017b, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Komarkova 1986, Padgett et al. 1988b, Padgett et al. 1989, Sanderson and March 1996, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Tuhy and Jensen 1982, Welsh et al. 1987, Youngblood et al. 1985a, Youngblood et al. 1985b

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

A3974. *Crataegus douglasii* / *Symphoricarpos albus* Wet Shrubland Alliance

Type Concept Sentence: This deciduous broad-leaved shrubland alliance is dominated by *Crataegus douglasii*, often forming dense thickets, and is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Central Rockies in Idaho and northwestern Wyoming.

OVERVIEW

Scientific Name: *Crataegus douglasii* / *Symphoricarpos albus* Wet Shrubland Alliance

Common Name (Translated Scientific Name): Black Hawthorn / Common Snowberry Wet Shrubland Alliance

Colloquial Name: Valley Bottom Black Hawthorn / Common Snowberry Wet Shrubland

Type Concept: The shrub canopy of this deciduous broad-leaved shrubland alliance is dominated by *Crataegus douglasii*, often forming dense thickets. Occasional the broad-leaved deciduous trees *Populus tremuloides* or *Populus balsamifera ssp. trichocarpa* may codominate the tree layer for a period of years before dying back from heart rot. Other trees are occasionally present with low cover. The understory is dominated by short shrubs or herbaceous species. Common shrubs include *Rosa nutkana*, *Rosa woodsii*, *Spiraea betulifolia*, and *Symphoricarpos albus*. The sparse to moderately dense herbaceous layer is composed of perennial graminoids, such as *Deschampsia cespitosa*, *Elymus glaucus*, and *Leymus cinereus* (= *Elymus cinereus*), and diverse forbs. The herbaceous layer is relatively depauperate if *Heracleum maximum* is abundant due to the extreme shading. Many weedy introduced grasses are common, such as the perennial forage species *Bromus inermis*, *Phleum pratense*, *Poa pratensis*, and invasive annual grass *Bromus tectorum*. This alliance is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Central Rockies in Idaho and northwestern Wyoming. Stands occur on relatively moist sites on deep soils within flat valleys on low-gradient streams with broad floodplains that flood seasonally. Elevations range between 400 and 850 m. Stands often extend up adjacent north-facing toeslopes where seepage provides constant moisture. Soils are typically deep and fine-textured.

Classification Comments: Associations within this alliance are often degraded and poorly described. Characteristics which differentiate this alliance from the moister *Crataegus douglasii* alliances are not clearly quantified.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: The alliance is characterized by dominance of diagnostic species *Crataegus douglasii*, often forming dense thickets 3-8 m tall. Broad-leaved deciduous trees *Populus tremuloides* and *Populus balsamifera ssp. trichocarpa* may codominate the tree layer for a period of years before dying back and *Crataegus douglasii* becoming dominant again. Occasional individuals of *Alnus incana*, *Betula occidentalis*, or *Celtis laevigata var. reticulata* may be present with low cover. The understory is dominated by short shrubs or herbaceous species. If present the shrub layer is composed of associated species *Amelanchier alnifolia*, *Cornus sericea*, *Rosa nutkana*, *Rosa woodsii*, *Salix exigua*, *Spiraea betulifolia*, or *Symphoricarpos albus*. A sparse to moderately dense herbaceous layer may be present, typically composed of mesic perennial graminoids and forbs. Associated species include grasses *Deschampsia cespitosa*, *Elymus glaucus*, *Leymus cinereus*, and many forbs such as *Geum macrophyllum*, *Heracleum maximum*, *Hydrophyllum fendleri*, *Iris missouriensis*, *Lithophragma parviflorum*, *Pteridium aquilinum*, and *Urtica dioica*.

VEGETATION

Physiognomy and Structure: Associations in this alliance generally support a dense thicket of tall (2-8 m) cold-deciduous woody shrubs with a secondary canopy of low shrubs. The herbaceous layer is usually well-developed and diverse, ranging from low-statured graminoids to coarse forbs approaching 2 m in height. A phase described by Daubenmire (1970) has an emergent open tree canopy of cold-deciduous trees, but this does not occur in all stands.

Floristics: The shrub canopy of this deciduous broad-leaved shrubland alliance is dominated by *Crataegus douglasii*, often forming dense thickets 3-7 m tall. Occasionally the broad-leaved deciduous trees *Populus tremuloides* or *Populus balsamifera ssp. trichocarpa* may codominate the tree layer for a period of years before dying back from heart rot (Daubenmire 1970). These *Populus*-codominated phases may repeat periodically when *Populus* stems sprout from roots. The process is described by Daubenmire (1970). Other trees occasionally present with low cover are *Alnus incana*, *Betula occidentalis*, or *Celtis laevigata var. reticulata*, but they never dominate the stand. The understory is dominated by short shrubs or herbaceous species. Shrubs may include *Amelanchier alnifolia*, *Cornus sericea*, *Rosa nutkana*, *Rosa woodsii*, *Salix exigua*, *Spiraea betulifolia*, and *Symphoricarpos albus*. The sparse to moderately dense herbaceous layer is composed of perennial graminoids, such as *Carex spp.*, *Deschampsia cespitosa*, *Elymus glaucus*, and *Leymus cinereus* (= *Elymus cinereus*), and forbs such as *Achillea millefolium*, *Besseyia rubra*, *Galium boreale*, *Geranium viscosissimum*, *Geum macrophyllum*, *Heracleum maximum*, *Hydrophyllum fendleri*, *Iris missouriensis*, *Lithophragma parviflorum*, *Osmorhiza berteroi*, *Potentilla arguta*, *Potentilla gracilis*, *Pteridium aquilinum*, and *Urtica dioica*. The herbaceous layer is relatively depauperate if *Heracleum maximum* is abundant due to extreme shading. Many weedy introduced grasses are common in the understories of most *Crataegus* stands. These can include perennial forage species *Bromus inermis*, *Phleum pratense*, *Poa pratensis*, invasive annual grass *Bromus tectorum*, and many others.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Central Rockies in Idaho and northwestern Wyoming. Elevations range between 400 and 850 m. The climate of the region is characterized by a mix of continental and maritime influences. It is in the rainshadow of the Cascades, with annual precipitation between 23 and 51 cm (9-20 inches). Between 55 and 75% of the precipitation falls as snow during October through March, and summers are typically dry. Summer temperatures can be hot, and winters are typically cold. Stands occur on relatively moist sites on deep soils within flat valleys on low-gradient streams with broad floodplains that flood seasonally. This alliance is typically found on aggraded valley floors which border intermittent or permanent streams and have dependable soil moisture through the growing season (Daubenmire 1970). These sites may be flooded seasonally, but due to the low gradients are rarely scoured. Soils are generally accumulated glacial outwash composed of fine silts and clays of moderate to deep depths. Stands of this alliance often extend up adjacent north-facing toeslopes where seepage provides constant moisture. Adjacent vegetation is usually *Artemisia* steppe or *Pseudoroegneria - Festuca* grassland.

Dynamics: Historically, fire appears to have been important in maintaining the open nature of *Crataegus* shrublands (Daubenmire 1970). Fire may also have been somewhat influential in maintaining the much branched morphology of the dominant shrubs. Most stands have been severely degraded by livestock grazing. Livestock browse all accessible parts of *Crataegus douglasii*, and can eliminate entire stands (Daubenmire 1970).A

DISTRIBUTION

Geographic Range: This deciduous broadleaf shrubland alliance is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Central Rockies in Idaho and northwestern Wyoming.

Nations: US

States/Provinces: CA?, ID, OR, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Crataegus douglasii* / *Heracleum lanatum* Association Habitat types (Daubenmire 1970)
- > *Crataegus douglasii* / *Symphoricarpos albus* Association Habitat types (Daubenmire 1970)
- > *Crataegus douglasii* Shrubland Alliance (Bourgeron and Engelking 1994)

LOWER LEVEL UNITS

Associations:

- CEG001095 *Crataegus douglasii* / *Rosa woodsii* Wet Shrubland
- CEG001096 (*Populus tremuloides*) / *Crataegus douglasii* / *Symphoricarpos albus* Wet Shrubland
- CEG001094 (*Populus tremuloides*) / *Crataegus douglasii* / *Heracleum maximum* Wet Shrubland

AUTHORSHIP

Primary Concept Source: R.F. Daubenmire (1970)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by D. Sarr.

Version Date: 2014/03/14

REFERENCES

References: Bourgeron and Engelking 1994, Crowe and Clausnitzer 1997, Daubenmire 1970, Evans 1989a, Faber-Langendoen et al. 2017b, Kovalchik 1987, ORNHP unpubl. data, Reid et al. 1994

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

A3769. *Salix boothii* - *Salix geyeriana* - *Salix lutea* Montane Wet Shrubland Alliance

Type Concept Sentence: This alliance contains tall (>1.5 m) *Salix*-dominated shrublands in riparian and wetland settings. It is dominated by single or multiple *Salix* species, including *Salix bebbiana*, *Salix boothii*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*, *Salix ligulifolia*, *Salix lucida ssp. caudata*, *Salix lucida ssp. lasiandra*, *Salix lutea*, *Salix planifolia*, and *Salix prolixa*. These shrub species occur in the same broad geographic region, spreading from eastern Oregon and Washington, Idaho, Montana, Wyoming, Colorado, Utah, Nevada, New Mexico, and Arizona.

OVERVIEW

Scientific Name: *Salix boothii* - *Salix geyeriana* - *Salix lutea* Montane Wet Shrubland Alliance

Common Name (Translated Scientific Name): Booth's Willow - Geyer's Willow - Yellow Willow Montane Wet Shrubland Alliance

Colloquial Name: Western Montane Tall Willow Wet Shrubland

Type Concept: This alliance contains tall (>1.5 m) *Salix*-dominated shrublands in riparian and wetland settings. It is dominated by single or multiple *Salix* species including *Salix bebbiana*, *Salix boothii*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*, *Salix ligulifolia*, *Salix lucida ssp. caudata*, *Salix lucida ssp. lasiandra*, *Salix lutea*, *Salix planifolia*, and *Salix prolixa*. *Salix monticola* may also be present but is not a dominant species. These shrub species occur in the same broad geographic region, spreading from eastern Oregon and Washington, Idaho, Montana, Wyoming, Colorado, Utah, Nevada, New Mexico, and Arizona. Understories range from thick graminoids or forbs to very sparse cover depending on the degree of overstory shading. Common dominant graminoid species include *Calamagrostis canadensis*, *Carex aquatilis*, *Carex utriculata*, *Carex nebrascensis*, and *Deschampsia cespitosa*. Forb species are often mixed. These are generally subirrigated soils that are mineral with some degree of organic layers, but not deep peat soils.

Classification Comments: This covers the tall willow shrublands in the heart of the Intermountain West and Rocky Mountains within the U.S. Some of the associations include stands on mineral soils and stands on peat soils, and these will need to be separated into organic and non-organic soil counterparts. Many of these species are codominant in varying combinations, making single-*Salix* species alliances problematic. Stands with codominance of *Salix monticola* belong to *Salix monticola* Wet Shrubland Alliance (A0981).

Internal Comments:

Other Comments:

Similar NVC Types:

- A0981 *Salix monticola* Wet Shrubland Alliance: may have some of the same codominant *Salix* species.

Diagnostic Characteristics: Dominance or codominance (>5% relative cover) of one or more of the following tall *Salix* species: *Salix bebbiana*, *Salix boothii*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*, *Salix ligulifolia*, *Salix lucida ssp. caudata*, *Salix lucida ssp. lasiandra*, *Salix lutea*, *Salix planifolia*, and *Salix prolixa*.

VEGETATION

Physiognomy and Structure: This alliance is dominated by tall (1-4 m) broad-leaved deciduous shrublands. It is characterized by a dense to open canopy. The herbaceous layer can be dominated by graminoids or forbs and is often a mix.

Floristics: The tall-shrub layer is dominated by large stands of one or several willow species, including *Salix bebbiana*, *Salix boothii*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*, *Salix ligulifolia*, *Salix lucida ssp. caudata*, *Salix lucida ssp. lasiandra*, *Salix lutea*, *Salix planifolia*, and *Salix prolixa*. *Salix monticola* may also be present but not dominant. Other shorter shrub species include *Dasiphora fruticosa ssp. floribunda* (= *Pentaphylloides fruticosa*), *Lonicera utahensis*, and *Ribes* spp. The herbaceous layer is characterized by a moderate forb layer or dense graminoids. When forbs dominate the herbaceous layer, rarely is one forb species dominant, but rather several species form a combined cover. Forb species include *Achillea millefolium*, *Epilobium ciliatum*, *Galium trifidum*, *Geum macrophyllum*, *Heracleum maximum* (= *Heracleum lanatum*), *Pedicularis groenlandica*, *Polygonum bistortoides*,

Pyrola asarifolia, and *Swertia perennis*. Graminoids, when dominant, can be only one or two species and include *Carex aquatilis*, *Carex utriculata*, *Carex microptera*, *Calamagrostis canadensis*, *Calamagrostis stricta*, and *Poa palustris*.

ENVIRONMENT & DYNAMICS

Environmental Description: Vegetation types in this alliance occur in valley bottoms on swales, banks, and occasionally terraces of stream channels, areas which may have surface water in wet years. The ground surface is often uneven and hummocky. Soils are typically highly stratified with alternating layers of sandy loam and clay loam and are mottled within the top 10 cm. Other soils are finely textured, dark-colored, highly organic soils with silty clay loam. Lower profiles typically contain a gravel or cobble layer which may indicate that the soil section is a silted-in beaver pond (Kittel et al. 1999b).

Dynamics: Stands within this alliance are generally highly productive. Understory production varies, depending on the density of overstory shrubs. Characteristics of the herbaceous layer and soils suggest that many of the vegetation types within this alliance are stable (Youngblood et al. 1985b). However, livestock or wildlife grazing pressure will cause a decrease in the native graminoids (Hansen et al. 1995), and an opening of the overstory canopy, especially if browsing pressure is heavy. Beavers can increase the amount of surface water and decrease willow density.

DISTRIBUTION

Geographic Range: Montane elevations in eastern Oregon and Washington, Idaho, Montana, Wyoming, Colorado, Utah, Nevada, New Mexico, and Arizona.

Nations: CA, US

States/Provinces: AZ, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Salix* spp. Series (Johnston 1987)

LOWER LEVEL UNITS

Associations:

- CEG001173 *Salix bebbiana* Wet Shrubland
- CEG001190 *Salix drummondiana* Wet Shrubland [Placeholder]
- CEG001181 *Salix boothii* / Mesic Graminoids Wet Shrubland
- CEG001233 *Salix eriocephala* / *Ribes aureum* - *Rosa woodsii* Wet Shrubland
- CEG001180 *Salix boothii* / Mesic Forbs Wet Shrubland
- CEG002621 *Salix lucida* ssp. *caudata* / *Rosa woodsii* Wet Shrubland
- CEG001205 *Salix geyeriana* / *Calamagrostis canadensis* Wet Shrubland
- CEG001208 *Salix geyeriana* / *Deschampsia cespitosa* Wet Shrubland
- CEG002975 *Salix ligulifolia* / *Carex utriculata* Wet Shrubland
- CEG002671 *Salix boothii* / *Equisetum arvense* Wet Shrubland
- CEG001218 *Salix ligulifolia* Wet Shrubland
- CEG002904 *Salix boothii* / *Deschampsia cespitosa* - *Geum rossii* Wet Shrubland
- CEG001187 *Salix boothii* / *Maianthemum stellatum* Wet Shrubland
- CEG001211 *Salix geyeriana* / *Poa palustris* Wet Shrubland
- CEG001186 *Salix boothii* - *Salix lemmonii* Wet Shrubland
- CEG002607 *Salix boothii* - *Salix eastwoodiae* / *Carex nigricans* Wet Shrubland
- CEG001219 *Salix lutea* / *Calamagrostis canadensis* Wet Shrubland
- CEG001220 *Salix lutea* / *Carex utriculata* Wet Shrubland
- CEG001174 *Salix bebbiana* / Mesic Graminoids Wet Shrubland
- CEG001184 *Salix boothii* - *Salix geyeriana* Wet Shrubland
- CEG003452 *Salix prolixa* / *Rosa woodsii* Wet Shrubland
- CEG001176 *Salix (boothii, geyeriana)* / *Carex aquatilis* Wet Shrubland
- CEG001212 *Salix geyeriana* - *Salix lemmonii* / *Carex aquatilis* var. *dives* Wet Shrubland
- CEG001584 *Salix drummondiana* / *Carex scopulorum* var. *prionophylla* Wet Shrubland
- CEG002631 *Salix drummondiana* / *Carex utriculata* Wet Shrubland
- CEG002667 *Salix drummondiana* / *Calamagrostis canadensis* Wet Shrubland

NBR alliances

- CEG001185 *Salix boothii* - *Salix geyeriana* / *Carex angustata* Wet Shrubland
- CEG001192 *Salix drummondiana* / Mesic Forbs Wet Shrubland
- CEG005937 *Salix planifolia* / *Carex utriculata* Wet Shrubland
- CEG001247 *Salix geyeriana* - *Salix monticola* / *Calamagrostis canadensis* Wet Shrubland
- CEG002624 *Salix lutea* / *Rosa woodsii* Wet Shrubland
- CEG001177 *Salix boothii* / *Carex nebrascensis* Wet Shrubland
- CEG001213 *Salix geyeriana* - *Salix eriocephala* Wet Shrubland
- CEG002666 *Salix geyeriana* / Mesic Forbs Wet Shrubland
- CEG001210 *Salix geyeriana* / Mesic Graminoids Wet Shrubland
- CEG001183 *Salix boothii* / *Poa palustris* Wet Shrubland
- CEG001178 *Salix boothii* / *Carex utriculata* Wet Shrubland
- CEG001137 *Salix glauca* / *Deschampsia cespitosa* Wet Shrubland
- CEG002774 *Salix lutea* / Mesic Forbs Wet Shrubland
- CEG001175 *Salix boothii* / *Calamagrostis canadensis* Wet Shrubland
- CEG001224 *Salix planifolia* Wet Shrubland
- CEG002893 *Salix planifolia* / Mesic Forbs Wet Shrubland
- CEG001206 *Salix geyeriana* / *Carex aquatilis* Wet Shrubland
- CEG002073 *Salix lutea* / Mesic Graminoids Wet Shrubland
- CEG001207 *Salix geyeriana* / *Carex utriculata* Wet Shrubland
- CEG003780 *Salix lutea* Wet Shrubland
- CEG005322 *Salix lutea* / *Leymus cinereus* Wet Shrubland
- CEG005363 *Salix eriocephala* / Mesic Graminoids Wet Shrubland
- CEG001215 *Salix lucida* ssp. *caudata* Wet Shrubland
- CEG001223 *Salix geyeriana* - *Salix monticola* / Mesic Forbs Wet Shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Carsey et al. 2003a, Carsey et al. 2003b, Cooper and Cottrell 1990, Dorn 1997, Evenden 1990, Faber-Langendoen et al. 2017b, Girard et al. 1997, Hallock et al. 1986, Hansen et al. 1991, Hansen et al. 1995, Hess 1981, Jensen and Tuhy 1981, Johnston 1987, Jones 1992b, Kagan 1997, Kearney et al. 1969, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, MTNHP unpubl. data, Manning and Padgett 1991, Manning and Padgett 1992, Manning and Padgett 1995, Mutz and Graham 1982, Mutz and Queiroz 1983, Norton et al. 1981, ORNHP unpubl. data, Padgett 1982, Padgett and Manning 1988, Padgett et al. 1988b, Padgett et al. 1989, Phillips 1977, Reid 1990, Sawyer and Keeler-Wolf 1995, Tuhy and Jensen 1982, Weixelman et al. 1996, Youngblood et al. 1985a, Youngblood et al. 1985b

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

A1003. *Salix commutata* Wet Shrubland Alliance

Type Concept Sentence: These are short-statured (<1.5 m) willow-dominated communities found at subalpine elevations. *Salix commutata* dominates the shrub canopy with cover of >25%. Stands are confined to narrow riparian zones along upper reaches of streams and to elongated openings in higher elevation forests. Stands are typically found at moderate to high elevations between 2065 and 2220 m in British Columbia, Oregon, Washington, Idaho, western Montana and just into northern California and possibly as far east as Wyoming.

OVERVIEW

Scientific Name: *Salix commutata* Wet Shrubland Alliance

Common Name (Translated Scientific Name): Undergreen Willow Wet Shrubland Alliance

Colloquial Name: Cascadian Undergreen Willow Wet Shrubland

Type Concept: These are short-statured (<1.5 m) willow-dominated communities found at subalpine elevations. Stands within this alliance are classified as seasonally flooded, cold-deciduous shrublands. *Salix commutata* dominates the shrub canopy with cover of >25%. *Salix planifolia* and *Lonicera caerulea* may also be present. *Carex scopulorum* dominates the herbaceous layer with *Calamagrostis canadensis*. *Galium trifidum* has high constancy, and some stands contain a complement of wet-site forbs such as

Aconitum columbianum and *Caltha leptosepala ssp. howellii* (= *Caltha biflora*). Adjacent communities may be herbaceous bogs dominated by *Eleocharis quinqueflora* (= *Eleocharis pauciflora*). In some stands, a fringe of *Vaccinium uliginosum* (= *Vaccinium occidentale*) separates the bog from the willow stands. Stands are confined to narrow riparian zones along upper reaches of streams and to elongated openings in higher elevation forests. Stands are typically found at moderate to high elevations between 2065 and 2220 m in British Columbia, Oregon, Washington, Idaho, western Montana and just into northern California and possibly as far east as Wyoming. Microtopography is usually hummocky to undulating. Slopes range from 2-4%. Soils in Idaho stands are wet to saturated at the surface by flowing groundwater for most or all of the growing season. Soils are poorly to very poorly drained due to accumulation of organic material.

Classification Comments: This is the short shrub of higher elevations in the Cascades and Rocky Mountains that does not tend to overlap with other short-statured willows.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3770 *Salix wolfii* - *Salix brachycarpa* - *Betula glandulosa* Wet Shrubland Alliance: occupies similar environments and has similar stature, with some shared species, but tends to be further west and north.

Diagnostic Characteristics: Greater than 5% relative cover of *Salix commutata*.

VEGETATION

Physiognomy and Structure: This alliance is dominated by short, 1- to 2-m tall, broad-leaved deciduous shrublands. Canopy cover is continuous with 60-100% cover. The herbaceous layer is dominated by graminoids (60-100% cover) and a sparse forb layer.

Floristics: Stands within this alliance are classified as seasonally flooded, cold-deciduous shrublands. *Salix commutata* dominates the shrub canopy with cover of >25%. *Salix planifolia* and *Lonicera caerulea* may also be present. *Carex scopulorum* dominates the herbaceous layer with *Calamagrostis canadensis*. *Galium trifidum* has high constancy, and some stands contain a complement of wet-site forbs such as *Aconitum columbianum* and *Caltha leptosepala ssp. howellii* (= *Caltha biflora*).

ENVIRONMENT & DYNAMICS

Environmental Description: Communities found within this alliance are found in the subalpine zone. Stands are confined to narrow riparian zones along upper reaches of streams and to elongated openings in higher elevation forests. Stands are typically found at moderate to high elevations between 2065 and 2220 m. Microtopography is usually hummocky to undulating. Slopes range from 2-4%. Soils in Idaho stands are wet to saturated to the surface by flowing groundwater for most or all of the growing season. Soils are poorly to very poorly drained due to accumulation of organic material.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found in British Columbia, Oregon, Washington, Idaho, western Montana and just into northern California and possibly as far east as Wyoming.

Nations: CA, US

States/Provinces: BC, CA, ID, MT, OR, WA, WY?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG003497 *Salix commutata* / Mesic Graminoid Wet Shrubland
- CEG001189 *Salix commutata* / *Carex scopulorum* Wet Shrubland

AUTHORSHIP

Primary Concept Source: D. Culver, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Dorn 1984, Faber-Langendoen et al. 2017b, Hickman 1993, Hitchcock et al. 1964, Tuhy and Jensen 1982

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

A3774. *Salix eastwoodiae* - *Salix lemmonii* Wet Shrubland Alliance

Type Concept Sentence: These riparian shrublands, found scattered throughout high-elevation, late-snowmelt areas of the western U.S., are dominated by *Salix eastwoodiae* and/or *Salix lemmonii*. Other species such as *Salix planifolia*, *Salix boothii*, and *Betula glandulosa* may also occur in the shrub layer. They are found within glacial valley bottoms (e.g., seeps, toeslopes, benches, and stream benches), wet mountain meadows, and streambanks with gentle slopes (3%). Elevations range from 2300-3200 m. Sites that support these communities contain surface waters that collect in rivulets or are fed by seeps with water flowing at or near the surface.

OVERVIEW

Scientific Name: *Salix eastwoodiae* - *Salix lemmonii* Wet Shrubland Alliance

Common Name (Translated Scientific Name): Mountain Willow - Lemmon's Willow Wet Shrubland Alliance

Colloquial Name: Mountain Willow - Lemmon's Willow Wet Shrubland

Type Concept: These riparian shrublands, found scattered throughout high-elevation, late-snowmelt areas, are dominated by *Salix eastwoodiae* and/or *Salix lemmonii*. Other species such as *Salix planifolia*, *Salix boothii*, and *Betula glandulosa* may also occur in the shrub layer. Total shrub cover varies from 30 to over 75%. *Carex scopulorum*, *Carex aquatilis*, and *Carex utriculata* are usually dominant in the understory with at least 40% cover. *Carex cusickii* (= *Carex obovoidea*) and *Carex luzulina* are frequent and abundant. *Calamagrostis canadensis* is a dominant graminoid in Idaho stands. Forb cover is low with *Mertensia ciliata*, *Saxifraga odontoloma*, and *Thalictrum occidentale*. Adjacent upland communities are dominated by *Pinus monticola*, *Pinus contorta*, and *Abies concolor*. This alliance is found in the Rocky Mountains of western Wyoming and eastern Idaho, and the Sierra Nevada of western Nevada and California. These shrublands are found within glacial valley bottoms (e.g., seeps, toeslopes, benches, and stream benches), wet mountain meadows, and streambanks with gentle slopes (3%). Elevations range from 2300-3200 m. Sites that support these communities contain surface waters that collect in rivulets or are fed by seeps with water flowing at or near the surface. Soils are characterized by organic surface horizons. Textures of the underlying mineral horizons range from silty clay loam to loam sand.

Classification Comments: These *Salix* species do overlap somewhat with other Rocky Mountain tall willows, but are centered in their distribution further west and extend into California.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Riparian shrublands dominated by *Salix eastwoodiae* and/or *Salix lemmonii*.

VEGETATION

Physiognomy and Structure: This alliance is composed of tall (2-5 m), broad-leaved deciduous shrublands. They are characterized by intermittent shrub cover (30-75%). The herbaceous layer is dominated by 10-20% cover of graminoids. Forb cover is low to none.

Floristics: Vegetation types within this alliance are characterized as cold-deciduous, seasonally flooded shrublands. They are dominated by *Salix eastwoodiae* and/or *Salix lemmonii*. *Salix planifolia*, *Salix boothii*, and *Betula glandulosa* also occur in the shrub layer. Total shrub cover varies from 30 to over 75%. *Carex scopulorum*, *Carex aquatilis*, and *Carex utriculata* are usually dominant in the understory with at least 40% cover. *Carex cusickii* (= *Carex obovoidea*) and *Carex luzulina* are frequent and abundant (Mutz and Queiroz 1983). Tuhy and Jensen (1982) report *Calamagrostis canadensis* as a dominant graminoid in their Idaho stands. Forb cover is low with *Mertensia ciliata*, *Saxifraga odontoloma*, and *Thalictrum occidentale*.

ENVIRONMENT & DYNAMICS

Environmental Description: Communities within this shrubland alliance are scattered throughout the high-elevation, late-snowmelt areas. They are found within glacial valley bottoms (e.g., seeps, toeslopes, benches, and stream benches), wet mountain meadows, and streambanks with gentle slopes (3%). Elevations range from 2300-3200 m (Dorn 1997). Sites that support these communities

NBR alliances

contain surface waters that collect in rivulets or are fed by seeps with water flowing at or near the surface (Mutz and Queiroz 1983). Soils are characterized by organic surface horizons. Textures of the underlying mineral horizons range from silty clay loam to loam sand.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found in the Rocky Mountains of western Wyoming and eastern Idaho, and the Sierra Nevada of western Nevada and California.

Nations: US

States/Provinces: CA, ID, NV, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Salix eastwoodiae* (Sierran willow thickets) Alliance (Sawyer et al. 2009) [61.112.00]
- > *Salix lemmonii* (Lemmon's willow thickets) Alliance (Sawyer et al. 2009) [61.113.00]

LOWER LEVEL UNITS

Associations:

- CEGLO02772 *Salix lemmonii* / *Rosa woodsii* Wet Shrubland
- CEGLO03128 *Salix eastwoodiae* / *Deschampsia cespitosa* Wet Shrubland
- CEGLO08698 *Salix lemmonii* Sierran Wet Shrubland
- CEGLO02069 *Salix lemmonii* / Mesic Graminoids Wet Shrubland
- CEGLO02771 *Salix lemmonii* / Mesic-Tall Forbs Wet Shrubland
- CEGLO01194 *Salix eastwoodiae* Wet Shrubland
- CEGLO01196 *Salix eastwoodiae* / *Carex utriculata* Wet Shrubland
- CEGLO01195 *Salix eastwoodiae* / *Carex aquatilis* Wet Shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Dorn 1997, Faber-Langendoen et al. 2017b, Mutz and Queiroz 1983, Padgett and Manning 1988, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Tuhy and Jensen 1982, Walford et al. 1997, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

A0981. *Salix monticola* Wet Shrubland Alliance

Type Concept Sentence: This is a montane riparian shrubland alliance that is characterized by a tall, nearly closed canopy of *Salix monticola* often with one or more other willow species such as *Salix geyeriana*, *Salix drummondiana*, *Salix lucida ssp. lasiandra*, *Salix planifolia*, and *Salix wolfii*. It occurs in the Rocky Mountains along stream reaches in wide to narrow valleys (20-500 m) with broad, swift-moving streams and active, flat (3-8%) floodplains. Elevations range between 2310 and 3350 m.

OVERVIEW

Scientific Name: *Salix monticola* Wet Shrubland Alliance

Common Name (Translated Scientific Name): Park Willow Wet Shrubland Alliance

Colloquial Name: Park Willow Wet Shrubland

Type Concept: This is a montane riparian shrubland alliance that is characterized by a tall, nearly closed canopy of *Salix monticola* often with one or more other willow species such as *Salix geyeriana*, *Salix drummondiana*, *Salix lucida ssp. lasiandra* (= *Salix*

lasianдра), *Salix planifolia* and *Salix wolfii*. Other shrubs may be present as well, such as *Cornus sericea*, *Betula glandulosa*, and *Lonicera involucrata*. The forb layer is dense (up to 50%) and consists of *Angelica ampla*, *Galium boreale*, *Geum macrophyllum*, *Senecio bigelovii*, *Solidago canadensis*, and others. Graminoids can also be very abundant with species such as *Calamagrostis canadensis*, *Carex utriculata*, and *Carex aquatilis*. This alliance occurs in the Rocky Mountains along stream reaches in wide to narrow valleys (20-500 m) with broad, swift-moving streams and active, flat (3-8%) floodplains. Elevations range between 2310 and 3350 m. Large stands occur between meanders and at the edges of beaver ponds. The ground surface is usually undulating, from past flooding or beaver activity. These shrublands occur right at stream's edge, and up to 15 m from the channel, usually >0.5 m above the channel elevation. Soils are predominantly heavy silty clays with occasional to abundant mottling evident. Some stands occur on coarse, well-drained alluvium.

Classification Comments: This tall willow species does not range as widely as others in the Rocky Mountains, so it seems prudent to keep it as its own alliance. It could be included with *Salix boothii* - *Salix geyeriana* - *Salix lutea* Montane Wet Shrubland Alliance (A3769), as many of the willow species included there can co-occur with *Salix monticola*.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3769 *Salix boothii* - *Salix geyeriana* - *Salix lutea* Montane Wet Shrubland Alliance

Diagnostic Characteristics: Riparian shrublands dominated by *Salix monticola*.

VEGETATION

Physiognomy and Structure: This alliance is dominated by a tall (2-5 m) broad-leaved deciduous shrub. It forms a thick, closed canopy (30-75%) with a short-shrub layer (25-35% cover). The graminoid and forb layer varies widely among associations, but percent cover averages 30%.

Floristics: Plant associations within this alliance are intermittent in the montane areas of the Rocky Mountains. They are temporarily flooded, cold-deciduous shrublands dominated by *Salix monticola*. The tall-shrub layer is characterized by a tall, nearly closed canopy of *Salix monticola* (8-70%), typically with *Salix geyeriana* (40-50%) or *Salix drummondiana* (10%). Other shrubs present include *Betula glandulosa*, *Salix lucida* ssp. *lasianдра* (= *Salix lasianдра*), *Salix planifolia*, and *Salix wolfii*. The short-shrub layer is dominated by *Cornus sericea* and *Lonicera involucrata*. The forb layer is dense (up to 50%) and consists of *Angelica ampla*, *Galium boreale*, *Geum macrophyllum*, *Senecio bigelovii*, *Solidago canadensis*, and others. *Calamagrostis canadensis* comprises a dense graminoid layer of 40-50% cover. *Carex utriculata* and *Carex aquatilis* also contribute to the graminoid understory in several associations.

ENVIRONMENT & DYNAMICS

Environmental Description: Plant associations occur in the mountains along stream reaches in moderately wide to narrow valleys (20-120 m) with broad, swift-moving streams and active, flat (3-8%) floodplains. Elevations range between 2310 and 3350 m. Large stands occur between meanders and at the edges of beaver ponds. The ground surface is usually undulating, from past flooding or beaver activity. Associations occur right at stream's edge, and up to 15 m from the channel, usually >0.5 m above the channel elevation. Adjacent riparian vegetation can include deciduous shrublands and woodlands with mesic meadows. Adjacent upslope vegetation is typically coniferous forests dominated by *Pinus contorta*, *Picea* spp., and *Populus tremuloides*. Soils are predominantly heavy silty clays with occasional to abundant mottling evident. Some stands occur on coarse, well-drained alluvium.

Dynamics: Several associations within this alliance are influenced by beaver activity. *Carex utriculata* usually forms monotypic stands at the edge of ponds, where a persistent high water table limits the occurrence of other species. *Carex* stands are slowly invaded by *Salix* spp. as the ground becomes less saturated (Hansen et al. 1988b). Presence of dying conifer trees may indicate an increase in the water table due to decreased transpiration rates, allowing for expansion of *Calamagrostis canadensis* and conversion from a conifer / *Calamagrostis canadensis* plant association to a *Salix monticola* / *Calamagrostis canadensis* association (Padgett et al. 1989).

DISTRIBUTION

Geographic Range: This alliance is intermittent in the montane areas of the Rocky Mountains of Wyoming, Colorado and New Mexico.

Nations: US

States/Provinces: CO, NM, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- C EGL001139 *Salix monticola* Thicket Wet Shrubland
- C EGL001222 *Salix monticola* / *Calamagrostis canadensis* Wet Shrubland
- C EGL002656 *Salix monticola* / *Carex aquatilis* Wet Shrubland
- C EGL001221 *Salix monticola* / *Angelica ampla* Wet Shrubland
- C EGL002657 *Salix monticola* / *Carex utriculata* Wet Shrubland
- C EGL002659 *Salix monticola* / Mesic Graminoids Wet Shrubland
- C EGL002658 *Salix monticola* / Mesic Forbs Wet Shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Andrews 1983, Baker 1989b, Carsey et al. 2003a, Carsey et al. 2003b, Cooper and Cottrell 1990, Faber-Langendoen et al. 2017b, Hansen et al. 1988b, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Padgett et al. 1989, Richard et al. 1996, Sanderson and Kettler 1996

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G527. Western Montane-Subalpine Riparian & Seep Shrubland

A3770. *Salix wolfii* - *Salix brachycarpa* - *Betula glandulosa* Wet Shrubland Alliance

Type Concept Sentence: These are short (<1.5 m) *Salix*- or *Betula*-dominated shrublands of Intermountain West and Rocky Mountain high subalpine altitudes dominated by *Betula nana*, *Salix brachycarpa*, *Salix farriae*, *Salix planifolia*, and/or *Salix wolfii*. Canopy can be closed to open. Understory is usually fairly dense, graminoid-dominated herbaceous cover and occasionally forb-dominated, including several *Carex* spp. (e.g., *Carex aquatilis*, *Carex microptera*, *Carex scopulorum*, *Carex utriculata*), *Deschampsia cespitosa*, and others. Forb species may include *Caltha leptosepala*, *Fragaria virginiana*, *Pedicularis groenlandica*, *Swertia perennis*, and others.

OVERVIEW

Scientific Name: *Salix wolfii* - *Salix brachycarpa* - *Betula glandulosa* Wet Shrubland Alliance

Common Name (Translated Scientific Name): Wolf's Willow - Short-fruit Willow - Resin Birch Wet Shrubland Alliance

Colloquial Name: Rocky Mountain Short Willow Wet Shrubland

Type Concept: These are short (<1.5 m) *Salix*- or *Betula*-dominated shrublands of Intermountain West and Rocky Mountain high subalpine altitudes dominated by *Betula nana*, *Salix brachycarpa*, *Salix farriae*, *Salix planifolia*, and/or *Salix wolfii*. Canopy can be closed to open. Understory is usually fairly dense, graminoid-dominated herbaceous cover and occasionally forb-dominated, including several *Carex* spp. (e.g., *Carex aquatilis*, *Carex microptera*, *Carex scopulorum*, *Carex utriculata*), *Deschampsia cespitosa*, and others. Forb species may include *Caltha leptosepala*, *Fragaria virginiana*, *Pedicularis groenlandica*, *Swertia perennis*, and others. Communities within this alliance occur in moderately narrow to wide valleys and glacial basins on floodplains with lateral seepage of groundwater. Valley slopes range from 3-7%, and stream channels that run through the valleys vary from deep, narrow, and sinuous to shallow, broad, and gently meandering. Beavers are often active within the stands. Some stands occur on sideslope seeps, which remain wet throughout the growing season. Elevation ranges from 1950-3350 m. Soils are mineral. Soil textures include silty clay loams, silty loams, and sandy clay loams with mottling. Some stands occur on deep sandy clays, often with a high organic content, while other stands occur on shallow silty clays over gravels and rocks.

Classification Comments: This alliance covers low-statured (short <1.5 m) shrublands of subalpine altitudes in the Intermountain West and Rocky Mountains. *Salix commutata* occupies similar habitats but are regionally limited to the Cascade Range and Coast Ranges.

Internal Comments:

Other Comments:

Similar NVC Types:

- A1003 *Salix commutata* Wet Shrubland Alliance: occupies similar habitats with overlapping ranges but generally does not mix with *Salix* species in this alliance.

Diagnostic Characteristics: Short (<1.5 m) willow- or birch-dominated shrublands of high subalpine altitudes dominated by *Betula nana*, *Salix brachycarpa*, *Salix farriae*, *Salix planifolia*, and/or *Salix wolfii*.

VEGETATION

Physiognomy and Structure: This alliance is characterized by broad-leaved deciduous shrubs. The canopy consists of short (1-2 m), rounded shrubs that form a dense canopy. The herbaceous layer is dense with graminoids, especially rhizomatous sedges, and has a sparse to moderately dense forb layer.

Floristics: These are cold-deciduous, short-statured shrublands. The shrub layer is typically dominated by *Betula nana*, *Salix brachycarpa*, *Salix farriae*, *Salix planifolia*, and/or *Salix wolfii*. Stands can be monotypic, but are more often a mix of at least 2 species. *Salix brachycarpa* occupies the drier margins or raised hummocks. The herbaceous undergrowth is generally dense and rich, dominated by graminoids such as *Carex aquatilis*, *Carex microptera*, *Carex nebrascensis*, *Carex utriculata*, or *Deschampsia cespitosa*, or by forbs that may include *Caltha leptosepala*, *Ligusticum tenuifolium*, *Pedicularis groenlandica*, *Swertia perennis*, or *Thalictrum alpinum*.

ENVIRONMENT & DYNAMICS

Environmental Description: Communities within this alliance occur in moderately narrow to wide valleys and glacial basins on floodplains with lateral seepage of groundwater. Valley slopes range from 3-7%, and stream channels that run through the valleys vary from deep, narrow, and sinuous to shallow, broad, and gently meandering. Beavers are often active within the stands. Some stands occur on sideslope seeps, which remain wet throughout the growing season. Elevation ranges from 1950-3350 m. Soils are mineral. Soil textures include silty clay loams, silty loams, and sandy clay loams with mottling. Some stands occur on deep sandy clays, often with a high organic content, while other stands occur on shallow silty clays over gravels and rocks.

Dynamics: Browsing may weaken or eventually eliminate some willow species. With increasing levels of grazing, *Deschampsia cespitosa* will be replaced by *Juncus arcticus* ssp. *littoralis*, *Poa pratensis*, and *Taraxacum officinale*.

DISTRIBUTION

Geographic Range: This alliance is found in the Intermountain West and Rocky Mountains of Idaho, Montana, Wyoming, Colorado, Utah, and New Mexico, extending into eastern Oregon and Washington.

Nations: CA, US

States/Provinces: CO, ID, MT, NM, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Salix* spp. Series (Johnston 1987)

LOWER LEVEL UNITS

Associations:

- CEG002653 *Betula glandulosa* / Mesic Forbs - Mesic Graminoids Wet Shrubland
- CEG002064 *Salix wolfii* / *Calamagrostis canadensis* Wet Shrubland
- CEG001240 *Salix wolfii* / Mesic Forbs Wet Shrubland
- CEG001241 *Salix wolfii* / *Poa palustris* Wet Shrubland
- CEG001244 *Salix brachycarpa* / *Carex aquatilis* Wet Shrubland
- CEG001236 *Salix wolfii* / *Carex nebrascensis* Wet Shrubland
- CEG001242 *Salix wolfii* / *Swertia perennis* - *Pedicularis groenlandica* Wet Shrubland
- CEG001225 *Salix planifolia* / *Calamagrostis canadensis* Wet Shrubland
- CEG001135 *Salix brachycarpa* / Mesic Forbs Wet Shrubland

NBR alliances

- CEGLO02665 *Salix planifolia* / *Caltha leptosepala* Wet Shrubland
- CEGLO01079 *Betula glandulosa* / *Carex utriculata* Wet Shrubland
- CEGLO01235 *Salix wolfii* / *Carex microptera* Wet Shrubland
- CEGLO01237 *Salix wolfii* / *Carex utriculata* Wet Shrubland
- CEGLO01230 *Salix planifolia* / *Deschampsia cespitosa* Wet Shrubland
- CEGLO05828 *Betula glandulosa* / *Salix brachycarpa* Wet Shrubland
- CEGLO01229 *Salix planifolia* / *Carex scopulorum* Wet Shrubland
- CEGLO01238 *Salix wolfii* / *Deschampsia cespitosa* Wet Shrubland
- CEGLO01227 *Salix planifolia* / *Carex aquatilis* Wet Shrubland
- CEGLO01136 *Salix glauca* Wet Shrubland
- CEGLO01228 *Salix (farriae, planifolia)* / *Carex utriculata* Wet Shrubland
- CEGLO01234 *Salix wolfii* / *Carex aquatilis* Wet Shrubland
- CEGLO05887 *Betula glandulosa* / *Carex* spp. Wet Shrubland
- CEGLO01239 *Salix wolfii* / *Fragaria virginiana* Wet Shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Cooper 1986a, Cooper and Cottrell 1990, Dorn 1997, Faber-Langendoen et al. 2017b, Girard et al. 1997, Hansen et al. 1991, Hansen et al. 1995, Heifner 1974, Hess 1981, Hess and Wasser 1982, Hitchcock et al. 1964, Jensen and Tuhy 1981, Johnston 1987, Jones 1992b, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Lewis 1970, Mattson 1984, Mutz and Graham 1982, Mutz and Queiroz 1983, Norton et al. 1981, Olson and Gerhart 1982, Padgett et al. 1988b, Padgett et al. 1989, Phillips 1977, Sanderson and Kettler 1996, Tuhy 1981, Tuhy and Jensen 1982, Youngblood et al. 1985a, Youngblood et al. 1985b

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

2.C.4.Nb.2.f. M075 Western North American Montane-Subalpine-Boreal Marsh, Wet Meadow & Shrubland

G528. Western North American Boreal Wet Meadow & Marsh

Type Concept Sentence: This wetland group occurs in boreal Alaska and Canada on mineral soils and is characterized by graminoid species such as *Calamagrostis canadensis*, *Carex aquatilis*, *Carex lasiocarpa*, *Carex utriculata*, *Equisetum palustre*, *Eriophorum angustifolium*, and others. It may include shrub cover (<25%) such as *Myrica gale*, *Alnus incana ssp. tenuifolia*, and *Salix* spp.

OVERVIEW

Scientific Name: *Carex aquatilis* - *Carex utriculata* Boreal Wet Meadow & Marsh Group

Common Name (Translated Scientific Name): Water Sedge - Northwest Territory Sedge Boreal Wet Meadow & Marsh Group

Colloquial Name: Boreal Sedge Wet Meadow

Type Concept: This group is widespread in the boreal and boreal transitional areas of Alaska and British Columbia, extending east into Alberta, Saskatchewan, and Manitoba and south into Idaho, Montana, North Dakota and Minnesota. Vegetation is largely graminoid-dominated. Common species include *Calamagrostis canadensis*, *Carex aquatilis*, *Carex lasiocarpa*, *Carex utriculata*, *Equisetum palustre*, and *Eriophorum angustifolium*. Shrubs may be a minor component of the canopy cover (less than 25%) and include *Myrica gale*, *Alnus incana ssp. tenuifolia*, and *Salix* spp. It occurs on floodplains, depressions, pond and lake margins, oxbows and abandoned channels. Frequent river channel migration and associated flooding and fluvial processes constitute the major disturbances. Wetland succession and species composition are variable due to diverse environmental conditions such as water depth, substrate, and nutrient input. Floodplain wetland vegetation includes freshwater marsh and wet low shrub. Patch size is small to large and often linear. Moisture regime varies from saturated to semipermanently flooded.

Classification Comments:

Similar NVC Types:

Diagnostic Characteristics: This group is characterized principally by hydrophytic herbaceous vegetation and less commonly low-shrub marshes that are saturated to semipermanently flooded on boreal and boreal transition areas.

VEGETATION

Physiognomy and Structure: This group is defined by hydrophytic graminoids.

Floristics: Freshwater marsh vegetation may be dominated by emergent sedges, forbs, or grasses. Species that often dominate or codominate include *Calamagrostis canadensis*, *Carex aquatilis*, *Carex lasiocarpa*, *Carex utriculata*, *Equisetum palustre*, and *Eriophorum angustifolium*. Shrubs may be a minor component of the canopy cover (less than 25% cover) and include *Myrica gale*, *Alnus incana ssp. tenuifolia*, and *Salix* spp.

ENVIRONMENT & DYNAMICS

Environmental Description: Freshwater marshes are found throughout the boreal transition and boreal regions of Alaska and British Columbia, extending east into Alberta, Saskatchewan, and Manitoba and south into Idaho, Montana, North Dakota and Minnesota. They are characterized by emergent herbaceous vegetation. Freshwater marshes typically occur with other wetland groups. They occur on the margins of abandoned channels, floodplains, ponds, lakes, and riparian systems and on inland deltas where rivers drain into large lakes. Inland marshes are mostly small-patch, confined to limited areas in suitable floodplain or basin topography. They are typically saturated or semipermanently flooded, but some marshes have seasonal flooding. Water is at or above the surface for most of the growing season (typically 10 cm above the surface). Soils are muck or mineral, and water is nutrient-rich. These systems are highly productive and have high rates of decomposition.

Dynamics: This group requires a source of freshwater. Seasonal flooding is characteristic of inland deltas. Marsh zonation is related to water depth and duration of flooding. A typical sequence progresses from open water to emergent deep marsh to shallow marsh to wet meadow or fen. Floating marsh mats may be seral to fens. River channel migration, flooding and other fluvial processes constitute the major disturbance in this group.

DISTRIBUTION

Geographic Range: This group occurs throughout the boreal transition and boreal regions of Alaska and British Columbia, extending east into Alberta, Saskatchewan, and Manitoba and south into Idaho, Montana, North Dakota and Minnesota.

Spatial Scale & Pattern [optional]: Large patch, Small patch, Linear

Nations: CA, US

States/Provinces: AB, AK, BC, ID, MB, MN, ND, SK, YT

TNC Ecoregions [optional]: 71:C, 72:C, 73:C, 74:C, 75:?, 76:C, 77:C, 78:C, 79:C, 134:P, 135:C, 139:C, 140:C, 141:C, 144:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Katmai)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A3824 *Typha* spp. - *Schoenoplectus* spp. Boreal Marsh Alliance
- A3825 *Myrica gale* - *Alnus incana ssp. tenuifolia* - *Salix* spp. Boreal Wet Shrubland Alliance
- A3823 *Carex aquatilis* - *Carex utriculata* Boreal Wet Meadow Alliance

AUTHORSHIP

Primary Concept Source: G. Kittel, K. Boggs, P. Comer, M. Reid, D. Faber-Langendoen, in Faber-Langendoen et al. (2011)

Author of Description: M.E. Hall, G. Kittel and T. Boucher

Acknowledgments:

Version Date: 01/19/2016

Classif Resp Region: West

Internal Author: MEH 10-11, mod. GK 10-11, 9-13, 11-15, mod. TB 1-16

REFERENCES

References: Boggs 2002, Boggs et al. 2003, Comer et al. 2003, Faber-Langendoen et al. 2017a, Fleming and Spencer 2007, Gracz et al. 2005, Jorgenson 1999, Lawrence et al. 2005, National Wetlands Working Group 1997, Shiflet 1994, Stone et al. 2007, Thompson and Hansen 2003, Viereck et al. 1992, Willoughby 2007, Willoughby et al. 2006

 2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G528. Western North American Boreal Wet Meadow & Marsh

M301. Western North American Ruderal Marsh, Wet Meadow & Shrubland

This macrogroup includes disturbed natural wetland habitats of temperate western North America that are now strongly dominated by non-native and sometimes weedy or generalist native species.

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

2.C.4.Nb.90.a. M301 Western North American Ruderal Marsh, Wet Meadow & Shrubland

G524. Western North American Ruderal Marsh, Wet Meadow & Shrubland

Type Concept Sentence: This group contains wet meadows dominated by non-native species such as *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, *Conyza canadensis*, *Cirsium arvense*, *Sonchus* spp., *Lactuca serriola*, *Phalaris arundinacea*, *Phragmites australis* ssp. *australis*, *Poa palustris*, and/or *Poa pratensis* that occur in the same physical settings as native wet meadows found throughout the western U.S. and Canada.

OVERVIEW**Scientific Name:** *Poa pratensis* - *Conyza canadensis* - *Cirsium arvense* Ruderal Marsh, Wet Meadow & Shrubland Group**Common Name (Translated Scientific Name):** Kentucky Bluegrass - Canadian Horseweed - Canada Thistle Ruderal Marsh, Wet Meadow & Shrubland Group**Colloquial Name:** Western Ruderal Forb Wet Meadow

Type Concept: This group contains disturbed wet meadows found in lowland, montane and subalpine elevations, occasionally reaching into the lower edges of the alpine elevations (sea level to 3600 m) throughout the western U.S. and Canada. Vegetation is dominated by non-native species such as *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, *Bromus inermis*, *Conyza canadensis*, *Cirsium arvense*, *Sonchus* spp., *Lactuca serriola*, *Phalaris arundinacea*, *Phragmites australis* ssp. *australis*, *Poa bulbosa*, *Poa palustris*, and *Poa pratensis*. Native species may be present but are so low in abundance that the original native plant association is impossible to determine. These can be wet meadows, wet emergent marshes, coastal backwater dunes, sloughs, open wet depressions, basins and flats with low-velocity surface and subsurface flows. They can be large meadows in montane or subalpine valleys, or occur as narrow strips bordering ponds, lakes, and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Soils are mostly mineral and show typical hydric soil characteristics such as low chroma and redoximorphic features; some areas may have high organic content as inclusions or pockets. Due to disturbance, soils may be compacted.

Classification Comments: This group may be difficult to tease apart from its native counterpart. The test is that the non-native species far outweigh native species in abundance and richness, such that a well-trained observer cannot tell what the native counterpart may have been or to do so is only speculation. This group does not include actively managed irrigated hay meadows that have been historically seeded. Those belong under 7 Agricultural & Developed Vegetation Class (CCL01).

Similar NVC Types:

- G517 Vancouverian Freshwater Wet Meadow & Marsh: is dominated by native species.
- G521 Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh: is dominated by native species.
- G531 Arid West Interior Freshwater Marsh
- G819 North American Warm Desert Ruderal Scrub
- G677 North American Warm Desert Ruderal Grassland
- G600 Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

Diagnostic Characteristics: Wet graminoid and forb meadow or marsh dominated by non-native species.**VEGETATION****Physiognomy and Structure:** Herbaceous wet meadow dominated by perennial herbs introduced to North America.

Floristics: Vegetation of this group is dominated by non-native species such as *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, *Bromus inermis*, *Conyza canadensis*, *Lactuca serriola*, *Cirsium arvense*, *Iris pseudacorus*, *Phalaris arundinacea*, *Phragmites australis*, *Poa bulbosa*, *Poa palustris*, *Poa pratensis*, *Poa trivialis*, and *Scirpus cyperinus*. Native species may be present but are so low in abundance that the original native plant association is impossible to determine. Floristic information was compiled from Whitson et al. (1996), Rondeau (2001), Faber-Langendoen et al. (2008), and Sawyer et al. (2009).

ENVIRONMENT & DYNAMICS

Environmental Description: *Soil/substrate/hydrology:* These wet meadows occur in open wet depressions, basins and flats with low-velocity surface and subsurface flows. They can be large meadows in montane or subalpine valleys, or occur as narrow strips bordering ponds, lakes, and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. Some sites occur under an agricultural management regime of seasonal sheet irrigation for grazing or haying purposes, and may bear no resemblance to historical types of the area. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Soils are mostly mineral and show typical hydric soil characteristics such as low chroma and redoximorphic features; some areas may have high organic content as inclusions or pockets. Due to disturbance, soils may be compacted.

This group occurs in the same environmental settings as Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh Group (G521), Vancouverian Freshwater Wet Meadow & Marsh Group (G517), and Arid West Interior Freshwater Marsh Group (G531).

Dynamics: This group is a product of disturbance such as continuous heavy grazing by domestic livestock, soil disturbance/compactions, significant change in hydrologic regime, invasion after natural disturbance such as fire, floods or landslides, and are a combination of infestation by non-native invasive plants, and by diminished or lack of competition by native plants.

DISTRIBUTION

Geographic Range: This group is found throughout the entire western U.S. and Canada.

Spatial Scale & Pattern [optional]: Small patch

Nations: CA, US

States/Provinces: AB, AK, BC, CA, CO, ID, MT, NM, NV, OR, SD, TX, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A2020 *Sorghum halepense* Ruderal Desert Grassland Alliance
- A3848 *Poa pratensis* - *Agrostis gigantea* - *Agrostis stolonifera* Ruderal Marsh Alliance
- A4217 *Salix* spp. - *Artemisia cana* Ruderal Understory Wet Shrubland Alliance
- A3847 *Phragmites australis* ssp. *australis* - *Arundo donax* - *Typha angustifolia* Ruderal Marsh Alliance
- A3849 *Conyza canadensis* - *Cirsium arvense* - *Lactuca serriola* Ruderal Wet Meadow Alliance
- A3846 *Phalaris arundinacea* Western Ruderal Marsh Alliance

AUTHORSHIP

Primary Concept Source: D. Faber-Langendoen, in Faber-Langendoen et al. (2011)

Author of Description: G. Kittel

Acknowledgments: Associate Editor: F.J. Triepke. Peer review by J. Rocchio.

Version Date: 09/29/2016

Classif Resp Region: West

Internal Author: GK 12-10, 3-11, 6-12, 9-13, 12-15, 9-16, 10-16, 8-17

REFERENCES

References: Buck-Diaz et al. 2012, Faber-Langendoen et al. 2008a, Faber-Langendoen et al. 2017a, Rondeau 2001, Sawyer et al. 2009, Whitson et al. 2000

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G524. Western North American Ruderal Marsh, Wet Meadow & Shrubland

A3849. *Conyza canadensis* - *Cirsium arvense* - *Lactuca serriola* Ruderal Wet Meadow Alliance

Type Concept Sentence: This alliance covers those non-native forb-dominated waste and other disturbed places of the western U.S. dominated by such species as *Conyza canadensis*, *Cirsium arvense*, or *Lactuca serriola* (other species may be present to dominant).

OVERVIEW

Scientific Name: *Conyza canadensis* - *Cirsium arvense* - *Lactuca serriola* Ruderal Wet Meadow Alliance

Common Name (Translated Scientific Name): Canadian Horseweed - Canada Thistle - Prickly Lettuce Ruderal Wet Meadow Alliance

Colloquial Name: Western Ruderal Forb Wet Meadow

Type Concept: This alliance covers herbaceous areas dominated by non-native forb species such as *Conyza canadensis*, *Cirsium arvense*, or *Lactuca serriola*. Many other facultative wet forbs may be present or dominant, such as *Chenopodium album*, *Dipsacus fullonum*, *Lepidium perfoliatum*, *Rumex crispus*, *Sisymbrium altissimum*, *Sonchus arvensis*, and many others. These disturbed places are generally seasonally or intermittently flooded, usually drying completely between wet episodes. They are generally not alkaline but may be mildly so. It is found throughout the western U.S.

Classification Comments: This alliance covers western U.S. mesic to seasonally wet to moist areas, not dry upland areas.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Disturbed areas dominated by one or a mix of non-native wetland or facultative forb species such as *Chenopodium album*, *Cirsium arvense*, *Conyza canadensis*, *Dipsacus fullonum*, *Lactuca serriola*, *Lepidium perfoliatum*, *Rumex crispus*, *Sisymbrium altissimum*, or *Sonchus arvensis*.

VEGETATION

Physiognomy and Structure: Broad-leaved annual or perennial herbaceous stands <2 m in height.

Floristics: These stands are dominated by non-native forb species such as *Conyza canadensis*, *Cirsium arvense*, or *Lactuca serriola*. Many other facultative wet forbs may be present or dominant, such as *Chenopodium album*, *Cirsium arvense*, *Conyza canadensis*, *Dipsacus fullonum*, *Lactuca serriola*, *Lepidium perfoliatum*, *Rumex crispus*, *Sisymbrium altissimum*, *Sonchus arvensis*, and many others. Other commonly associated forbs present and contributing low to moderate cover include *Melilotus officinalis*, *Rorippa palustris* ssp. *hispida*, *Salsola tragus*, and *Verbascum thapsus*. Some graminoids such as *Hordeum jubatum* may also be present, but these tend to be not as abundant as the total forb cover.

ENVIRONMENT & DYNAMICS

Environmental Description: These alliance occur in mesic areas that are somehow disturbed, and are common throughout western North America. Stands occur in reservoir drawdown zones, disturbed areas near streams or old fields, and heavily damaged soils near open water.

Dynamics: This alliance is generally a product of serious soil disturbance in areas that are periodically wet, such as abandoned fields within flood zones or high water areas or drawn down reservoirs, or rings around stock ponds.

DISTRIBUTION

Geographic Range: This alliance is found throughout the western U.S.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY**LOWER LEVEL UNITS****Associations:**

- C EGL002800 *Conyza canadensis* Ruderal Wet Meadow

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/01/07

REFERENCES

References: Faber-Langendoen et al. 2017b

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G524. Western North American Ruderal Marsh, Wet Meadow & Shrubland

A3846. Phalaris arundinacea Western Ruderal Marsh Alliance

Type Concept Sentence: Stands are dominated by *Phalaris arundinacea*, which tends to occur in monocultures and is known to occur in mesic to wet disturbed areas and along rivers that no longer flood throughout the western U.S.

OVERVIEW

Scientific Name: *Phalaris arundinacea* Western Ruderal Marsh Alliance

Common Name (Translated Scientific Name): Reed Canarygrass Western Ruderal Marsh Alliance

Colloquial Name: Western Ruderal Reed Canarygrass Marsh

Type Concept: This herbaceous alliance covers stands dominated by *Phalaris arundinacea*, which tends to occur in monocultures. Stands are found along riparian areas, pond and lake margins, wet meadows, and intermittent drainages, and is known from throughout the western U.S.

Classification Comments: This alliance covers non-native strains of the nominal species. Extensive planting as a forage crop has led to the spread of this semi-natural type (Hansen et al. 1995, Hall and Hansen 1997). *Phalaris arundinacea* is native and widespread in Alberta, although some introduced genotypes may be present. Further work is required to resolve the natural versus introduced nature of this type in western North America. Midwest and eastern North American stands are covered by groups and alliances for those geographic areas.

Internal Comments: mjr 2-15: CA added based on Buck-Diaz et al. (2012).

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Stands dominated by *Phalaris arundinacea*, which tends to occur in monocultures.

VEGETATION

Physiognomy and Structure: Tall herbaceous perennial graminoid that can reach heights >2 m tall.

Floristics: Stands are dominated by non-native strains of *Phalaris arundinacea*, which tends to occur in monocultures or associated with *Calamagrostis canadensis* in northern areas.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs in wet areas, primarily riparian, occurring along rivers and streams, as well as shallow lakeshores (MacKenzie and Moran 2004, Willoughby et al. 2004). Elevations range from near sea level to 2307 m. The poorly drained alluvial soils are commonly fine-textured (occasionally coarse-textured) and may be flooded for brief to extended periods.

Dynamics:

DISTRIBUTION

Geographic Range: This herbaceous alliance occurs throughout the western U.S. It also occurs in Canada, in the southern two-thirds of British Columbia, in areas with warm and relatively dry summers and in Alberta. Its distribution as a natural type is complicated

NBR alliances

because this native species is widely cultivated as a forage crop and has escaped and established in wetlands and riparian areas, displacing the local flora.

Nations: CA, US

States/Provinces: AB, BC, CA, CO, ID, MT, NM, NV, OR, UT, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Phalaris arundinacea* Provisional Semi-Natural Stands (Reed canary grass grassland) (Buck-Diaz et al. 2012)

LOWER LEVEL UNITS

Associations:

- CEG001474 *Phalaris arundinacea* Western Marsh

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Boggs et al. 1990, Buck-Diaz et al. 2012, Crawford 2001, Faber-Langendoen et al. 2017b, Hall and Hansen 1997, Hansen et al. 1991, Hansen et al. 1995, MacKenzie and Moran 2004, Muldavin et al. 2000a, Willoughby et al. 2004

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G524. Western North American Ruderal Marsh, Wet Meadow & Shrubland

A3847. *Phragmites australis* ssp. *australis* - *Arundo donax* - *Typha angustifolia* Ruderal Marsh Alliance [Low - Poorly Documented]

Type Concept Sentence: This common reed marsh alliance is dominated by introduced *Phragmites australis* ssp. *australis*, *Arundo donax*, *Typha angustifolia* or other invasive wetland graminoid species, and is found across the west-temperate regions of the United States and Canada.

OVERVIEW

Scientific Name: *Phragmites australis* ssp. *australis* - *Arundo donax* - *Typha angustifolia* Ruderal Marsh Alliance

Common Name (Translated Scientific Name): European Common Reed - Giant Reed - Narrowleaf Cattail Ruderal Marsh Alliance

Colloquial Name: Western Ruderal Common Reed Marsh

Type Concept: This common reed-dominated marsh alliance is found across the west-temperate regions of the United States and Canada. *Phragmites australis* ssp. *australis*, *Arundo donax*, or *Typha angustifolia* will often invade into existing natural or semi-natural communities present on the site, and once established, this alliance is usually strongly dominated with few or no other vascular plants present. Stands occur in semipermanently flooded marshes, ditches, impoundments, etc. that have often been disturbed by human activity.

Classification Comments: This alliance is limited to the western U.S. and is intended to cover the non-native stands of introduced *Phragmites australis* ssp. *australis*, *Arundo donax*, or *Typha angustifolia*. Compare with similar monotypic stands in Great Plains and eastern U.S. alliances.

Internal Comments: DFL 8-17: AB added. mjr 8-15: MX added based on members.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Stands strongly dominated by non-native *Phragmites australis* ssp. *australis*, *Arundo donax*, or *Typha angustifolia*.

VEGETATION

Physiognomy and Structure: Tall perennial graminoid herbaceous that is <3 m in height.

Floristics: Stands are monocultures of introduced *Phragmites australis* ssp. *australis*, *Arundo donax*, or *Typha angustifolia*. Some stands may have minor cover of associates such as *Agrostis stolonifera*, *Carex* spp., *Conyza canadensis*, *Glycyrrhiza lepidota*, *Iva axillaris*, *Mentha arvensis*, *Schoenoplectus acutus* (= *Scirpus acutus*), and *Typha* spp. Other species present may include *Ambrosia psilostachya*, *Anemopsis californica*, *Baccharis douglasii*, *Distichlis spicata*, *Juncus arcticus*, *Juncus cooperi*, *Lepidium latifolium*, *Schoenoplectus americanus*, *Schoenoplectus californicus*, and *Xanthium strumarium*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is found in non-tidal marshes with semipermanently or, rarely, seasonally flooded hydrology, either in depressions or along rivers with seasonal fluctuation in water level throughout the western United States and adjacent Canada. This includes semipermanently flooded marshes, ditches, impoundments, etc.

Dynamics: Stands are generally a product of human-induced disturbance, either through direct habitat manipulation or through passive introduction of reproductive material to naturally disturbed substrates (Marks et al. 1994).

DISTRIBUTION

Geographic Range: West-temperate regions of the United States and Canada.

Nations: CA, MX, US

States/Provinces: AB, AZ, CA, CO, ID, MT, NM, NV, TX, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Lake Mead, Mojave); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

- > *Arundo donax* (Giant reed breaks) Semi-natural Stands (Sawyer et al. 2009) [42.080.00]
- > *Arundo donax* Herbaceous Alliance (Keeler-Wolf and Evens 2006)
- > *Arundo donax* Semi-Natural Stands (Giant reed breaks) (Buck-Diaz et al. 2012)
- > *Phragmites australis* (Common reed marshes) Alliance (Sawyer et al. 2009) [41.061.00]
- = *Phragmites australis* Herbaceous Alliance (Evens et al. 2014)

LOWER LEVEL UNITS

Associations:

- CEG001475 *Phragmites australis* ssp. *australis* Western Ruderal Wet Meadow
- CEG004101 *Arundo donax* Riverbank Ruderal Wet Meadow

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2017/08/14

REFERENCES

References: Buck-Diaz et al. 2012, Evens et al. 2014, Faber-Langendoen et al. 2017b, Hickson and Keeler-Wolf 2007, Keeler-Wolf and Evens 2006, Keeler-Wolf and Vaghti 2000, Marks et al. 1994, Niering and Warren 1977, Overholt et al. 2015, Sawyer et al. 2009, Sproul et al. 2011, Swearingen and Saltonstall 2010, Swearingen and Saltonstall 2012, VegCAMP and AIS 2013

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G524. Western North American Ruderal Marsh, Wet Meadow & Shrubland

A3848. *Poa pratensis* - *Agrostis gigantea* - *Agrostis stolonifera* Ruderal Marsh Alliance

Type Concept Sentence: This alliance includes grasslands dominated by introduced grasses such as *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, or *Poa pratensis*, and is a very common and widespread in the western U.S. where it has invaded natural meadows, wetlands and riparian areas.

OVERVIEW

Scientific Name: *Poa pratensis* - *Agrostis gigantea* - *Agrostis stolonifera* Ruderal Marsh Alliance

Common Name (Translated Scientific Name): Kentucky Bluegrass - Redtop - Creeping Bentgrass Ruderal Marsh Alliance

Colloquial Name: Ruderal Kentucky Bluegrass - Redtop - Creeping Bentgrass Marsh

Type Concept: This alliance includes mesic grasslands and wetlands dominated by introduced grasses such as *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, or *Poa pratensis*. This semi-natural grassland is widespread in the western U.S. where it has invaded natural meadows, wetlands and riparian areas. *Agrostis stolonifera* and *Poa pratensis* have been widely planted for forage and have invaded native communities from hay fields, especially more mesic areas such as riparian floodplains and seasonally flooded wetlands in the semi-arid western U.S.

Classification Comments: This alliance covers areas invaded by these non-native grasses and does not include irrigated hay meadows or other actively managed areas.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Grasslands dominated by *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, or *Poa pratensis*.

VEGETATION

Physiognomy and Structure: Low-statured perennial herbaceous graminoid, generally <1 m in height.

Floristics: This widespread, semi-natural alliance is characterized by a moderate to dense herbaceous canopy that is strongly dominated by *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, or *Poa pratensis*. Associate species are often those early-seral and weedy species that tolerate historic heavy livestock grazing or other disturbance well, such as *Achillea millefolium*, *Cirsium arvense*, *Elymus repens*, *Equisetum* spp., *Fragaria virginiana*, *Hordeum* spp., *Juncus balticus*, *Linaria vulgaris*, *Potentilla gracilis*, *Taraxacum officinale*, and introduced forage species such as *Agrostis stolonifera*, *Bromus inermis*, and *Phleum pratense*. Remnant native species present may include *Ambrosia psilostachya*, *Amorpha canescens*, *Andropogon gerardii*, *Artemisia ludoviciana*, *Carex* spp., *Deschampsia cespitosa*, *Pascopyrum smithii*, and *Psoralidium tenuiflorum*.

ENVIRONMENT & DYNAMICS

Environmental Description: Sites are generally flat to moderately sloping and occur on all aspects. Stands typically occur on pastures found in the plains, montane meadows, stream benches and terraces. In the semi-arid region it is restricted to relatively mesic sites. Stands with *Alopecurus pratensis* are the wettest of this alliance that tolerates very high water table throughout the growing season. Stands can also tolerate mildly alkaline and saline soils, and some drought (Kovalchik 1987, Padgett et al. 1989, Hansen et al. 1995, Manning and Padgett 1995, Hall and Hansen 1997).

Dynamics: *Poa pratensis* is tolerant of heavy grazing and increases at the expense of less tolerant native species (Volland 1978, Hansen et al. 1995). It is also adapted to burning and quickly resprouts after fire, except when burned during growing periods (Volland and Dell 1981).

DISTRIBUTION

Geographic Range: This alliance is found throughout western U.S.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NV, OR, SD, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Agrostis (gigantea, stolonifera) - Festuca arundinacea* (Bent grass - tall fescue meadows) Semi-natural Stands (Sawyer et al. 2009) [45.106.00]
- > *Agrostis (gigantea, stolonifera)-Festuca arundinacea* Herbaceous Semi-Natural Alliance (CNPS 2017) [45.106.00]
- > *Poa pratensis* (Kentucky blue grass turf) Semi-natural Stands (Sawyer et al. 2009) [42.060.00]
- > *Poa pratensis* Herbaceous Semi-Natural Alliance (CNPS 2017) [42.060.00]

LOWER LEVEL UNITS**Associations:**

- C EGL001558 *Agrostis (gigantea, stolonifera)* Ruderal Marsh
- C EGL005615 *Echinochloa crus-galli* Ruderal Wet Meadow
- C EGL005209 *Alopecurus pratensis* Western Ruderal Wet Meadow
- C EGL003081 *Poa pratensis* Ruderal Marsh

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: CNPS 2017, Carsey et al. 2003a, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Hall and Hansen 1997, Hansen et al. 1991, Hansen et al. 1995, Kauffman et al. 1983, Kauffman et al. 1985, Kittel et al. 1999b, Kovalchik 1987, Manning and Padgett 1995, Padgett et al. 1989, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Tuhy and Jensen 1982, Volland 1978, Volland and Dell 1981, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

G524. Western North American Ruderal Marsh, Wet Meadow & Shrubland

A4217. *Salix* spp. - *Artemisia cana* Ruderal Understory Wet Shrubland Alliance [Low - Poorly Documented]

Type Concept Sentence: Stands of native willows and/or native *Artemisia cana* sagebrush with non-native grasses and forbs dominant in the understory, found in western U.S. streams and floodplains.

OVERVIEW

Scientific Name: *Salix* spp. - *Artemisia cana* Ruderal Understory Wet Shrubland Alliance

Common Name (Translated Scientific Name): Willow species - Silver Sagebrush Ruderal Understory Wet Shrubland Alliance

Colloquial Name: Ruderal Willow - Silver Sagebrush Wet Shrubland

Type Concept: These riparian shrublands are dominated by native willows such as *Salix exigua*, *Salix monticola*, *Salix geyeriana*, *Salix drummondiana*, *Salix commutata*, and others, as well as shrublands dominated by *Artemisia cana* (*ssp. viscidula* and *ssp. bolanderi*) where the understory herbaceous layer has been completely replaced by non-native invasive species such as *Bromus tectorum*, *Poa pratensis*, *Dactylis glomerata*, *Bromus inermis*, *Elymus repens*, *Medicago sativa*, *Trifolium repens*, *Melilotus officinalis*, and *Phragmites australis*. This alliance occurs in relatively moist environments, including riparian areas and alkaline or saline playa lakes of the western U.S.

Classification Comments:

Internal Comments: GK 9-16: CO confirmed and AZ, CA, NV, WA added.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Stands lack an abundance of native herbaceous species such as *Danthonia intermedia*, *Deschampsia cespitosa*, *Eleocharis palustris*, *Elymus elymoides*, *Festuca idahoensis*, *Festuca ovina*, *Festuca thurberi*, *Leymus cinereus*, *Muhlenbergia richardsonis*, *Poa cusickii*, and *Poa secunda*.

VEGETATION**Physiognomy and Structure:**

Floristics: These riparian shrublands are dominated by native willows such as *Salix exigua*, *Salix monticola*, *Salix geyeriana*, *Salix drummondiana*, *Salix commutata*, and others, as well as shrublands dominated by *Artemisia cana* (*ssp. viscidula* and *ssp. bolanderi*) where the understory herbaceous layer has been completely replaced by non-native invasive species such as *Bromus tectorum*, *Poa pratensis*, *Dactylis glomerata*, *Bromus inermis*, *Elymus repens*, *Medicago sativa*, *Trifolium repens*, *Melilotus officinalis*, and *Phragmites australis*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs in relatively moist environments, including riparian areas and alkaline or saline playa lakes.

Dynamics: Stands have been disturbed by chronic grazing (by native ungulates or livestock), recreational use, or other heavy use that disturbs the soil surface and makes it possible for invasive species to become dominant.

DISTRIBUTION

Geographic Range: This alliance is found throughout the western U.S. in riparian areas, especially near populated areas.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG001199 *Salix exigua* / *Agrostis stolonifera* Ruderal Wet Shrubland
- CEG005623 *Salix exigua* / *Phalaris arundinacea* Ruderal Wet Shrubland
- CEG002988 *Artemisia cana* (*ssp. bolanderi*, *ssp. viscidula*) / *Poa pratensis* Ruderal Wet Shrubland

AUTHORSHIP

Primary Concept Source: M. Reid, in Faber-Langendoen et al. (2015)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2016/09/28

REFERENCES

References: Faber-Langendoen et al. 2017b, Manning and Padgett 1995, Padgett et al. 1989

2.C.5. Salt Marsh

Salt Marsh is a wetland that has shallow water and levels that usually fluctuate due primarily to tides along the coast or changes in water depth in depressions. Coastal salt marshes are primarily intertidal; that is, they are found in areas at least occasionally inundated by high tide but not flooded during low tide, including estuaries, lagoons, and the lee side of barrier islands. The vegetation comprises emergent shrubs and herbs with at least 10% cover, especially saline or halophytic species. They occur at all latitudes around the globe, but are concentrated in the temperate mid-latitudes (23-70°N and S).

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

Interior saline-alkaline wetlands of North American interior west, including salt flats, marshes and seeps, whose species composition is driven by water chemistry and duration and seasonality of wetness. Stands range from sparse cover of shrubs and/or herbs to productive marshes dominated by tall emergent graminoids.

M082. Warm & Cool Desert Alkali-Saline Marsh, Playa & Shrubland

This macrogroup consists of alkaline and saline wetlands with salt-tolerant plant growth where dominant and characteristic plant species include *Atriplex* spp., *Distichlis spicata*, *Salicornia* spp., *Sarcobatus vermiculatus*, *Sesuvium verrucosum*, *Sporobolus* spp., *Suaeda moquinii*, and *Triglochin maritima*. These are located in playas, washes, mudflats and depressional wetlands where

evaporation far exceeds precipitation and/or where bedrock and soil properties contribute to alkaline/saline conditions. Sites are found throughout the western U.S. and southwestern Canada.

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

2.C.5.Nd.1.a. M082 Warm & Cool Desert Alkali-Saline Marsh, Playa & Shrubland

G538. North American Desert Alkaline-Saline Marsh & Playa

Type Concept Sentence: This group contains alkaline-saline marshes found in non-coastal and non-tidal areas of the Intermountain West. Marshes can be densely vegetated emergent or barren and sparsely vegetated playas where soils and water (if present) are alkaline. Characteristic species may include *Allenrolfea occidentalis*, *Atriplex* spp., *Distichlis spicata*, *Grayia spinosa*, *Leymus cinereus*, *Leymus triticoides*, *Muhlenbergia* spp., *Poa secunda*, *Puccinellia lemmonii*, *Salicornia* spp., *Sarcobatus vermiculatus*, and *Triglochin maritima*.

OVERVIEW

Scientific Name: *Distichlis spicata* - *Puccinellia lemmonii* - *Salicornia* spp. Alkaline-Saline Marsh & Playa Group

Common Name (Translated Scientific Name): Saltgrass - Lemmon's Alkali Grass - Saltwort species Alkaline-Saline Marsh & Playa Group

Colloquial Name: Saltgrass Alkaline Wet Meadow

Type Concept: This group is found in the intermountain western U.S. Associations are composed of densely vegetated seasonal wetlands, saltwater emergent marshes to barren and sparsely vegetated playas (generally <10% plant cover). Characteristic species may include *Allenrolfea occidentalis*, *Atriplex* spp., *Distichlis spicata*, *Grayia spinosa*, *Leymus cinereus*, *Leymus triticoides* (= *Elymus triticoides*), *Muhlenbergia* spp., *Poa secunda*, *Puccinellia lemmonii*, *Salicornia* spp., *Sarcobatus vermiculatus*, and *Triglochin maritima*. Soils and standing water (if present) are alkaline. Salt crusts are common where there are actively drying ponds, that can have saltgrass beds in depressions and sparse shrubs around the margins. Playa flats are intermittently, seasonally to semipermanently flooded, usually retaining water into the growing season and drying completely only in drought years. Many are associated with hot and cold springs, located in basins with internal drainage. Soils are alkaline to saline clays with hardpans. Seasonal drying exposes mudflats colonized by annual wetland vegetation. Water is prevented from percolating through the soil by an impermeable soil subhorizon and is left to evaporate. Soil salinity varies greatly with soil moisture and greatly affects species composition. During exceptionally wet years, increased precipitation can dilute soil salt concentrations which may allow less salt-tolerant species to become established or more abundant. Some stands occur on floodplains, along the margins of perennial lakes, and in alkaline closed basins, with extremely low-gradient shorelines.

Classification Comments:

Similar NVC Types:

- G531 Arid West Interior Freshwater Marsh
- G324 Great Plains Saline Wet Meadow & Marsh: also includes salt-tolerant herbaceous wetlands, but occurs east of the Continental Divide on the Great Plains.
- G537 North American Desert Alkaline-Saline Wet Scrub: also occurs in cold desert regions but is dominated by shrub species.

Diagnostic Characteristics: Salt-tolerant herbs that are seasonally or intermittently wet on barren to sparsely vegetated playas, lake margins, closed basins, and low-gradient shorelines.

VEGETATION

Physiognomy and Structure: Open shrub and/or herb vegetation.

Floristics: Characteristic species may include *Allenrolfea occidentalis*, *Atriplex* spp., *Distichlis spicata*, *Grayia spinosa*, *Leymus cinereus*, *Leymus triticoides* (= *Elymus triticoides*), *Muhlenbergia* spp., *Poa secunda*, *Puccinellia lemmonii*, *Salicornia* spp., *Schoenoplectus americanus*, *Bolboschoenus maritimus* (= *Schoenoplectus maritimus*), and *Triglochin maritima*.

ENVIRONMENT & DYNAMICS

Environmental Description: *Climate:* Cold desert. *Soil/substrate/hydrology:* This group is found on barren and sparsely vegetated playas (generally <10% plant cover). Salt crusts are common throughout, with small saltgrass beds in depressions and sparse shrubs around the margins. The flats are intermittently, seasonally to semipermanently flooded, usually retaining water into the growing season and drying completely only in drought years. Many are associated with hot and cold springs, located in basins with internal drainage. Soils are alkaline to saline clays with hardpans. Seasonal drying exposes mudflats colonized by annual wetland vegetation.

Water is prevented from percolating through the soil by an impermeable soil subhorizon and is left to evaporate. Soil salinity varies greatly with soil moisture and greatly affects species composition. During exceptionally wet years, increased precipitation can dilute soil salt concentrations which may allow less salt-tolerant species to become established or more abundant. Some stands occur on floodplains, along the margins of perennial lakes, and in alkaline closed basins, with extremely low-gradient shorelines. Environmental information compiled from individual associations and Knight (1994).

Dynamics: Playas are shallow, seasonal wetlands that lie in the lowest point of a closed watershed. Their basins are lined with clay soils, which collect and hold water from rainfall and runoff events. Water evaporates, leaving high salt concentrations in the soils. Some playas will only flood with water during years with high precipitation, sometimes only once or twice in a decade. Others will have standing water every spring, except in the driest of years. During flooded years, some salt-tolerant marsh plant species may grow, such as cattails (*Typha* spp.) or bulrush (*Scirpus* and/or *Schoenoplectus* spp.) (Knight 1994).

DISTRIBUTION

Geographic Range: This group is found throughout the intermountain western U.S.

Spatial Scale & Pattern [optional]: Large patch, Small patch

Nations: CA, MX, US

States/Provinces: CA, CO, ID, MT, NM, NV, OR, TX, UT, WA?, WY

TNC Ecoregions [optional]: 6:C, 10:C, 11:C, 19:C

USFS Ecoregions (2007): 313A:CP, 313B:CP, 313D:CC, 322A:??, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CP, 342F:CC, 342G:CC, 342H:CC, 342I:C?, 342J:CC, M242C:CC, M261D:P?, M261G:PP, M313A:CC, M331D:??, M331E:??, M332G:CC, M341A:CC, M341B:C?, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: High.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A1334 *Sporobolus airoides* - *Muhlenbergia asperifolia* - *Spartina gracilis* Alkaline Wet Meadow Alliance
- A4241 *Frankenia salina* Salt Marsh & Playa Alliance
- A4164 *Cladium californicum* Alkaline Seep Alliance
- A3930 *Eleocharis palustris* - *Eleocharis rostellata* Alkaline-Saline Marsh Alliance
- A3932 *Hordeum jubatum* Alkaline Wet Meadow Alliance
- A1332 *Distichlis spicata* Alkaline Wet Meadow Alliance
- A1329 *Leymus cinereus* - *Leymus triticooides* Alkaline Wet Meadow Alliance
- A4247 *Anemopsis californica* - *Helianthus nuttallii* - *Solidago spectabilis* Alkaline Wet Meadow Alliance

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al.

Author of Description: G. Kittel

Acknowledgments: J. Kagan and P. Comer

Version Date: 12/02/2015

Classif Resp Region: West

Internal Author: GK 10-10, 9-13, 12-15

REFERENCES

References: Faber-Langendoen et al. 2017a, Knight 1994, Rodriguez et al. 2017, Shiflet 1994, Stout et al. 2013

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

G538. North American Desert Alkaline-Saline Marsh & Playa

A1332. *Distichlis spicata* Alkaline Wet Meadow Alliance

Type Concept Sentence: This wetland herbaceous alliance consists of playas and ephemeral streams with sparse to dense herbaceous cover dominated by *Distichlis spicata* on deep, saline, alkaline and fine-textured soils. This alliance occurs throughout much of the semi-arid and arid western U.S. in lowland sites such as playas, swales and terraces along washes that are seasonally, temporarily or intermittently flooded.

OVERVIEW

Scientific Name: *Distichlis spicata* Alkaline Wet Meadow Alliance

Common Name (Translated Scientific Name): Saltgrass Alkaline Wet Meadow Alliance

Colloquial Name: Saltgrass Alkaline Wet Meadow

Type Concept: This alkaline or saline wetland herbaceous alliance covers grasslands of playas and ephemeral streams. Cover may be a sparse or dense herbaceous layer dominated by *Distichlis spicata*, sometimes occurring in nearly pure stands, or with any of the following as a codominant: *Carex filifolia*, *Hordeum jubatum*, *Juncus arcticus* ssp. *littoralis* (= *Juncus balticus*), *Pascopyrum smithii*, *Puccinellia nuttalliana*, and/or *Sporobolus airoides*. Forb cover is generally low and may include Asteraceae spp., *Helianthus* spp., *Salicornia rubra*, *Suaeda calceoliformis* (= *Suaeda depressa*), and *Triglochin maritima*. Occasionally *Suaeda* may be the dominant species and *Distichlis* may be completely absent. This alliance occurs throughout much of the semi-arid and arid western U.S. on saline or alkaline soils in lowland sites such as playas, swales and terraces along washes that are seasonally, temporarily or intermittently flooded. Soils are deep, saline, alkaline and fine-textured. They generally have an impermeable layer and therefore are poorly drained. When the soil is dry, the surface usually has salt accumulations.

Classification Comments: These are highly alkaline or saline sites.

Internal Comments: mjr 1-17: CNPS recommends a rank of G5/S4.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of this alliance is the *Distichlis spicata*- or *Suaeda calceoliformis*-dominated herbaceous layer.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a sparse to moderately dense graminoid layer dominated by rhizomatous mid grasses less than 0.5 m tall.

Floristics: Cover is sparse to dense and is dominated by *Distichlis spicata*, occurring in nearly pure stands. Associates from sites with higher soil salinity may include the graminoid *Puccinellia nuttalliana* and the forbs *Salicornia rubra*, *Triglochin maritima*, and *Suaeda calceoliformis* (= *Suaeda depressa*). Species from sites with lower salinity include the graminoids *Carex filifolia*, *Juncus balticus*, *Hordeum jubatum*, *Pascopyrum smithii*, and *Sporobolus airoides*, and the forbs *Helianthus* spp. and Asteraceae spp. (Ungar 1974c). Forb cover is generally low. Shrubs are rare but may include scattered *Atriplex canescens* and *Sarcobatus vermiculatus*.

ENVIRONMENT & DYNAMICS

Environmental Description: Grasslands in this western alliance occur in lowland habitats such as playas, swales and terraces along washes that are intermittently flooded. The flooding is usually the result of highly localized thunderstorms which can flood one basin and leave the next dry. It also occurs along California coastal areas, and the Channel Islands, where it is sometimes found in a tidal wetland or riparian situation. Climate is semi-arid to arid. Soil texture ranges from clay loam to sandy clay (Redmann 1972, Johnston 1987). These soils are deep, saline and alkaline. They generally have an impermeable layer and therefore are poorly drained. When the soil is dry, the surface usually has salt accumulations.

Dynamics: Stands have higher diversity and cover during wet years and near boundaries with other vegetation types. Higher soil salinity favors *Distichlis spicata* over less salt-tolerant species. However, very high salinity will dwarf the *Distichlis spicata* and reduce cover. Generally, vegetation height and cover and species diversity tend to vary inversely with salinity (Ungar 1967, Steinauer 1989). Associated species may be restricted by the level of salinity in the soil. This osmotic stress of growing in alkaline and saline soils is compensated by the accumulation of proline by some halophytic species including *Distichlis spicata*. This aids the plants' water uptake by increasing the osmotic potential of the plant (Shupe et al. 1986). Vegetation forms zones at some saline sites, where species abundance is stratified by salt tolerance (Ungar et al. 1969, Shupe et al. 1986). In playas, the soil salinity at field capacity generally increases from the edge to the center allowing for several different vegetation stands to co-occur (Ungar 1967, 1970, Ungar et al. 1969). Microtopography can also affect vegetation structure. Where soil accumulates to form hummocks, less salt- and alkali-tolerant plants can occur (Ungar 1972, Johnson 1987).

Distichlis spicata is rhizomatous and tolerant of moderate grazing and its roots resist trampling. Although relatively unpalatable, it can provide valuable winter forage for livestock if needed. If grazed heavily, *Distichlis spicata* will decline and may be replaced by less desirable warm-season grasses such as *Schedonnardus paniculatus* (Costello 1944b). Weeds are generally not a problem because few grow well in saline soils.

DISTRIBUTION

Geographic Range: This alliance occurs throughout much of the semi-arid and arid western U.S. It also occurs along California coastal areas, and the Channel Islands.

Nations: CA, MX?, US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, SK, UT, WA, WY

TNC Ecoregions [optional]: 6:C, 8:C, 9:C, 10:C, 11:C, 15:C, 16:C, 17:C, 18:C, 19:C, 20:C, 23:C, 24:C, 26:C, 27:C, 28:C

USFS Ecoregions (2007): 261A:CC, 261B:CC, 321A:CC, 322Ab:CCC, 322Ai:CCC, 322B:CC, 341A:CC, 341B:CC, 341D:CC, 341E:CC, 341F:CC

Omerik Ecoregions:

Federal Lands [optional]: NPS (Channel Islands, Death Valley); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Distichlis spicata* (Salt grass flats) Alliance (Sawyer et al. 2009) [41.200.00]
- = *Distichlis spicata* Alkaline Flats Alliance (Rodriguez et al. 2017)
- = *Distichlis spicata* Alliance (Salt grass flats) (Buck-Diaz et al. 2012)
- = *Distichlis spicata* Herbaceous Alliance (Evens et al. 2014)
- ? *Distichlis spicata* Series (Johnston 1987)
- = *Distichlis spicata* Herbaceous Alliance (CNPS 2017) [41.200.00]
- >< Alkali Meadow (#45310) (Holland 1986b)
- >< Northern Coastal Salt Marsh (#52110) (Holland 1986b)
- ? Overland Flow # 36 (Soil Conservation Service n.d.)
- ? Salt Flat # 34 (Soil Conservation Service n.d.)
- = Saltgrass Series (Sawyer and Keeler-Wolf 1995)
- >< Southern Coastal Salt Marsh (#52120) (Holland 1986b)
- ? Wet Meadow # 38 (Soil Conservation Service n.d.)

LOWER LEVEL UNITS

Associations:

- CEG001771 *Distichlis spicata* - Mixed Herb Wet Meadow
- CEG001770 *Distichlis spicata* Alkaline Wet Meadow
- CEG001772 *Distichlis spicata* - *Lepidium perfoliatum* Wet Meadow
- CEPP006701 *Distichlis spicata* - *Juncus cooperi* Alkaline Wet Meadow
- CEPP005679 *Distichlis spicata* - *Bromus diandrus* Ruderal Saline/Alkaline Grassland
- CEPP006700 *Distichlis spicata* - *Juncus arcticus* ssp. *littoralis* Alkaline Wet Meadow
- CEPP005715 *Distichlis spicata* - (*Baccharis douglasii*, *Equisetum hyemale*) Wet Meadow
- CEPP005716 *Distichlis spicata* - *Leymus triticoides* Wet Meadow
- CEPP006712 *Juncus cooperi* Alkaline Wet Meadow
- CEG003462 *Distichlis spicata* - *Frankenia salina* - *Jaumea carnosa* Salt Marsh
- CEG001773 *Distichlis spicata* - (*Scirpus nevadensis*) Alkaline Wet Meadow
- CEG005417 *Suaeda calceoliformis* Wet Meadow

AUTHORSHIP

Primary Concept Source: K.A. Schulz and J. Evens, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel, K.A. Schulz, J. Evens

Acknowledgments:

Version Date: 2016/11/10

REFERENCES

References: Baker 1984a, Beatley 1976, Bradley 1970, Brotherson 1987, Buck-Diaz et al. 2012, Bunin 1985, CNPS 2017, Copeland 1979, Costello 1944b, Crouch 1961a, Daniels 1911, Daubenmire 1970, Evens et al. 2014, Faber-Langendoen et al. 2017b, Ferren and Davis 1991, Franklin and Dyrness 1973, Graham 1937, Griffiths 1902, Hansen et al. 1991, Hansen et al. 1995, Henrickson 1974, Hickson and Keeler-Wolf 2007, Holland 1986b, Hyder et al. 1966, Johnston 1987, Jones and Walford 1995, Junak et al. 2007, Keeler-Wolf and Evens 2006, Keeler-Wolf and Vaghti 2000, Keeler-Wolf et al. 2003b, Keeler-Wolf et al. 2005, Kittel and Lederer 1993, Kittel et al. 1994, Klipple and Costello 1960, Macdonald 1977, Odion et al. 1992, Osborn 1974, Peinado et al. 1994b, Pickart 2006, Ralston 1969, Ramaley 1942, Redmann 1972, Rodriguez et al. 2017, Rogers 1953, Saul 1974, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shanks 1977, Shupe et al. 1986, Soil Conservation Service 1978, Soil Conservation Service n.d., Solomeshch and Barbour 2006, Sproul et al. 2011, Stearns-Roger, Inc. 1978, Steinauer 1989, Thorne 1976, Tuhy and Jensen 1982, Ungar 1967, Ungar 1968, Ungar 1970, Ungar 1972, Ungar 1974b, Ungar 1974c, Ungar et al. 1969, VegCAMP and AIS 2013, Vestal 1914, Weaver and Albertson 1956, Zedler et al. 1992

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

G538. North American Desert Alkaline-Saline Marsh & Playa

A3930. Eleocharis palustris - Eleocharis rostellata Alkaline-Saline Marsh Alliance

Type Concept Sentence: This alliance is characterized by a sparse to dense herbaceous layer that is dominated or codominated by *Eleocharis palustris*, a facultative wetland species, or *Eleocharis rostellata*. Other salt-tolerant species may also be present to codominant, such as *Carex aquatilis*, *Distichlis spicata*, *Glaux maritima*, *Juncus arcticus ssp. littoralis*, and *Muhlenbergia asperifolia*. Stands occur adjacent to salt waterbodies or on the margins of high-evaporation playas of central Intermountain West basins. Surface water, if present, is highly saline and may or may not be present during the entire growing season.

OVERVIEW

Scientific Name: *Eleocharis palustris* - *Eleocharis rostellata* Alkaline-Saline Marsh Alliance

Common Name (Translated Scientific Name): Common Spikerush - Beaked Spikerush Alkaline-Saline Marsh Alliance

Colloquial Name: Common Spikerush Alkaline-Saline Marsh

Type Concept: This herbaceous wetland alliance occurs in shallow, mostly still water. The vegetation is characterized by a sparse to dense herbaceous layer that is dominated or codominated by *Eleocharis palustris*, a facultative wetland species, or *Eleocharis rostellata*. Other salt-tolerant species may also be present to codominant, such as *Carex aquatilis*, *Distichlis spicata*, *Glaux maritima*, *Juncus arcticus ssp. littoralis* (= *Juncus balticus*), and *Muhlenbergia asperifolia*. Stands occur adjacent to salt waterbodies or on the margins of high-evaporation playas. Surface water, if present, is highly saline and may or may not be present during the entire growing season. Known locations are near the Great Salt Lake, playas, and springs of the central Intermountain West.

Classification Comments: These are very salty conditions, and much more than the mild alkalinity freshwater *Eleocharis palustris* associations experience near the end of the growing season as water sources dwindle.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Highly saline wetlands (perennial or ephemeral) dominated by *Eleocharis palustris*.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a rhizomatous perennial that dominates the graminoid stratum (up to 70% cover). The forb layer is sparse (0-20%) and contains both aquatic and terrestrial species.

Floristics: *Eleocharis palustris* or *Eleocharis rostellata* dominates the graminoid stratum. Other salt-tolerant species may also be present to codominant, such as *Carex aquatilis*, *Distichlis spicata*, *Glaux maritima*, *Juncus arcticus ssp. littoralis* (= *Juncus balticus*), and *Muhlenbergia asperifolia*. Cover ranges from sparse to quite dense (10-80%).

ENVIRONMENT & DYNAMICS

Environmental Description: These conspicuous, common emergent communities occur in shallow, mostly still water. Stands occur on a variety of landforms, including lake margins, stream terraces, floodplains, gravel bars, and wet basins (ciénegas) or meadows. Soil reaction is alkaline (Hansen et al. 1988). All sites are saturated throughout much of the growing season.

Dynamics:

DISTRIBUTION

Geographic Range: This alliances is found in the central Intermountain West basins of Utah, Wyoming and possibly Nevada.

Nations: US

States/Provinces: NV?, UT, WY

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Carex* spp. Series (Johnston 1987)
- = *Eleocharis (palustris, rostellata)* Herbaceous Alliance (Evens et al. 2014)
- > *Eleocharis rostellata - Schoenus nigricans* community (Sada and Cooper 2012)
- ? Montane, Plains, and Great Basin Marshlands (Brown 1982a)

LOWER LEVEL UNITS**Associations:**

- CEGLO01834 *Eleocharis palustris - Distichlis spicata* Marsh
- CEGLO03428 *Eleocharis rostellata* Marsh
- CEGLO01835 *Eleocharis palustris - Juncus arcticus ssp. littoralis* Marsh

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Baker and Kennedy 1985, Brotherson 1987, Brotherson and Barnes 1984, Brown 1982a, Cronquist et al. 1977, Evens et al. 2014, Faber-Langendoen et al. 2017b, Hendrickson and Minckley 1984, Johnston 1987, Kovalchik 1987, Manning and Padgett 1995, Mutel and Marr 1973, Padgett et al. 1988b, Padgett et al. 1989, Reid et al. 1994, Sada and Cooper 2012, Shupe et al. 1986, Sturges 1968, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

G538. North American Desert Alkaline-Saline Marsh & Playa

A3932. *Hordeum jubatum* Alkaline Wet Meadow Alliance

Type Concept Sentence: This alliance consists of grasslands dominated by *Hordeum jubatum* found in lowlands with moderately to strongly saline or alkaline soils within the western U.S. and Canada.

OVERVIEW

Scientific Name: *Hordeum jubatum* Alkaline Wet Meadow Alliance

Common Name (Translated Scientific Name): Foxtail Barley Alkaline Wet Meadow Alliance

Colloquial Name: Foxtail Barley Alkaline Wet Meadow

Type Concept: This alkaline grassland alliance contains stands dominated by *Hordeum jubatum*. Vegetation is dominated by short and medium-tall graminoids with a total cover of nearly 100%. Shrubs are often absent, and forbs are present but not usually abundant. Other common species include *Distichlis spicata*, *Elymus trachycaulus*, *Pascopyrum smithii*, *Poa arida*, *Poa compressa*, *Rumex crispus*, and *Sonchus arvensis*. *Hordeum jubatum* is a native increaser species that responds to disturbance, and with time since disturbance, sites will grade into other alkaline alliances. This alliance is found throughout the interior western U.S., including California's Central Valley, and Alberta, Canada. Stands are located in lowlands with moderately to strongly saline or alkaline soils. The topography is flat and the soils are often briefly flooded or saturated in the spring.

Classification Comments: This combines temporarily and intermittently flooded alliances, and often grades into other alliances with time since disturbance, and therefore may be difficult to classify when *Hordeum jubatum* is codominant with other species. This alliance is limited to the western U.S. and Canada.

Internal Comments:

Other Comments:

Similar NVC Types:

- A1341 *Distichlis spicata - Hordeum jubatum* Wet Meadow Alliance: is restricted to the Great Plains.

Diagnostic Characteristics: Bottomland alkaline grasslands dominated by *Hordeum jubatum*. Stands are often monotypic, or with 1-3 dominants.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a sparse to dense graminoid layer dominated by perennial bunch grasses less than 0.5 m tall. Forbs are infrequent.

Floristics: Grasslands included in this alliance have vegetation that is a sparse to dense layer of short and medium-tall graminoids dominated by the cool-season, short-lived, perennial bunchgrass *Hordeum jubatum*. It often occurs in nearly pure stands. Ungar et al. (1969) described one stand that was dominated by *Hordeum jubatum* in the spring and early summer, which then became dominated by *Iva annua* in the late summer. Total vegetation cover is usually high but can range from 20% to nearly 100% (Barnes and Tieszen 1978, Hansen et al. 1995). Shrubs are often absent, and forbs are present but not usually abundant. Species diversity is typically low. Other species include *Chenopodium* spp., *Distichlis spicata*, *Eleocharis* spp., *Elymus trachycaulus*, *Iva annua*, *Pascopyrum smithii*, *Poa arida*, *Poa compressa*, *Puccinellia nuttalliana*, *Rumex crispus*, *Salicornia rubra*, and *Bolboschoenus maritimus* (= *Scirpus paludosus*).

ENVIRONMENT & DYNAMICS

Environmental Description: The topography is flat, and the soils are often briefly flooded or saturated in the spring (Redmann 1972). It is also found in the drawdown zone of ponds with moderately saline water (Hansen et al. 1995). Soils are clay loam to clay and poor to very poorly drained. Soil salinity is somewhat variable. In the field with competition, this grass grows best in moderately saline conditions (up to 0.7% salinity) (Wilson 1967). The soil surface may be covered with white salt crusts with moderately to strongly saline soils (Wilson 1967, Ungar et al. 1969, Barnes and Tieszen 1978, Hansen et al. 1995).

Dynamics: *Hordeum jubatum* is a common, short-lived pioneer species of mesic habitats where permanent grass cover has been destroyed (Dodd and Coupland 1966). It may represent a seral stage that will be taken over by more permanent grasses (Hansen et al. 1995). It is moderately salt-tolerant and can densely colonize areas disturbed by flooding along drainages, around playas and more permanent ponds. *Hordeum jubatum* is moderately tolerant of salinity. Often on playas, these grasslands occupy a zone of intermediate salinity between halophytic vegetation dominated by *Distichlis spicata*, *Puccinellia nuttalliana*, or *Salicornia rubra*, and non-saline, mesic prairie vegetation dominated by *Pascopyrum smithii*, *Poa* spp. or *Elymus* spp. Total vegetation cover (density and height), species composition and soil salinity depend on the amount and timing of precipitation and flooding. Growth-inhibiting salt concentrations are diluted when the soil is saturated, allowing the growth of less salt-tolerant species and more robust growth (Ungar 1967).

DISTRIBUTION

Geographic Range: This alliance is found in the interior west of California, Oregon, and Washington east to Colorado, Idaho, Montana, south into New Mexico, and north into Alberta.

Nations: CA, US

States/Provinces: AB, CA, CO, ID, MT, NM, NV, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Hordeum brachyantherum* (Meadow barley patches) Alliance (Sawyer et al. 2009) [42.052.00]
- ? *Hordeum jubatum* Community Type (Hansen et al. 1995)
- ? *Hordeum jubatum* Dominance Type (Hansen et al. 1988b)
- ? *Hordeum jubatum* Plains Grassland (Baker 1984a)
- ? *Hordeum brachyantherum* Herbaceous Alliance (CNPS 2017) [42.052.00]
- >< *Hordeum* Type (Redmann 1972)

LOWER LEVEL UNITS

Associations:

- CEG005285 *Hordeum jubatum* Great Basin Wet Meadow

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz, L. Allen, and G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Airphoto Analysis Associates 1979, Baker 1984a, Barnes and Tieszen 1978, Bunin 1985, CNPS 2017, Dodd and Coupland 1966, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995,

Redmann 1972, Reid 1974, Sawyer et al. 2009, Thompson and Hansen 2002, Ungar 1967, Ungar et al. 1969, Vestal 1914, Wilson 1967

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

G538. North American Desert Alkaline-Saline Marsh & Playa

A1329. *Leymus cinereus* - *Leymus triticoides* Alkaline Wet Meadow Alliance

Type Concept Sentence: This alliance is of *Leymus cinereus*- and *Leymus triticoides*-dominated grasslands of alkaline/saline wet meadows that occur throughout much of the Intermountain West, including the Great Basin and Columbia River Basin, as well as and California's Central Valley and coastal plains.

OVERVIEW

Scientific Name: *Leymus cinereus* - *Leymus triticoides* Alkaline Wet Meadow Alliance

Common Name (Translated Scientific Name): Basin Wildrye - Beardless Wildrye Alkaline Wet Meadow Alliance

Colloquial Name: Western Wildrye Alkaline Wet Meadow

Type Concept: This grassland alliance is of alkaline wetlands where tall bunchgrasses *Leymus cinereus* and/or *Leymus triticoides* are the dominant species. Other graminoids present may include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Achnatherum thurberianum* (= *Stipa thurberiana*), *Carex praegracilis*, *Distichlis spicata*, *Elymus elymoides*, *Hesperostipa comata* (= *Stipa comata*), *Hordeum brachyantherum ssp. californicum* (= *Hordeum californicum*), *Hordeum jubatum*, *Juncus arcticus ssp. littoralis* (= *Juncus balticus*), *Lolium perenne ssp. multiflorum* (= *Lolium multiflorum*), *Onopordum acanthium*, *Pascopyrum smithii*, *Poa secunda*, *Pseudoroegneria spicata*, *Schoenoplectus* spp., and/or *Scirpus* spp. It is rarely without several introduced annual plants such as *Avena fatua*, *Brassica nigra*, *Bromus diandrus*, *Bromus hordeaceus*, *Carduus pycnocephalus*, *Lactuca serriola*, *Lolium perenne ssp. multiflorum* (= *Lolium multiflorum*), *Polypogon monspeliensis*, *Sonchus* spp., or *Vulpia myuros*. This alliance occurs throughout much of the Intermountain West, including the Great Basin and Columbia River Basin, as well as California's Central Valley and coastal plains. Elevations range from sea level to 3000 m. Stands are restricted to intermittently flooded habitats such as playas, intermittent streams, dry washes, poorly drained floodplains, margins of marshes, and historic lake basins. Soils are saline or alkaline with a shallow water table. Soils are typically moderately deep silts and clays, and the soil surface often has high cover of bare ground.

Classification Comments:

Internal Comments: mjr 1-17: CNPS recommends a rank of G4/S3.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of this alliance is the medium-tall grassland dominated by *Leymus cinereus* or *Leymus triticoides* that is restricted to lowland sites that are flooded intermittently.

VEGETATION

Physiognomy and Structure: Perennial bunch grasses less than 1.5 m tall.

Floristics: The tall bunchgrasses *Leymus cinereus* or *Leymus triticoides* (= *Elymus triticoides*) are the sole or dominant grasses. Other graminoids may include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Achnatherum thurberianum* (= *Stipa thurberiana*), *Carex praegracilis*, *Distichlis spicata*, *Elymus elymoides*, *Hesperostipa comata* (= *Stipa comata*), *Hordeum brachyantherum ssp. californicum* (= *Hordeum californicum*), *Hordeum jubatum*, *Juncus balticus*, *Lolium perenne ssp. multiflorum* (= *Lolium multiflorum*), *Pascopyrum smithii*, *Poa secunda*, *Pseudoroegneria spicata*, *Schoenoplectus* spp., and/or *Scirpus* spp. There is often sparse to moderate cover of forbs such as *Achillea millefolium*, *Agoseris glauca*, *Claytonia perfoliata* (= *Montia perfoliata*), *Crepis runcinata*, *Iris missouriensis*, *Lactuca serriola*, *Nitrophila occidentalis*, *Potentilla gracilis var. fastigiata* (= *Potentilla gracilis var. nuttallii*), *Sonchus* spp., *Suaeda* spp., and *Triglochin maritima*. Shrubs such as *Ericameria nauseosa* (= *Chrysothamnus nauseosus*) may be scattered within the stand.

ENVIRONMENT & DYNAMICS

Environmental Description: Elevations range from 0-3000 m. Sites are nearly level to gently sloping (to 18%) occurring on all aspects. Stands are restricted to intermittently flooded habitats such as playas, intermittent streams, drainage bottoms, poorly drained floodplains, margins of marshes, historic lake basins, and dry washes. Flooding is not predictable to a given season and is dependent upon localized rainstorms. Soils are typically poorly drained, alkaline, deep silts, clays, sandy loam to clay loam in texture. The soil surface often has high cover of bare ground. The water table is generally shallow.

Dynamics: *Leymus cinereus* is considered fire-adapted and generally resprouts after fire and recovers quite rapidly on most sites (FEIS 1998).

DISTRIBUTION

Geographic Range: This alliance is found in the Intermountain West of Montana, Wyoming, Idaho, Washington, southeastern Oregon; northwestern Nevada; and interior central Coast Ranges, southern coastal Transverse Ranges, Central Valley and Sierra Nevada foothills of California.

Nations: US

States/Provinces: CA, CO, ID, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 12:C, 13:C, 15:C, 16:C, 19:C, 20:C, 26:C

USFS Ecoregions (2007): 261A:CC, 261B:CC, 313A:CC, 331A:CC, 341F:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, M261F:CC, M261G:CC, M262A:CC, M262B:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M341A:CC, M341B:C?

Omernik Ecoregions:

Federal Lands [optional]: NPS (Channel Islands); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Elymus cinereus* - *Elymus triticoides* Herbaceous Alliance (Rodriguez et al. 2017)
- ? *Elymus cinereus*/*Distichlis stricta* habitat type (Daubenmire 1970)
- > *Leymus cinereus* (Ashy ryegrass meadows) Alliance (Sawyer et al. 2009) [41.020.00]
- > *Leymus cinereus* Alliance (Ashy rye grass meadows) (Buck-Diaz et al. 2012)
- > *Leymus triticoides* (Creeping rye grass turfs) Alliance (Sawyer et al. 2009) [41.080.00]
- > *Leymus triticoides* Alliance (Creeping rye grass turfs) (Buck-Diaz et al. 2012)
- > *Leymus triticoides* Herbaceous Alliance (Keeler-Wolf and Evens 2006)
- >< Alkali Grassland and Wetlands (Chappell et al. 1997)
- >< Ashy Ryegrass Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEGLO01479 *Leymus cinereus* Alkaline Wet Meadow
- CEGLO01480 *Leymus cinereus* Bottomland Wet Meadow
- CEGLO01571 *Leymus triticoides* Wet Meadow
- CEPP005717 *Leymus triticoides* - *Bromus* spp. - *Avena* spp. Wet Meadow
- CEGLO01481 *Leymus cinereus* - *Distichlis spicata* Alkaline Wet Meadow
- CEGLO05306 *Muhlenbergia rigens* Wet Meadow
- CEGLO01572 *Leymus triticoides* - *Poa secunda* Wet Meadow

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel, K.A. Schulz, and J. Evens

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: AIS 2007, Blackburn et al. 1969a, Blackburn et al. 1969d, Buck-Diaz et al. 2012, Chappell et al. 1997, Christensen 1963, Cooper et al. 1995, Copeland 1979, Daubenmire 1970, Daubenmire 1992, Easterday and Mamone 1980, Evens and San 2004, Evens et al. 2006, FEIS 1998, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Hamilton 1997, Holstein 2001, Hull and Hull 1974, Johnson and Simon 1985, Johnson and Simon 1987, Junak et al. 2007, Keeler-Wolf and Evens 2006, Keeler-Wolf and Vaghti 2000, Mueggler and Stewart 1980, Peterson pers. comm., Poulton 1955, Rodriguez et al. 2017, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Seyer 1984, Solomeshch and Barbour 2006, Sproul et al. 2011, Stoddart 1941, Stout et al. 2013, Walker and Brotherson 1982

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

G538. North American Desert Alkaline-Saline Marsh & Playa

A1334. Sporobolus airoides - Muhlenbergia asperifolia - Spartina gracilis Alkaline Wet Meadow Alliance

Type Concept Sentence: This alliance is characterized by sparse to dense grasslands and meadows dominated by *Muhlenbergia asperifolia*, *Poa secunda*, *Puccinellia lemmonii*, *Puccinellia nuttalliana*, *Spartina gracilis*, and/or *Sporobolus airoides*, any of which may form nearly pure stands. It occurs in lowland habitats such as playas, swales, terraces along intermittently flooded washes, and flats that are alkaline or moderately saline. This alliance is found on plains, in mountain parks and valleys, and in canyons and plateaus of the western U.S.

OVERVIEW

Scientific Name: *Sporobolus airoides* - *Muhlenbergia asperifolia* - *Spartina gracilis* Alkaline Wet Meadow Alliance

Common Name (Translated Scientific Name): Alkali Sacaton - Scratchgrass - Alkali Cordgrass Alkaline Wet Meadow Alliance

Colloquial Name: Alkali Sacaton - Scratchgrass - Alkali Cordgrass Alkaline Wet Meadow

Type Concept: Vegetation included in this alliance is characterized by grasslands and meadows dominated by *Muhlenbergia asperifolia*, *Poa secunda*, *Puccinellia lemmonii*, *Puccinellia nuttalliana*, *Spartina gracilis*, and/or *Sporobolus airoides*, any of which may form monotypic stands. Other species that co-occur include *Carex microptera*, *Distichlis spicata*, *Elymus elymoides*, *Hordeum brachyantherum*, *Juncus arcticus* ssp. *littoralis* (= *Juncus balticus*), *Juncus ensifolius*, *Muhlenbergia richardsonis*, *Pascopyrum smithii*, and/or *Pseudoroegneria*. Forb cover is generally low with *Achillea millefolium*, *Arnica longifolia*, *Iris missouriensis*, *Stellaria longipes*, the annuals *Montia linearis* and *Trifolium cyathiferum*, and may include species of *Atriplex*, *Polygonum*, and *Rumex*. Shrubs are rare, but because of the patchy distribution of these stands, scattered *Atriplex canescens* and *Sarcobatus vermiculatus* may be present. Sites are found in lowland habitats such as playas, swales, terraces along intermittently flooded washes, and alkali flats. Any flooding that occurs tends to be the result of localized thunderstorms in the summer. Soils are variable, ranging from deep, fine-textured soil to shallow sand deposits. They are alkaline and may be moderately saline and poorly drained due to an impermeable layer. Stands are documented from eastern Oregon, Washington, California, Nevada, Colorado, Utah, and New Mexico.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

- A3186 *Sporobolus airoides* - *Sporobolus wrightii* - *Panicum obtusum* Lowland Desert Grassland Alliance

Diagnostic Characteristics: Bottomland alkaline grasslands dominated by *Muhlenbergia asperifolia*, *Puccinellia lemmonii*, *Puccinellia nuttalliana*, *Spartina gracilis*, and/or *Sporobolus airoides*. Stands are often monotypic, or with 1-3 dominants, with any combination of these species.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a sparse to dense herbaceous layer dominated by medium-tall bunch grasses.

Floristics: Dominant graminoids include *Muhlenbergia asperifolia*, *Poa secunda*, *Puccinellia lemmonii*, *Puccinellia nuttalliana*, and/or *Sporobolus airoides*. Other graminoids present to codominant may include *Agrostis gigantea*, *Carex douglasii*, *Carex microptera*, *Distichlis spicata*, *Elymus elymoides*, *Hordeum brachyantherum*, *Juncus balticus*, *Juncus ensifolius*, *Muhlenbergia richardsonis*, *Pascopyrum smithii*, *Pseudoroegneria spicata*, *Bolboschoenus maritimus* (= *Scirpus paludosus*), and *Spartina gracilis*. Forb cover is generally low but may include *Achillea millefolium*, *Arnica longifolia*, *Atriplex argentea*, *Iris missouriensis*, *Montia linearis*, *Plantago eriopoda*, *Polygonum* spp., *Rumex* spp., *Stellaria longipes*, and *Trifolium cyathiferum*. Shrubs may be present as well with very low cover (<3%) and include *Atriplex canescens* and *Sarcobatus vermiculatus*. Exotic annual grasses such as *Bromus tectorum* and *Polypogon monspeliensis* are often abundant on disturbed sites.

ENVIRONMENT & DYNAMICS

Environmental Description: Sites occur in lowland habitats such as playas, swales, terraces along intermittently flooded washes, and alkali flats. Soils are variable, ranging from deep, fine-textured soil to shallow sand deposits. They are alkaline and may be moderately saline and poorly drained due to an impermeable layer. When dry the soil may have salt accumulations on the soil surface. Stands are typically flooded in the spring and have a shallow water table that may drop below 1 m by the early summer. Elevation ranges from low interior valleys of eastern Oregon to high-elevation mountain parks of Colorado (Reid 1974).

Dynamics: Total vegetation abundance (density and height), species composition and soil salinity depend on the amount and timing of precipitation and flooding. Growth inhibiting salt concentrations are diluted when the soil is saturated allowing the growth of less salt-tolerant species. As the saturated soils dry, the salt concentrates until it precipitates out on the soil surface (Dodd and Coupland

1966, Ungar 1968). Higher salinity favors some species over others, and may influence changes in species composition from year to year. For example, higher soil salinity favors *Distichlis spicata*, *Hordeum jubatum*, and *Sporobolus airoides* over the less salt-tolerant *Muhlenbergia asperifolia*. Ungar (1965) lists *Muhlenbergia asperifolia* as significantly less salt-tolerant than *Sporobolus airoides* and much less tolerant than *Distichlis spicata*. The special configuration (often concentric rings) of salt-tolerant species may also change with microtopography and degree of ponded water (Ungar 1967, 1970, 1972, Ungar et al. 1969).

DISTRIBUTION

Geographic Range: This alliance is found in the interior west of California, Oregon, and Washington east to Colorado, south into New Mexico, and north into Alberta.

Nations: CA, US

States/Provinces: AB, AZ, CA, CO, NM, NV, OR, UT, WA

TNC Ecoregions [optional]: 17:C

USFS Ecoregions (2007): 322Ab:CCC, 322Al:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Muhlenbergia asperifolia* salt marsh (Baker 1984a)
- > *Poa secunda* (Curly blue grass grassland) Alliance (Sawyer et al. 2009) [41.180.00]
- > *Poa secunda* Alliance (Curly blue grass grassland) (Buck-Diaz et al. 2012)
- > *Spartina gracilis* (Alkali cordgrass marsh) Alliance (Sawyer et al. 2009) [52.030.00]
- > *Sporobolus airoides* (Alkali sacaton grassland) Alliance (Sawyer et al. 2009) [41.010.00]
- > *Sporobolus airoides* Alliance (Alkali sacaton grassland) (Buck-Diaz et al. 2012)
- > *Sporobolus airoides* Herbaceous Alliance (Evens et al. 2014)
- >< *Sporobolus cryptandrus* - *Aristida purpurea* var. *longiseta* Grasslands (Chambers et al. 1997)
- >< One-sided Bluegrass Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- C EGL001688 *Sporobolus airoides* Monotype Wet Meadow
- C EGL001685 *Sporobolus airoides* Southern Plains Wet Meadow
- C EGL001658 *Puccinellia lemmonii* - *Poa secunda* Wet Meadow
- C EGL001588 *Spartina gracilis* Wet Meadow
- C EGL001779 *Muhlenbergia asperifolia* Wet Meadow
- C EGL001799 *Puccinellia nuttalliana* Salt Marsh
- C EGL001687 *Sporobolus airoides* - *Distichlis spicata* Wet Meadow
- C EGL005809 *Tiquilia latior* / *Sporobolus airoides* Dwarf-shrub Wet Meadow
- C EGL001476 *Spartina pectinata* Western Wet Meadow

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel and K.A. Schulz

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Baker 1984a, Blackburn et al. 1969b, Bolen 1964, Borgais unpubl. data 1990, Buck-Diaz et al. 2012, Chambers et al. 1997, Dodd and Coupland 1966, Evens et al. 2014, Faber-Langendoen et al. 2017b, Keeler-Wolf and Thomas 2000, Kittel and Lederer 1993, Manning 1988, Reid 1974, Reid et al. 1994, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shupe et al. 1986, Stout et al. 2013, USBOR 1976, Ungar 1972, Ungar et al. 1969, VegCAMP and AIS 2013

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

2.C.5.Nd.1.b. M082 Warm & Cool Desert Alkali-Saline Marsh, Playa & Shrubland

G537. North American Desert Alkaline-Saline Wet Scrub

Type Concept Sentence: This group consists of saline scrub wetlands of the Intermountain West. Characteristic species include *Atriplex* spp., *Allenrolfea occidentalis*, *Salicornia rubra*, *Sarcobatus vermiculatus*, *Sesuvium verrucosum*, and/or *Suaeda moquinii*.

OVERVIEW

Scientific Name: *Sarcobatus vermiculatus* - *Atriplex* spp. Alkaline-Saline Wet Scrub Group

Common Name (Translated Scientific Name): Greasewood - Saltbush species Alkaline-Saline Wet Scrub Group

Colloquial Name: Iodinebush Wet Shrubland

Type Concept: This group occurs throughout much of the western U.S. in intermountain basins. Stands typically occur near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This group consists of open to moderately dense shrublands dominated by *Atriplex lentiformis*, *Atriplex parryi*, *Atriplex polycarpa*, *Atriplex spinifera*, *Allenrolfea occidentalis*, *Salicornia rubra*, *Sarcobatus vermiculatus*, *Sesuvium verrucosum*, and/or *Suaeda moquinii*. Stands may be monotypic or have lesser abundance of other shrubs such as *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex gardneri*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tridentata* ssp. *tridentata*, *Artemisia cana* ssp. *cana*, *Baccharis* spp., *Krascheninnikovia lanata*, and others. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of *Calamovilfa longifolia*, *Distichlis spicata* (where water remains ponded the longest), *Eleocharis palustris*, *Pascopyrum smithii*, *Poa pratensis*, *Puccinellia nuttalliana*, or *Sporobolus airoides* herbaceous types.

Classification Comments:

Similar NVC Types:

- G534 Western Great Plains Saline Wet Meadow: occurs in the northern and western Great Plains and is also dominated by *Sarcobatus vermiculatus* with more Great Plains herbaceous species.
- G538 North American Desert Alkaline-Saline Marsh & Playa: includes salt communities in the cold desert that are dominated by herbaceous species.

Diagnostic Characteristics: Salt-tolerant shrublands with a shallow water table.

VEGETATION

Physiognomy and Structure: Shrubland.

Floristics: These shrublands are dominated by *Atriplex lentiformis*, *Atriplex parryi*, *Atriplex polycarpa*, *Atriplex spinifera*, *Allenrolfea occidentalis*, *Salicornia rubra*, *Sarcobatus vermiculatus*, *Sesuvium verrucosum*, and/or *Suaeda moquinii*. Codominant shrubs include *Ambrosia dumosa*, *Artemisia californica*, *Atriplex canescens*, *Baccharis pilularis*, *Baccharis salicifolia*, *Encelia californica*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Hymenoclea salsola*, *Bassia americana* (= *Kochia americana*), *Larrea tridentata*, *Malosma laurina*, *Myoporum laetum*, *Pluchea sericea*, *Prosopis glandulosa*, *Rhus integrifolia*, and/or *Suaeda taxifolia* plus several others. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of *Calamovilfa longifolia*, *Distichlis spicata* (where water remains ponded the longest), *Eleocharis palustris*, *Pascopyrum smithii*, *Poa pratensis*, *Puccinellia nuttalliana*, or *Sporobolus airoides* herbaceous types (West 1983b, Knight 1994).

ENVIRONMENT & DYNAMICS

Environmental Description: *Climate:* Cold interior desert. *Soil/substrate/hydrology:* Sites are generally flat to gently sloping and moderately saline, but some sites do occur on rolling to hilly fans and slopes. Sites typically have saline soils, a shallow water table and flood intermittently, on margins of intermittently flooded desert playas, and usually remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations, often with fine soils such as clays (West 1983b, Knight 1994).

Dynamics:

DISTRIBUTION

Geographic Range: This group occurs throughout much of the western U.S. in intermountain basins.

Spatial Scale & Pattern [optional]: Large patch

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, TX, UT, WA, WY

TNC Ecoregions [optional]: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:??, 322A:CC, 331B:CC, 331C:CP, 331D:CP, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 331K:CP, 331L:C?, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342H:CC, 342I:C?, 342J:CC, M242C:??, M261D:CC, M261E:CP, M261G:CC, M313A:CC, M313B:CC, M331A:C?, M331B:CP, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CP, M331J:C?, M332A:C?, M332D:CP, M332E:C?, M332G:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omerik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- < Salt Desert Shrub (414) (Shiflet 1994)
- >< Saltbush - Greasewood (501) (Shiflet 1994)

LOWER LEVEL UNITS

Alliances:

- A0798 *Pluchea sericea* Wet Shrubland Alliance
- A3173 *Atriplex lentiformis* Wet Shrubland Alliance
- A1046 *Sarcobatus vermiculatus* Intermountain Wet Shrubland Alliance
- A0866 *Allenrolfea occidentalis* Wet Shrubland Alliance
- A3880 *Suaeda moquinii* - *Salicornia rubra* - *Isocoma acradenia* Alkaline Wet Scrub Alliance
- A2507 *Atriplex parryi* Wet Shrubland Alliance
- A0865 *Atriplex spinifera* Wet Shrubland Alliance
- A3879 *Sesuvium verrucosum* Desert Salt Mudflat Scrub Alliance

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2011)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 12/02/2015

Classif Resp Region: West

Internal Author: GK 10-10, 9-13, 5-15, 12-15

REFERENCES

References: Comer et al. 2003, Faber-Langendoen et al. 2017a, Knight 1994, Shiflet 1994, West 1983b

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

G537. North American Desert Alkaline-Saline Wet Scrub

A0866. Allenrolfea occidentalis Wet Shrubland Alliance

Type Concept Sentence: This alliance consists of herbaceous flats dominated by *Allenrolfea occidentalis* known from saline habitats throughout the arid intermountain western United States, such as alkaline flats along the margins of salt lakes, in depressions among gypsum ridges, and along washes in saline overflow areas.

OVERVIEW

Scientific Name: *Allenrolfea occidentalis* Wet Shrubland Alliance

Common Name (Translated Scientific Name): Iodinebush Wet Shrubland Alliance

Colloquial Name: Iodinebush Wet Shrubland

Type Concept: This herbaceous alliance consists of vegetation dominated by *Allenrolfea occidentalis*. Associated species include *Atriplex canescens*, *Atriplex gardneri*, *Distichlis spicata*, *Suaeda suffrutescens*, *Sporobolus airoides*, and/or *Sporobolus wrightii*. Stands occur in alkaline flats along the margins of salt lakes, in depressions among gypsum ridges, and along washes in saline overflow areas. In all cases, it occurs at sites that are seasonally moist or flooded and where evaporation concentrates transported salts, leaving visible mineral crusts at the soil surface. The nominal species can cover large acreages, with little else except barren soil. This alliance occurs throughout the arid intermountain western United States.

Classification Comments: This alliance can form landscape mosaics with other saline communities in saline marshes or gyp-influenced habitats.

Internal Comments:

Other Comments:**Similar NVC Types:**

Diagnostic Characteristics: *Allenrolfea occidentalis* >2% absolute cover in the shrub canopy, and no other species with greater or equal cover (Keeler-Wolf et al. 1998a, Thomas et al. 2004).

VEGETATION

Physiognomy and Structure: These are sparse to moderately dense (15-45% cover) xeromorphic, evergreen, succulent shrublands. Shrubs are generally less than 1 m in height. These stands are usually monotypic and harbor a depauperate understory and abundant bare ground. When present, the herbaceous layer consists of a sparse cover of mat-forming or cespitose graminoids and/or salt-tolerant annual forbs.

Floristics: Stands are usually strongly dominated by *Allenrolfea occidentalis* and may cover large areas of excessively salty soils. Stands of this alliance may be monotypic. Associated species are all halophytic, and other shrub species may occur. Such species include *Atriplex canescens*, *Atriplex gardneri*, *Atriplex lentiformis*, *Atriplex polycarpa*, *Frankenia salina*, and *Sarcobatus vermiculatus*. Common graminoid associates include *Distichlis spicata*, *Eleocharis palustris*, *Kalinia obtusiflora* (= *Eragrostis obtusiflora*), and *Sporobolus airoides*. Succulent halophytic annuals, such as *Salicornia rubra*, *Salicornia bigelovii*, and *Suaeda* spp., are typical forb associates. Additional associated species from stands in western Texas include *Suaeda suffrutescens* var. *detonsa* and *Sporobolus wrightii*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs in topographic depressions usually without surface drainage (playas) and stream terraces from sea level to 1800 m (5900 feet) elevation. In all cases, it occurs at sites that are seasonally moist or flooded and where evaporation concentrates transported salts, leaving visible mineral crusts at the soil surface. *Allenrolfea occidentalis* is tolerant of extreme salinities and heavy soils which tend to exclude other species, and usually forms the lowest ring of perennial vegetation around desert salt flats. This vegetation is also associated with hummocks scattered over barren salt flats. These hummocks are formed by eolian deposition of sands within the individual shrubs. Although *Allenrolfea* occurs at sites with up to 3% soil salinity, optimum growth occurs at about 1% (Mozingo 1987).

Dynamics: Fluvial processes rather than fire primarily disturb stands. Plants sprout after fire and other disturbances, but information on fire characteristics is lacking. Because of the harsh environment and succulent nature of the plants, fire is unlikely in all but the densest and driest stands.

DISTRIBUTION

Geographic Range: Vegetation included in this widespread western alliance occurs in saline habitats in the deserts of the southwestern U.S. and northern Mexico, from the Chihuahuan Desert of western Texas and New Mexico, across the Sonoran and Mojave deserts to Baja California and north into the Central Valley of California. It also occurs in the Colorado Plateau, Great Basin and Columbia Plateau regions of Nevada, Oregon, and Utah from Death Valley to Petrified Forest national parks.

Nations: MX, US

States/Provinces: AZ, CA, MXBC, NM, NV, OR, TX, UT, WY

TNC Ecoregions [optional]: 11:C, 13:C, 15:C, 17:C, 23:C

USFS Ecoregions (2007): 262A:CC, 322Ab:CCC, 322Ai:CCC, 322B:CC, 322C:CC, 341D:CC, 341Fc:CCC, 341Ff:CCC, 342B:CC, M262A:CC

Omernik Ecoregions:

Federal Lands [optional]: BLM (Carrizo Plain); NPS (Death Valley, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Allenrolfea occidentalis* (Iodine bush scrub) Alliance (Sawyer et al. 2009) [36.120.00]
- = *Allenrolfea occidentalis* Alliance (Iodine bush scrub) (Buck-Diaz et al. 2012)
- = *Allenrolfea occidentalis* Shrubland Alliance (Evens et al. 2014)
- ? Iodine Bush Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS**Associations:**

- CEG000988 *Allenrolfea occidentalis* Wet Shrubland
- CEPP005788 *Allenrolfea occidentalis* / *Distichlis spicata* Wet Shrubland
- CEPP005787 *Allenrolfea occidentalis* - *Suaeda moquinii* Wet Shrubland

- CEGLO00989 *Allenrolfea occidentalis* / *Atriplex gardneri* Wet Shrubland

AUTHORSHIP

Primary Concept Source: D. Sarr and K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel, D. Sarr, K.A. Schulz

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Barbour and Major 1977, Bradley 1970, Buck-Diaz et al. 2012, Burgess and Klein n.d., Burgess and Northington 1977, Burk 1977, Diamond 1993, Dick-Peddie 1993, Evens and Hartman 2007, Evens et al. 2014, Faber-Langendoen et al. 2017b, Fautin 1946, Griffiths 1902, Henrickson 1974, Holland 1986b, Keeler-Wolf and Thomas 2000, MacMahon 1988, MacMahon and Wagner 1985, McHargue 1973, Mazingo 1987, Nelson 1976, ORNHP unpubl. data, Odion et al. 1992, Paysen et al. 1980, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Stout et al. 2013, Thomas et al. 2004, Thorne 1982, Vasek and Barbour 1988, VegCAMP and AIS 2013, Vest 1962b, Young et al. 1977

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

G537. North American Desert Alkaline-Saline Wet Scrub

A1046. *Sarcobatus vermiculatus* Intermountain Wet Shrubland Alliance

Type Concept Sentence: Shrublands included in this alliance are dominated or codominated by *Sarcobatus vermiculatus*. They occur on lowland sites in plains, mountain valleys and intermountain basins throughout the arid and semi-arid western United States, on generally flat, poorly drained, seasonally, temporarily or intermittently flooded sites with a shallow or perched water table often within 1 m depth such as alkali flats around playas and floodplains along stream channels.

OVERVIEW

Scientific Name: *Sarcobatus vermiculatus* Intermountain Wet Shrubland Alliance

Common Name (Translated Scientific Name): Greasewood Intermountain Wet Shrubland Alliance

Colloquial Name: Intermountain Greasewood Wet Shrubland

Type Concept: Shrublands included in this alliance are dominated or codominated by *Sarcobatus vermiculatus*. Other shrubby codominants include *Artemisia cana*, *Artemisia tridentata*, *Atriplex confertifolia*, *Atriplex gardneri*, *Chrysothamnus* spp., *Collomia linearis*, *Grayia spinosa*, or *Picrothamnus desertorum* (= *Artemisia spinescens*). In more saline environments, *Nitrophila occidentalis* and *Suaeda moquinii* may be present. If present, the sparse to moderate herbaceous layer is dominated by perennial grasses, such as *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua gracilis*, *Distichlis spicata*, *Elymus elymoides*, *Hordeum jubatum*, *Leymus cinereus*, *Nassella viridula*, *Pascopyrum smithii*, *Poa secunda* (= *Poa juncifolia*), and *Sporobolus airoides*. Forbs are generally sparse except on disturbed weedy sites. The native perennial forbs include *Achillea millefolium*, *Artemisia ludoviciana*, *Astragalus* spp., *Chenopodium fremontii*, *Glycyrrhiza lepidota*, and *Opuntia polyacantha*. Perennial forbs are typically sparse and often include *Grindelia squarrosa*, *Iva axillaris*, and *Sphaeralcea coccinea*. Annual grasses, especially the exotic *Bromus* spp., may be present to abundant. Forbs are common on disturbed sites. Weedy annual forbs may include the exotics *Descurainia* spp., *Helianthus annuus*, *Halogeton glomeratus*, *Lactuca serriola*, and *Lepidium perfoliatum*. This alliance occurs throughout the arid and semi-arid western United States. Sites are generally flat, poorly drained, seasonally, temporarily or intermittently flooded with a shallow or perched water table often within 1 m depth such as alkali flats around playas and floodplains along stream channels. Substrates are generally shallow, calcareous, fine-textured soils derived from alluvium. Soils are alkaline and typically moderately saline.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of this alliance is the *Sarcobatus vermiculatus*-dominated shrub layer in a shrubland that has a relatively shallow water table and may be flooded at any time.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a moderate to dense layer of microphyllous, deciduous xeromorphic shrubs 0.5-2 m tall. The herbaceous layer is sparse to moderately dense and dominated by tall to medium-tall bunch grasses or rhizomatous mid grasses. Perennial forbs are sparse. Scattered cacti and perennial forbs may be present. Annual grasses and forbs may be seasonally present to abundant.

Floristics: This alliance has shrublands dominated or codominated by the deciduous, facultative halophytic shrub *Sarcobatus vermiculatus*. Other shrubby codominants include *Artemisia cana*, *Artemisia tridentata*, *Atriplex confertifolia*, *Atriplex gardneri*, *Chrysothamnus* spp., *Collomia linearis*, *Grayia spinosa*, *Nitrophila occidentalis*, *Picrothamnus desertorum* (= *Artemisia spinescens*), and/or *Suaeda moquinii*. Herbaceous layers range from absent to a moderately dense canopy of medium-tall to short bunchgrasses or sod grasses (0-25% cover) such as *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua gracilis*, *Distichlis spicata*, *Elymus elymoides*, *Hordeum jubatum*, *Leymus cinereus*, *Nassella viridula*, *Pascopyrum smithii*, *Poa secunda* (= *Poa juncifolia*), and/or *Sporobolus airoides*. Perennial forbs are typically sparse and often include *Achillea millefolium*, *Artemisia ludoviciana*, *Astragalus* spp., *Chenopodium fremontii*, *Glycyrrhiza lepidota*, *Grindelia squarrosa*, *Iva axillaris*, *Opuntia polyacantha*, and/or *Sphaeralcea coccinea*. Exotic species can be abundant on disturbed weedy sites and include such species as *Bassia scoparia* (= *Kochia scoparia*), *Bromus arvensis* (= *Bromus japonicus*), *Bromus rubens*, *Bromus tectorum*, *Descurainia* spp., *Halogeton glomeratus*, *Helianthus annuus*, *Lactuca serriola*, and/or *Lepidium perfoliatum*.

ENVIRONMENT & DYNAMICS

Environmental Description: Elevations range from 100-2400 m. Sites are generally flat, poorly drained and intermittently flooded with a shallow or perched water table often within 1 m depth (West 1983b). Sites may receive overland flow during intense summer thunderstorms. Some sites are well-drained and do not have a shallow water table. Substrates are generally shallow, calcareous, fine-textured soils (clays to silt-loams), derived from alluvium. Soils are alkaline and typically moderately saline (West 1983b). Summers are hot. Winters are generally cold, but are mild in subtropical regions. Precipitation varies with geography but is generally low and infrequent.

Dynamics: *Sarcobatus vermiculatus* is often found on sites with high water tables that are intermittently flooded. Hansen et al. (1995) reported that it can tolerate saturated soil conditions for up to 40 days. Hansen et al. (1995) also reported browsing damage with heavy spring and summer grazing, but noted that *Sarcobatus vermiculatus* is moderately poisonous to livestock especially in the fall, and supplemental feed is recommended to avoid livestock loss. Hanson (1929) states that *Sarcobatus vermiculatus* can form an important part of winter forage for sheep. Fire will top-kill *Sarcobatus vermiculatus*, but the shrub will promptly resprout from the root crown (Daubenmire 1970).

DISTRIBUTION

Geographic Range: This alliance is found throughout the interior arid west from California, eastern Oregon and Washington, Idaho, Montana, Wyoming, Colorado, Nevada, Utah, northern Arizona, and New Mexico, not dropping into the warm desert provinces.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 4:C, 6:C, 11:C, 17:C

USFS Ecoregions (2007): 322Ai:CCC, 341D:CC, 341Fc:CCC, 342B:CC, M261G:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Mojave); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Sarcobatus vermiculatus* (Greasewood scrub) Alliance (Sawyer et al. 2009) [36.400.00]
- ? *Sarcobatus vermiculatus/Sporobolus airoides* plant association (Johnston 1987) [included within the *Sarcobatus vermiculatus* Series.]
- ? *Sarcobatus vermiculatus* Association (152.171) (Brown 1982a) [included within Great Basin Desertscrub, Saltbush Series.]
- >< *Sarcobatus vermiculatus* Series (Johnston 1987)
- ? *Sarcobatus vermiculatus* Series (Mueggler and Stewart 1980) [includes both *Sarcobatus vermiculatus/Elymus cinereus* and *Sarcobatus vermiculatus/Agropyron smithii* habitat types.]
- >< *Sarcobatus vermiculatus* Series (Francis 1986)
- = *Sarcobatus vermiculatus* Shrubland Alliance (Evens et al. 2014)
- >< *Sarcobatus vermiculatus* habitat type (Daubenmire 1970)
- = *Sarcobatus vermiculatus* Shrubland Alliance (CNPS 2017) [36.400.00]
- >< Desert Greasewood Scrub (#36130) (Holland 1986b)
- >< Desert Sink Scrub (Holland 1986b)
- >< Greasewood Series (Sawyer and Keeler-Wolf 1995)
- ? Greasewood-Desert Shrub Series (Dick-Peddie 1993) [within the Arroyo Riparian Habitat Type.]
- >< Northern Plains: Saline lowland (Soil Conservation Service n.d.)
- ? Saltbush Series (Dick-Peddie 1993) [within the Great Basin Desert Scrub.]

LOWER LEVEL UNITS

Associations:

- CEGLO01362 *Sarcobatus vermiculatus* / *Ericameria nauseosa* Wet Shrubland
- CEGLO01368 *Sarcobatus vermiculatus* / *Sporobolus airoides* Wet Shrubland
- CEGLO01369 *Sarcobatus vermiculatus* / *Nitrophila occidentalis* - *Suaeda moquinii* Wet Shrubland
- CEGLO01370 *Sarcobatus vermiculatus* / *Suaeda moquinii* Wet Shrubland
- CEGLO01373 *Sarcobatus vermiculatus* / *Achnatherum hymenoides* Wet Shrubland
- CEGLO01371 *Sarcobatus vermiculatus* / *Atriplex confertifolia* - (*Picrothamnus desertorum*, *Suaeda moquinii*) Wet Shrubland
- CEGLO02919 *Sarcobatus vermiculatus* / *Juncus arcticus* ssp. *littoralis* Sparse Vegetation
- CEGLO01366 *Sarcobatus vermiculatus* / *Leymus cinereus* Wet Shrubland
- CEGLO01360 *Sarcobatus vermiculatus* / *Atriplex gardneri* Wet Shrubland
- CEGLO01359 *Sarcobatus vermiculatus* / *Artemisia tridentata* Wet Shrubland
- CEGLO01365 *Sarcobatus vermiculatus* / *Elymus elymoides* - *Pascopyrum smithii* Wet Shrubland
- CEGLO01357 *Sarcobatus vermiculatus* Disturbed Wet Shrubland
- CEGLO02763 *Sarcobatus vermiculatus* - *Psoralea polydenius* Wet Shrubland
- CEGLO01361 *Sarcobatus vermiculatus* / *Bouteloua gracilis* Wet Shrubland
- CEGLO01372 *Sarcobatus vermiculatus* / *Elymus elymoides* Wet Shrubland
- CEGLO02764 *Sarcobatus vermiculatus* - *Atriplex parryi* / *Distichlis spicata* Wet Shrubland
- CEGLO01364 *Sarcobatus vermiculatus* Dune Wet Shrubland
- CEGLO01363 *Sarcobatus vermiculatus* / *Distichlis spicata* Wet Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz and G. Kittel

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Anderson 2004b, Baker 1984a, Barbour and Major 1977, Blackburn et al. 1969b, Blackburn et al. 1969c, Blackburn et al. 1969d, Blackburn et al. 1971, Branson and Owen 1970, Branson et al. 1976, Brotherson et al. 1986, Brown 1982a, Bundy et al. 1996, Burk 1977, CNPS 2017, Chappell et al. 1997, Charlton 2000a, Copeland 1979, Copeland and Greene 1982, Dastrup 1963, Daubenmire 1970, DeVelice and Lesica 1993, DeVelice et al. 1991, DeVelice et al. 1995, Dick-Peddie 1993, Evens et al. 2014, Faber-Langendoen et al. 2017b, Fenemore 1970, Ferren and Davis 1991, Francis 1986, Franklin and Dyrness 1973, Graham 1937, Hamner 1964, Hansen et al. 1995, Hanson 1929, Holland 1986b, Johnston 1987, Jones and Walford 1995, Knight et al. 1987, Lesica and DeVelice 1992, MacMahon 1988, Medicine Bow Mine Application n.d., Mueggler and Stewart 1980, Paysen et al. 1980, Paysen et al. 2000, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Soil Conservation Service n.d., Sweetwater Uranium Project 1978, Terwilliger and Smith 1978, Terwilliger et al. 1979a, Terwilliger et al. 1979b, Thomas et al. 2004, Thorne 1982, Tueller 1994, Tweit and Houston 1980, Ungar et al. 1969, Vasek and Barbour 1988, VegCAMP and AIS 2013, West 1983b, West 1988, Young et al. 1977, Young et al. 1986, Young et al. 2007b

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland

G537. North American Desert Alkaline-Saline Wet Scrub

A3880. *Suaeda moquinii* - *Salicornia rubra* - *Isocoma acradenia* Alkaline Wet Scrub Alliance

Type Concept Sentence: This alliance is characterized by an open to dense canopy dominated by saline wet species *Suaeda moquinii* and/or *Salicornia rubra*. Sites include moist or seasonally dry flats, margins of intermittently flooded playas, and low coastal areas. Stands generally have low cover of vegetation and may be sparse (<10% total vegetation). It occurs in the Central Valley and San Joaquin Valley in California south into Baja California.

OVERVIEW

Scientific Name: *Suaeda moquinii* - *Salicornia rubra* - *Isocoma acradenia* Alkaline Wet Scrub Alliance

Common Name (Translated Scientific Name): Mojave Seablite - Red Swampfire - Alkali Goldenbush Alkaline Wet Scrub Alliance

Colloquial Name: Mojave Seablite - Red Swampfire Alkaline Wet Scrub

Type Concept: This alliance includes stands that are characterized by an open to dense canopy of *Suaeda moquinii* and/or *Salicornia rubra*. Other saline wetland species present may include *Anemopsis californica*, *Distichlis spicata*, *Eleocharis palustris*, *Juncus arcticus* ssp. *littoralis* (= *Juncus balticus*), *Schoenoplectus americanus* (= *Scirpus americanus*), *Tiquilia* spp., or *Triglochin maritima*. Stands generally have low cover of vegetation and may be sparse (<10% total vegetation). Sites are moist or seasonally dry flats, and margins of intermittently flooded desert playas and may extend to coast. This highly variable saline wet herbaceous vegetation

NBR alliances

alliance occurs across the warm deserts of North America, extending into the Central Valley and San Joaquin Valley in California south into Baja California.

Classification Comments:

Internal Comments: MSR 1-16: add CO, NM, NV, UT. mjr 1-15: AZ added for Lake Mead (MOJN). GK 4-14: Existing related alliances are included in G538.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: This alkaline, saline wet flats warm desert scrub is identified by an open scrub canopy characterized by saline wet species such as *Suaeda moquinii* and/or *Salicornia rubra*.

VEGETATION

Physiognomy and Structure:

Floristics: This alliance includes stands that are characterized by an open to dense canopy of *Suaeda moquinii* and/or *Salicornia rubra*. Other saline wetland species present may include *Anemopsis californica*, *Distichlis spicata*, *Eleocharis palustris*, *Juncus balticus*, *Schoenoplectus americanus* (= *Scirpus americanus*), *Tiquilia* spp., or *Triglochin maritima*. Stands generally have low cover of vegetation and may be sparse (<10% total vegetation).

ENVIRONMENT & DYNAMICS

Environmental Description: Sites are moist or seasonally dry flats, and margins of intermittently flooded desert playas and may extend to coast.

Dynamics:

DISTRIBUTION

Geographic Range: This saline wet scrub alliance is found in suitable sites across the warm deserts of North America, extending into the Central Valley and San Joaquin Valley in California south into Baja California.

Nations: MX, US

States/Provinces: AZ, CA, CO, MXBC, NM, NV, UT

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007): 322Ab:CCC, 322Ae:CCC, 322Ai:CCC, 322Ay:CCC, 341Fc:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Lake Mead, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Suaeda moquinii* (Bush seepweed scrub) Alliance (Sawyer et al. 2009) [36.200.00]
- > *Suaeda moquinii* Shrubland Alliance (Evens et al. 2014)
- > *Suaeda nigra* Alliance (Bush seepweed scrub) (Buck-Diaz et al. 2012)

LOWER LEVEL UNITS

Associations:

- CEG001991 *Suaeda moquinii* Wet Shrubland
- CEPP006758 *Suaeda moquinii* - *Atriplex canescens* Alkaline Wet Shrubland
- CEG005465 *Isocoma acradenia* Desert Scrub
- CEG005395 *Isocoma acradenia* Wet Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Buck-Diaz et al. 2012, Evens and Hartman 2007, Evens et al. 2014, Faber-Langendoen et al. 2017b, Keeler-Wolf and Thomas 2000, Sawyer et al. 2009, VegCAMP and AIS 2013

3. DESERT & SEMI-DESERT

Cool and warm semi-deserts dominated by xeromorphic growth forms, including *succulent* (e.g., cacti, euphorbias) and *small-leaved shrubs* and *trees*, desert grasses and other xeromorphic growth forms, with an irregular horizontal canopy spacing that is often open to very sparse (1%) cover.

3.B. Cool Semi-Desert Scrub & Grassland

Cool Semi-Desert Scrub & Grassland occurs in dry, cool-temperate climates, at mid-latitudes (35° to 50°N), typically in the interior of continents, and varies from low shrublands to very open grassland and shrub-steppe, including open rocky or sandy semi-desert vegetation.

3.B.1. Cool Semi-Desert Scrub & Grassland

Cool Semi-Desert Scrub & Grassland occurs in dry, cool-temperate climates, at mid-latitudes (35° to 50°N), typically in the interior of continents.

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

This division encompasses all upland shrub and grassland vegetation within the Western North American Cool Semi-desert region, from south-central Alberta through the Great Basin and western margins of the Great Plains to New Mexico, westward to dry-interior southern British Columbia and south through eastern Oregon and interior California, into the mountains of northwestern Baja California, Mexico. It includes extensive shrublands dominated by *Artemisia tridentata*, ranging from mid to upper slopes and deep to shallow soils, and extensive *Atriplex* shrublands.

M171. Great Basin-Intermountain Dry Shrubland & Grassland

This diverse semi-arid macrogroup is found throughout the Intermountain West, including mid-elevation sites in eastern and central Mojave Desert, the Great Basin, Colorado Plateau, Columbia Plateau, and lower elevation sites in the central Rocky Mountains extending east across Wyoming Basins into the western Great Plains. It can occur as open shrubland, dwarf-shrub, shrub herbaceous, or grassland communities. Characteristic species include shrubs *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ephedra* spp., *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, and dry grasses such as *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, *Leymus salinus* ssp. *salinus*, *Muhlenbergia pungens*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus cryptandrus*, and *Sporobolus airoides*.

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.1.a. M171 Great Basin-Intermountain Dry Shrubland & Grassland

G296. Mojave Mid-Elevation Mixed Desert Scrub

Type Concept Sentence: This group represents the extensive desert scrub in the transition zone above *Larrea tridentata* - *Ambrosia dumosa* desert scrub and below the lower montane woodlands (at mid-elevations of 700-1800 m) that occurs in the eastern and central Mojave Desert and transition zone into the southern Great Basin. Stands are dominated by a variety characteristic species such as *Coleogyne ramosissima*, *Ericameria cooperi*, *Eriogonum fasciculatum*, *Ephedra* spp., *Eriogonum corymbosum*, *Grayia spinosa*, *Lycium andersonii*, *Menodora spinescens*, *Nolina* spp., *Cylindropuntia acanthocarpa*, *Purshia glandulosa*, *Purshia stansburiana*, *Salazaria mexicana*, *Thamnosma montana*, *Yucca brevifolia*, or *Yucca schidigera*.

OVERVIEW

Scientific Name: *Yucca brevifolia* - *Eriogonum fasciculatum* - *Ephedra aspera* Mixed Desert Scrub Group

Common Name (Translated Scientific Name): Joshua Tree - Eastern Mojave Buckwheat - Rough Joint-fir Mixed Desert Scrub Group

Colloquial Name: Arizona Joint-fir Scrub

Type Concept: This group represents the extensive desert scrub in the transition zone above *Larrea tridentata* - *Ambrosia dumosa* desert scrub and below the lower montane woodlands at mid-elevations in the eastern and central Mojave Desert. It is also common on lower piedmont slopes in the transition zone into the southern Great Basin. The vegetation in this group is quite variable. *Larrea tridentata* may be absent or present to codominant in some examples, but typically does not dominate. Characteristic and dominant species include *Ambrosia eriocentra*, *Arctostaphylos patula*, *Coleogyne ramosissima*, *Ericameria cooperi*, *Eriogonum fasciculatum*, *Ephedra californica*, *Ephedra nevadensis*, *Ephedra torreyana*, *Ephedra viridis*, *Eriogonum corymbosum*, *Grayia spinosa*, *Lycium andersonii*, *Menodora spinescens*, *Nolina bigelovii*, *Nolina microcarpa*, *Nolina parryi*, *Cylindropuntia acanthocarpa* (= *Opuntia acanthocarpa*), *Purshia glandulosa*, *Purshia stansburiana*, *Salazaria mexicana*, *Thamnosma montana*, *Viguiera parishii*, *Yucca brevifolia*, or *Yucca schidigera*. Less common are stands with scattered *Yucca brevifolia* and a saltbush short-shrub layer dominated by *Atriplex canescens*, *Atriplex confertifolia*, or *Artemisia tridentata*. In some areas in the western Mojave, shrubby *Juniperus californica* is common with the yuccas. *Grayia spinosa* is a common codominant shrub in disturbed stands. Desert grasses, including *Achnatherum hymenoides*, *Achnatherum speciosum*, *Muhlenbergia porteri*, *Pleuraphis jamesii*, *Pleuraphis rigida*, *Poa secunda*, or *Pseudoroegneria spicata*, may form an herbaceous layer. Scattered *Juniperus osteosperma* or warm desert scrub species may also be present. This shrubland group is found in the Mojave Desert of southeastern California and southern Nevada and forms a cool-temperate elevational belt on desert ranges (700-1800 m) elevation. It also occurs at the longitudinal transition zone between the Mojave and southern Great Basin, generally at mid-elevations. Landforms include valleys, bajadas, mountain slopes, ridges, mesas or alluvial fans bordering intermountain basins. The climate is semi-arid and characterized by hot, dry summers and cold winters with precipitation ranging from 5-30 cm annually. Temperatures are continental, with large annual and diurnal ranges. Soils are highly variable across the large range of this vegetation type and are generally shallow, well-drained, coarse-textured loams or sand with rock fragments, but include finer-textured substrates such as silt.

Classification Comments: Diagnostics needs to be rewritten to solidify how this group differs from Colorado Plateau Blackbrush - Mormon-tea Shrubland Group (G312) (T. Keeler-Wolf pers. comm. 2013). TKW recommends the following species be removed from diagnostics: *Coleogyne ramosissima*, *Peucephyllum schottii*. Former Sonoran Mid-elevation Desert Scrub Group (G291) was merged into this group. TKW recommends moving *Chrysothamnus albidus* / *Puccinellia nuttalliana* Shrubland (CEGL001328) to an "alkali" group, perhaps G537 or G672. Colloquial name of the group changed per TKW recommendation, from Mojave Mid-Elevation Mixed Desert Scrub Group to Mojavean-Sonoran Rocky Upland Desert Scrub Group. Also, need to revisit placement of the *Grayia spinosa* associations; *Grayia* alliance is generally considered in this group in California, but may belong in a Great Basin group (cold desert) in Nevada Idaho, Utah, and elsewhere in Great Basin (T. Keeler-Wolf pers. comm. 2013).

Similar NVC Types:

- G312 Colorado Plateau Blackbrush - Mormon-tea Shrubland: shares several dominant species such as *Coleogyne ramosissima* and species of *Ephedra*.

Diagnostic Characteristics: The presence of *Eriogonum fasciculatum*, *Ephedra aspera*, *Yucca brevifolia*, or *Yucca schidigera* is diagnostic of this type, as is *Coleogyne ramosissima*, which is often a dominant species. The widespread desert shrub *Larrea tridentata* may be absent or present to codominant in some stands, but typically does not dominate here as it does at lower elevations. This is a diverse group, and stands may also be dominated or codominated by *Ambrosia eriocentra*, *Ericameria cooperi*, *Ephedra californica*, *Ephedra nevadensis*, *Ephedra torreyana*, *Ephedra viridis*, *Grayia spinosa*, *Lycium andersonii*, *Juniperus californica*, *Menodora spinescens*, *Nolina bigelovii*, *Nolina microcarpa*, *Nolina parryi*, *Cylindropuntia acanthocarpa*, *Purshia glandulosa*, *Purshia stansburiana*, and *Salazaria mexicana*.

VEGETATION

Physiognomy and Structure: This group is an extremely xeromorphic evergreen shrubland sometimes with a sparse tree layer of evergreen sclerophyllous trees. The herbaceous layer is generally sparse, but may have significant perennial grass cover.

Floristics: The vegetation in this group is quite variable. *Larrea tridentata* may be absent or present to codominant in some stands, but typically does not dominate. Characteristic and dominant species include *Ambrosia eriocentra*, *Arctostaphylos patula*, *Coleogyne ramosissima*, *Ericameria cooperi*, *Eriogonum fasciculatum*, *Ephedra californica*, *Ephedra nevadensis*, *Ephedra torreyana*, *Ephedra viridis*, *Eriogonum corymbosum*, *Grayia spinosa*, *Lycium andersonii*, *Menodora spinescens*, *Nolina bigelovii*, *Nolina microcarpa*, *Nolina parryi*, *Cylindropuntia acanthocarpa* (= *Opuntia acanthocarpa*), *Purshia glandulosa*, *Purshia stansburiana*, *Salazaria mexicana*, *Thamnosma montana*, *Viguiera parishii*, *Yucca brevifolia*, or *Yucca schidigera*. Less common are stands with scattered *Yucca brevifolia* and a saltbush short-shrub layer dominated by *Atriplex canescens*, *Atriplex confertifolia*, or *Artemisia tridentata*. In some areas in the western Mojave, shrubby *Juniperus californica* is common with the yuccas. *Grayia spinosa* is a common codominant shrub in disturbed stands. Desert grasses, including *Achnatherum hymenoides*, *Achnatherum speciosum*, *Muhlenbergia porteri*, *Pleuraphis jamesii*, *Pleuraphis rigida*, *Poa secunda*, *Pseudoroegneria spicata*, or *Sporobolus cryptandrus*, may form an herbaceous layer. Scattered *Juniperus osteosperma* or warm desert scrub species may also be present.

ENVIRONMENT & DYNAMICS

Environmental Description: This shrubland group is found in the Mojave Desert of southeastern California and southern Nevada and forms a cool-temperate elevational belt on desert ranges. It also occurs at the longitudinal transition zone between the Mojave and southern Great Basin at mid-elevation (800-1800 m) (Sawyer et al. 2009). Landforms include valleys, bajadas, mountain slopes, ridges, mesas or alluvial fans bordering intermountain basins. Some authors regard this group as delimiting the upper elevational boundary of the Mojave Desert in the transition between the Mojave and Great Basin deserts (Mozingo 1987). Full elevation ranges from 50-2500 m, with stands regularly occurring above 900 m. The climate is semi-arid and characterized by hot, dry summers and cold winters with precipitation ranging from 5-30 cm annually. Winter precipitation dominates in the western portions, with summer rain becoming more important eastward. Year-to-year precipitation variability can be quite large. Temperatures are continental, with large annual and diurnal ranges. Soils are highly variable across the large range of this vegetation type and are generally shallow, well-drained, coarse-textured loams or sand with rock fragments, but include finer-textured substrates such as silt. Soils are derived from bedrock or alluvial deposits from granitic and sedimentary rocks (Keeler-Wolf and Thomas 2000, Thomas et al. 2004, Sawyer et al. 2009). These communities are more drought-tolerant than *Artemisia tridentata*-dominated communities of the Great Basin but less tolerant of drought than either *Larrea tridentata* or *Atriplex* spp. shrublands. Adjacent vegetation is typically *Artemisia* shrublands at the upper elevational margin and *Larrea tridentata* or *Atriplex* - *Sarcobatus* shrublands where these communities grade into lower-elevation deserts or heavy alkaline soils.

Dynamics:

DISTRIBUTION

Geographic Range: This desert scrub group is found in the eastern and central Mojave Desert and on lower piedmont slopes in the transition zone into the southern Great Basin.

Spatial Scale & Pattern [optional]: Large patch

Nations: MX?, US

States/Provinces: AZ, CA, NV, UT

TNC Ecoregions [optional]: 11:C, 12:P, 17:C, 23:P

USFS Ecoregions (2007): 313A:CC, 322A:CC, 322B:CC, 322C:CC, 341D:CP, 341E:C?, 341F:CC, 342B:PP, M261E:CC, M341A:CC, M341D:C?

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > Mohave Desertscrub, Blackbrush Series - 153.12 (Brown et al. 1979)
- > Mohave Desertscrub, Blackbrush Series, Blackbrush Series, *Coleogyne ramosissima*-*Yucca* spp. Association - 153.122 (Brown et al. 1979)
- > Mohave Desertscrub, Blackbrush Series, Blackbrush Series, *Coleogyne ramosissima* Association - 153.121 (Brown, et al. 1979) (Brown et al. 1979)
- > Mohave Desertscrub, Bladdersage Series - 153.14 (Brown et al. 1979)
- > Mohave Desertscrub, Bladdersage Series, *Salazaria mexicana* Association - 153.141 (Brown et al. 1979)
- > Mohave Desertscrub, Joshuatree Series - 153.15 (Brown et al. 1979)
- > Mohave Desertscrub, Joshuatree Series, *Yucca brevifolia*-*Acamptopappus sphaerocephalus*-*Larrea divaricata*-Mixed Scrub Association - 153.151 (Brown et al. 1979)
- > Mohave Desertscrub, Joshuatree Series, *Yucca brevifolia*-*Coleogyne ramosissima* Association - 153.152 (Brown et al. 1979)
- > Mohave Desertscrub, Joshuatree Series, *Yucca brevifolia*-*Larrea divaricata* Association - 153.153 (Brown et al. 1979)

LOWER LEVEL UNITS

Alliances:

- A3139 *Ephedra aspera* Scrub Alliance
- A4167 *Eriogonum wrightii* - *Eriogonum heermannii* - *Buddleja utahensis* Scrub Alliance
- A4156 *Cylindropuntia acanthocarpa* / *Pleuraphis rigida* Scrub Alliance
- A4157 *Ephedra funerea* Scrub Alliance
- A3150 *Eriogonum fasciculatum* - *Viguiera parishii* Desert Scrub Alliance
- A4159 *Amphipappus fremontii* - *Salvia funerea* Scrub Alliance
- A3148 *Yucca brevifolia* Wooded Scrub Alliance
- A3144 *Coleogyne ramosissima* Mojave Desert Scrub Alliance
- A0502 *Juniperus californica* Mojave Scrub Alliance

- A3147 *Yucca schidigera* Scrub Alliance
- A4245 *Ephedra nevadensis* - *Lycium andersonii* - *Grayia spinosa* Scrub Alliance
- A3145 *Nolina parryi* - *Nolina microcarpa* Scrub Alliance
- A2515 *Menodora spinescens* Scrub Alliance
- A0833 *Purshia stansburiana* Scrub Alliance
- A4158 *Mortonia utahensis* Scrub Alliance

AUTHORSHIP

Primary Concept Source: D.E. Brown, C.H. Lowe, and C.P. Pase (1979)

Author of Description: K.A. Schulz, M.S. Reid and T. Keeler-Wolf

Acknowledgments: T. Keeler-Wolf

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: KAS 3-10, 4-15, 11-15, mod. MSR/TKW 10-13

REFERENCES

References: Barbour and Major 1988, Beatley 1976, Brown 1982a, Brown et al. 1979, Faber-Langendoen et al. 2017a, Holland and Keil 1995, Keeler-Wolf 2007, Keeler-Wolf and Thomas 2000, MacMahon 1988, Mozingo 1987, Ostler et al. 2000, Peinado et al. 1995c, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shiflet 1994, Thomas et al. 2004

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G296. Mojave Mid-Elevation Mixed Desert Scrub

G312. Colorado Plateau Blackbrush - Mormon-tea Shrubland

Type Concept Sentence: This semi-arid shrubland group occurs in the Colorado Plateau on sandy substrates and is characterized by extensive, typically open shrublands dominated by *Artemisia filifolia*, *Coleogyne ramosissima*, *Ephedra cutleri*, *Ephedra torreyana*, *Ephedra viridis*, *Poliomintha incana*, *Quercus havardii* var. *tuckeri*, or *Vancleavea stylosa*.

OVERVIEW

Scientific Name: *Coleogyne ramosissima* - *Ephedra cutleri* - *Ephedra torreyana* Colorado Plateau Shrubland Group

Common Name (Translated Scientific Name): Blackbrush - Cutler's Joint-fir - Torrey's Joint-fir Colorado Plateau Shrubland Group

Colloquial Name: Colorado Plateau Blackbrush Shrubland

Type Concept: This semi-arid Colorado Plateau shrubland group is characterized by extensive, typically open shrublands dominated by *Coleogyne ramosissima* or one of three species of *Ephedra*: *Ephedra cutleri*, *Ephedra torreyana*, or *Ephedra viridis*. *Ephedra cutleri* and *Ephedra viridis* often assume a distinctive matty growth form. Other dominant /diagnostic shrubs that occur either singly or in mixed stands include *Artemisia filifolia* (often on deep-sand sites), *Poliomintha incana*, *Quercus havardii* var. *tuckeri*, and *Vancleavea stylosa*. Other more widespread shrubs, such as *Ericameria nauseosa* and *Grayia spinosa*, may be present to dominant locally. The herbaceous layer is sparse and composed of graminoids such as *Achnatherum hymenoides*, *Hesperostipa comata*, *Pleuraphis jamesii*, or *Sporobolus cryptandrus*. The general aspect of occurrences is an open low shrubland but may include small blowouts and dunes. Occasionally grasses may be moderately abundant locally and form a distinct layer. Stands occur on windswept mesas, benchlands, colluvial slopes, pediments, alluvial fans, broad basins and plains. Elevation ranges from 560-1800 m. Substrates are shallow, typically calcareous, non-saline and gravelly or sandy soils over sandstone bedrock or limestone bedrock (less common), caliche or limestone alluvium. It also occurs in deeper soils on sandy plains and stabilized sandsheets and may form small hummocks or small coppice dunes. Disturbance may be important in maintaining the woody component. Eolian processes are evident, such as pediceled plants, occasional blowouts or small dunes, but the generally higher vegetative cover and less prominent geomorphic features distinguish this group from active and stabilized dune complexes.

Classification Comments:

Similar NVC Types:

- G296 Mojave Mid-Elevation Mixed Desert Scrub

Diagnostic Characteristics: *Coleogyne ramosissima* is an indicator species for this shrubland group in the northern portion of its range and often dominates or codominates with species of *Ephedra*. *Ephedra* species are typically present to dominant throughout the range of this group with *Ephedra cutleri* largely restricted to the southern portions. *Artemisia filifolia* may also be present to dominant, but is a widespread western shrub on sandy substrates and is not a good indicator of this Colorado Plateau group.

VEGETATION

Physiognomy and Structure: This group is composed of a typically open evergreen, microphyllous semi-desert scrub with succulents, half-shrubs, and scattered deciduous shrubs. Occasionally shrub cover can be moderately dense. Herbaceous species are typically sparse and composed of perennial graminoids.

Floristics: This semi-arid shrubland group is characterized by extensive, typically open shrublands dominated by *Coleogyne ramosissima* or one of several different species of *Ephedra*: *Ephedra cutleri*, *Ephedra torreyana*, or *Ephedra viridis*. *Ephedra cutleri* and *Ephedra viridis* often assume a distinctive matty growth form. *Artemisia filifolia* is often present and may be codominant to dominant on deep-sand sites. *Poliomintha incana*, *Quercus havardii* var. *tuckeri*, and *Vanclevea stylosa* may also dominant stands in either singly or in mixed stands. Other more widespread shrubs may be present, including *Atriplex canescens*, *Atriplex confertifolia*, *Ericameria nauseosa*, and *Grayia spinosa*, but not dominant. The herbaceous layer is sparse and composed of perennial graminoids such as *Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, or *Sporobolus cryptandrus*. The general aspect of occurrences is an open low shrubland but may include small blowouts and dunes. Occasionally grasses may be moderately abundant locally and form a distinct layer.

ENVIRONMENT & DYNAMICS

Environmental Description: This semi-arid shrubland group occurs in the Colorado Plateau on windswept mesas, benchlands, colluvial slopes, pediments, alluvial fans, broad basins and plains. Elevation ranges from 560-1800 m. Substrates are shallow, typically calcareous, non-saline and gravelly or sandy soils over sandstone bedrock and, less commonly, limestone bedrock (regolith), caliche (petrocalcic layer) or limestone alluvium. Stands also occur in deeper soils on extensive sandy plains and stabilized sandsheets and may form small hummocks or small coppice dunes. Disturbance may be important in maintaining the woody component. Eolian processes are evident, such as pediceled plants, occasional blowouts or small dunes, but the generally higher vegetative cover and less prominent geomorphic features distinguish this group from active and stabilized dune complexes.

Climate: This shrubland group occurs in an arid to semi-arid climate with annual precipitation in the form of summer monsoons and winter storms averaging approximately 20 cm. **Soil/substrate/hydrology:** This group typically occurs on gentle to steep, bouldery or rocky slopes of mountains, canyons, and mesas with varying aspects, but includes extensive sandy plains and basin in the southern portion of the Colorado Plateau. Soils are highly variable, and parent materials may include shale, sandstone, limestone, quartzites, and igneous rocks. Soils are generally coarse-textured, often rocky, shallow and well-drained. Effective soil moisture appears to be primarily controlled by depth of regolith (layer of loose, heterogeneous material covering solid rock) and position in relation to the water table. In most sites the regolith is uniformly shallow. In association with blackbrush (*Coleogyne ramosissima*) sites, the soil moisture is concentrated on top of impermeable bedrock at a shallow depth. This perching effect allows for gradual uptake of moisture by the plants roots (Loope and West 1979). This permits growth of plants with more mesic habitat requirements (Warren et al. 1982). On sites with deep soil, blackbrush may occur in almost pure stands with only a few associated species (Warren et al. 1982). Dark-colored cryptogamic soil crusts, composed of lichens, mosses, fungi, and algae, are often present in this group in fairly undisturbed areas. Sandy soils may have more cryptogamic crusts than clayish or silty soil surfaces. This group also occurs in deeper soils on sandy plains and stabilized sandsheets and may form small hummocks or small coppice dunes. Eolian processes are evident, such as pediceled plants, occasional blowouts or small dunes, but the generally higher vegetative cover and less prominent geomorphic features distinguish this group from active and stabilized dune complexes.

Dynamics: Fire does not appear to play a role in maintenance of shrublands within this group. Topographic breaks dissect the landscape, and isolated pockets of vegetation are separated by rockwalls or steep canyons. Blackbrush is fire-intolerant (Loope and West 1979). Following fires, these communities are often colonized by non-native grasses, which serve to encourage recurrent fires and delay shrub regeneration (Reid et al. 1999). In shallow regolith situations, secondary succession, in the sense of site preparation by seral plants, may not occur at all (Loope and West 1979). When this vegetation group (especially *Artemisia filifolia*-dominated stands) occurs on deeper loessal soils, some consider this shrub invasion of semi-desert shrub-steppe (Loope 1977).

Disturbance may be important in maintaining the woody component. Eolian processes are typically evident, such as pediceled plants, occasional blowouts or small dunes, but the generally higher vegetative cover and less prominent geomorphic features distinguish this group from active and stabilized dune complexes.

DISTRIBUTION

Geographic Range: This group occurs in the Colorado Plateau on benchlands, colluvial slopes, pediments or alluvial fans common in Canyonlands portion in central Utah and extends south into southern Utah and northeastern Arizona where it occurs on vast sandy plains and mesatops.

Spatial Scale & Pattern [optional]: Large patch

Nations: US

States/Provinces: AZ, CO, NM, NV, UT

TNC Ecoregions [optional]: 18:C, 19:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313D:CC, 322A:CC, 341B:CC, 341C:C?, 341F:CP, M313A:CC, M331E:PP, M331H:PP, M341B:CC, M341C:CP

Omernik Ecoregions:

Federal Lands [optional]: NPS (Arches, Canyonlands)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = Colorado Plateau - Mohavian Blackbush Semi-Desert (West 1983d)

LOWER LEVEL UNITS

Alliances:

- A3220 *Coleogyne ramosissima* Colorado Plateau Shrubland Alliance
- A0862 *Poliomintha incana* Shrubland Alliance
- A3201 *Ephedra viridis* Colorado Plateau Shrubland Alliance
- A3181 *Artemisia filifolia* Colorado Plateau Shrubland Alliance
- A2572 *Ephedra torreyana* Shrubland Alliance
- A2654 *Quercus havardii* var. *tuckeri* Shrubland Alliance
- A2644 *Ephedra cutleri* Shrubland Alliance

AUTHORSHIP

Primary Concept Source: N.E. West (1983d)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: KAS 2-10, 11-15

REFERENCES

References: AZGAP unpubl. data 2004, Faber-Langendoen et al. 2017a, Loope 1977, Loope and West 1979, Reid et al. 1999, Shiflet 1994, Thatcher 1975, Tuhy and MacMahon 1988, Tuhy et al. 2002, Warren et al. 1982, West 1983d

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G312. Colorado Plateau Blackbrush - Mormon-tea Shrubland

G311. Intermountain Semi-Desert Grassland

Type Concept Sentence: This widespread semi-arid to arid grassland group occurs throughout the intermountain western U.S. that are composed of dominant drought-resistant perennial bunchgrasses such as *Achnatherum* spp., *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, *Poa cusickii*, *Poa secunda*, and *Pseudoroegneria spicata* often with scattered shrubs, especially *Artemisia tridentata*, *Atriplex* spp., *Coleogyne ramosissima*, *Ephedra* spp., *Gutierrezia sarothrae*, and *Krascheninnikovia lanata*.

OVERVIEW

Scientific Name: *Pleuraphis jamesii* - *Achnatherum hymenoides* - *Hesperostipa comata* Semi-Desert Grassland Group

Common Name (Translated Scientific Name): James' Galleta - Indian Ricegrass - Needle-and-Thread Semi-Desert Grassland Group

Colloquial Name: Indian Ricegrass - Bluebunch Wheatgrass - Sandhill Muhly Grassland

Type Concept: This widespread group includes semi-arid to arid grasslands found throughout the intermountain western U.S. The dominant perennial bunchgrasses and shrubs within this group are all drought-resistant plants. Dominant or codominant species are *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Achnatherum nelsonii*, *Achnatherum speciosum*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, *Poa cusickii*, *Poa secunda*, *Pseudoroegneria spicata*, and *Sporobolus cryptandrus*. Scattered shrubs and dwarf-shrubs often are present, especially *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex* spp., *Coleogyne ramosissima*, *Ephedra* spp., *Gutierrezia sarothrae*, and *Krascheninnikovia lanata*, which are the typical dominant species of adjacent shrublands. Stands occur on sites on a variety of landforms, including swales, playas, mesas, alluvial flats, and plains over an elevational range of approximately 1100 to 3290 m in most of its range and 350 to 425 m in the Columbia Basin. This group may constitute the matrix over large areas of intermountain basins, and also may occur as large patches in mosaics with semi-desert shrublands. Grasslands in areas of higher precipitation, at higher elevation, typically belong to other groups. Substrates are often well-drained sandy or loam soils derived from sedimentary parent materials but are quite variable and may include fine-textured soils derived from igneous and metamorphic rocks.

Classification Comments: This group was merged with former Columbia Basin Foothill & Canyon Dry Grassland Group (G274), which was very similar compositionally and a northern variant of this intermountain group. Communities dominated by *Achnatherum lettermanii*, *Achnatherum nelsonii*, and *Agrostis variabilis* are poorly understood and require further documentation. The only occurrence of a community dominated by *Agrostis variabilis* is known from Utah and may be the result of disturbance. *Achnatherum speciosum* is a southern Great Basin species, which extends in distribution into the Mojave and Colorado deserts, for now its communities are included here. Occurrences of this semi-desert grassland group in the relatively high-elevation basins of Wyoming and south-central Montana resemble in species composition the foothill grasslands that grow at slightly higher elevations and in the Columbia Plateau.

Similar NVC Types:

- G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland

Diagnostic Characteristics: This group consists of semi-arid to arid grasslands often creating the matrix over large areas. Characteristic graminoids include *Achnatherum hymenoides*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, *Poa cusickii*, *Poa secunda*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: Medium to tall bunchgrass-dominated group occurring with scattered shrubs as a matrix community or interspersed among shrub-dominated communities. Cover within this group is variable from dense to less than 25% cover.

Floristics: The dominant perennial bunchgrasses and shrubs within this group are all drought-resistant plants. Dominant or codominant species are *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Achnatherum nelsonii*, *Achnatherum speciosum*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, *Poa cusickii*, *Poa secunda*, and *Pseudoroegneria spicata*. Other graminoids may include *Aristida purpurea*, *Carex filifolia*, *Elymus elymoides*, *Koeleria macrantha*, *Leymus salinus*, or *Sporobolus cryptandrus*. Scattered shrubs and dwarf-shrubs often are present, especially *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex* spp., *Coleogyne ramosissima*, *Ephedra* spp., *Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. Forb cover is also sparse but can be relatively diverse. Common forbs are *Gaura coccinea*, *Balsamorhiza sagittata*, *Hymenopappus filifolius*, *Machaeranthera canescens*, *Sphaeralcea coccinea*, *Vicia americana*, *Lappula occidentalis* (= *Lappula redowskii*), *Lithophragma glabrum*, *Lupinus pusillus*, *Opuntia aurea* (= *Opuntia basilaris* var. *aurea*), *Opuntia polyacantha*, *Plantago patagonica*, *Pediomelum argophyllum*, *Artemisia campestris*, *Artemisia dracunculul*, *Artemisia ludoviciana*, and species of *Antennaria*, *Astragalus*, *Cryptantha*, *Eriogonum*, *Gilia*, and *Lappula*. Cryptogams are important in some stands with up to 40% ground cover on sites in the Colorado Plateau. Exotic species such as *Bromus tectorum*, *Draba verna*, *Lactuca serriola*, *Salsola tragus*, *Bassia scoparia* (= *Kochia scoparia*), *Onopordum acanthium*, *Poa pratensis*, *Sisymbrium altissimum*, and *Tragopogon dubius* are present in many of these stands.

ENVIRONMENT & DYNAMICS

Environmental Description: Low-elevation grasslands in the Intermountain West region occur in semi-arid to arid climates at approximately 1450 to 2320 m (4750-7610 feet) elevation, but can reach as low as 350 m in the Columbia Basin. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesatops, plateau parks, alluvial flats, plains and extend into dry foothills. In the Columbia Plateau stands extend up into the Columbia and Snake river canyons on stream terraces and dry, rocky slopes. These grasslands typically occur on relatively xeric sites. This group experiences cold temperate conditions. Hot summers and cold winters with freezing temperatures and snow are common. Annual precipitation is usually from 20-40 cm (7.9-15.7 inches). A significant portion of the precipitation falls in July through October during the summer monsoon storms, with the rest falling as snow during the winter and early spring months. These grasslands occur on a variety of aspects and slopes. Sites may range from flat to moderately steep. Soils supporting this group also vary from deep to shallow, and from sandy to finer-textured. The substrate is typically derived from sandstone or shale. Some occurrences on sandy soils have a high cover of cryptogams on the soil surface. These cryptogams tend to increase the stability of the highly erodible sandy soils of these grasslands during torrential summer rains and heavy wind storms (Kleiner and Harper 1977).

Dynamics: *Achnatherum hymenoides* is one of the most drought-tolerant grasses in the western U.S. (USFS 1937). It is also a valuable forage grass in arid and semi-arid regions. Improperly managed livestock grazing could increase soil erosion, decrease cover of this palatable plant species and increase weedy species (USDA 1937). *Hesperostipa comata* is a deep-rooted grass that uses soil moisture below 0.5 m during the dry summers. Burning generally kills or severely damages *Hesperostipa comata* plants. After fire, regeneration of this non-rhizomatous bunchgrass is through seed and may take many years to reach prefire densities. *Pleuraphis jamesii* is both drought- and grazing-resistant (USFS 1937, Weaver and Albertson 1956, West et al. 1972). In parts of its range it increases under grazing, and in others parts it decreases. The grass is favored in mixedgrass stands because it is only moderately palatable to livestock, but decreases when heavily grazed during drought and in the more arid portions of its range where it is the dominant grass (West et al. 1972). This grass reproduces extensively from scaly rhizomes. These rhizomes make the plant resistant

to trampling by livestock and have good soil binding properties (USFS 1937, Weaver and Albertson 1956, West et al. 1972). The cool-season annual grass *Bromus tectorum* can be an effective competitor for winter soil moisture because it can germinate in the fall, over-winter, then begin re-growing in the early spring before it is warm enough for many perennial grasses, completing its lifecycle and depleting soil moisture before the dry summer weather begins. This annual species also produces abundant fine fuels that carry fire well and increase the frequency of fires (FEIS 1998).

DISTRIBUTION

Geographic Range: This group occurs throughout the intermountain western U.S. on dry plains, foothills and mesas, at approximately 1450 to 2320 m (4750-7610 feet) elevation. Stands extend up into the Columbia and Snake river canyons on stream terraces and dry, rocky slopes. In the Bighorn Basin of north-central Wyoming, there may be some semi-desert grasslands, but this is uncertain.

Spatial Scale & Pattern [optional]: Large patch

Nations: MX?, US

States/Provinces: AZ, CA, CO, ID, MT?, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 322A:CC, 331A:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CP, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:C?, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CP, M331J:CP, M332G:CC, M333A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Arches); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > Grama - Galleta (502) (Shiflet 1994)
- = Southeastern Utah galleta-threawn shrub steppe (West 1983e)

LOWER LEVEL UNITS

Alliances:

- A1290 *Achnatherum speciosum* Grassland Alliance
- A3976 *Pseudoroegneria spicata* - *Opuntia polyacantha* Dry Canyon Slope Grassland Alliance
- A4216 *Sphaeralcea ambigua* - *Sphaeralcea coccinea* - *Sphaeralcea parvifolia* Dry Meadow Alliance
- A1262 *Achnatherum hymenoides* - *Pseudoroegneria spicata* - *Muhlenbergia pungens* Grassland Alliance
- A1287 *Pleuraphis jamesii* Grassland Alliance
- A1270 *Hesperostipa comata* Grassland Alliance
- A3977 *Sporobolus cryptandrus* - *Aristida purpurea* var. *longiseta* - *Poa secunda* Sandy Stream Terrace Grassland Alliance

AUTHORSHIP

Primary Concept Source: N.E. West (1983e)

Author of Description: M.E. Hall and M.S. Reid

Acknowledgments:

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: MEH/MSR 3-10, mod. KAS 4-15, 11-15, mod. GK 9-16

REFERENCES

References: Bowers 1982, Cable 1967, Cable 1969, Cable 1975b, Castle 1954, FEIS 1998, Faber-Langendoen et al. 2017a, Kleiner and Harper 1972, Kleiner and Harper 1977, McClaran and Van Devender 1995, Ramaley 1939b, Shiflet 1994, USFS 1937, Van Pelt 1978, Weaver and Albertson 1956, West 1983e, West et al. 1972

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G311. Intermountain Semi-Desert Grassland

A1262. *Achnatherum hymenoides* - *Pseudoroegneria spicata* - *Muhlenbergia pungens* Grassland Alliance

Type Concept Sentence: These grasslands are dominated by a variety of grasses, the most frequently occurring being *Achnatherum hymenoides*, *Muhlenbergia pungens*, and *Pseudoroegneria spicata*, and occur in the southern and middle Rocky Mountains and Colorado Plateau, into adjacent ecoregions.

OVERVIEW

Scientific Name: *Achnatherum hymenoides* - *Pseudoroegneria spicata* - *Muhlenbergia pungens* Grassland Alliance

Common Name (Translated Scientific Name): Indian Ricegrass - Bluebunch Wheatgrass - Sandhill Muhly Grassland Alliance

Colloquial Name: Indian Ricegrass - Bluebunch Wheatgrass - Sandhill Muhly Grassland

Type Concept: Vegetation of this alliance is characterized by a sparse to moderately dense herbaceous layer of graminoids, the most of common of which include *Achnatherum hymenoides*, *Muhlenbergia pungens*, and *Pseudoroegneria spicata*. Other common graminoid associates may include *Hesperostipa comata* (= *Stipa comata*), *Koeleria macrantha*, *Leucopoa kingii*, *Pascopyrum smithii*, *Pleuraphis jamesii* (= *Hilaria jamesii*), *Poa fendleriana*, *Poa secunda*, *Redfieldia flexuosa*, and *Schizachyrium scoparium*. Scattered shrubs may be found throughout stands. Forbs are rarely important, although cushion plants may be a prominent feature in some stands. These grasslands occur throughout the southern and middle Rocky Mountains and Colorado Plateau, into adjacent ecoregions. Habitats are variable and may include sand dunes and deposits, shale barrens, rocky or badland slopes, foothills, mesas, ridgetops, plateaus and saddles. Sites are flat to gently sloping between 1220 and 2700 m elevation.

Classification Comments: Some vegetation in this alliance may be too sparse in sandy sites to be classified as grassland. Renee Rondeau (CONHP pers. comm.) reported that *Ericameria nauseosa* is codominant in fire-suppressed stands in the San Luis Valley in Colorado. *Sphaeralcea (coccinea, parvifolia)* Grassland (CEGL005366) has been included in this alliance tentatively despite being forb-dominated as these stands exhibit floristic overlap with associations included here and may represent forb-dominated inclusions within these communities.

Internal Comments: GK 9-16: ID added for Minidoka. mjr 12-14: CA added for MOJN.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: *Achnatherum hymenoides*, *Muhlenbergia pungens*, or *Pseudoroegneria spicata* have >50 % relative cover in the herbaceous layer. Forbs are rarely important. Occurrences of these grasslands are extremely widespread throughout their range, and habitats vary widely, therefore diagnostic characters are difficult to determine.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by a sparse to dense cover of graminoids that is dominated by perennial bunch grasses less than 1 m tall. There is also sparse to moderate cover of perennial forbs. Occasional scattered shrubs and dwarf-shrubs may be present. Annual forbs and grasses are seasonally present.

Floristics: Vegetation of this alliance is characterized by a sparse to moderately dense herbaceous layer of graminoids, the most of common of which include *Achnatherum hymenoides*, *Muhlenbergia pungens*, and *Pseudoroegneria spicata*. Other common graminoid associates may include *Festuca idahoensis*, *Hesperostipa comata* (= *Stipa comata*), *Koeleria macrantha*, *Leucopoa kingii*, *Pascopyrum smithii*, *Pleuraphis jamesii* (= *Hilaria jamesii*), *Poa fendleriana*, *Poa secunda*, *Redfieldia flexuosa*, and *Schizachyrium scoparium*. Scattered shrubs may be found throughout stands, but only occur at low cover and may include *Artemisia frigida*, *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus montanus*, *Ericameria* spp., *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, and *Tetradymia canescens*. A sparse layer of forbs is typically present. Cushion plants may be important in some stands and may include species of *Arenaria*, *Astragalus*, *Cryptantha*, *Heterotheca*, *Hymenoxys*, *Phlox*, and *Stenotus*.

ENVIRONMENT & DYNAMICS

Environmental Description: Climate is semi-arid with highly variable precipitation during the growing season. Mean annual precipitation ranges from 30-60 cm. Drought is not uncommon and contributes to the formation of blowouts. Habitats are variable and may include sand dunes and deposits, shale barrens, rocky or badland slopes, foothills, mesas, ridgetops, plateaus and saddles. Sites are flat to gently sloping between 1220 and 2700 m elevation. Stands occur on all aspects, but often on the drier southern and western slopes. Substrates are also variable and range from shallow, lithic soils with a rocky surface to moderately deep soils with little rock. Disturbance is usually a factor; upland sites often have blowing sand, and wash sites are subject to periodic flooding.

Dynamics: *Achnatherum hymenoides* is one of the most drought-tolerant grasses in the western U.S. and occurs on a variety of xeric sites (USFS 1937). It is also a valuable forage grass in arid and semi-arid regions. Improperly managed livestock grazing could increase soil erosion, decrease cover of this palatable plant species and increase weedy species (USFS 1937). Fire has variable effects on *Pseudoroegneria spicata*. Plants usually survive burning, and growth is often stimulated, except when fire occurs in the driest month when the crowns will burn because of low moisture in the vegetation, and the meristems are damaged (Johnson and Simon 1987). Grazing impacts are concentrated on the gentler slopes accessible to livestock. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris* (Mueggler and Stewart 1980). It tolerates dormant-period grazing well, but is sensitive to defoliation during

the growing season. Light spring use or fall grazing can help retain plant vigor. It is particularly sensitive to defoliation in late spring (Comer et al. 1999). The exotic species *Bromus tectorum* occurs in many stands of the alliance and contributes significant cover on sites disturbed by livestock.

DISTRIBUTION

Geographic Range: Stands of this grassland alliance occur in the Colorado Plateau, Wyoming Basins, Utah-Wyoming Mountains, southern and middle Rocky Mountains, in southern Idaho, and the Great Basin.

Nations: US

States/Provinces: CA, CO, ID, MT, UT, WY

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007): 322Ai:CCC, 341Fc:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Mojave); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Achnatherum hymenoides* (Indian rice grass grassland) Alliance (Sawyer et al. 2009) [41.120.00]
- > *Achnatherum hymenoides* Alliance (Indian rice grass grassland) (Buck-Diaz et al. 2012)
- > *Achnatherum hymenoides* Herbaceous Alliance (Evens et al. 2014)
- > *Pseudoroegneria spicata* (Bluebunch wheat grass grassland) Alliance (Sawyer et al. 2009) [41.040.00]

LOWER LEVEL UNITS

Associations:

- CEGLO01674 *Pseudoroegneria spicata* - *Achnatherum hymenoides* Grassland
- CEGLO01651 *Achnatherum hymenoides* Shale Barren Grassland
- CEGLO01661 *Pseudoroegneria spicata* ssp. *inermis* Grassland
- CEPP006710 *Achnatherum hymenoides* - *Oenothera deltoides* Dune Grassland
- CEGLO01666 *Pseudoroegneria spicata* - Cushion Plants Grassland
- CEGLO02343 *Achnatherum hymenoides* Colorado Plateau Grassland
- CEGLO02363 *Muhlenbergia pungens* Grassland
- CEGLO05470 *Achnatherum thurberianum* - *Bromus tectorum* Ruderal Grassland
- CEGLO03300 *Achnatherum hymenoides* Shrub Grassland
- CEGLO01652 *Achnatherum hymenoides* - *Sporobolus contractus* Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz and J. Coles, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2016/09/29

REFERENCES

References: Buck-Diaz et al. 2012, Evens et al. 2014, Faber-Langendoen et al. 2017b, Keeler-Wolf and Thomas 2000, Sawyer et al. 2009, USFS 1937, VegCAMP and AIS 2013

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G311. Intermountain Semi-Desert Grassland

A1290. *Achnatherum speciosum* Grassland Alliance

Type Concept Sentence: This grassland is documented from the Mojave Desert and dominated by *Achnatherum speciosum*, which is the sole dominant or important plant in the herbaceous layer.

OVERVIEW

Scientific Name: *Achnatherum speciosum* Grassland Alliance

Common Name (Translated Scientific Name): Desert Needlegrass Grassland Alliance

Colloquial Name: Desert Needlegrass Grassland

Type Concept: Stands of this alliance are dominated by *Achnatherum speciosum* (= *Stipa speciosa*), which is the sole dominant or important plant in the herbaceous layer. Species composition varies among stands, but *Achnatherum speciosum* is the unifying

NBR alliances

species. Other graminoids which may be present include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Elymus elymoides*, *Nassella cernua*, *Nassella lepida*, and *Poa secunda*. Scattered emergent shrubs such as *Hymenoclea salsola* may be present. This uncommon grassland is documented from the Mojave Desert. It grows in very xeric conditions with hot summers and occasional freezes in the winter. This alliance requires well-drained rocky or sandy soils. It was formerly widespread, but overgrazing has decimated stands. Remaining stands occur from 600-1000 m elevation on flat ridges, lower slopes, valleys, and washes.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Vegetation appears to be endemic to the Mojave Desert and is characterized by dominance or codominance of the perennial grass *Achnatherum speciosum* having >50% of the total herbaceous cover.

VEGETATION

Physiognomy and Structure: This graminoid-dominated alliance typically is less than 1 m in height. The herbaceous layer can vary from open to fairly continuous. Scattered, emergent shrubs may be present.

Floristics: Stands of this alliance are dominated by *Achnatherum speciosum* (= *Stipa speciosa*) which is the sole dominant or important plant in the herbaceous layer. Species composition varies among stands, but *Achnatherum speciosum* is the unifying species. Other graminoids which may be present include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Elymus elymoides*, *Nassella cernua*, *Nassella lepida*, and *Poa secunda*. Scattered emergent shrubs such as *Hymenoclea salsola* may be present.

ENVIRONMENT & DYNAMICS

Environmental Description: This grassland of the Mojave Desert grows in very xeric conditions with hot summers and occasional freezes in the winter. This alliance requires well-drained rocky or sandy soils. It was formerly widespread, but overgrazing has decimated stands. Remaining stands occur from 600 to 1000 m elevation on flat ridges, lower slopes, valleys, and washes.

Dynamics: Plants of this alliance evolved in a very xeric environment with infrequent disturbance. Fires were not well-supported by the light plant cover, and grazing pressure was very light due to the low carrying capacity of the environment. The impact of cattle and sheep grazing and the consequent introduction of exotic plants such as *Bromus tectorum* have reduced stands of this alliance to a few dozen across its range.

DISTRIBUTION

Geographic Range: This alliance was once widespread throughout the Mojave Desert but has been reduced to scattered stands by overgrazing. It is reported from California and Utah.

Nations: US

States/Provinces: CA, UT

TNC Ecoregions [optional]: 11:C, 12:C, 17:C

USFS Ecoregions (2007): 322Ag:CCC, 341Fc:CCC, 341Ff:CCC, M261Er:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Joshua Tree)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Achnatherum speciosum* (Desert needlegrass grassland) Alliance (Sawyer et al. 2009) [41.090.00]
- = *Achnatherum speciosum* Herbaceous Alliance (Evens et al. 2012)
- = *Achnatherum speciosum* Herbaceous Alliance (Evens et al. 2014)
- = *Achnatherum speciosum* Herbaceous Alliance (CNPS 2017) [41.090.00]
- < Desert needlegrass series (Sawyer and Keeler-Wolf 1995)
- >< Valley Needlegrass Grassland (#42110) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEG003112 *Achnatherum speciosum* Grassland
- CEG003113 *Achnatherum speciosum* Shrub Grassland

AUTHORSHIP

Primary Concept Source: R. F. Holland (1986b); J.O. Sawyer and T. Keeler-Wolf (1995)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: CNPS 2017, Evens et al. 2012, Evens et al. 2014, Faber-Langendoen et al. 2017b, Holland 1986b, Humphrey 1974, Keeler-Wolf and Thomas 2000, Pavek 1993c, Reid et al. 1999, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Thomas et al. 2004, Tueller et al. 1991, Vasek and Thorne 1977, VegCAMP and AIS 2013

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G311. Intermountain Semi-Desert Grassland

A1270. Hesperostipa comata Grassland Alliance

Type Concept Sentence: This grassland alliance is dominated or codominated by *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, or *Sporobolus cryptandrus* and is found primarily from Wyoming Basins, Colorado Plateau and Great Basin.

OVERVIEW

Scientific Name: *Hesperostipa comata* Grassland Alliance

Common Name (Translated Scientific Name): Needle-and-Thread Grassland Alliance

Colloquial Name: Needle-and-Thread Grassland

Type Concept: Grasslands included in this alliance are characterized by a sparse to moderately dense herbaceous layer dominated by *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, or *Sporobolus cryptandrus*. Other common to codominant graminoids include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Carex filifolia*, *Koeleria macrantha*, *Pleuraphis jamesii* (= *Hilaria jamesii*), *Poa secunda*, *Sporobolus contractus*, and *Sporobolus giganteus*. The invasive species *Bromus tectorum* is common in disturbed stands. Forb cover is also sparse, but can be relatively diverse. Common forbs are *Gaura coccinea*, *Lappula occidentalis* (= *Lappula redowskii*), *Lithophragma glabrum*, *Lithophragma glabrum*, *Lupinus pusillus*, *Opuntia aurea* (= *Opuntia basilaris* var. *aurea*), *Opuntia polyacantha*, *Plantago patagonica*, or *Pediomelum argophyllum* (= *Psoralea argophylla*). Cryptogams are important in some stands with up to 40% ground cover on sites in the Colorado Plateau. This grassland alliance is found primarily from Wyoming Basins, Colorado Plateau, and Great Basin. Sites are on flat to moderately steep, often south-facing slopes, but can occur on any aspect. Soils are shallow to moderately deep, well-drained, coarse-textured, and non-saline. Sites include intermountain basins, alluvial flats, alluvial terraces of large rivers, sandy upper stream terraces along intermittent washes, and on sand deposits on mesas and plains.

Classification Comments: More investigation is needed to clarify the concept of this alliance. Some stands described by Kleiner (1968) have less than 25% herbaceous cover and are better classified in a sparsely vegetated alliance. Stands containing a mix of *Bouteloua gracilis*, *Carex filifolia*, and moderate amounts of *Pascopyrum smithii* or *Hesperostipa comata* may present classification problems. *Bouteloua gracilis* increases with heavy grazing pressure as other species decline in many western plant communities, often resulting in difficulties in classification. *Sporobolus cryptandrus* is found throughout the western and northern U.S. where it usually occurs as a minor species in various grassland and shrubland vegetation types. It may be locally common in areas disturbed by drought and overgrazing in the plains (Weaver and Albertson 1956). Further survey may find other associations than are currently in the classification.

Internal Comments: GK 9-16: ID added for Minidoka.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Vegetation is characterized by dominance or codominance of the perennial bunch grasses *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, or *Sporobolus cryptandrus* having >50% of the total herbaceous cover in association with other graminoids.

VEGETATION

Physiognomy and Structure: This vegetation has a sparse to dense herbaceous layer less than 1 m tall that is dominated by perennial mid- and shortgrass species. Sparse to scattered cover of shrubs may be present. Perennial forbs are common but are not abundant in most stands. Annual forbs and grasses are seasonally present.

Floristics: Grasslands included in this alliance are characterized by a sparse to moderately dense herbaceous layer dominated by the medium-tall, cool-season bunchgrasses *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, or *Sporobolus cryptandrus*. Other common to codominant graminoids include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Carex filifolia*, *Koeleria macrantha*, *Pleuraphis jamesii* (= *Hilaria jamesii*), *Poa secunda*, *Sporobolus contractus*, and *Sporobolus giganteus*. The invasive species *Bromus tectorum* is common in disturbed stands. Shrubs and dwarf-shrubs are sparse and may include scattered *Artemisia cana*, *Artemisia frigida*, *Artemisia tridentata*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), or *Gutierrezia sarothrae*. Forb cover is also sparse, but can be relatively diverse. Common forbs are *Gaura coccinea*, *Lappula occidentalis* (= *Lappula redowskii*), *Lithophragma glabrum*, *Lithophragma glabrum*, *Lupinus pusillus*, *Opuntia aurea* (= *Opuntia basilaris* var. *aurea*), *Opuntia polyacantha*, *Plantago patagonica*, or *Pediomelum argophyllum* (= *Psoralea argophylla*). Cryptogams are important in some stands with up to 40% ground cover on sites in the Colorado Plateau.

ENVIRONMENT & DYNAMICS

Environmental Description: Grasslands included in this alliance are found on sandy loam, loam, silty loam, or loamy clay soils (Weaver and Albertson 1956, Johnston 1987, Steinauer 1989) that are shallow to moderately deep, well-drained, coarse-textured, and non-saline. They are often derived of alluvium or eolian deposits. Climate is temperate, mostly continental and semi-arid to arid. Mean annual precipitation ranges from 25-35 cm. The year-to-year variation of annual precipitation is great. Sites are on flat to moderately steep, often south-facing slopes, but can occur on any aspect. Sites include intermountain basins, alluvial flats, alluvial terraces of large rivers, sandy upper stream terraces along intermittent washes, and on sand deposits on mesas and plains. Elevations range from 1100-2300 m.

Dynamics: These grasslands are dominated by relatively deep-rooted grasses that use soil moisture below 0.5 m during the typically dry summers. The coarse-textured soils allow for rapid infiltration and storage of winter and summer precipitation (Kleiner 1968, Daubenmire 1970, Kleiner and Harper 1977, Thilenius et al. 1995). Burning generally kills or severely damages *Hesperostipa comata* plants. After fire, regeneration of this non-rhizomatous bunchgrass is through seed and may take many years to reach prefire densities (FEIS 1998). Exotic species such as *Bromus tectorum*, *Draba verna*, *Lactuca serriola*, *Tragopogon dubius* are present in some these stands (Daubenmire 1970). The cool-season annual grass *Bromus tectorum* can be an effective competitor for winter soil moisture because it can germinate in the fall, overwinter, then begin regrowing in the early spring before it is warm enough for many perennial grasses, completing its lifecycle and depleting soil moisture before the dry summer weather begins. This annual species also produces abundant fine fuels that carry fire well and increase the frequency of fires (FEIS 1998). *Bouteloua gracilis* is an extremely drought- and grazing-tolerant shortgrass species. It is one of the most widely distributed grasses in the western U.S. and is present in many different grassland, shrubland and woodland communities. It evolved with grazing by large herbivores and generally forms a short sod. However, in some stands ungrazed plants develop the upright physiognomy of a bunchgrass.

DISTRIBUTION

Geographic Range: Vegetation included in this grassland alliance is found in the central Wyoming Basins, Utah-Wyoming Mountains, Colorado Plateau, Great Basin, on the Snake River plain and foothills of the Rocky Mountains in Idaho, and east to the fringe of the Great Plains.

Nations: US

States/Provinces: AZ, CO, ID, NM, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG001703 *Hesperostipa comata* - *Achnatherum hymenoides* Grassland
- CEG005800 *Aristida purpurea* Grassland
- CEG002997 *Hesperostipa comata* - (*Bouteloua eriopoda*, *Pleuraphis jamesii*) Grassland
- CEG001705 *Hesperostipa comata* Great Basin Grassland
- CEG002932 *Bouteloua gracilis* - *Hesperostipa comata* Grassland
- CEG002691 *Sporobolus cryptandrus* Great Basin Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2016/09/29

REFERENCES

References: Daubenmire 1970, FEIS 1998, Faber-Langendoen et al. 2017b, Kleiner 1968, Kleiner and Harper 1977, Thilenius et al. 1995

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G311. Intermountain Semi-Desert Grassland

A1287. *Pleuraphis jamesii* Grassland Alliance

Type Concept Sentence: This alliance is dominated or codominated by *Bouteloua eriopoda*, *Bouteloua gracilis*, *Pleuraphis jamesii*, or *Sporobolus airoides*. It occurs in arid and semi-arid regions in the southwestern Great Plains, Colorado Plateau, southern Rocky Mountains, Great Basin, and northern Chihuahuan Desert.

OVERVIEW

Scientific Name: *Pleuraphis jamesii* Grassland Alliance

Common Name (Translated Scientific Name): James' Galleta Grassland Alliance

Colloquial Name: James' Galleta Grassland

Type Concept: The vegetation is characterized by an herbaceous layer with sparse to moderately dense cover of perennial grasses that is usually dominated or codominated by *Bouteloua eriopoda*, *Bouteloua gracilis*, *Pleuraphis jamesii*, or *Sporobolus airoides*. Other common perennial grasses may include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Aristida purpurea*, *Bouteloua curtipendula*, *Bouteloua dactyloides* (= *Buchloe dactyloides*), *Elymus elymoides*, *Hesperostipa neomexicana* (= *Stipa neomexicana*), *Muhlenbergia porteri*, *Muhlenbergia torreyi*, *Pascopyrum smithii*, and *Sporobolus cryptandrus*. The sparse forb layer may include *Artemisia carruthii*, *Artemisia dracunculul*, *Astragalus* spp., *Chaenactis stevioides*, *Cryptantha* sp., *Cymopterus newberryi*, *Grindelia squarrosa*, *Lappula occidentalis*, *Machaeranthera pinnatifida*, *Plantago patagonica*, *Ratibida* spp., *Scleropogon brevifolius*, *Sphaeralcea coccinea*, and *Zinnia grandiflora*. This alliance occurs in arid and semi-arid regions in the southwestern Great Plains, Colorado Plateau, Great Basin, and northern Chihuahuan Desert. These grasslands occur on a variety of landforms, including plains, mesas, alluvial flats, floodplains, swales, hillslopes, dunes, badlands and bajadas. Soils are variable and range from sand to clay textures. Stands occur on all slopes and aspects. Substrates are variable and range from sand- to clay-textured soils. Parent materials include alluvium, colluvium and eolian deposits derived from igneous, metamorphic and, most commonly, sedimentary rocks, especially shale and sandstone. Elevation ranges from 1200-2800 m.

Classification Comments: Stands containing a mix of *Bouteloua gracilis*, *Carex filifolia*, and moderate amounts of *Pascopyrum smithii* or *Hesperostipa comata* may present classification problems. *Bouteloua gracilis* increases with heavy grazing pressure as other species decline in many western plant communities, often resulting in difficulties in classification.

Internal Comments: mjr 12-14: CA added for MOJN.

Other Comments:

Similar NVC Types:

- A3186 *Sporobolus airoides* - *Sporobolus wrightii* - *Panicum obtusum* Lowland Desert Grassland Alliance

Diagnostic Characteristics: Vegetation is characterized by dominance or codominance of the perennial grasses *Bouteloua eriopoda*, *Bouteloua gracilis*, *Pleuraphis jamesii*, and *Sporobolus airoides* having >50% of the total herbaceous cover. These grasslands have their main area of distribution in the Colorado Plateau and southern Rocky Mountains and have a broad ecological amplitude.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance has a sparse to moderately dense herbaceous layer is dominated by perennial bunch grasses. A sparse to moderately dense forb layer is often present. Annuals may be seasonally abundant.

Floristics: The vegetation is characterized by an herbaceous layer with sparse to moderately dense cover of perennial grasses that is usually dominated or codominated by *Bouteloua eriopoda*, *Bouteloua gracilis*, *Pleuraphis jamesii*, or *Sporobolus airoides*. Other common perennial grasses may include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Aristida purpurea*, *Bouteloua curtipendula*, *Bouteloua dactyloides* (= *Buchloe dactyloides*), *Elymus elymoides*, *Hesperostipa neomexicana* (= *Stipa neomexicana*), *Muhlenbergia porteri*, *Muhlenbergia torreyi*, *Pascopyrum smithii*, and *Sporobolus cryptandrus*. The sparse forb layer may include *Artemisia carruthii*, *Artemisia dracunculul*, *Astragalus* spp., *Chaenactis stevioides*, *Cryptantha* sp., *Cymopterus newberryi*, *Grindelia*

squarrosa, *Lappula occidentalis*, *Machaeranthera pinnatifida*, *Plantago patagonica*, *Ratibida* spp., *Scleropogon brevifolius*, *Sphaeralcea coccinea*, and *Zinnia grandiflora*. Occasional shrubs and dwarf-shrubs, such as *Artemisia bigelovii*, *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex obovata*, *Ericameria nauseosa*, *Ephedra* spp., *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Opuntia* spp., or *Yucca* spp., may occur with less than 10% total cover.

ENVIRONMENT & DYNAMICS

Environmental Description: These grasslands occur on a variety of landforms, including plains, mesas, alluvial flats, floodplains, swales, hillslopes, dunes, badlands and bajadas. Soils are variable and range from sand to clay textures. Stands occur on all slopes and aspects. Parent materials include alluvium, colluvium and eolian deposits derived from igneous, metamorphic and, most commonly, sedimentary rocks, especially shale and sandstone. Elevation ranges from 1200-2800 m. The climate is semi-arid with highly variable, bimodally distributed precipitation. Approximately two-thirds of the 20-40 cm mean annual precipitation occurs in the late summer and early fall, usually as localized high-intensity thunderstorms.

Dynamics: *Pleuraphis jamesii* is both drought- and grazing-resistant (USFS 1937, Weaver and Albertson 1956, West et al. 1972). In parts of its range it increases under grazing, and in others parts it decreases. The grass is favored in mixedgrass stands because it is only moderately palatable to livestock, but decreases when heavily grazed during drought and in the more arid portions of its range where it is the dominant grass (West et al. 1972). This grass reproduces extensively from scaly rhizomes. These rhizomes make the plant resistant to trampling by livestock and have good soil-binding properties (USFS 1937, Weaver and Albertson 1956, West et al. 1972). The abundance of *Bouteloua eriopoda*-dominated grasslands has declined significantly in the last 50 years (Nelson 1934, Gardner 1950, Buffington and Herbel 1965, Herbel et al. 1972, Hennessy et al. 1983). These grasslands have been replaced largely by shrublands dominated by *Prosopis glandulosa* in Trans-Pecos Texas, southern New Mexico, and southeastern Arizona. Studies on the Jornada Experimental Range suggest that combinations of drought, overgrazing by livestock, wind and water erosion, seed dispersal by livestock, fire suppression, shifting dunes, and changes in the seasonal distribution of precipitation have caused this recent, dramatic shift in vegetation physiognomy (Buffington and Herbel 1965, Herbel et al. 1972, Humphrey 1974, McLaughlin and Bowers 1982, Gibbens et al. 1983, Hennessy et al. 1983, Schlesinger et al. 1990, McPherson 1995). *Prosopis* spp. and other shrubs have extensive root systems that allow them to exploit deep soil water that is unavailable to shallower-rooted grasses and cacti (Burgess 1995). This strategy works well, except on sites that have well-developed argillic or calcic soil horizons that limit infiltration and storage of winter moisture in the deeper soil layers (McAuliffe 1995). McAuliffe (1995) found *Prosopis* spp. invasion on these sites to be limited to a few small individuals. This has implications in plant geography and grassland revegetation work in the southwestern United States. *Bouteloua gracilis* is an extremely drought- and grazing-tolerant shortgrass species. It is one of the most widely distributed grasses in the western U.S. and is present in many different grassland, shrubland and woodland communities. It evolved with grazing by large herbivores and generally forms a short sod. However, in some stands ungrazed plants develop the upright physiognomy of a bunchgrass.

DISTRIBUTION

Geographic Range: The distribution of this southwestern alliance is centered in the Colorado Plateau region of Colorado, New Mexico, Arizona, and Utah. It is also found in the shortgrass steppe in eastern Colorado and New Mexico (and possibly the panhandles of Oklahoma and Texas), north to Wyoming, south to the northern Chihuahuan Desert and west to the Great Basin.

Nations: US

States/Provinces: AZ, CA, CO, NM, NV, OK?, TX?, UT, WY

TNC Ecoregions [optional]: 17:C

USFS Ecoregions (2007): 322Ai:CCC, 322Al:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Hilaria jamesii* - *Sporobolus airoides* Plant Community (Francis 1986) [Plant community #37]
- = *Pleuraphis jamesii* (James' galleta shrub-steppe) Alliance (Sawyer et al. 2009) [41.610.00]
- = *Pleuraphis jamesii* Herbaceous Alliance (Evens et al. 2014)

LOWER LEVEL UNITS

Associations:

- CEG001751 *Bouteloua eriopoda* - *Pleuraphis jamesii* Grassland
- CEG001759 *Bouteloua gracilis* - *Pleuraphis jamesii* Grassland
- CEG001760 *Bouteloua gracilis* Grassland
- CEG006755 *Scleropogon brevifolius* - *Pleuraphis jamesii* - *Bouteloua eriopoda* Grassland
- CEG001778 *Pleuraphis jamesii* - *Sporobolus airoides* Grassland

- CEGLO01777 *Pleuraphis jamesii* Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, B. Hoagland, D. Diamond, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Evens et al. 2014, Faber-Langendoen et al. 2017b, Francis 1986, Francis and Aldon 1983, Keeler-Wolf and Thomas 2000, Sawyer et al. 2009, Thomas et al. 2004, USFS 1937, VegCAMP and AIS 2013, Weaver and Albertson 1956, West et al. 1972

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G311. Intermountain Semi-Desert Grassland

A3976. *Pseudoroegneria spicata* - *Opuntia polyacantha* Dry Canyon Slope Grassland Alliance

Type Concept Sentence: These dry grasslands occur in the canyons and valleys of the northern Great Basin and in the Columbia Basin and are characterized by a sparse to moderately dense graminoid layer of *Pseudoroegneria spicata* codominated by *Aristida purpurea* var. *longiseta* and/or *Poa secunda*. *Pseudoroegneria spicata* is sometimes absent or has low cover, and *Sporobolus cryptandrus* and *Opuntia polyacantha* may be especially abundant on disturbed or harsh windswept sites.

OVERVIEW

Scientific Name: *Pseudoroegneria spicata* - *Opuntia polyacantha* Dry Canyon Slope Grassland Alliance

Common Name (Translated Scientific Name): Bluebunch Wheatgrass - Plains Prickly-pear Dry Canyon Slope Grassland Alliance

Colloquial Name: Dry Canyon Slope Wheatgrass - Prickly-pear Grassland

Type Concept: The vegetation of this dry grassland alliance is characterized by a sparse to moderately dense graminoid layer of *Pseudoroegneria spicata* codominated by *Aristida purpurea* var. *longiseta* and/or *Poa secunda*. *Pseudoroegneria spicata* is sometimes absent or has low cover. *Sporobolus cryptandrus* and *Opuntia polyacantha* are especially abundant on disturbed sites or harsh windswept ridgetops and steep upper slopes. Important forbs include *Achillea millefolium*, *Allium acuminatum*, *Arnica sororia*, *Balsamorhiza sagittata*, *Castilleja* spp., *Calochortus* spp., *Crepis acuminata*, *Erigeron pumilus*, *Eriophyllum lanatum*, *Lupinus* spp., *Plantago patagonica*, and *Sedum stenopetalum*. Deciduous shrubs such as *Holodiscus discolor*, *Physocarpus malvaceus*, *Ribes* spp., *Rhus glabra*, and *Symphoricarpos* spp. are occasionally present and may increase in abundance with fire exclusion. These grasslands occur in the canyons and valleys of the northern Great Basin and in the Columbia Basin, particularly along the Snake River canyon, the lower foothill slopes of the Blue Mountains, Wallowa Mountains, Hells Canyon, Seven Devil Mountains, and Salmon River Mountains of eastern Oregon, Washington and Idaho and along the main stem of the Columbia River in eastern Washington. Stands occur on gentle to steep mid and upper slopes and ridgetops in highly dissected foothills and canyon slope terrain and on stream terraces, alluvial fans, and benchlands in lower canyons. Sites are as low as 240 m and up to 1130 m elevation. Soils are typically shallow with a high percentage of rock fragments.

Classification Comments: These grasslands are floristically similar to other lower montane and foothill grasslands of the Central Rockies, but are found in environmental settings that tend to be drier than the "matrix" grasslands. Some of the dominant species (*Aristida*, *Sporobolus*, and *Opuntia*) are not particularly common in other Central Rockies grasslands, and forb taxa are also different.

Internal Comments: KAS 2-14: *Aristida purpurea* var. *longiseta* - *Pseudoroegneria spicata* - *Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001589) is included in this alliance because of codominance of *Pseudoroegneria spicata*, but it occurs in similar river terrace habitats and the grasslands in the *Sporobolus cryptandrus* - *Aristida purpurea* var. *longiseta* - *Poa secunda* Sandy Stream Terrace Grassland Alliance (A3977).

Other Comments:

Similar NVC Types: Alliances in Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group (G273) and Central Rocky Mountain Montane Grassland Group (G267) may share some of the widespread dominant grass species. This alliance typically occurs in drier, often lower elevation sites.

Diagnostic Characteristics: This alliance has a sparse to moderately dense graminoid layer characterized by diagnostic and often dominant species *Pseudoroegneria spicata* codominated by *Aristida purpurea* var. *longiseta* and/or *Poa secunda*. *Pseudoroegneria spicata* is sometimes absent or has low cover with *Aristida purpurea* var. *longiseta* and *Poa secunda* dominating. Indicator species *Sporobolus cryptandrus* and *Opuntia polyacantha* are especially abundant on disturbed sites or harsh windswept ridgetops and steep upper slopes.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by a sparse to dense cover of graminoids that is dominated by perennial bunch grasses less than 1 m tall. There is also sparse to moderate cover of perennial forbs. Occasional scattered shrubs and dwarf-shrubs may be present. Annual forbs and grasses are seasonally present. Nonvascular cover is important in some stands.

Floristics: The vegetation is characterized by a sparse to moderately dense graminoid layer of *Pseudoroegneria spicata* codominated by *Aristida purpurea* var. *longiseta* and/or *Poa secunda*. *Pseudoroegneria spicata* is sometimes absent or has low cover. *Sporobolus cryptandrus* and *Opuntia polyacantha* are especially abundant on disturbed sites or harsh windswept ridgetops and steep upper slopes. Other associated grasses include *Danthonia unispicata*, *Elymus elymoides*, and *Hesperostipa comata*. Important forbs include *Achillea millefolium*, *Allium acuminatum*, *Antennaria* spp., *Arnica sororia*, *Balsamorhiza sagittata*, *Castilleja* spp., *Calochortus* spp., *Crepis acuminata*, *Erigeron pumilus*, *Eriophyllum lanatum*, *Lomatium cous*, *Lupinus* spp., *Plantago patagonica*, *Scutellaria angustifolia*, and *Sedum stenopetalum*. Deciduous shrubs such as *Holodiscus discolor*, *Phlox longifolia*, *Physocarpus malvaceus*, *Ribes* spp., *Rhus glabra*, and *Symphoricarpos* spp. are occasionally present and may increase in abundance with fire exclusion. The shrub *Ericameria nauseosa* (= *Chrysothamnus nauseosus*) is present in some stands, and will increase with overgrazing and other disturbance (Daubenmire 1970). The introduced annual grasses *Bromus tectorum*, *Bromus arvensis* (= *Bromus japonicus*), and *Bromus briziformis* and diverse non-native forbs such as *Hypericum perforatum* and *Erodium cicutarium* are abundant in many stands.

ENVIRONMENT & DYNAMICS

Environmental Description: These dry grasslands occur in the canyons and valleys of the northern Great Basin and in the Columbia Basin, particularly along the Snake River canyon, the lower foothill slopes of the Blue Mountains, Wallowa Mountains, Hells Canyon, Seven Devil Mountains, and Salmon River Mountains of eastern Oregon, Washington and Idaho and along the main stem of the Columbia River in eastern Washington. Climate is temperate continental. Mean annual precipitation ranges from 33-60 cm. Precipitation primarily occurs in the winter as snow or rain. Stands occur on gentle to steep mid and upper slopes and ridgetops in highly dissected foothills and canyon slope terrain and on stream terraces, alluvial fans, and benchlands in lower canyons. Sites are as low as 240 m and up to 1130 m elevation. This moisture is stored in the soil profile and utilized during the typically dry summers. Sites include soil pockets between rocks on cliffs lining the sides of ravines. This grassland occurs on all aspects, but is more common on southern slopes. Soils are typically shallow with a high percentage of rock fragments and exposed rock (lithic), but also may be moderately deep on some sites. They are moderately to well-drained, non-calcareous, sandy to clay soils with pH of 5.8-7.2, and are derived from alluvium, colluvium, residuum or loess. Parent materials include basalt, andesite, rhyolite and tuff. Rock and moss cover significant amounts of the ground surface often with over 40% cover of each.

Dynamics: Fire has variable effects on *Pseudoroegneria spicata*. Plants usually survive burning, and growth is often stimulated, except when fire occurs in the driest month when the crowns will burn because of low moisture in the vegetation, and the meristems are damaged (Johnson and Simon 1987). Grazing impacts are concentrated on the gentler slopes accessible to livestock. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris* (Mueggler and Stewart 1980). It tolerates dormant-period grazing well, but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. It is particularly sensitive to defoliation in late spring (Comer et al. 1999).

Poa secunda-dominated grasslands usually have relatively shallow, rocky soils with limited water-holding capacity. The winter precipitation wets these soils, but they typically dry out completely to bedrock by midsummer (Ganskopp 1979). *Poa secunda* is well-adapted to these conditions because it starts growing early in the spring and completes its reproductive cycle early while there is still moisture in the soil (Daubenmire 1970). If there is late summer or fall precipitation, dominant *Poa secunda* can green up quickly again. Shrubs are uncommon. Daubenmire (1970) and Johnson and Simon (1987) suggest that bedrock present under these grasslands is not fractured enough to support deeper-rooted shrubs. In addition to drought tolerance, *Poa secunda* is also tolerant of grazing and trampling by livestock (Daubenmire 1970, Ganskopp 1979).

Stands in this alliance are generally considered to be late-seral with species composition controlled by the harsh edaphic conditions of the site (Daubenmire 1970, Johnson and Simon 1987). However, some stands, especially stands of *Aristida purpurea* var. *longiseta* - *Poa secunda* Grassland (CEGL001781) that occur on deeper soils, may be early-seral forms of a *Pseudoroegneria spicata* grassland, because *Poa secunda* increases under moderate grazing (Daubenmire 1970).

Sporobolus cryptandrus occurs throughout the western U.S. as a minor species, occasionally becoming locally dominant in disturbed or sandy sites in the midgrass prairie (Weaver and Albertson 1956). In the headwaters of the Columbia River basin these stands occur as climax grasslands in canyons on river bars and terraces, and on upland benches and terraces as grazing disclimax and edaphic climax grasslands (Daubenmire 1970, Johnson and Simon 1987, Tisdale 1986).

Many of these grasslands have been severely disturbed by grazing livestock and exotic weeds (Daubenmire 1970, Johnson and Simon 1987, Tisdale 1986). Early-season grazing reduces the abundance of the very palatable cool-season bunchgrass *Pseudoroegneria spicata* and favors the warm-season *Sporobolus cryptandrus* that greens up later in the season. Also, *Sporobolus cryptandrus* is a C4 plant that grows on sites that stay moist when it is hot, giving the C4 the advantage over the cool-season (C3) bunchgrasses. *Poa secunda*, another cool-season grass, is also affected by early grazing, but is better able to withstand it because of

its short stature. *Aristida purpurea* var. *longiseta* is an unpalatable warm-season grass that increases as the palatable grasses decline. As native perennial grasses decline, exotic species fill the gaps (Tisdale 1986). Exotic annual grasses (*Bromus tectorum*, *Bromus arvensis*, and *Bromus briziformis*) and others may make up 20-50% of the vegetation cover. These annual grasses are especially abundant during wet years (Ganskopp 1979, Tisdale 1986).

Other disturbances such as frost heaving also favor exotic species invasion. Frost heaving causes local soil disturbance in the winter when these thin, saturated soils freeze and push soil and plants up out of the ground. Exotic forbs, both perennials such as *Hypericum perforatum*, and annuals such as *Arenaria serpyllifolia*, *Epilobium brachycarpum*, *Erodium cicutarium*, *Draba verna*, *Holosteum umbellatum*, *Lactuca serriola*, *Lepidium perfoliatum*, *Myosotis stricta*, *Tragopogon dubius*, and *Veronica arvensis* make up significant cover and diversity in many stands. The newest exotic threats are four species of *Centaurea* that are invading large areas in this region. Fire appears to have little effect on the species composition of these grasslands (Tisdale 1986).

DISTRIBUTION

Geographic Range: These dry grasslands occur in the canyons and valleys of the northern Great Basin and in the Columbia Basin, particularly along the Snake River canyon, the lower foothill slopes of the Blue Mountains, Wallowa Mountains, Hells Canyon, Seven Devil Mountains, and Salmon River Mountains of eastern Oregon, Washington and Idaho and along the main stem of the Columbia River in eastern Washington.

Nations: US

States/Provinces: ID, NV, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Agropyron spicatum* Series (Johnson and Simon 1987)
- >< *Agropyron spicatum* Series (Tisdale 1986)
- >< *Pseudoroegneria spicata* Grasslands (Chappell et al. 1997)
- >< *Sporobolus cryptandrus* - *Aristida purpurea* var. *longiseta* Grasslands (Chappell et al. 1997)
- >< Bluebunch Wheatgrass - Sand Dropseed - Red Three Awn Plant Community Type - Sand (Johnson and Simon 1987)
- = Bluebunch Wheatgrass Series (Johnson and Simon 1987) [roughly includes types in this alliance.]
- >< Bluegrass Scabland (Volland 1976)
- >< Bluegrass Scabland (Hall 1973)
- >< River Terrace Canyon Grasslands (Kagan 1997)
- ? Sand Dropseed Plant Association (Johnson and Simon 1987)

LOWER LEVEL UNITS

Associations:

- CEG001781 *Aristida purpurea* var. *longiseta* - *Poa secunda* Grassland
- CEG001673 *Pseudoroegneria spicata* - *Opuntia polyacantha* - (*Poa secunda*) Grassland
- CEG001589 *Aristida purpurea* var. *longiseta* - *Pseudoroegneria spicata* - *Sporobolus cryptandrus* Grassland

AUTHORSHIP

Primary Concept Source: C.G. Johnson and S.A. Simon (1987)

Author of Description: K.A. Schulz

Acknowledgments: This alliance is based in part on Columbia Basin Foothill and Canyon Dry Grassland (CES304.993), ecological system concept (authored by R. Crawford, J. Kagan, and M. Reid).

Version Date: 2015/09/21

REFERENCES

References: Anderson 1956, Chappell et al. 1997, Christensen 1963, Copeland 1980a, Daubenmire 1970, Daubenmire 1992, Faber-Langendoen et al. 2017b, Fisser et al. 1965, Francis 1983, Ganskopp 1979, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Johnson and Simon 1987, Kagan 1997, Manning and Padgett 1992, Poulton 1955, Reid et al. 1994, Tisdale 1979, Tisdale 1986, USFS 1937, Volland 1976, Winward and Youtie 1976

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G311. Intermountain Semi-Desert Grassland

A4216. *Sphaeralcea ambigua* - *Sphaeralcea coccinea* - *Sphaeralcea parvifolia* Dry Meadow Alliance [Low - Poorly Documented]

Type Concept Sentence:

OVERVIEW

Scientific Name: *Sphaeralcea ambigua* - *Sphaeralcea coccinea* - *Sphaeralcea parvifolia* Dry Meadow Alliance

Common Name (Translated Scientific Name): Desert Globemallow - Scarlet Globemallow - Small-leaf Globemallow Dry Meadow Alliance

Colloquial Name: Globemallow Dry Meadow

Type Concept:

Classification Comments:

Internal Comments: mjr 12-16: AZ & CA added based on child records (MOJN).

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics:

ENVIRONMENT & DYNAMICS

Environmental Description:

Dynamics:

DISTRIBUTION

Geographic Range:

Nations: US

States/Provinces: AZ, CA, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEPP009532 *Sphaeralcea ambigua* Dry Meadow
- CEG005366 *Sphaeralcea (coccinea, parvifolia)* Grassland

AUTHORSHIP

Primary Concept Source: M. Reid, in Faber-Langendoen et al.

Author of Description:

Acknowledgments:

REFERENCES

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G311. Intermountain Semi-Desert Grassland

A3977. *Sporobolus cryptandrus* - *Aristida purpurea* var. *longiseta* - *Poa secunda* Sandy Stream Terrace Grassland Alliance

Type Concept Sentence: This dry grassland alliance is characterized by a moderately dense graminoid layer dominated by *Sporobolus cryptandrus*, often codominant with *Aristida purpurea* var. *longiseta* or *Poa secunda*. It occurs on gentle lower slopes, river terraces and alluvial bars on hot, dry sites in the Columbia Basin and lower Snake and Clearwater rivers in Oregon and Washington, and in the lowest elevations of Hells Canyon within the Blue Mountains in Idaho, and the Bighorn Basin in Montana.

OVERVIEW

Scientific Name: *Sporobolus cryptandrus* - *Aristida purpurea* var. *longiseta* - *Poa secunda* Sandy Stream Terrace Grassland Alliance

Common Name (Translated Scientific Name): Sand Dropseed - Red Three-awn - Sandberg Bluegrass Sandy Stream Terrace Grassland Alliance

Colloquial Name: Sandy Stream Terrace Sand Dropseed Grassland

Type Concept: The vegetation of this grassland alliance is characterized by a moderately dense graminoid layer dominated by *Sporobolus cryptandrus*. *Poa secunda* or *Aristida purpurea* var. *longiseta* often codominate the graminoid layer. *Hesperostipa comata* (= *Stipa comata*) may be present in low abundance; *Pseudoroegneria spicata* is generally absent. Forb cover is typically low, but *Astragalus inflexus*, *Calochortus macrocarpus*, and *Heterotheca villosa* (= *Chrysopsis villosa*) are often present. *Bromus tectorum* (and several other exotic species) is common. This grassland alliance is described for the Columbia Basin and lower Snake and Clearwater rivers in Oregon and Washington, and in the lowest elevations of Hells Canyon within the Blue Mountains in Idaho, and the Bighorn Basin in Montana. Stands occur on lower slopes, river terraces and alluvial bars on hot, dry sites. Sites are flat to gentle (to 30%) and occur on all aspects. Substrates are excessively drained soils with sand or sandy loam texture.

Classification Comments: *Sporobolus cryptandrus* is found throughout the western and northern U.S. where it usually occurs as a minor species in various grassland and shrubland vegetation types. It may be locally common in areas disturbed by drought and overgrazing in the plains (Weaver and Albertson 1956). Further survey may find other associations than are currently in the classification.

Johnson and Simon (1987) describe a similar community with *Sporobolus cryptandrus* dominant, but *Poa secunda* is not present in any of the stands they sampled. It is not certain if these stands represent distinct environmental conditions or if *Poa secunda* has simply been eliminated by grazing pressure. Most stands are in poor condition in canyons in eastern Washington. Overgrazed stands develop a significant shrub layer of *Ericameria nauseosa* and may be better classified in a shrubland alliance (Daubenmire 1970).

Internal Comments:

Other Comments:

Similar NVC Types: Alliances in Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group (G273) and Central Rocky Mountain Montane Grassland Group (G267) may share some of the widespread dominant grass species.

Diagnostic Characteristics: The vegetation is characterized by a moderately dense graminoid layer dominated by diagnostic species *Sporobolus cryptandrus*. *Poa secunda* or *Aristida purpurea* var. *longiseta* often codominate. *Hesperostipa comata* may be present in low abundance; *Pseudoroegneria spicata* is generally absent. Forb cover is typically low, but *Astragalus inflexus*, *Calochortus macrocarpus*, and *Heterotheca villosa* are often present. *Bromus tectorum* and several other exotic species are common.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a sparse to moderately dense layer of medium-tall graminoids, primarily perennial bunch grasses. Forbs are present but usually not abundant. Shrubs are rarely present except in livestock-grazed sites.

Floristics: Vegetation in this alliance is sparse to moderately dense grassland communities that are dominated or codominated by the perennial medium-tall, warm-season bunchgrasses *Sporobolus cryptandrus* and *Aristida purpurea* var. *longiseta* and cool-season bunchgrass *Poa secunda*. Cool-season bunchgrass *Hesperostipa comata* may be present in lesser amounts, especially on the more upland sites. *Pseudoroegneria spicata* is generally absent or has low cover. Associated perennial forbs include *Achillea millefolium*, *Astragalus inflexus*, *Calochortus macrocarpus*, *Erigeron pumilus*, *Heterotheca villosa*, and *Opuntia polyacantha*. Common annuals are the forbs *Epilobium brachycarpum* (= *Epilobium paniculatum*) and *Plantago patagonica*, and the grasses *Vulpia octoflora* (= *Festuca octoflora*) and *Vulpia microstachys* var. *pauciflora* (= *Festuca pacifica*). The shrub *Ericameria nauseosa* (= *Chrysothamnus nauseosus*) is present in some stands, and will increase with overgrazing (Daubenmire 1970). The introduced annual grasses *Bromus tectorum*, *Bromus arvensis* (= *Bromus japonicus*), and *Bromus briziformis* and diverse non-native forbs such as *Hypericum perforatum* and *Erodium cicutarium* are abundant in many stands. Diagnostic of this grassland alliance is the dominance or codominance of *Sporobolus cryptandrus*.

ENVIRONMENT & DYNAMICS

Environmental Description: Grasslands in this alliance are found in the lower Salmon and Snake river canyons of Idaho, Oregon and Washington, and the Columbia River in central Washington. Stands occur on dry alluvial bars, river terraces, footslopes of benches and alluvial fans. The elevation ranges from 240-1630 m. Sites are flat to gentle (to 30%) and occur on all aspects. Climate in the canyon bottoms is relatively hot and dry with as little as 25 cm mean annual precipitation. Substrates are derived from loess and alluvium-colluvium. Soils are moderately deep (0.75-1.5 m), and surface soil texture varies from sandy loam to silt loam. This alliance includes grasslands in two successional stages. The first is later seral and is found on river terraces and alluvial bars. *Celtis laevigata* var. *reticulata* communities are often adjacent. The second is a grazing disclimax and occurs on terraces, alluvial fans and benchlands within the more mesic *Pseudoroegneria spicata* zone. Daubenmire (1970) also described it as an edaphic climax where it occurs on sandy sites adjacent to *Pseudoroegneria spicata*-dominated grasslands. His research found these soils deficient in magnesium and possibly potassium. He hypothesized that the low levels prevented *Pseudoroegneria spicata* from becoming dominant.

Dynamics: *Sporobolus cryptandrus* occurs throughout the western U.S. as a minor species, occasionally becoming locally dominant in disturbed or sandy sites in the midgrass prairie (Weaver and Albertson 1956). In the headwaters of the Columbia River basin these stands occur as climax grasslands in canyons on river bars and terraces, and on upland benches and terraces as grazing disclimax and edaphic climax grasslands (Daubenmire 1970, Johnson and Simon 1987, Tisdale 1986). Many of these grasslands have been severely disturbed by grazing livestock and exotic weeds (Daubenmire 1970, Johnson and Simon 1987, Tisdale 1986). Early-season grazing reduces the abundance of the very palatable cool-season bunchgrass *Pseudoroegneria spicata* and favors the warm-season *Sporobolus cryptandrus* that greens up later in the season. Also, *Sporobolus cryptandrus* is a C4 plant that grows on sites that stay moist when it is hot giving the C4 the advantage over the cool-season (C3) bunch grasses. *Poa secunda*, another cool-season grass, is also affected by early grazing, but is better able to withstand it because of its short stature. *Aristida purpurea* var. *longiseta* is an unpalatable warm-season grass that increases as the palatable grasses decline. As native perennial grasses decline, exotic species fill the gaps (Tisdale 1986). Exotic annual grasses (*Bromus tectorum*, *Bromus arvensis*, and *Bromus briziformis*) and others may make up 20-50% of the vegetation cover. These annual grasses are especially abundant during wet years (Ganskopp 1979, Tisdale 1986). Exotic forbs, both perennials, such as *Hypericum perforatum*, and annuals, such as *Arenaria serpyllifolia*, *Epilobium brachycarpum*, *Erodium cicutarium*, *Draba verna*, *Holosteum umbellatum*, *Lactuca serriola*, *Lepidium perfoliatum*, *Myosotis stricta*, *Tragopogon dubius*, and *Veronica arvensis*, make up significant cover and diversity in many stands. The newest exotic threats are four species of *Centaurea* that are invading large areas in this region. Fire appears to have little effect on the species composition of these grasslands (Tisdale 1986).

DISTRIBUTION

Geographic Range: This dry grassland alliance is described for the Columbia Basin and lower Snake and Clearwater rivers in Oregon and Washington, and in the lowest elevations of Hells Canyon within the Blue Mountains in Idaho.

Nations: US

States/Provinces: ID, MT, OR, WA, WY?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< River Terrace Canyon Grasslands (Kagan 1997)
- = Sand Dropseed Plant Association (Johnson and Simon 1987)

LOWER LEVEL UNITS

Associations:

- CEG001514 *Sporobolus cryptandrus* Shrub Grassland
- CEG001516 *Sporobolus cryptandrus* - *Poa secunda* Grassland
- CEG001515 *Aristida purpurea* var. *longiseta* - *Sporobolus cryptandrus* Grassland

AUTHORSHIP

Primary Concept Source: C.G. Johnson and S.A. Simon (1987)

Author of Description: K.A. Schulz

Acknowledgments: This alliance is based in part on Columbia Basin Foothill and Canyon Dry Grassland (CES304.993), an ecological system concept (authored by R. Crawford, J. Kagan, and M. Reid).

Version Date: 2014/03/14

REFERENCES

References: Chappell et al. 1997, Daubenmire 1970, Faber-Langendoen et al. 2017b, Ganskopp 1979, Johnson and Simon 1985, Johnson and Simon 1987, Kagan 1997, Reid et al. 1994, Tisdale 1986, USFS 1937, Weaver and Albertson 1956

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.1.d. M171 Great Basin-Intermountain Dry Shrubland & Grassland

G310. Intermountain Semi-Desert Steppe & Shrubland

Type Concept Sentence: This widespread dwarf-shrubland, shrubland and shrub-steppe group occurs throughout the semi-arid western U.S. on a variety of sites and disturbance regimes and is characterized by an open to moderately dense woody layer composed of diverse woody species such as *Chamaebatiaria millefolium*, *Chrysothamnus albidus*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Ephedra viridis*, *Ephedra torreyana*, *Glossopetalon spinescens*, *Gutierrezia sarothrae*, *Gutierrezia microcephala*, *Ericameria nana*, *Ericameria parryi*, *Ericameria teretifolia*, *Krascheninnikovia lanata*, *Mahonia fremontii*, *Opuntia polyacantha*, and *Tetradymia canescens* with or without an herbaceous layer.

OVERVIEW

Scientific Name: *Chrysothamnus viscidiflorus* - *Ericameria nauseosa* - *Krascheninnikovia lanata* Steppe & Shrubland Group

Common Name (Translated Scientific Name): Yellow Rabbitbrush - Rubber Rabbitbrush - Winterfat Steppe & Shrubland Group

Colloquial Name: White-flower Rabbitbrush Shrubland

Type Concept: This group occurs throughout the semi-arid western U.S., including areas in the western Great Plains. This group can either be shrub-, dwarf-shrub-, or grass-dominated with an open (5-25% cover) woody layer. Stands dominated by *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Gutierrezia microcephala*, and *Gutierrezia sarothrae* are often associated with disturbance. Other common shrubs may include *Chamaebatiaria millefolium*, *Chrysothamnus albidus*, *Ephedra viridis*, *Ephedra torreyana*, *Glossopetalon spinescens*, *Ericameria nana*, *Ericameria parryi*, *Ericameria teretifolia*, *Krascheninnikovia lanata*, *Mahonia fremontii*, *Opuntia fragilis*, *Opuntia polyacantha*, *Opuntia phaeacantha*, and *Tetradymia canescens*. Herbaceous species include *Achnatherum hymenoides*, *Aristida purpurea*, *Hesperostipa comata*, and *Pleuraphis jamesii*. Scattered *Juniperus* spp. are common, but rarely attain more than 5% cover. Landforms include alluvial flats and fans, talus slopes, plateaus, and bluffs. Slopes range from gentle to steep, and substrates are variable and include sandstone talus, fine-textured alluvium, sand, clay, loams, cinder, cobbles, and coarse gravels. Disturbance and grazing have impacted many occurrences, and in some cases may be important in maintaining these communities.

Classification Comments: This group encompasses a somewhat broad range of semi-desert shrublands in the Intermountain West. Many of these communities are somewhat disturbance-maintained, early-seral types. Additional data and analysis are needed to clarify the associations that should be placed here. Shrub communities occurring over talus included in this group are part of a continuum and can be highly variable, and some dwarf-shrub communities can technically be defined as herbaceous types.

Similar NVC Types:

Diagnostic Characteristics: This group occurs as open shrub, dwarf-shrub, or shrub herbaceous communities. Shrub canopy ranges from 10-60% shrub cover with herbaceous layer usually sparse but ranging from dense to absent. Dominant/diagnostic shrubs in this group include *Chamaebatiaria millefolium*, *Chrysothamnus albidus*, *Chrysothamnus viscidiflorus*, *Ephedra viridis*, *Ephedra torreyana*, *Ericameria nauseosa*, *Ericameria nana*, *Ericameria parryi*, *Ericameria teretifolia*, *Glossopetalon spinescens*, *Gutierrezia sarothrae*, *Gutierrezia microcephala*, *Krascheninnikovia lanata*, *Mahonia fremontii*, *Opuntia fragilis*, *Opuntia phaeacantha*, *Opuntia polyacantha*, *Tetradymia canescens*, and *Tetradymia tetrameres*. Characteristic herbaceous species may include *Achnatherum hymenoides*, *Aristida purpurea*, *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, *Poa secunda*, *Sphaeralcea coccinea*, and *Sporobolus cryptandrus*. Scattered *Juniperus* spp. are common, but rarely attain more than 5% cover.

VEGETATION

Physiognomy and Structure: Open shrub, dwarf-shrub, or shrub herbaceous communities dominated by cold-deciduous, broad-leaved shrub, dwarf-shrub species, or perennial grasses with an open shrub layer.

Floristics: The most important, widespread shrubs in this group include *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Gutierrezia microcephala*, *Krascheninnikovia lanata*, *Opuntia polyacantha*, and *Opuntia phaeacantha*. Other dominant/diagnostic shrubs with narrower ranges are *Chrysothamnus albidus*, *Chamaebatiaria millefolium*, *Ericameria nana*, *Ericameria parryi*, *Ericameria teretifolia*, *Glossopetalon spinescens*, *Mahonia fremontii*, *Opuntia phaeacantha*, and *Opuntia polyacantha*. Other commonly present to codominant species include *Artemisia* spp., *Ephedra torreyana*, *Ephedra viridis*, *Coleogyne*

ramosissima, *Fallugia paradoxa*, *Isocoma drummondii*, *Eriogonum* spp., *Grayia spinosa*, *Holodiscus dumosus*, *Lycium pallidum*, *Opuntia fragilis*, *Purshia tridentata*, *Tetradymia canescens*, and *Tetradymia tetrameres*. Semi-desert grasses are common, including *Achnatherum hymenoides*, *Aristida purpurea*, *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Elymus elymoides*, *Hesperostipa comata*, *Leymus salinus*, *Muhlenbergia pungens*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. Perennial forbs may include *Achillea millefolium*, *Astragalus purshii*, *Calochortus macrocarpus*, *Chamaesyce* spp., *Erigeron* spp., *Penstemon deustus*, *Phlox hoodii*, *Sphaeralcea coccinea*, and *Sphaeralcea munroana*. Annuals may be seasonally present to abundant depending on precipitation and disturbance. Exotic annuals such as *Bromus tectorum* or *Salsola kali* can be abundant.

ENVIRONMENT & DYNAMICS

Environmental Description: This group occurs throughout the Intermountain West from the western Great Basin to the Northern Rocky Mountains and Colorado Plateau at elevations ranging from 300 m up to 2500 m. The climate where this group occurs is generally hot in summers and cold in winters with low annual precipitation, ranging from 18-40 cm and high inter-annual variation. Much of the precipitation falls as snow, and growing-season drought is characteristic. Temperatures are continental with large annual and diurnal variations. Sites are generally alluvial fans and flats with moderate to deep soils. Some sites can be flat, poorly drained and intermittently flooded with a shallow or perched water table often within 1 m depth (West 1983e). Substrates are generally shallow, calcareous, fine-textured soils (clays to silt-loams), derived from alluvium; deep, fine to medium-textured alluvial soils with some source of subirrigation during the summer season, or sandstone talus over shale. Soils may be alkaline and typically moderately saline (West 1983e).

Dynamics:

DISTRIBUTION

Geographic Range: This group occurs throughout the semi-arid western U.S., including areas in the western Great Plains.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA?, US

States/Provinces: AZ, CA, CO, ID, KS, MT, NM, NV, OR, SD, TX, UT, WY

TNC Ecoregions [optional]: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 331B:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242C:CC, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332E:CP, M332G:CC, M333A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Arches); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = Southeastern Utah galleta-threeawn shrub steppe (West 1983e)

LOWER LEVEL UNITS

Alliances:

- A2650 *Opuntia* spp. Colorado Plateau Shrubland Alliance
- A2540 *Ericameria teretifolia* Shrubland Alliance
- A3197 *Ericameria parryi* Shrubland Alliance
- A3196 *Ericameria nauseosa* Steppe & Shrubland Alliance
- A3203 *Gutierrezia sarothrae* - *Gutierrezia microcephala* Dwarf-shrubland Alliance
- A1032 *Glossopetalon spinescens* Shrubland Alliance
- A0834 *Chrysothamnus albidus* Shrubland Alliance
- A3202 *Krascheninnikovia lanata* Steppe & Dwarf-shrubland Alliance
- A3195 *Chrysothamnus viscidiflorus* Steppe & Shrubland Alliance

AUTHORSHIP

Primary Concept Source: N.E. West (1983e)

Author of Description: M.E. Hall, M.S. Reid, K.A. Schulz

Acknowledgments: P. Comer

Version Date: 11/06/2015

Classif Resp Region: West

REFERENCES

References: Branson et al. 1976, Faber-Langendoen et al. 2017a, Hanson 1929, Shiflet 1994, Stout et al. 2013, Tuhy et al. 2002, West 1983e

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G310. Intermountain Semi-Desert Steppe & Shrubland

A0834. *Chrysothamnus albidus* Shrubland Alliance

Type Concept Sentence: Stands included in this shrubland alliance have a sparse woody layer dominated by the microphyllous evergreen shrub *Chrysothamnus albidus* and occur around seeps, saline meadows and flats, and around pluvial lakes in the Great Basin.

OVERVIEW

Scientific Name: *Chrysothamnus albidus* Shrubland Alliance

Common Name (Translated Scientific Name): White-flower Rabbitbrush Shrubland Alliance

Colloquial Name: White-flower Rabbitbrush Shrubland

Type Concept: Stands have a sparse woody layer dominated by the microphyllous evergreen shrub *Chrysothamnus albidus*. The herbaceous layer is sparse to possibly moderately dense, but no cover values are available. The most frequent species are the graminoids *Muhlenbergia richardsonis* and *Puccinellia nuttalliana*. Other scattered species include *Crepis runcinata*, *Distichlis spicata*, and *Nitrophila occidentalis*. Adjacent vegetation includes sparse shrublands dominated by *Atriplex confertifolia*, *Pyrrocoma uniflora* var. *uniflora*, and *Distichlis spicata* or *Sarcobatus vermiculatus*-dominated herbaceous community. Stands included in this shrubland alliance occur around seeps, saline meadows and flats, and around pluvial lakes in the Great Basin. The climate is arid; mean annual precipitation is generally less than 15 cm. Summers are hot and winters are cold. Elevations range from 1450-1900 m. Described stands occur on mesic sites on the nearly flat lakeplain where groundwater reaches the soil surface at some time during the growing season. Soils are generally deep, fine-textured (silty clay), poorly drained, calcareous, alkaline and saline.

Classification Comments: Stands described by Young et al. (1986) on the lakeplain had only 3% cover of the shrub canopy and would be better classified in a shrub herbaceous or a sparsely vegetated alliance. Data from other stands are not available.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Shrublands inhabiting saline environments of the Great Basin dominated by *Chrysothamnus albidus*. Total stand cover may be sparse to dense and is often composed of species adapted to saline conditions.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a sparse shrub layer dominated by microphyllous evergreen shrubs (0.3-1.5 m tall). A sparse to moderately dense herbaceous layer is dominated by perennial grasses. Scattered forbs may be present.

Floristics: Stands have a sparse woody layer dominated by the microphyllous evergreen shrub *Chrysothamnus albidus*. The herbaceous layer is sparse to possibly moderately dense, but no cover values are available. The most frequent species are the graminoids *Muhlenbergia richardsonis* and *Puccinellia nuttalliana*. Other scattered species include *Crepis runcinata*, *Distichlis spicata*, *Nitrophila occidentalis*, and *Pyrrocoma uniflora* var. *uniflora*.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands included in this shrubland alliance occur around seeps, saline meadows and flats, and around pluvial lakes in the Great Basin. Climate is arid; mean annual precipitation is generally less than 15 cm. Summers are hot and winters are cold. Elevations range from 1450-1900 m. Stands described by Young et al. (1986) occur on mesic sites on the nearly flat lakeplain where groundwater reaches the soil surface at some time during the growing season. Soils are generally deep, fine-textured (silty clay), poorly drained, calcareous, alkaline and saline.

Dynamics: Access to the water table is necessary for plants in this mesic vegetation type in the arid Great Basin. Where it occurs on playas, there is likely temporary flooding. *Puccinellia nuttalliana* is a valuable forage grass and may be depleted where heavy livestock grazing is allowed.

DISTRIBUTION

Geographic Range: Stands included in this minor shrubland alliance occur in the Great Basin. It has been reported from Utah and Nevada and likely occurs in eastern California.

Nations: US

States/Provinces: CA?, NV, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Chrysothamnus albidus* / *Puccinellia* plant community (Young et al. 1986) [occurs on the lake plain of a pluvial lake in Nevada]
- ? Saltgrass Series (Sawyer and Keeler-Wolf 1995) [*Chrysothamnus albidus* was mentioned in text.]

LOWER LEVEL UNITS**Associations:**

- CEGL001328 *Chrysothamnus albidus* / *Puccinellia nuttalliana* Shrubland
- CEGL005596 *Ericameria nana* - *Holodiscus dumosus* / *Penstemon deustus* Shrubland
- CEGL005597 *Ericameria nana* / *Poa secunda* - *Penstemon deustus* Sparse Vegetation

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b, Sawyer and Keeler-Wolf 1995, Young et al. 1986

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G310. Intermountain Semi-Desert Steppe & Shrubland

A3195. Chrysothamnus viscidiflorus Steppe & Shrubland Alliance

Type Concept Sentence: This alliance is characterized by a sparse to dense layer of *Chrysothamnus viscidiflorus* and sparse to dense layer of graminoids and is known from in the southern San Luis Valley of Colorado, the lower slopes of mountains in western Wyoming and northern Utah, and on mesas and high plateaus of the Colorado Plateau.

OVERVIEW

Scientific Name: *Chrysothamnus viscidiflorus* Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Yellow Rabbitbrush Steppe & Shrubland Alliance

Colloquial Name: Yellow Rabbitbrush Steppe & Shrubland

Type Concept: The vegetation is characterized by an open to moderate shrub layer dominated by *Chrysothamnus viscidiflorus* with 3-35% cover. Other shrub species may be present with low cover, such as *Amelanchier utahensis*, *Artemisia bigelovii*, *Artemisia tridentata*, *Atriplex canescens*, *Atriplex confertifolia*, *Eriogonum corymbosum*, *Ephedra viridis*, *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Mahonia fremontii*, *Shepherdia rotundifolia*, *Symphoricarpos oreophilus*, *Tetradymia canescens*, and *Yucca baccata*. The herbaceous layer is variable and ranges from being moderately dense, diverse and bunchgrass-dominated to sparse and often depauperate. In some stands the herbaceous layer is dominant over shrubs. Dominant and common grasses may include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua gracilis*, *Elymus elymoides*, *Hesperostipa comata*, *Koeleria macrantha*, *Leymus salinus* ssp. *salinus*, *Pascopyrum smithii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, and the introduced annuals *Bromus briziformis* and *Bromus tectorum*. *Leymus cinereus* may be present in mesic gully bottoms in Utah. Scattered forbs are present, such as *Antennaria* spp., *Astragalus bisulcatus*, *Castilleja* spp., *Cirsium undulatum*, *Cryptantha humilis*, *Linanthus pungens* (= *Leptodactylon pungens*), and *Linanthus watsonii* (= *Leptodactylon watsonii*). Stands of the alliance occur in the southern San Luis Valley of Colorado, the lower slopes of mountains in western Wyoming and northern Utah, and on mesas and high plateaus of the Colorado Plateau. Stands occur on a variety of sites and range from level to moderately sloping, disturbed sites on ridges and in valleys. Elevations range from 1300 to 2440 m (4250-8000 feet). Substrates include eolian sands, alluvium,

NBR alliances

metamorphic rocks, granite or limestone, and the soil is likewise variable, with textures ranging from silt loam, sandy loam, loamy sand and silty clay loam.

Classification Comments: This alliance has one association that is based on the Van Pelt (1978) description of *Chrysothamnus viscidiflorus* / *Leymus salinus* ssp. *salinus* Plant Association on Bridger Jack Mesa. Information on other occurrences is needed to describe the full range of this alliance.

Internal Comments: mjr 12-14: CA added for MOJN.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Shrublands of the Colorado Plateau and southern Rocky Mountains where *Chrysothamnus viscidiflorus* is the dominant species ranging from 3-35% cover or some stands with <10% cover and graminoid layer with 5-25% cover.

VEGETATION

Physiognomy and Structure: The vegetation in this alliance has a sparse to dense graminoid layer dominated by medium-tall bunch grasses with a sparse to dense short xeromorphic shrub layer.

Floristics: Vegetation included in this shrub herbaceous alliance is characterized by a sparse to moderate shrub layer dominated by *Chrysothamnus viscidiflorus* with 3-20% cover. Other shrub species may be present with low cover, such as *Amelanchier utahensis*, *Artemisia tridentata*, *Artemisia bigelovii*, *Atriplex canescens*, *Atriplex confertifolia*, *Ephedra viridis*, *Ericameria nauseosa*, *Eriogonum corymbosum*, *Gutierrezia sarothrae*, *Mahonia fremontii*, *Shepherdia rotundifolia*, *Symphoricarpos oreophilus*, *Tetradymia canescens*, and *Yucca baccata*. Occasional *Pinus edulis* and *Juniperus osteosperma* trees or seedlings may be present in the stand. The herbaceous layer is variable and ranges from being moderately dense, diverse and bunchgrass-dominated to sparse and sometimes depauperate. Common dominant graminoid species include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua gracilis*, *Elymus elymoides*, *Hesperostipa comata*, *Koeleria macrantha*, *Leymus salinus* ssp. *salinus*, *Pascopyrum smithii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, and introduced annuals *Bromus briziformis* and *Bromus tectorum*. *Leymus cinereus* may be present in mesic gully bottoms in Utah. Forbs may be diverse but typically contribute very little cover. Associate species may include *Antennaria* spp., *Arenaria* sp., *Astragalus bisulcatus*, *Castilleja* spp., *Chenopodium leptophyllum*, *Cirsium undulatum*, *Crepis acuminata*, *Cryptantha cinerea* var. *jamesii*, *Cryptantha humilis*, *Erigeron* spp., *Eriogonum* sp., *Heterotheca villosa*, *Linanthus pungens* (= *Leptodactylon pungens*), *Linanthus watsonii* (= *Leptodactylon watsonii*), *Lupinus caudatus*, *Packera tridenticulata*, *Sedum lanceolatum*, *Schoenocrambe linifolia*, *Stenotus armerioides* var. *armerioides*, and cacti such as *Mammillaria* spp. and *Opuntia* spp.

ENVIRONMENT & DYNAMICS

Environmental Description: This shrubland alliance includes associations found in the Colorado Plateau extending east into the southern Rocky Mountains. Stands occur on a variety of sites and range from level to moderately sloping, disturbed sites on ridges and in valleys. Elevations range from 1300 to 2440 m (4250-8000 feet). Substrates include eolian sands, alluvium, metamorphic rocks, granite or limestone, and the soil is likewise variable, with textures ranging from silt loam to sandy loam to loamy sand. Ground surface is variable and has low to high cover of gravel, bare soil, litter and duff.

Dynamics: Disturbance by fire may be important in the creation and maintenance of these stands. Burned tree snags indicate these stands were created by fire that burned openings in the *Pinus edulis* and *Juniperus osteosperma* woodland (Van Pelt 1978). Van Pelt (1978) reported that young *Pinus edulis* are slowly invading the park and in time will convert it back to woodland unless fire reburns the site. Lightning likely starts these fires. With past fire suppression policies on some federal lands and livestock grazing which removes the necessary fine fuels needed to carry fire through woodlands, these parks may be disappearing. More information is needed to understand their current status and management needs.

DISTRIBUTION

Geographic Range: Stands of the alliance occur in the southern San Luis Valley of Colorado, the lower slopes of mountains in western Wyoming and northern Utah, and on mesas and high plateaus of the Colorado Plateau.

Nations: US

States/Provinces: CA, CO, ID, MT, NV, UT, WY

TNC Ecoregions [optional]: 11:C

USFS Ecoregions (2007): 341Fc:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley); USFWS (Minidoka)

CONFIDENCE LEVEL**USNVC Confidence Level with Comments:** Low.**SYNONYMY**

- = *Chrysothamnus viscidiflorus* Shrubland Alliance (Evens et al. 2014)
- ? Salina Wildrye/Douglas Rabbitbrush Community (Van Pelt 1978)

LOWER LEVEL UNITS**Associations:**

- CEGLO05594 *Chrysothamnus viscidiflorus* / *Pseudoroegneria spicata* Shrubland
- CEGLO02781 *Chrysothamnus viscidiflorus* - *Ericameria parryi* Shrub Grassland
- CEGLO01501 *Chrysothamnus viscidiflorus* / *Leymus salinus* ssp. *salinus* Shrub Grassland
- CEPP005695 *Chrysothamnus viscidiflorus* / Disturbed Understorey Shrubland
- CEGLO02530 *Chrysothamnus viscidiflorus* Shrub Grassland
- CEGLO02799 *Chrysothamnus viscidiflorus* / *Hesperostipa comata* Shrubland
- CEGLO05592 *Chrysothamnus viscidiflorus* / *Pascopyrum smithii* Shrubland

AUTHORSHIP**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2013)**Author of Description:** K.A. Schulz**Acknowledgments:** M.E. Hall**Version Date:** 2014/03/14**REFERENCES****References:** Evens et al. 2014, Faber-Langendoen et al. 2017b, Van Pelt 1978

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G310. Intermountain Semi-Desert Steppe & Shrubland

A3196. *Ericameria nauseosa* Steppe & Shrubland Alliance

Type Concept Sentence: This alliance is characterized by shrub and shrub herbaceous vegetation where *Ericameria nauseosa* is dominant and includes both natural and semi-natural stands from localized areas across the northern Great Plains and throughout the western U.S.

OVERVIEW**Scientific Name:** *Ericameria nauseosa* Steppe & Shrubland Alliance**Common Name (Translated Scientific Name):** Rubber Rabbitbrush Steppe & Shrubland Alliance**Colloquial Name:** Rubber Rabbitbrush Steppe & Shrubland

Type Concept: The vegetation is characterized by a sparse to moderately dense, short-shrub layer (5-60% cover) that is dominated by *Ericameria nauseosa*. Depending on geography, associated shrubs may include scattered *Artemisia filifolia*, *Artemisia tridentata*, *Chrysothamnus viscidiflorus*, *Gutierrezia sarothrae*, *Opuntia* spp., *Prunus virginiana*, *Rhus trilobata*, *Symphoricarpos occidentalis*, and *Yucca* spp. The herbaceous layer can vary from sparse moderately dense, being more prominent in some stands than shrubs, and dominated by graminoids. Common native grasses include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua* spp., *Elymus trachycaulus* ssp. *trachycaulus*, *Leymus flavescens* (= *Elymus flavescens*), *Pascopyrum smithii*, *Pleuraphis jamesii*, *Pseudoroegneria spicata*, and *Sporobolus cryptandrus*. Native forbs generally have low cover. Disturbed stands typically have high cover of introduced annual *Bromus* species. This alliance includes both natural and semi-natural stands from localized areas across the northern Great Plains and throughout the western U.S. Elevations range from 1100 to 2200 m. Soils are variable but generally well-drained and coarse-textured. Sites are flat to gently sloping, occurring on all aspects. The semi-natural stands included in this alliance are seral shrubland communities resulting from overgrazing by livestock, road building, or other cultural disturbance of typically grass-dominated communities.

Classification Comments: Further study is needed on the effects of livestock grazing on vegetation structure in these stands and on the relationship between *Ericameria nauseosa* shrub herbaceous associations and shrubland associations. *Mahonia fremontii* Shrubland (CEGL003967) has been placed in this alliance tentatively until further studies can be completed on this association.

Internal Comments: GK 9-16: ID added for Minidoka.**Other Comments:****Similar NVC Types:**

Diagnostic Characteristics: Very widespread shrub and shrub herbaceous vegetation where *Ericameria nauseosa* ranges in cover from 15-60% cover and where herbaceous component is sparse or absent. Cover of *Ericameria nauseosa* is 5-25% in cover when graminoids are more abundant.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance has a sparse to dense layer of microphyllous evergreen shrubs (<2 m tall) with a sparse to moderately dense herbaceous layer dominated by perennial medium-tall and short grasses. Perennial forbs are sparse. Annual forbs and grasses may be present seasonally.

Floristics: The vegetation is characterized by a sparse to moderately dense, short-shrub layer (5-60% cover) that is dominated by *Ericameria nauseosa*. Depending on geography, associated shrubs may include scattered *Artemisia filifolia*, *Artemisia tridentata*, *Chrysothamnus viscidiflorus*, *Gutierrezia sarothrae*, *Opuntia* spp., *Prunus virginiana*, *Rhus trilobata*, *Symphoricarpos occidentalis*, and *Yucca* spp. The herbaceous layer can vary from sparse to dense and is dominated by graminoids. In some stands, the herbaceous component may surpass that of shrubs. Common native grasses include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Aristida purpurea*, *Bouteloua* spp., *Elymus trachycaulus* ssp. *trachycaulus*, *Leymus flavescens* (= *Elymus flavescens*), *Pascopyrum smithii*, *Pleuraphis jamesii*, *Pseudoroegneria spicata*, and *Sporobolus cryptandrus*. Native forbs generally have low cover, but may include species such as *Lygodesmia grandiflora*, *Machaeranthera canescens* (= *Aster canescens*), *Phacelia hastata* (= *Phacelia leucophylla*), and *Psoralidium lanceolatum* (= *Psoralea lanceolata*). Disturbed stands typically have high cover of introduced annual *Bromus* species such as *Bromus tectorum*, *Bromus arvensis* (= *Bromus japonicus*), and *Bromus rubens*. Introduced forbs may include *Bassia scoparia* (= *Kochia scoparia*), *Melilotus officinalis*, and *Salsola kali*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance includes both natural and semi-natural stands from localized areas across the northern Great Plains and throughout the western U.S. Stands occur in the a variety of habitats such as gentle or steep slopes, dunes, and washes. Elevations range from 1100 to 2200 m elevation. Substrates may be eolian, alluvial, or colluvial with soils that are generally well-drained and coarse-textured. The semi-natural stands included in this alliance are seral shrubland communities resulting from overgrazing by livestock, road building, or other cultural disturbance of typically grass-dominated communities.

Dynamics: Grazing has significantly impacted much of the vegetation in this region, which has had a long history of settlement and heavy livestock use. With proper livestock management and time, palatable species such as *Achnatherum hymenoides*, *Artemisia tridentata*, *Elymus elymoides*, *Pascopyrum smithii*, *Schedonnardus paniculatus*, and *Sporobolus cryptandrus* may increase, and *Gutierrezia sarothrae* and *Ericameria nauseosa* may decline in abundance (Francis 1986).

DISTRIBUTION

Geographic Range: This alliance includes shrublands from localized areas across the northern Great Plains and throughout much of the western U.S.

Nations: US

States/Provinces: AZ, CO, ID, MT, ND, NM, NV, SD, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Chrysothamnus* Subformation (Francis 1986)

LOWER LEVEL UNITS

Associations:

- CEG002713 *Ericameria nauseosa* Shrubland
- CEG002918 *Ericameria nauseosa* / *Sporobolus airoides* Shrubland
- CEG002996 *Ericameria nauseosa* / *Pleuraphis jamesii* - (*Hesperostipa comata*) Shrub Grassland
- CEPP006725 *Lepidospartum latisquamum* Shrubland
- CEG003495 *Ericameria nauseosa* / *Bouteloua gracilis* Shrub Grassland
- CEG003967 *Mahonia fremontii* Shrubland
- CEG001330 *Ericameria nauseosa* / *Pseudoroegneria spicata* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b, Francis 1986

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G310. Intermountain Semi-Desert Steppe & Shrubland

A3197. *Ericameria parryi* Shrubland Alliance

Type Concept Sentence: Vegetation included in this shrubland alliance is characterized by having a sparse to dense shrub layer dominated by *Ericameria parryi*. It occurs in the Great Basin, Arizona-New Mexico Mountains, Colorado Plateau and in isolated locations in the northern Coast Ranges of California.

OVERVIEW

Scientific Name: *Ericameria parryi* Shrubland Alliance

Common Name (Translated Scientific Name): Parry's Rabbitbrush Shrubland Alliance

Colloquial Name: Parry's Rabbitbrush Shrubland

Type Concept: Vegetation included in this shrubland alliance is characterized by having a sparse to dense shrub layer dominated by *Ericameria parryi* (= *Chrysothamnus parryi*). Shrub associates include *Artemisia tridentata*, *Ephedra* spp., *Krascheninnikovia lanata*, and *Purshia tridentata*. The sparse to moderate herbaceous layer is dominated by graminoids such as *Achnatherum occidentale* ssp. *pubescens* (= *Stipa occidentalis* var. *pubescens*), *Bouteloua gracilis*, *Elymus elymoides*, *Pleuraphis jamesii* (= *Hilaria jamesii*), and *Sporobolus airoides*. Perennial forbs are generally sparse. Some stands may have scattered *Juniperus* spp. and *Pinus* spp. trees. This alliance occurs in the Great Basin, Arizona-New Mexico Mountains, Colorado Plateau and in isolated locations in the northern Coast Ranges of California. These shrublands occur on bajadas, pediments and valleys, including pumice flats. Substrates and parent materials are variable. Soils are shallow, well-drained, calcareous, alkaline and often gravelly.

Classification Comments: This alliance includes all shrublands dominated by any of the 12 subspecies of *Ericameria parryi* that occur in the western U.S. Vegetation included in this alliance may be too sparse to be classified as a shrubland. Further study is needed throughout its range, especially to assess the effects of livestock grazing on vegetation structure and to describe stands of different subspecies.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Sparse to dense shrublands dominated by *Ericameria parryi* found in the Great Basin and Colorado Plateau. The sparse to moderate herbaceous layer is dominated by graminoids.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is dominated by sparse to moderately dense microphyllous evergreen shrubs and graminoids in the understory.

Floristics: These shrublands have a sparse to dense shrub layer with a sparse to moderate herbaceous layer dominated by grasses. Some stands have a sparse tree layer of scattered *Juniperus* spp. and *Pinus* spp. *Ericameria parryi* dominates the shrub layer. Associated species vary greatly with geography. Other shrubs present may include *Artemisia tridentata*, *Ephedra* spp., *Krascheninnikovia lanata*, and *Purshia tridentata*. Common perennial grasses include *Achnatherum occidentale* ssp. *pubescens* (= *Stipa occidentalis* var. *pubescens*), *Bouteloua gracilis*, *Elymus elymoides*, *Pleuraphis jamesii* (= *Hilaria jamesii*), and *Sporobolus airoides*. Perennial forbs are generally sparse (Taylor 1980, Francis 1986, Sawyer and Keeler-Wolf 1990).

ENVIRONMENT & DYNAMICS

Environmental Description: The alliance is found on alluvial flats, on bajadas, pediments and valleys, including pumice flats from 1800-2400 m elevation. Substrates and parent materials are variable (Taylor 1980, Sawyer and Keeler-Wolf 1995). Soils are shallow, poorly developed, well-drained, calcareous, alkaline and often gravelly. They are typically derived from sedimentary rocks. Textures range from fine sandy loams to silty clay loams (Taylor 1980, Francis 1986, Sawyer and Keeler-Wolf 1995).

Dynamics: Grazing has significantly impacted much of the vegetation in this region with its long history of settlement and heavy livestock use (Griffiths 1902, Francis 1986). With proper livestock management and time, palatable species such as *Krascheninnikovia lanata* and *Sporobolus airoides* may increase in abundance (Francis 1986). This alliance may respond positively to disturbance because many species of *Chrysothamnus* in the Great Basin increase in abundance with excessive livestock grazing and accelerated fire frequencies (West 1988).

DISTRIBUTION

Geographic Range: This alliance occurs in the Great Basin, Arizona-New Mexico Mountains, Colorado Plateau and in isolated locations in the northern Coast Ranges of California.

Nations: US

States/Provinces: CA, CO, NM, NV?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Ericameria parryi* (Parry's rabbitbrush scrub) Alliance (Sawyer et al. 2009) [35.340.00]
- ? Parry Rabbitbrush Series (Sawyer and Keeler-Wolf 1995) [includes shrubland dominated by any of the 6 subspecies that occur in California.]
- ? Rabbitbrush Scrub (#35400) (Holland 1986b) [includes all *Chrysothamnus*-dominated scrub in California.]

LOWER LEVEL UNITS

Associations:

- CEG003040 *Ericameria parryi* Shrubland
- CEG003751 *Ericameria parryi* / *Achnatherum hymenoides* Shrubland
- CEG001331 *Ericameria parryi* / *Pleuraphis jamesii* - *Bouteloua gracilis* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b, Francis 1986, Griffiths 1902, Holland 1986b, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Taylor 1990, West 1988

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G310. Intermountain Semi-Desert Steppe & Shrubland

A2540. *Ericameria teretifolia* Shrubland Alliance [Low - Poorly Documented]

Type Concept Sentence: This xeromorphic shrubland alliance is dominated by *Ericameria teretifolia* and occurs from southern California mountains and valleys to the Mojave Desert, north into the southeastern Great Basin.

OVERVIEW

Scientific Name: *Ericameria teretifolia* Shrubland Alliance

Common Name (Translated Scientific Name): Green Rabbitbrush Shrubland Alliance

Colloquial Name: Green Rabbitbrush Shrubland

Type Concept: The vegetation of this alliance is characterized by an open, xeromorphic, short-shrub layer (<2 m tall) that is dominated by *Ericameria teretifolia*. Other shrubs and dwarf-shrubs present may include *Ephedra viridis*, *Eriogonum fasciculatum*, *Grayia spinosa*, *Gutierrezia sarothrae*, *Cylindropuntia acanthocarpa* (= *Opuntia acanthocarpa*), *Opuntia chlorotica*, *Prunus fasciculata*, *Salazaria mexicana*, *Salvia dorrii*, *Sphaeralcea ambigua*, or *Stephanomeria pauciflora*. The generally sparse herbaceous layer is dominated by perennial graminoids. This xeromorphic shrubland alliance occurs from southern California mountains and valleys to the Mojave Desert, north into the southeastern Great Basin. Stands are found on ridges, slopes and valleys above *Larrea*

tridentata- and *Ambrosia dumosa*-dominated desert scrub and below *Artemisia tridentata*-dominated shrublands and *Pinus monophylla* woodlands. Substrates are coarse-textured soils derived from bedrock or alluvium. Habitats include disturbed areas, including burns, washes, road cuts, and heavily grazed sites. Soils are variable in parent material and usually coarse, well-drained, and moderately acidic to slightly saline.

Classification Comments: This description is based on classification work done by Keeler-Wolf and Thomas (2000) on the Mojave Ecosystem Mapping Project. *Ericameria teretifolia* nearly always shares the shrub canopy with other shrub species. Stands occur above *Larrea tridentata* alliance and below *Pinus monophylla* and *Artemisia tridentata* alliances. Stands are adjacent to those of the *Atriplex confertifolia*, *Coleogyne ramosissima*, *Grayia spinosa*, *Juniperus californica*, and *Juniperus osteosperma* alliances.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: *Ericameria teretifolia* cover greater than or equal to other species (such as *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, or *Opuntia chlorotica*) in relative cover in the shrub canopy (Keeler-Wolf et al. 1998, Thomas et al. 2004).

VEGETATION

Physiognomy and Structure:

Floristics: The vegetation is characterized by an open, xeromorphic, short-shrub layer (<2 m tall) that is dominated by *Ericameria teretifolia*. Other shrubs and dwarf-shrubs present may include *Ephedra viridis*, *Eriogonum fasciculatum*, *Grayia spinosa*, *Gutierrezia sarothrae*, *Cylindropuntia acanthocarpa* (= *Opuntia acanthocarpa*), *Opuntia chlorotica*, *Prunus fasciculata*, *Salazaria mexicana*, *Salvia dorrii*, *Sphaeralcea ambigua*, or *Stephanomeria pauciflora*. The generally sparse herbaceous layer is dominated by perennial graminoids such as *Achnatherum speciosum*, *Muhlenbergia porteri*, *Pleuraphis jamesii*, *Pleuraphis rigida*, and *Poa secunda* (Keeler-Wolf and Thomas 2000).

ENVIRONMENT & DYNAMICS

Environmental Description: This xeromorphic shrubland alliance occurs from southern California mountains and valleys to the Mojave Desert, north into the southeastern Great Basin. Elevation ranges from 800 to 1700 m. Stands are found on ridges, slopes and valleys above *Larrea tridentata*- and *Ambrosia dumosa*-dominated desert scrub and below *Artemisia tridentata*-dominated shrublands and *Pinus monophylla* woodlands. Habitats include disturbed areas, including burns, washes, road cuts, and heavily grazed sites. Soils are variable in parent material and usually coarse, well-drained, and moderately acidic to slightly saline. Substrates are coarse-textured soils derived from bedrock or alluvium (Keeler-Wolf and Thomas 2000).

Dynamics: Disturbance appears to be important to the maintenance of this seral shrubland as it is found in burned-over *Juniperus californica* stands, road cuts, and heavily grazed areas, and in intermittent washes (Keeler-Wolf and Thomas 2000).

DISTRIBUTION

Geographic Range: This alliance is found in the Mojave Desert and extends into the southern California mountains and southeastern Great Basin.

Nations: US

States/Provinces: CA

TNC Ecoregions [optional]: 11:C, 12:C, 16:C, 17:C

USFS Ecoregions (2007): 322Ab:CCC, 322Ad:CCC, 322Af:CCC, 322Al:CCC, 341D:CC, 341Ff:CCC, M261E:CC, M262B:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Joshua Tree, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

- = *Ericameria teretifolia* (Needleleaf rabbitbrush scrub) Alliance (Sawyer et al. 2009) [35.330.00]
- = *Ericameria teretifolia* Shrubland Alliance (Evens et al. 2014)
- = *Ericameria teretifolia* Shrubland Alliance (Evens et al. 2012)
- = *Ericameria teretifolia* Shrubland Alliance (CNPS 2017) [35.330.00]
- >> Blackbush Scrub (#34300) (Holland 1986b)
- >> Mojave Mixed Woody Scrub (#34210) (Holland 1986b)
- >> Mojave Mixed Woody and Succulent Scrub (#34240) (Holland 1986b)

- >< Mojavean Juniper Woodland and Scrub (#72220) (Holland 1986b)
- >< Peninsular Juniper Woodland and Scrub (#72320) (Holland 1986b)
- >< Sonoran Mixed Woody and Succulent Scrub (#33220) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEG002963 *Ericameria teretifolia* Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid and K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: CNPS 2017, Evens et al. 2012, Evens et al. 2014, Faber-Langendoen et al. 2017b, Holland 1986b, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998a, Sawyer et al. 2009, Thomas et al. 2004, Thorne 1982, VegCAMP and AIS 2013

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G310. Intermountain Semi-Desert Steppe & Shrubland

A1032. *Glossopetalon spinescens* Shrubland Alliance

Type Concept Sentence: These sparse shrublands are dominated by the xeromorphic shrub *Glossopetalon spinescens* and occur along the rims of the Snake River and Imnaha River canyons in Idaho and eastern Oregon.

OVERVIEW

Scientific Name: *Glossopetalon spinescens* Shrubland Alliance

Common Name (Translated Scientific Name): Spiny Greasebush Shrubland Alliance

Colloquial Name: Spiny Greasebush Shrubland

Type Concept: Vegetation included in this minor alliance has a sparse woody layer (usually less than 1 m tall) that is dominated by the xeromorphic shrub *Glossopetalon spinescens* (15-23% cover). The herbaceous layer is also relatively sparse (typically 10-20% cover). It is dominated by the perennial bunchgrass *Pseudoroegneria spicata*. Other characteristic species include the annual grass *Vulpia myuros* and forbs such as *Achillea millefolium*, *Cerastium arvense*, *Erigeron pumilus*, *Opuntia polyacantha*, and *Phacelia heterophylla*. Moss and lichen cover is moderate and averages 22% cover. Exotic species, namely *Bromus tectorum*, *Bromus arvensis* (= *Bromus japonicus*), and *Bromus briziformis*, are often present. These sparse shrublands occur along the rims of the Snake River and Imnaha River canyons in Idaho and eastern Oregon. Elevations range from 550-900 m, and the climate is temperate continental. Mean annual precipitation is approximately 25-30 cm. Precipitation primarily occurs in the winter as snow or rain. This moisture is stored in the soil and in fractures in the highly weathered bedrock, and utilized during the usually dry summers. Stands are typically found on steep upper canyon slopes, but may occur on the lower canyon slopes. Sites are predominantly on hot, dry southwestern aspects, although the alliance may occur on all aspects. Soils are shallow, well-drained loams or sandy loams with a high percentage of rock fragments (greater than 35% by volume and 40% ground cover), and derived from loess and various bedrock types.

Classification Comments: Some stands in this alliance may be too sparse to be classified as dwarf-shrublands (Johnson and Simon 1987).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Nearly dwarf-shrublands with low to open cover dominated by *Glossopetalon spinescens* in association with a sparse to open herbaceous layer composed of grasses.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance has sparse to moderate cover of shrubs (usually less than 1 m tall). There is also a sparse herbaceous layer that is dominated by perennial bunch grasses with sparse scattered perennial forbs. Annual forbs and grasses are seasonally present in small amounts.

Floristics: Vegetation included in this minor alliance has a sparse woody layer (usually less than 1 m tall) that is dominated by the xeromorphic shrub *Glossopetalon spinescens* (15-23% cover). The herbaceous layer is also relatively sparse (typically 10-20% cover). It is dominated by the perennial bunchgrass *Pseudoroegneria spicata*. Other characteristic species include the annual grass *Vulpia myuros* and forbs such as *Achillea millefolium*, *Cerastium arvense*, *Erigeron pumilus*, *Opuntia polyacantha*, and *Phacelia heterophylla*. Moss and lichen cover is moderate and averages 22% cover. Exotic species, namely *Bromus tectorum*, *Bromus arvensis* (= *Bromus japonicus*), and *Bromus briziformis* are often present.

ENVIRONMENT & DYNAMICS

Environmental Description: These sparse shrublands occur along the rims of the Snake and Imnaha River canyons in Idaho and eastern Oregon. Elevations range from 550-900 m, and the climate is temperate continental. Mean annual precipitation is approximately 25-30 cm. Precipitation primarily occurs in the winter as snow or rain. This moisture is stored in the soil and in fractures in the highly weathered bedrock, and utilized during the usually dry summers. Stands are typically found on steep upper canyon slopes, but may occur on the lower canyon slopes. Sites are predominantly on hot, dry southwest aspects, although the alliance may occur on all aspects. Soils are shallow, well-drained loam or sandy loam with a high percentage of rock fragments (greater than 35% by volume and 40% ground cover), and derived from loess and various bedrock types.

Dynamics: Stands occur on steep hot, dry, canyon slopes. *Glossopetalon spinescens* appears restricted to these areas with weathered, fractured bedrock that provides deeper rooting for these shrubs and other plants. Fire is infrequent because stands are isolated on rims and rock outcrops (Johnson and Simon 1987). The biggest threat is exotic plants that have invaded many stands.

DISTRIBUTION

Geographic Range: This is a minor alliance found on rocky slopes in the Snake and Imnaha river canyons in Idaho and Oregon. It may also occur in Washington.

Nations: US

States/Provinces: ID, OR, WA?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG001100 *Glossopetalon spinescens* var. *aridum* / *Pseudoroegneria spicata* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b, Johnson and Simon 1987

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G310. Intermountain Semi-Desert Steppe & Shrubland

A3203. *Gutierrezia sarothrae* - *Gutierrezia microcephala* Dwarf-shrubland Alliance

Type Concept Sentence: This alliance represents shrub and shrub herbaceous vegetation of the Colorado Plateau and southern Rocky Mountains with shrub layers most often dominated by *Gutierrezia sarothrae* with an open to dense herbaceous layer composed of perennial graminoids.

OVERVIEW

Scientific Name: *Gutierrezia sarothrae* - *Gutierrezia microcephala* Dwarf-shrubland Alliance

Common Name (Translated Scientific Name): Broom Snakeweed - Threadleaf Snakeweed Dwarf-shrubland Alliance

Colloquial Name: Snakeweed Dwarf-shrubland

Type Concept: The vegetation is characterized by an open (10-30% cover) woody layer dominated by *Gutierrezia sarothrae* with a sparse to luxuriant perennial graminoid layer. *Atriplex canescens* and *Krascheninnikovia lanata* may codominate the shrub layer in some stands. Other shrub associates may include *Artemisia tridentata*, *Ephedra viridis*, *Eriogonum corymbosum*, *Ericameria nauseosa*, *Fallugia paradoxa*, *Isocoma drummondii*, and *Opuntia* spp. Trees are absent or represented by scattered individuals of *Juniperus monosperma* or *Pinus edulis*, mostly as seedlings or saplings. The most common dominant graminoids include *Bouteloua gracilis*, *Bouteloua eriopoda*, *Elymus elymoides*, *Pleuraphis jamesii*, and *Sporobolus airoides*. Other herbaceous associates include *Aristida purpurea*, *Hesperostipa comata*, *Muhlenbergia porteri*, *Pleuraphis rigida* (= *Hilaria rigida*), *Sphaeralcea coccinea*, and *Sporobolus cryptandrus*. Introduced species such as *Bromus tectorum* or *Salsola kali* may dominate the herbaceous layer of some disturbed stands. This alliance represents shrub and shrub herbaceous vegetation of the Colorado Plateau and southern Rocky Mountains. It most commonly occurs on level to gently sloping sites, including gently rolling mesatops, terraces, hillslopes, plateaus, sand deposits, bluffs and occasionally along canyon footslopes on sites with moderate solar exposure. Elevation ranges from 1300 to 2230 m.

Classification Comments:

Internal Comments: mjr 12-14: CA added for MOJN.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: *Gutierrezia sarothrae* or *Atriplex obovata* have 10-25% cover with an herbaceous layer composed of *Bouteloua gracilis*, *Pleuraphis jamesii*, *Sporobolus airoides*, or *Sporobolus cryptandrus*.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance has a sparse to dense layer of microphyllous evergreen shrubs (<2 m tall) with a sparse to moderately dense herbaceous layer dominated by perennial medium-tall and short grasses. Perennial forbs are sparse. Annual forbs and grasses may be present seasonally.

Floristics: The vegetation is characterized by an open (10-30% cover) woody layer dominated by *Gutierrezia sarothrae* with a sparse to luxuriant perennial graminoid layer. *Atriplex canescens* and *Krascheninnikovia lanata* may codominate the shrub layer in some stands. Other shrub associates may include *Artemisia tridentata*, *Ephedra viridis*, *Eriogonum corymbosum*, *Ericameria nauseosa*, *Fallugia paradoxa*, *Isocoma drummondii*, and *Opuntia* spp. Trees are absent or represented by scattered individuals of *Juniperus monosperma* or *Pinus edulis*, mostly as seedlings or saplings. The most common dominant graminoids include *Bouteloua gracilis*, *Bouteloua eriopoda*, *Elymus elymoides*, *Pleuraphis jamesii*, and *Sporobolus airoides*. Other graminoids may include *Aristida purpurea*, *Hesperostipa comata*, *Muhlenbergia porteri*, *Pleuraphis rigida* (= *Hilaria rigida*), and *Sporobolus cryptandrus*. Introduced species such as *Bromus tectorum* or *Salsola kali* may dominate the herbaceous layer of some disturbed stands. Other types of herbaceous species are not consistent, but may include *Chamaesyce* spp., *Opuntia phaeacantha*, *Opuntia polyacantha*, and *Sphaeralcea coccinea*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance most commonly occurs on level to gently sloping sites, including gently rolling mesatops, terraces, hillslopes, plateaus, sand deposits, bluffs and occasionally along canyon footslopes on sites with moderate solar exposure. Elevation ranges from 1300 to 2230 m. Aspects are reported from the southeast, south and southwest. Soils are variable and range from sandy to clayey texture and may occur over gravel, cinders and cobbles or talus.

Dynamics: Grazing has significantly impacted much of the vegetation in this region, which has had a long history of settlement and heavy livestock use. With proper livestock management and time, palatable species such as *Krascheninnikovia lanata* and *Sporobolus airoides* may increase, and *Gutierrezia sarothrae* and *Opuntia* spp. may decline in abundance (Francis 1986).

DISTRIBUTION

Geographic Range: This alliance is known from the Colorado Plateau and southern Rocky Mountains.

Nations: US

States/Provinces: AZ, CA, NM, UT

TNC Ecoregions [optional]: 17:C

USFS Ecoregions (2007): 322Af:CCC, 322Aj:CCC, 322Ak:CCC, 322Al:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Gutierrezia (microcephala, sarothrae)* Shrubland Alliance (Evens et al. 2014)
- = *Gutierrezia sarothrae* (Broom snake weed scrub) Provisional Alliance (Sawyer et al. 2009) [32.043.00]
- ? Grama Grass - Scrub Series (Warren et al. 1982)

LOWER LEVEL UNITS**Associations:**

- CEGLO01776 *Gutierrezia sarothrae* / *Sporobolus airoides* - *Pleuraphis jamesii* Shrub Grassland
- CEGLO02690 *Gutierrezia sarothrae* - (*Opuntia* spp.) / *Pleuraphis jamesii* Dwarf-shrubland
- CEGLO01733 *Gutierrezia sarothrae* - *Krascheninnikovia lanata* - *Atriplex canescens* / *Bouteloua eriopoda* Shrub Grassland
- CEGLO01543 *Gutierrezia sarothrae* / *Pleuraphis rigida* - *Sphaeralcea ambigua* Shrub Grassland
- CEPP005693 *Gutierrezia (microcephala, sarothrae)* - (*Encelia frutescens, Brickellia microphylla*) / *Stephanomeria pauciflora* Dwarf-shrubland
- CEGLO05382 *Gutierrezia sarothrae* / *Bouteloua gracilis* Dwarf-shrub Grassland
- CEPP009523 *Gutierrezia (microcephala, sarothrae)* Dwarf-shrubland
- CEGLO05130 *Gutierrezia (sarothrae, microcephala)* - *Ephedra* spp. - *Agave utahensis* Dwarf-shrubland
- CEGLO02787 *Bouteloua eriopoda* Coconino Plateau Shrub Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Evens et al. 2014, Faber-Langendoen et al. 2017b, Francis 1986, Sawyer et al. 2009, Warren et al. 1982

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G310. Intermountain Semi-Desert Steppe & Shrubland

A3202. Krascheninnikovia lanata Steppe & Dwarf-shrubland Alliance

Type Concept Sentence: This alliance represents vegetation of the interior western U.S. characterized by a sparse to dense layer of *Krascheninnikovia lanata*.

OVERVIEW

Scientific Name: *Krascheninnikovia lanata* Steppe & Dwarf-shrubland Alliance

Common Name (Translated Scientific Name): Winterfat Steppe & Dwarf-shrubland Alliance

Colloquial Name: Winterfat Steppe & Dwarf-shrubland

Type Concept: This alliance includes dwarf-shrublands dwarf-shrub herbaceous vegetation scattered across the interior western U.S. Shrub layers are characterized by a sparse to moderately dense dwarf-shrub layer dominated by *Krascheninnikovia lanata*. Other woody species may include scattered *Artemisia frigida*, *Artemisia nova*, *Artemisia tridentata*, *Chrysothamnus* spp., *Gutierrezia sarothrae*, *Opuntia polyacantha*, *Rhus trilobata*, and *Yucca glauca*. In the Mojave Desert, *Ambrosia dumosa*, *Atriplex polycarpa*, *Larrea tridentata*, and *Lycium andersonii* may also be present. The herbaceous layer has sparse to very dense cover dominated by graminoids with scattered perennial forbs which in some stands may take prominence over shrubs. Graminoids such as *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua gracilis*, *Hesperostipa comata* (= *Stipa comata*), *Pascopyrum smithii*, *Pleuraphis jamesii* (= *Hilaria jamesii*), *Poa secunda*, and *Pseudoroegneria spicata* are most abundant. Perennial forbs may include *Achillea millefolium*, *Astragalus purshii*, *Calochortus macrocarpus*, *Erigeron* spp., *Phlox hoodii*, *Sphaeralcea coccinea*, and *Sphaeralcea munroana*. Annuals may be seasonally present to abundant depending on precipitation and disturbance. Exotic annuals, such as *Bromus tectorum*, can be abundant. Elevations range from 100-2700 m. Stands occur on plateaus, plains, mesas, hillslopes, alkaline flats around playas and along drainages. Some habitats are intermittently flooded wetlands. Sites are typically flat to gently sloping, occurring on any aspect, but stands have also been reported from moderately steep slopes. Soils are calcareous, moderately alkaline and sometimes saline. Soil texture is typically stony, sandy loam, but may be coarser textured. The ground cover is mostly bare soil.

Classification Comments: The vegetation is sparse in many of these stands, and they would be better classified in a sparsely vegetated alliance. Only stands described by Daubenmire (1970) and DeVelice et al. (1991) have the necessary woody cover to be dwarf-shrublands.

Internal Comments: mjr 12-14: CA confirmed for MOJN.

Other Comments:**Similar NVC Types:**

Diagnostic Characteristics: Shrublands of the interior western U.S. where *Krascheninnikovia lanata* is the dominant species ranging from 3-35% cover or some stands with <10% cover and graminoid layer with cover 5-25%.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance is dominated by a sparse to moderately dense evergreen, dwarf-shrub layer often with scattered shrubs. Also present is a sparse to moderately dense herbaceous layer dominated by perennial graminoids with scattered perennial forbs. Annual grasses and forbs are seasonally present to abundant.

Floristics: Vegetation included in this alliance has a sparse to moderately dense dwarf-shrub layer dominated by *Krascheninnikovia lanata*. Other woody species may include scattered *Artemisia frigida*, *Artemisia nova*, *Artemisia tridentata*, *Chrysothamnus* spp., *Gutierrezia sarothrae*, *Opuntia polyacantha*, *Rhus trilobata*, and *Yucca glauca*. In the Mojave Desert, *Ambrosia dumosa*, *Atriplex polycarpa*, *Larrea tridentata*, and *Lycium andersonii* may also be present. The herbaceous layer has sparse to moderately dense cover dominated by graminoids with scattered perennial forbs. In some stands, shrubs may be very widely spaced and graminoids take prominence over shrub cover. Graminoids such as *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua gracilis*, *Hesperostipa comata* (= *Stipa comata*), *Muhlenbergia torreyi*, *Pascopyrum smithii*, *Pleuraphis jamesii* (= *Hilaria jamesii*), *Poa secunda*, and *Pseudoroegneria spicata* are most abundant. Scattered *Carex filifolia*, *Koeleria macrantha*, *Nassella viridula*, and *Sporobolus airoides* are also often present. Perennial forbs may include *Achillea millefolium*, *Astragalus purshii*, *Calochortus macrocarpus*, *Erigeron* spp., *Phlox hoodii*, *Sphaeralcea coccinea*, and *Sphaeralcea munroana*. Annuals may be seasonally present to abundant depending on precipitation and disturbance. Common native annual are *Chenopodium* spp., *Descurainia pinnata*, *Lappula occidentalis* (= *Lappula redowskii*), and *Plantago patagonica*. Exotic annuals may include *Bromus arvensis* (= *Bromus japonicus*), *Bromus tectorum*, *Halogeton glomeratus*, *Melilotus officinalis*, *Salsola kali*, and many others.

ENVIRONMENT & DYNAMICS

Environmental Description: Elevations range from 100-2700 m. Climate is semi-arid with about half the annual precipitation occurring in July to September often as high-intensity, convective storms. Sites include plains, alkaline flats, mesas and plateaus, hillslopes, alkaline flats around playas and along drainages. Sites are typically flat to gentle-sloped, but occasionally occur on moderate slopes up to 45%. Sites include all aspects. Soil textures are typically stony, sandy loams, but range to fine-textured silty clays and are typically shallow to moderate deep.

Dynamics: Stands dominated by *Krascheninnikovia lanata* occur locally. They often have sharp ecotones with other vegetation types and are thought to be an edaphic community type by Daubenmire (1970). However, edaphic factors separating these stands from adjacent stands have yet to be found. Soil characteristics, such as excessive amounts of calcium carbonate or lack of the nutrients N, P, K or S, have been studied and do not appear to control the occurrence of this alliance (Daubenmire 1970, DeVelice et al. 1995). *Krascheninnikovia lanata* is also important range forage. It is highly palatable in the winter and is tolerant of heavy browsing (Daubenmire 1970). Many stands have long histories of grazing impacts and are thought to be in a degraded state (Francis 1986, DeVelice et al. 1995). These stands often have low perennial herbaceous cover and many have high cover of the exotic annual grass *Bromus tectorum* (Daubenmire 1970, Francis 1986). DeVelice et al. (1995) described stands dominated by *Krascheninnikovia lanata* and *Hesperostipa comata*, which they considered to be a seral stage of a *Krascheninnikovia lanata* / *Pseudoroegneria spicata* community type that is not currently described in the National Vegetation Classification. Francis (1986) predicts that with protection from grazing, *Gutierrezia sarothrae* cover will decrease and *Krascheninnikovia lanata*, *Sporobolus airoides*, and *Achnatherum hymenoides* will increase in cover.

DISTRIBUTION

Geographic Range: Stands in this minor dwarf-shrubland alliance occur on the Columbia Plateau and Great Basin, and extend east to the northwestern Great Plains and south to the Mojave Desert, northern Chihuahuan Desert and Colorado Plateau. It is reported from eastern Washington and Oregon, Idaho, Montana, Nevada, New Mexico, Colorado and likely occurs in Utah, California, and Saskatchewan, Canada.

Nations: CA?, US

States/Provinces: AZ, CA, CO, ID, KS, MT, NM, NV, OR, SK?, TX, UT, WA, WY

TNC Ecoregions [optional]: 6:C, 11:C, 13:C, 15:C, 17:C

USFS Ecoregions (2007): 262A:CC, 322Al:CCC, 322Av:CCC, 341D:CC, 341Fa:CCC, 341Fb:CCC, 341Fc:CCC, 341Fe:CCC, 341Ff:CCC, 342B:CC, M262A:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Lake Mead, Mojave); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Eurotia lanata* - *Poa secunda* habitat type (Daubenmire 1970)
- ? *Eurotia lanata* Series (Johnston 1987) [includes the *Eurotia lanata*/*Hilaria jamesii* plant association.]
- = *Krascheninnikovia lanata* (Winterfat scrubland) Alliance (Sawyer et al. 2009) [36.500.00]
- = *Krascheninnikovia lanata* Shrubland Alliance (Evens et al. 2014)
- = *Krascheninnikovia lanata* Shrubland Alliance (CNPS 2017) [36.500.00]
- >< Mixed Salt Desert Shrub - Playa (Chappell et al. 1997)
- >< Shadscale Scrub (#36140) (Holland 1986b)
- ? Winterfat Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS**Associations:**

- CEGLO01321 *Krascheninnikovia lanata* / *Bouteloua gracilis* Dwarf-shrub Grassland
- CEGLO01327 *Krascheninnikovia lanata* / *Hesperostipa comata* Dwarf-shrubland
- CEGLO01325 *Krascheninnikovia lanata* / *Phlox* spp. Dwarf-shrubland
- CEGLO01326 *Krascheninnikovia lanata* / *Poa secunda* Dwarf-shrubland
- CEGLO01324 *Krascheninnikovia lanata* / *Pascopyrum smithii* - *Bouteloua gracilis* Dwarf-shrub Grassland
- CEGLO01320 *Krascheninnikovia lanata* Dwarf-shrubland
- CEGLO01323 *Krascheninnikovia lanata* / *Achnatherum hymenoides* Dwarf-shrubland
- CEGLO01322 *Krascheninnikovia lanata* / *Pleuraphis jamesii* Dwarf-shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: CNPS 2017, Carey 1995, Chappell et al. 1997, Daubenmire 1970, DeVelice et al. 1991, DeVelice et al. 1995, Evens et al. 2014, Faber-Langendoen et al. 2017b, Francis 1986, Holland 1986b, Johnston 1987, Keeler-Wolf and Thomas 2000, MacMahon 1988, Reid et al. 1999, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Stout et al. 2013, Thomas et al. 2004, Turner 1982c, VegCAMP and AIS 2013, West 1988, Young et al. 1977, Young et al. 2007b

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G310. Intermountain Semi-Desert Steppe & Shrubland

A2650. Opuntia spp. Colorado Plateau Shrubland Alliance

Type Concept Sentence: This alliance is dominated by clumps of *Opuntia* cacti and occurs in disturbed or extremely xeric sites with coarse soils throughout the Colorado Plateau.

OVERVIEW

Scientific Name: *Opuntia* spp. Colorado Plateau Shrubland Alliance

Common Name (Translated Scientific Name): Prickly-pear species Colorado Plateau Shrubland Alliance

Colloquial Name: Colorado Plateau Prickly-pear Shrubland

Type Concept: Clumps of *Opuntia* cacti dominate the community, with sparse to moderate cover by grasses and forbs growing within and between clumps. *Bromus tectorum* is the most common and abundant herbaceous species in this community, but even disturbed examples generally include some cover of native grasses and forbs, including *Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, and *Sphaeralcea* spp. Cryptobiotic soil crusts may be well-developed in undisturbed sites. This alliance occurs throughout the Colorado Plateau in disturbed or extremely xeric sites with coarse soils. Many stands occur on eolian or alluvial deposits on gentle to moderate slopes.

Classification Comments: This is a Colorado Plateau-centric alliance that is placed within an ecological group with alliances that span multiple ecoregions.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Low shrublands composed of one or more species of *Opuntia*, most typically in association with native and non-native grasses and disturbed sites of the Colorado Plateau.

VEGETATION**Physiognomy and Structure:**

Floristics: This is often a somewhat sparse community, with total perennial vegetation cover rarely exceeding 30%. In wet years, weedy and native annual herbaceous species may provide more than 50% cover. *Opuntia polyacantha* and *Opuntia phaeacantha* are the most common dominant cacti in this alliance, occurring in patches or clumps throughout the community. Scattered individuals of other shrub species may also occur in this community, particularly *Atriplex canescens*. Other shrubs present may include *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex confertifolia*, *Chrysothamnus viscidiflorus*, *Ephedra* spp., *Gutierrezia sarothrae*, *Grayia spinosa*, and *Sarcobatus vermiculatus*. The exotic annual grass *Bromus tectorum* frequently dominates the herbaceous layer along with weedy and exotic forbs such as *Astragalus nuttallianus* and *Erodium cicutarium*; however, even in the most disturbed sites, some native forbs and grasses may persist, including *Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, and *Sphaeralcea* spp.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs on alluvial terraces, slopes and ridges throughout the Colorado Plateau. Sites are often disturbed or, if undisturbed, are extremely xeric. Slopes range from gently sloping to moderately steep, and elevations range from 1450 to 1750 m (4757-5740 feet). Substrates include sandy alluvium, eolian sands, and coarse black migmatitic gravels. Soils are usually coarse-textured, either sandy or gravelly. At Canyon de Chelly, Arizona, this alliance often indicates the location of Anasazi ruins that have become buried by eolian sands.

Dynamics: In all but the most xeric habitats, dominance by *Opuntia* species generally indicates heavy, chronic disturbance, such as grazing by domestic livestock (Rice and Westoby 1978). However, in some extremely xeric habitats, such as sandsheets or coarse dark metamorphic gravels, *Opuntia* will dominate a community that otherwise shows few signs of disturbance and may have a well-developed cryptobiotic soil crust.

DISTRIBUTION

Geographic Range: This alliance is currently known from the Colorado Plateau of western Colorado, northern Arizona and southeastern Utah.

Nations: US

States/Provinces: AZ, CO, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY**LOWER LEVEL UNITS****Associations:**

- CEG002299 *Opuntia polyacantha* / *Pleuraphis jamesii* Shrubland
- CEG004009 *Opuntia (fragilis, polyacantha, phaeacantha)* Shrubland

AUTHORSHIP

Primary Concept Source: J. Coles and K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b, Rice and Westoby 1978

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.1.e. M171 Great Basin-Intermountain Dry Shrubland & Grassland

G775. Intermountain Sparsely Vegetated Dune Scrub & Grassland

Type Concept Sentence: This shrubby and herbaceous group occurs on sandy sites in the intermountain western U.S. and is characterized by a sparse to open vegetation layer composed of shrubs *Ericameria nauseosa*, *Eriogonum leptocladon*, or *Tetradymia tetrameres* and herbaceous species *Achnatherum hymenoides*, *Leymus flavescens*, *Psoralidium lanceolatum*, and *Redfieldia flexuosa*, which may dominate solely or in a combination on active and stable dunes and sandsheets.

OVERVIEW

Scientific Name: Intermountain Sparsely Vegetated Dune Scrub & Grassland Group

Common Name (Translated Scientific Name): Intermountain Sparsely Vegetated Dune Scrub & Grassland Group

Colloquial Name: Rubber Rabbitbrush - Sand Buckwheat - Four-part Horsebrush Sparse Scrub

Type Concept: This group occurs on sandy sites in the intermountain western U.S. from the Columbia Basin, Great Basin, and Centennial Valley in Montana, Wyoming Basins, Colorado Plateau and the San Luis Valley of southern Colorado. This group is characterized by open to sparse (<15% total cover) shrub and/or herbaceous vegetation. Characteristic shrubs include *Ericameria nauseosa*, *Eriogonum leptocladon*, or *Tetradymia tetrameres*. Diagnostic herbaceous species are *Achnatherum hymenoides*, *Leymus flavescens*, *Muhlenbergia pungens*, *Psoralidium lanceolatum*, and *Redfieldia flexuosa*, which may dominate solely or in a combination. There are several associated species, including graminoids such as *Calamovilfa gigantea*, *Hesperostipa comata* (= *Stipa comata*), *Schizachyrium scoparium*, and forbs *Heliotropium convolvulaceum*, *Machaeranthera canescens* (= *Aster canescens*), *Oxytheca dendroidea* (= *Eriogonum dendroideum*), *Polanisia dodecandra* ssp. *trachysperma*, *Polanisia jamesii*, *Reverchonia arenaria*, *Sophora stenophylla*, *Scabrethia scabra* (= *Wyethia scabra*), and the annual forb *Eriogonum deflexum*. Stands occur on active and stable dunes and sandsheets. Elevations range from 1500-2400 m. All sites have cool, semi-arid continental climates. Substrates are eolian sand.

Classification Comments: The majority of this group occurs in the intermountain western U.S.; however, two of the associations may extend out into the shortgrass region of the western Great Plains. These associations need further review as far as floristic composition and range such as on "blowout" sites where sandy plains or stabilized dunes have been disturbed (Ramaley 1939b). Shrubby semi-arid dune communities in this group need further review.

Similar NVC Types:

- G675 North American Warm Semi-Desert Dune & Sand Flats: also occurs on dunes and sandsheets, but in warm, semi-arid climate.

Diagnostic Characteristics: This group is characterized by a sparse to open shrub and/or herbaceous layer composed of shrubs *Ericameria nauseosa*, *Eriogonum leptocladon*, *Tetradymia tetrameres*, and perennial grasses and forbs *Achnatherum hymenoides*, *Leymus flavescens*, *Psoralidium lanceolatum*, and *Redfieldia flexuosa*, which may dominate solely or in a combination on rapidly drained sands.

VEGETATION

Physiognomy and Structure: Vegetation has a sparse cover of xeromorphic shrubs and dwarf-shrubs less than 2 m tall and/or a short herbaceous layer that is typically sparse and is dominated by perennial graminoids, with ephemeral forbs and grasses present seasonally.

Floristics: This group occurs on sandy sites in the intermountain western U.S. from the Columbia Basin, Great Basin, and Centennial Valley in Montana, Wyoming Basins, Colorado Plateau and the San Luis Valley of southern Colorado. This group is characterized by open to sparse (<15% total cover) shrub and/or herbaceous vegetation. Dominant shrubs include *Ericameria nauseosa*, *Eriogonum leptocladon*, or *Tetradymia tetrameres*. Diagnostic herbaceous species are *Achnatherum hymenoides*, *Leymus flavescens*, *Muhlenbergia pungens*, *Psoralidium lanceolatum*, and *Redfieldia flexuosa*, which may dominate solely or in a combination. There are several associated species, including graminoids such as *Calamovilfa gigantea*, *Hesperostipa comata* (= *Stipa comata*), *Schizachyrium scoparium*, and forbs *Heliotropium convolvulaceum*, *Machaeranthera canescens* (= *Aster canescens*), *Oxytheca dendroidea* (= *Eriogonum dendroideum*), *Polanisia dodecandra* ssp. *trachysperma*, *Polanisia jamesii*, *Reverchonia arenaria*, *Sophora stenophylla*, *Scabrethia scabra* (= *Wyethia scabra*), and the annual forb *Eriogonum deflexum*. On the Colorado Plateau, active dune sites have codominants such as *Calamovilfa gigantea*, *Psoralidium lanceolatum*, *Reverchonia arenaria*, *Sophora stenophylla*, and *Scabrethia scabra* (Castle 1954, Bowers 1982).

ENVIRONMENT & DYNAMICS

Environmental Description: This group occurs on sandy sites in the intermountain western U.S. from the Columbia Basin, Great Basin, and Centennial Valley in Montana, Wyoming Basins, Colorado Plateau and the San Luis Valley of southern Colorado. Elevations range from 1500-2400 m. Stands occur on active and stable dunes and sandsheets. In the San Luis Valley in Colorado, at approximately 2400 m elevation, stands occur on a sandsheet on the windward side of dunes (R. Rondeau, CONHP, pers. comm.). In semi-arid dune systems in the Colorado Plateau and Great Basin, stands occur in active dunes (Van Pelt 1978, Bowers 1982). They are early-seral communities that colonize bare sand in interdune valleys. The plants adapt to sand deposition by stem elongation but eventually will be buried or dug up as the dunes move. On dune margins, stabilization may occur as other sand-adapted species colonize, eventually succeeding into the adjacent desert scrub community. In the Colorado Plateau of southeastern Utah and western Colorado, this vegetation is often limited to small stands on sandy point bars, islands or terraces in the beds of intermittent streams. These stands are subject to periodic flooding but are usually isolated from the water table. A few Colorado Plateau stands occupy unconsolidated sands in areas with active dunes. Additional review is needed to characterize the environments in its full range.

Climate: This group occurs in a cool, semi-arid continental climate. *Soil/substrate/hydrology:* Substrates are eolian sands.

Dynamics: *Achnatherum hymenoides* is one of the most drought-tolerant grasses in the western U.S. and occurs on a variety of xeric sites (USFS 1937). It is also a valuable forage grass in arid and semi-arid regions. Improperly managed livestock grazing could increase soil erosion, decrease cover of this palatable plant species and increase weedy species (USFS 1937).

Dunes gradually become smaller and reach a threshold of size, below which they become stabilized by vegetation. This vegetation occurs on recent sand deposits, but over time, if deposition slows, it will succeed to shrubland or grassland vegetation types.

DISTRIBUTION

Geographic Range: This group occurs on sandy sites in the intermountain western U.S. from the Columbia Basin, Great Basin, Centennial Valley in Montana, Wyoming Basins, Colorado Plateau and the San Luis Valley of southern Colorado.

Spatial Scale & Pattern [optional]:

Nations: US

States/Provinces: AZ, CO, ID, MT, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A4011 *Redfieldia flexuosa* - *Leymus flavescens* - *Achnatherum hymenoides* Grassland Alliance
- A4149 *Ericameria nauseosa* - *Eriogonum leptocladon* - *Tetradymia tetrameres* Sparse Scrub Alliance

AUTHORSHIP

Primary Concept Source: Faber-Langendoen et al. (2015)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 04/16/2015

Classif Resp Region: West

Internal Author: MSR 8-13, mod. KAS 4-15

REFERENCES

References: Faber-Langendoen et al. 2017a

3. Desert & Semi-Desert
 3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland
 G775. Intermountain Sparsely Vegetated Dune Scrub & Grassland

A4149. *Ericameria nauseosa* - *Eriogonum leptocladon* - *Tetradymia tetrameres* Sparse Scrub Alliance

Type Concept Sentence: Sparsely vegetated scrub of sand dunes, sandsheets and sand blowouts of the western U.S. dominated by *Ericameria nauseosa*, *Eriogonum leptocladon*, and/or *Tetradymia tetrameres*, with understory of herbaceous species such as *Achnatherum hymenoides*, *Leymus flavescens*, *Muhlenbergia pungens*, and/or *Psoralidium lanceolatum*.

OVERVIEW

Scientific Name: *Ericameria nauseosa* - *Eriogonum leptocladon* - *Tetradymia tetrameres* Sparse Scrub Alliance

Common Name (Translated Scientific Name): Rubber Rabbitbrush - Sand Buckwheat - Four-part Horsebrush Sparse Scrub Alliance

Colloquial Name: Rubber Rabbitbrush - Sand Buckwheat - Four-part Horsebrush Sparse Scrub

Type Concept: This sparse shrubland alliance of the western U.S. has open and low vegetative cover from 15 to 50%. Dominant diagnostic shrub species are *Ericameria nauseosa*, *Eriogonum leptocladon*, and/or *Tetradymia tetrameres*. Dominant and consistently present understory herbaceous species include *Achnatherum hymenoides*, *Leymus flavescens*, *Muhlenbergia pungens*, and/or *Psoralidium lanceolatum*. This sparse community is characteristic of flat to rolling areas of sandsheets, stabilized or moving sand dunes, sand blowouts, or colluvial slopes, between 1220 and 2505 m (4000-8218 feet) elevation. Sites include valley floors, floodplains, and stream terraces, are gentle to moderately sloping, but range from flat to steep and may occur on any aspect. Soils are sands, loamy sands and sandy loams derived from local eroding sandstone or eolian sands. Most of the unvegetated surface is bare soil, although incipient biological soil crusts (consisting mostly of dark cyanobacteria) may cover up to 20% of the ground in more stable sites.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:**Diagnostic Characteristics:****VEGETATION**

Physiognomy and Structure: Open and sparse low shrubland (<2 m height).

Floristics: This sparse shrubland has open and low vegetative cover from 15 to 60%. Dominant diagnostic shrub species are *Ericameria nauseosa*, *Eriogonum leptocladon*, and/or *Tetradymia tetrameres*. Dominant and consistently present understory herbaceous species include *Achnatherum hymenoides*, *Leymus flavescens*, *Muhlenbergia pungens*, and *Psoralidium lanceolatum*. Other common shrub associates include *Chrysothamnus viscidiflorus*, *Ephedra torreyana*, *Artemisia bigelovii*, *Atriplex canescens*, *Eriogonum corymbosum*, *Gutierrezia sarothrae*, *Ipomopsis congesta*, *Opuntia polyacantha*, *Sarcobatus vermiculatus*, and *Yucca elata* (= var. *utahensis*). Associated herbaceous species that have very low cover include graminoids such as *Aristida purpurea*, *Hesperostipa comata*, *Pleuraphis jamesii*, and *Sporobolus airoides*, and forbs such as *Abronia fragrans*, *Chamaesyce glyptosperma*, *Cirsium calcareum*, *Cirsium* spp., *Eriogonum cernuum*, *Gayophytum humile* (= *Gayophytum nuttallii*), *Heterotheca villosa*, *Lygodesmia grandiflora*, *Lygodesmia juncea*, *Machaeranthera canescens* (= *Aster canescens*), *Oenothera pallida*, *Oxytheca dendroidea* (= *Eriogonum dendroideum*), *Penstemon palmeri*, *Phacelia hastata* var. *hastata* (= *Phacelia leucophylla*), *Phacelia heterophylla*, *Salsola tragus*, *Sophora stenophylla*, *Sphaeralcea coccinea*, *Streptanthella longirostris*, and *Tragopogon dubius*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs on sandsheets, sand blowouts, and sand dunes both moving and stabilized. Soils are sands, loamy sands and sandy loams derived from local eroding sandstone or eolian sands.

Dynamics:**DISTRIBUTION**

Geographic Range: This alliance is found on southeastern Idaho Snake River basalts, Great Sand Dunes of south-central Colorado, and on the Colorado Plateau of southern and eastern Utah, northeastern Arizona and western Colorado.

Nations: US

States/Provinces: AZ, CO, ID, NV, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Canyonlands, Capitol Reef, Dinosaur, Glen Canyon, Great Sand Dunes, Navajo, Zion); USFWS (Minidoka, Ouray)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGLO02980 *Ericameria nauseosa* Sand Deposit Sparse Shrubland
- CEGLO02759 *Tetradymia tetrameres* Dune Sparse Vegetation
- CEGLO02821 *Eriogonum leptocladon* / *Muhlenbergia pungens* Dwarf-shrubland
- CEGLO02921 *Ericameria nauseosa* / *Muhlenbergia pungens* - *Achnatherum hymenoides* Shrub Grassland
- CEGLO02822 *Eriogonum leptocladon* Sparse Vegetation
- CEGLO01329 *Ericameria nauseosa* / *Leymus flavescens* / *Psoralidium lanceolatum* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2014)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2016/09/27

REFERENCES

References: Faber-Langendoen et al. 2017b

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G775. Intermountain Sparsely Vegetated Dune Scrub & Grassland

A4011. Redfieldia flexuosa - Leymus flavescens - Achnatherum hymenoides Grassland Alliance

Type Concept Sentence: This herbaceous alliance occurs on sandy sites in the intermountain western U.S. and is characterized by a sparse to an open herbaceous layer composed of *Redfieldia flexuosa*, *Leymus flavescens*, *Achnatherum hymenoides*, and *Psoralidium lanceolatum*, which may dominate solely or in combination on active and stable dunes and sandsheets.

OVERVIEW

Scientific Name: *Redfieldia flexuosa* - *Leymus flavescens* - *Achnatherum hymenoides* Grassland Alliance

Common Name (Translated Scientific Name): Blowout Grass - Yellow Wildrye - Indian Ricegrass Grassland Alliance

Colloquial Name: Blowout Grass - Yellow Wildrye - Indian Ricegrass Grassland

Type Concept: This herbaceous alliance occurs on sandy sites in the intermountain western U.S. from the Columbia Basin, Great Basin, Centennial Valley in Montana, Wyoming Basins, Colorado Plateau and the San Luis Valley of southern Colorado. This herbaceous layer is characterized by a sparsely vegetated to open herbaceous layer composed of *Redfieldia flexuosa*, *Leymus flavescens*, *Achnatherum hymenoides*, and *Psoralidium lanceolatum*, which may dominate solely or in combination. There are several associated species, including graminoids *Muhlenbergia pungens*, *Hesperostipa comata* (= *Stipa comata*), *Schizachyrium scoparium*, *Calamovilfa gigantea*, forbs *Heliotropium convolvulaceum*, *Machaeranthera canescens* (= *Aster canescens*), *Oxytheca dendroidea* (= *Eriogonum dendroideum*), *Polanisia dodecandra* ssp. *trachysperma*, *Polanisia jamesii*, *Reverchonia arenaria*, *Sophora stenophylla*, *Scabrethia scabra* (= *Wyethia scabra*), and the annual forb *Eriogonum deflexum*. Stands occur on active and stable dunes, sand blowouts and sandsheets. Elevations range from 1500-2400 m. All sites have semi-arid climates. Substrates are eolian sands.

Classification Comments: The majority of this alliance occurs in the intermountain western U.S.; however, two of the associations may extend out into the shortgrass region of the western Great Plains. These associations need further review of floristic composition and range, such as on "blowout" sites where sandy plains or stabilized dunes have been disturbed (Ramaley 1939b).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: This alliance is characterized by a sparse to open herbaceous layer composed of *Redfieldia flexuosa*, *Leymus flavescens*, *Achnatherum hymenoides*, and *Psoralidium lanceolatum*, which may dominate solely or in combination on rapidly drained sands.

VEGETATION

Physiognomy and Structure: The vegetation in this alliance has a sparse to moderate graminoid cover dominated by medium-tall bunchgrasses. Forb cover is generally sparse.

Floristics: This intermountain western U.S. herbaceous alliance is characterized by a sparsely vegetated to open herbaceous layer composed of *Redfieldia flexuosa*, *Leymus flavescens*, *Achnatherum hymenoides*, and *Psoralidium lanceolatum*, which may dominate solely or in combination. There are several associated species, including graminoids *Muhlenbergia pungens*, *Hesperostipa comata* (= *Stipa comata*), *Schizachyrium scoparium*, *Calamovilfa gigantea*, forbs *Heliotropium convolvulaceum*, *Machaeranthera canescens* (= *Aster canescens*), *Oxytheca dendroidea* (= *Eriogonum dendroideum*), *Polanisia dodecandra* ssp. *trachysperma*, *Polanisia jamesii*, *Reverchonia arenaria*, *Sophora stenophylla*, *Scabrethia scabra* (= *Wyethia scabra*), and the annual forb *Eriogonum deflexum*. On the Colorado Plateau, active dune sites have codominants such as *Calamovilfa gigantea*, *Psoralidium lanceolatum*, *Reverchonia arenaria*, *Sophora stenophylla*, and *Scabrethia scabra* (Castle 1954, Bowers 1982).

ENVIRONMENT & DYNAMICS

Environmental Description: Stands of this herbaceous alliance occur in the intermountain western U.S. on active and stable dunes, sandsheets, and small isolated sand blowouts. Elevations range from 1500-2400 m. All sites have semi-arid climates. Substrates are eolian sands. In the San Luis Valley in Colorado, at approximately 2400 m elevation, stands occur on a sandsheet on the windward side of dunes (R. Rondeau, CONHP, pers. comm.). In semi-arid dune systems in the Colorado Plateau and Great Basin, stands of this alliance occur in active dunes (Van Pelt 1978, Bowers 1982). They are early-seral communities that colonize bare sand in interdune valleys. The plants adapt to sand deposition by stem elongation but eventually will be buried or dug up as the dunes move. On dune margins, stabilization may occur as other sand-adapted species colonize, eventually succeeding into the adjacent desert scrub community. In the Colorado Plateau of southeastern Utah and western Colorado, this alliance is often limited to small stands on sandy point bars, islands or terraces in the beds of intermittent streams. These stands are subject to periodic flooding but are usually isolated from the water table. A few Colorado Plateau stands occupy unconsolidated sands in areas with active dunes. In the Snake River Valley, this community has been documented in sand blowouts in the rolling hills of sagebrush. Additional review is needed to characterize the environments of this alliance in its full range.

Dynamics: *Achnatherum hymenoides* is one of the most drought-tolerant grasses in the western U.S. and occurs on a variety of xeric sites (USFS 1937). It is also a valuable forage grass in arid and semi-arid regions. Improperly managed livestock grazing could increase soil erosion, decrease cover of this palatable plant species and increase weedy species (USFS 1937).

Dunes gradually become smaller and reach a threshold of size, below which they become stabilized by vegetation. This alliance occurs on recent sand deposits, but over time, if deposition slows, it will succeed to shrubby vegetation types.

DISTRIBUTION

Geographic Range: This alliance occurs on sandy sites in the intermountain western U.S. from the Columbia Basin, Great Basin, Centennial Valley in Montana, Wyoming Basins, Colorado Plateau and the San Luis Valley of southern Colorado.

Nations: CA?, US

States/Provinces: CO, ID, MT, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGLO01650 *Achnatherum hymenoides* - *Psoralidium lanceolatum* Grassland
- CEGLO02917 *Redfieldia flexuosa* - (*Psoralidium lanceolatum*) Grassland
- CEGLO01563 *Leymus flavescens* Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, Faber-Langendoen et al. (2014)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M.S. Reid.

Version Date: 2016/10/17

REFERENCES

References: Bowers 1982, Bowers 1984, Burgess and Northington 1977, Castle 1954, Chadwick and Dalke 1965, Daubenmire 1970, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Ramaley 1937, Ramaley 1939b, Ramaley 1942, Reid 1980, Reid et al. 1994, Strong 1980, Terwilliger and Tiedemann 1978, Tiedemann et al. 1987, USFS 1937, Van Pelt 1978, WNDD unpubl. data

M170. Great Basin-Intermountain Dwarf Sagebrush Steppe & Shrubland

This semi-arid intermountain western U.S. macrogroup is characterized by short sagebrush taxa that form an open to moderately dense dwarf-shrub layer on shallow, rocky, calcareous or alkaline soils. Stands are dominated by one of several diagnostic *Artemisia* taxa depending on location and habitat, including *Artemisia arbuscula ssp. arbuscula*, *Artemisia arbuscula ssp. longiloba*, *Artemisia arbuscula ssp. longicaulis*, *Artemisia arbuscula ssp. thermopola*, *Artemisia bigelovii*, *Artemisia frigida*, *Artemisia nova*, *Artemisia rigida*, or *Artemisia tripartita ssp. rupicola*.

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.2.a. M170 Great Basin-Intermountain Dwarf Sagebrush Steppe & Shrubland

G307. Columbia Plateau Scabland Dwarf-shrubland

Type Concept Sentence: This group is found in the Columbia Plateau region and forms extensive low shrublands dominated by diagnostic dwarf-shrub, *Artemisia rigida* along with other species, particularly diagnostic *Eriogonum* spp. such as *Eriogonum compositum*, *Eriogonum douglasii*, *Eriogonum microthecum*, *Eriogonum niveum*, *Eriogonum sphaerocephalum*, *Eriogonum strictum*, and *Eriogonum thymoides*, which sometimes dominate the dwarf-shrub layer without *Artemisia rigida*.

OVERVIEW

Scientific Name: *Artemisia rigida* - *Eriogonum* spp. Dwarf-shrubland & Steppe Group

Common Name (Translated Scientific Name): Scabland Sagebrush - Buckwheat species Dwarf-shrubland & Steppe Group

Colloquial Name: Scabland Sagebrush Steppe & Shrubland

Type Concept: This scabland group is found in the Columbia Plateau region and forms extensive low shrublands. Total vegetation cover is typically low, generally less than 50% and often much less than that. Vegetation is characterized by an open dwarf-shrub canopy dominated by *Artemisia rigida* or *Salvia dorrii* along with other dwarf-shrub and suffrutescent species, particularly diagnostic *Eriogonum* spp. such as *Eriogonum compositum*, *Eriogonum douglasii*, *Eriogonum microthecum*, *Eriogonum niveum*, *Eriogonum sphaerocephalum*, *Eriogonum strictum*, and *Eriogonum thymoides*, which sometimes dominate the dwarf-shrub layer without *Artemisia rigida* or *Salvia dorrii*. Other shrubs, especially shrubby *Artemisia* spp., are uncommon in this group. These stands are characterized by low cover of perennial bunchgrasses, primarily *Poa secunda*, but may include *Danthonia unispicata*, *Elymus elymoides*, *Festuca idahoensis*, or *Pseudoroegneria spicata*, as well as scattered forbs, including species of *Allium*, *Antennaria*, *Balsamorhiza*, *Lomatium*, *Phlox*, and *Sedum*. Individual sites can be dominated by grasses and semi-woody forbs, such as *Physaria oregona* or *Nestotus stenophyllus* (= *Stenotus stenophyllus*). Annuals may be seasonally abundant, and cover of moss and lichen is often high in undisturbed areas (1–60% cover). These xeric shrublands occur under relatively extreme soil-moisture conditions. Substrates are typically shallow lithic soils with limited water-holding capacity over fractured basalt. Because of poor drainage through basalt, these soils are often saturated from fall to spring by winter precipitation but typically dry out completely to bedrock by midsummer.

Classification Comments:

Similar NVC Types:

Diagnostic Characteristics: This group is characterized by an open dwarf-shrub canopy dominated or codominated by diagnostic species *Artemisia rigida*, *Eriogonum compositum*, *Eriogonum douglasii*, *Eriogonum microthecum*, *Eriogonum niveum*, *Eriogonum sphaerocephalum*, *Eriogonum strictum*, *Eriogonum thymoides*, and/or *Salvia dorrii*. *Poa secunda* and other dry-site grasses and forbs may be present usually with low cover.

VEGETATION

Physiognomy and Structure: Vegetation structure is a sparse to moderately dense dwarf-shrub canopy (10-25% cover and <0.5 m tall). Occasionally, woody cover may exceed 25%. If present, the herbaceous layer typically has low cover.

Floristics: This group is found in the Columbia Plateau region and forms extensive low shrublands. These xeric shrublands occur under relatively extreme soil-moisture conditions. Vegetation is characterized by an open dwarf-shrub canopy dominated by *Artemisia rigida* or *Salvia dorrii* along with other dwarf-shrub species, particularly *Eriogonum* spp. which sometimes dominates the dwarf-shrub layer without *Artemisia rigida* or *Salvia dorrii*. Diagnostic species of *Eriogonum* include *Eriogonum compositum*, *Eriogonum douglasii*, *Eriogonum microthecum*, *Eriogonum niveum*, *Eriogonum sphaerocephalum*, *Eriogonum strictum*, and *Eriogonum thymoides*. Other shrubs are uncommon. This group does not include mixed stands codominated by *Artemisia rigida* and other *Artemisia* species such as *Artemisia tridentata*. Low cover of perennial bunchgrasses, such as *Danthonia unispicata*, *Elymus elymoides*, *Festuca idahoensis*, or primarily *Poa secunda*, as well as scattered forbs, including species of *Allium*, *Antennaria*, *Balsamorhiza*, *Lomatium*, *Phlox*, and *Sedum*, characterize these sites. Individual sites can be dominated by grasses and semi-woody forbs, such as *Nestotus stenophyllus* (= *Stenotus stenophyllus*). Annuals may be seasonally abundant, and cover of moss and lichen is often high in undisturbed areas (1-60% cover).

ENVIRONMENT & DYNAMICS

Environmental Description: This scabland group is found in the Columbia Plateau region and forms extensive low shrublands. These xeric shrublands occur under relatively extreme soil-moisture conditions. Substrates are typically shallow lithic soils with limited water-holding capacity over fractured basalt. Because of poor drainage through basalt, these soils are often saturated from fall to spring by winter precipitation but typically dry out completely to bedrock by midsummer. Total vegetation cover is typically low, generally less than 50% and often much less than that.

Dynamics:

DISTRIBUTION

Geographic Range: This group occurs in the Columbia Plateau region of southern Idaho, eastern Oregon and eastern Washington, and extreme northern Nevada.

Spatial Scale & Pattern [optional]: Matrix

Nations: US

States/Provinces: CA, ID, NV, OR, UT?, WA

TNC Ecoregions [optional]: 6:C, 7:C, 68:C

USFS Ecoregions (2007): 331A:CC, 341E:C?, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:C?, M261G:CC, M332G:CC, M333A:PP, M341A:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- = Edaphic Series - Lithosols (Daubenmire 1970)

LOWER LEVEL UNITS

Alliances:

- A1568 *Eriogonum* spp. / *Poa secunda* Dwarf-shrub Steppe Alliance
- A1129 *Salvia dorrii* Dwarf-shrubland Alliance
- A1574 *Artemisia rigida* Steppe & Shrubland Alliance
- A1107 *Eriogonum microthecum* Dwarf-shrubland Alliance

AUTHORSHIP

Primary Concept Source: R.F. Daubenmire (1970)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: KAS 3-10, 11-15

REFERENCES

References: Copeland 1980a, Daubenmire 1970, Faber-Langendoen et al. 2017a, Franklin and Dyrness 1973, Ganskopp 1979, Hall 1973, Johnson and Simon 1985, Poulton 1955, Shiflet 1994

3. Desert & Semi-Desert
 3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland
 G307. Columbia Plateau Scabland Dwarf-shrubland

A1574. *Artemisia rigida* Steppe & Shrubland Alliance

Type Concept Sentence: This alliance is characterized by a woody layer of scattered *Artemisia rigida* and occurs in scablands east of the Cascade Range in the Columbia Basin steppe and on the Snake River plateau of Oregon, Washington and Idaho.

OVERVIEW

Scientific Name: *Artemisia rigida* Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Scabland Sagebrush Steppe & Shrubland Alliance

Colloquial Name: Scabland Sagebrush Steppe & Shrubland

Type Concept: A sparse (10-25% cover) woody layer of scattered *Artemisia rigida* is diagnostic of stands of this shrub-herbaceous alliance. Occasionally this dwarf-shrub layer exceeds 25% cover and may include woody *Eriogonum* spp. Stands have a sparse to moderately dense herbaceous layer (<0.5 m tall) that is dominated by either of the cool-season, perennial bunchgrasses *Poa secunda* or *Pseudoroegneria spicata*. Moss and lichen cover in undisturbed stands is often high and ranges from 1-60% cover. This alliance occurs in scablands east of the Cascade Range in the Columbia Basin steppe and on the Snake River plateau of Oregon, Washington and Idaho. Elevations range from 190-1830 m. Stands are found on flat to undulating to rolling plateaus, plains, ridgetops and brows. The key environmental indicator is the fact that soils are shallow with a high percentage of rock fragments (10-70%) (lithic). Parent material is restricted to colluvium and residuum derived from basalt and acidic lava. The soil surface is mostly rock, erosion pavement (pebble surface), bare ground, and moss.

Classification Comments: Vegetation included in this dwarf-shrub herbaceous alliance is very similar to the stands in *Eriogonum* spp. / *Poa secunda* Dwarf-shrub Steppe Alliance (A1568) except for dominance of *Artemisia rigida* instead of *Eriogonum* spp. in the woody layer. Both have high cover and constancy of *Poa secunda* in the herbaceous layer and occur in similar habitats (e.g., shallow, lithic soils over fractured basalt). Daubenmire (1970) described as many stands in an intermediate habitat type between the *Artemisia rigida* - *Poa* and *Eriogonum thymoides* - *Poa* habitat types as in each of the "parent" types which suggests a large ecotone between stands in the two alliances. In addition, woody cover in some stands in this alliance is dense enough to be classified as a shrubland (Daubenmire 1970, Johnson and Simon 1987), but most average between 10-25%.

Internal Comments:

Other Comments:

Similar NVC Types:

- A1568 *Eriogonum* spp. / *Poa secunda* Dwarf-shrub Steppe Alliance: is dominated *Eriogonum* spp. in the woody layer.

Diagnostic Characteristics: Sparse to moderately dense grassy herbaceous vegetation with a dominant woody layer of *Artemisia rigida* ranging from 10-25% cover occurring in scablands east of the Cascade Range in the Columbia Basin steppe and on the Snake River plateau of Oregon, Washington and Idaho.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance has a sparse to moderately dense herbaceous layer that is dominated by perennial bunch grasses less than 0.5 m tall. There is also a sparse, deciduous dwarf-shrub layer that is diagnostic of this type, and a sparse layer of perennial forbs. Mosses and lichens may be common (<0.1 m tall). Annual forbs and grasses are seasonally present.

Floristics: Vegetation included in this alliance is typically open with total vascular cover much less than 60%. A sparse (10-25% cover) woody layer of scattered *Artemisia rigida*, a cold-deciduous dwarf-shrub, is diagnostic of these stands. Occasionally this dwarf-shrub layer exceeds 25% cover and may include woody *Eriogonum* spp. Stands have a sparse to moderately dense herbaceous layer (<0.5 m tall) that is dominated by either of the cool-season, perennial bunchgrasses *Poa secunda* or *Pseudoroegneria spicata*. Other characteristic species may include occasional graminoids such as *Danthonia unispicata*, *Elymus elymoides*, or *Festuca idahoensis*; perennial forbs such as *Achillea millefolium*, *Allium* spp., *Antennaria* spp., *Balsamorhiza incana*, *Erigeron chrysopsidis*, *Eriogonum* spp., *Lithophragma glabrum*, *Lomatium* spp., *Phlox hoodii*, *Sedum lanceolatum*, *Sedum stenopetalum*, or *Trifolium macrocephalum*; and the annuals *Collinsia parviflora*, *Epilobium brachycarpum*, *Idahoia scapigera*, *Microsteris gracilis* (= *Phlox gracilis*), *Plantago patagonica*, and *Vulpia microstachys* var. *pauciflora*. Moss and lichen cover in undisturbed stands is often high and ranges from 1-60% cover.

ENVIRONMENT & DYNAMICS

Environmental Description: These sparse shrublands/grasslands are characteristic of the scablands in the Columbia Basin and portions of the Snake River plain. Elevations range from 190-1830 m. The climate is temperate, with a winter precipitation peak. Mean annual precipitation ranges from 25-50 cm, and occurs primarily in the winter as snow or rain. This moisture is stored in the soil profile and utilized during the typically dry summers. Stands are found on flat to undulating to rolling plateaus, plains, ridgetops and brows. Sites are nearly level to moderately sloping (to 30%). The alliance occurs on all aspects, but is more common on southern

slopes, although given that most sites are flat, aspect is not very significant. The key environmental indicator is the fact that soils are shallow (7-30 cm) with a high percentage of rock fragments (10-70%) (lithic). They are moderately to well-drained, non-calcareous, sandy to clay loams, with pH of 6.3-6.6. Parent material is restricted to colluvium and residuum derived from basalt and acidic lava. Soil surface is mostly rock, erosion pavement (pebble surface), bare ground, and moss. Litter accumulates under the scattered *Artemisia rigida* plants forming moss-covered mounds up to 20 cm deep. These hummocks persist several years after the death of the dwarf-shrub (Daubenmire 1970, 1992). Moss and lichen cover a significant amount of the ground surface, often with up to 50% cover.

Dynamics: This xeric shrubland vegetation occurs under relatively extreme soil-moisture conditions. Stands are found on shallow rocky soils with limited water-holding capacity. These soils are often saturated from fall to spring by winter precipitation, but they typically dry out completely to bedrock by mid-summer (Daubenmire 1970, 1992, Johnson and Simon 1987). *Poa secunda* is well-adapted to these conditions because it starts growing early in the spring and completes its reproductive cycle early while there is still moisture in the soil (Daubenmire 1970, 1992, Johnson and Simon 1987). Also, if there is late-summer or early-fall precipitation, dormant *Poa secunda* can respond quickly and green up. Daubenmire (1970) and Johnson and Simon (1987) suggest that the basalt bedrock present under these dwarf-shrub/grassland stands is fractured enough to support deeper-rooted dwarf-shrubs. Moss does well in this habitat. In addition to drought tolerance, *Poa secunda* is also tolerant of grazing and trampling by livestock (Daubenmire 1970, Ganskopp 1979). *Artemisia rigida* is favored winter browse for elk and deer, and moderately palatable to livestock (Johnson and Clausnitzer 1992). The saturated spring soils are vulnerable to trampling, but the rocky soils discourage livestock (Daubenmire 1992). However, in areas excluded from grazing entirely, *Pseudoroegneria spicata* and *Festuca idahoensis* may dominate with *Artemisia rigida* in portions of the alliance's range, also growing in rock fractures.

Stands in this alliance are generally considered to be late-seral with species composition controlled by the harsh edaphic conditions of the site (Daubenmire 1970, Johnson and Simon 1987). With disturbance, such as livestock impacts, comes an increase in erosion pavement and bare ground, and a decrease in moss and lichen cover (Daubenmire 1970, Johnson and Simon 1987). Frost heaving may be severe, causing local soil disturbance in the winter when these thin, saturated soils freeze and push soil and plants up out of the ground. Pedestalled *Artemisia rigida* plants and bunch grasses are common (Daubenmire 1970, Hironaka et al. 1983). Exotic plants have invaded many stands especially where disturbed (Tisdale 1986, Daubenmire 1992). Common exotics may include annual grasses such as *Bromus tectorum*, *Bromus arvensis*, and *Bromus briziformis*, which may be abundant during wet years, and annual forbs such as *Epilobium brachycarpum*, *Erodium cicutarium*, *Lactuca serriola*, *Tragopogon dubius*, and the perennial forb *Hypericum perforatum*.

Fire is thought to be unimportant because it is unlikely that the sparse vegetation in these stands could carry a fire. However, if it did occur, the *Artemisia rigida* plants are not tolerant and would be killed (Johnson and Simon 1987, Daubenmire 1992, Johnson and Clausnitzer 1992).

DISTRIBUTION

Geographic Range: These sparse dwarf-shrublands occur in the Columbia Basin of eastern Washington, eastern Oregon and Idaho.

Nations: US

States/Provinces: ID, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Artemisia rigida-Poa secunda* habitat type (Daubenmire 1970) [includes an association by the same name.]
- ? *Artemisia rigida-Poa secunda* habitat type (Hironaka et al. 1983)
- ? *Artemisia rigida* Series (Tisdale 1986)
- = SRM Cover Type #407 - Stiff Sagebrush (Shiflet 1994)
- ? Scabland Sage (Shantz 1924)
- ? Stiff Sage Scabland (Hall 1973) [*Artemisia rigida-Poa sandbergii* scabland]

LOWER LEVEL UNITS

Associations:

- CEG001528 *Artemisia rigida* / *Poa secunda* Shrub Grassland
- CEG002995 *Artemisia rigida* / *Festuca idahoensis* Shrub Grassland
- CEG001529 *Artemisia rigida* / *Pseudoroegneria spicata* Shrub Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz and J. Kagan, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Daubenmire 1970, Daubenmire 1992, Faber-Langendoen et al. 2017b, Ganskopp 1979, Hall 1973, Hironaka et al. 1983, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Shantz 1924, Shiflet 1994, Tisdale 1986

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G307. Columbia Plateau Scabland Dwarf-shrubland

A1107. Eriogonum microthecum Dwarf-shrubland Alliance

Type Concept Sentence: This minor dwarf-shrubland alliance is dominated by dwarf-shrub *Eriogonum microthecum* and occurs in portions of the Snake and Imnaha river canyons in Idaho and eastern Oregon and Washington.

OVERVIEW

Scientific Name: *Eriogonum microthecum* Dwarf-shrubland Alliance

Common Name (Translated Scientific Name): Slender Buckwheat Dwarf-shrubland Alliance

Colloquial Name: Slender Buckwheat Dwarf-shrubland

Type Concept: Vegetation included in this alliance has a sparse woody layer that is dominated by the dwarf-shrub *Eriogonum microthecum* and occurs in rather fine-scale mosaic patterns. Some stands may have *Eriogonum strictum* instead of, or in addition to, *Eriogonum microthecum*. The herbaceous layer is also sparse and composed of a relatively even mix of forbs and grasses. Other characteristic species include forbs, such as *Achillea millefolium*, *Chaenactis douglasii*, *Erysimum asperum*, *Oenothera caespitosa*, *Phacelia heterophylla*, *Polygonum douglasii*, *Physaria oregona*, and the grass *Pseudoroegneria spicata*. Moss and lichen are nearly absent, likely because of the instability of the slopes. Exotic species, namely *Bromus tectorum*, often make up a significant portion of the vegetation cover in these stands. This minor dwarf-shrubland alliance occurs in portions of the Snake and Imnaha river canyons in Idaho and eastern Oregon and Washington. Precipitation primarily occurs in the winter as snow or rain. This moisture is stored in the soil profile and utilized during the typically dry summers. Stands are typically found on highly weathered basalt outcrops in the canyons. Sites are very hot and dry, occurring on moderate to steep slopes with southern or western aspects. Soils are very shallow, coarse-textured, and well-drained with a high percentage of rock fragments. The soil surface has a high cover of pea-sized gravel and sand with cobbles. Parent material is colluvium and residuum derived from a unique, highly fractured, hydrothermally altered basalt lava. Chemically, this substrate is alkaline with low organic matter and high cation-exchange capacity of calcium and soluble sodium.

Classification Comments: Stands in this alliance may be too sparse to be classified as dwarf-shrublands (Daubenmire 1970, Johnson and Simon 1987).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Largely unvegetated sites (90%) characterized by nearly sparsely vegetated dwarf-shrublands of portions of the Snake and Imnaha river canyons in Idaho and eastern Oregon and Washington with *Eriogonum microthecum* as the most consistent dominant. Some stands may have *Eriogonum strictum* as the dominant species.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance has sparse to moderately sparse cover of dwarf-shrubs. There is also a sparse cover of perennial forbs. Annual forbs and grasses are seasonally present in small amounts.

Floristics: Vegetation included in this minor alliance has a sparse woody layer (usually less than 0.5 m tall) that is dominated by the dwarf-shrub *Eriogonum microthecum*. Some stands may have *Eriogonum strictum* instead of, or in addition to, *Eriogonum microthecum*. The herbaceous layer is also sparse (typically <10% cover). It is composed of a relatively even mix of forbs and grasses. Other characteristic species include forbs, such as *Achillea millefolium*, *Chaenactis douglasii*, *Erysimum asperum*, *Oenothera caespitosa*, *Phacelia heterophylla*, *Polygonum douglasii*, *Physaria oregona*, and the grass *Pseudoroegneria spicata*. *Poa bulbosa* is common in spring. Moss and lichen are nearly absent, likely because of the instability of the slopes. Exotic species, namely *Bromus tectorum*, often make up a significant portion of the vegetation cover in these stands.

ENVIRONMENT & DYNAMICS

Environmental Description: These sparse dwarf-shrublands occur in portions of the Snake and Imnaha river canyons in Idaho and eastern Oregon and Washington. Elevations range from 230-730 m, and the climate is temperate continental. Mean annual precipitation is approximately 25-30 cm. Precipitation primarily occurs in the winter as snow or rain. This moisture is stored in the soil profile and utilized during the typically dry summers. Stands are typically found on highly weathered basalt outcrops in the canyons. Sites are very hot and dry, occurring on moderate to steep (30-60%) slopes with southern or western aspects. Soils are very shallow (less than 15 cm), well-drained, with a high percentage of rock fragments (approximately 35%) (lithic). Soil texture ranges from gravelly sand to gravelly sandy loam. The soil surface has a high cover of pea-sized gravel and sand (approximately 70%) with cobbles. Parent material is colluvium and residuum derived from a unique, highly fractured, hydrothermally altered basalt lava. Chemically, this substrate is alkaline (pH 7-7.9) with low organic matter and high cation-exchange capacity of calcium and soluble sodium.

Dynamics: Stands are restricted to hot/dry, moderately steep slopes with a coarse-textured unstable substrate. The native vegetation is too sparse to carry fire, and the sites are too steep to be accessible to livestock (Daubenmire 1970, Johnson and Simon 1987). The biggest threat is exotic plants that have invaded many stands. Common exotics include annual grasses such as *Bromus tectorum*, *Bromus briziformis*, and annual forbs such as *Erodium cicutarium*, *Lactuca serriola*, and *Holosteum umbellatum*. *Bromus tectorum* is moderately dense on some stands and could possibly be dense enough to carry a fire.

DISTRIBUTION

Geographic Range: This is a minor alliance found on a limited and unique substrate in the vicinity of the Snake River Canyon at the boundaries of Idaho, Oregon, and Washington states.

Nations: US

States/Provinces: ID, OR, WA

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Eriogonum microthecum*-*Physaria oregana* habitat type (Daubenmire 1970)
- ? *Eriogonum* spp./*Physaria oregana* Habitat Type (Johnson and Simon 1987)

LOWER LEVEL UNITS

Associations:

- CEG001737 *Eriogonum microthecum* - *Physaria oregana* Dwarf-shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Daubenmire 1970, Faber-Langendoen et al. 2017b, Johnson and Simon 1987

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G307. Columbia Plateau Scabland Dwarf-shrubland

A1568. *Eriogonum* spp. / *Poa secunda* Dwarf-shrub Steppe Alliance

Type Concept Sentence: Grasslands included in this alliance occur in the Columbia Basin of eastern Washington, eastern Oregon, Idaho and into western Wyoming. The herbaceous layer is dominated or codominated by the cool-season, perennial bunchgrass *Poa secunda*. Codominant species may include one or more *Eriogonum* dwarf-shrub species.

OVERVIEW

Scientific Name: *Eriogonum* spp. / *Poa secunda* Dwarf-shrub Steppe Alliance

Common Name (Translated Scientific Name): Buckwheat species / Sandberg Bluegrass Dwarf-shrub Steppe Alliance

Colloquial Name: Buckwheat / Sandberg Bluegrass Dwarf-shrub Steppe

Type Concept: Stands have a sparse to moderately dense, short herbaceous layer (10-60% cover) with a very sparse to moderately dense dwarf-shrub layer (2-40% cover). The herbaceous layer is dominated or codominated by the cool-season, perennial bunchgrass *Poa secunda*. Codominant species may include one or more *Eriogonum* dwarf-shrub species. Associates include perennial graminoids such as *Elymus elymoides* and *Pseudoroegneria spicata* and perennial forbs. Scattered dwarf-shrubs and shrubs such as *Artemisia rigida*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), and *Nestotus stenophyllus* (= *Stenotus stenophyllus*) may be present. Moss and lichen cover in undisturbed stands is often high and ranges from 5-60% cover. Adjacent stands include other grasslands dominated by *Festuca idahoensis*, *Pseudoroegneria spicata*, or other perennial grasses, shrublands dominated by *Artemisia tridentata* or woodlands dominated by *Pinus ponderosa*. Grasslands included in this alliance occur in the Columbia Basin of eastern Washington, eastern Oregon, Idaho and into western Wyoming. Stands also likely occur in northeastern California. These grasslands are characteristic of the scablands in the Columbia Basin and portions of the Snake River plain, but extend east into Wyoming. Elevations range from 280-1650 m. Climate is temperate and continental, with mean annual precipitation ranging from 33-60 cm. Precipitation primarily occurs in the winter as snow or rain. Stands are found on flat to undulating ridgetops, plateaus, plains, and benches on steep canyon slopes. Sites are nearly level to moderately sloping (to 15%), but these communities may also occur in soil pockets between rocks on cliffs lining the sides of ravines. They occur on all aspects, but are more common on southern slopes. Soils are shallow with a high percentage of rock fragments and exposed rock (lithic soil). They are moderately to well-drained, sandy to clay loams, non-calcareous, and derived from alluvium, colluvium, residuum or loess. Parent materials include basalt lava.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types: This alliance is very similar to *Artemisia rigida* Steppe & Shrubland Alliance (A1574) in species composition, but is distinguished by having *Eriogonum* sp. as the dominant shrub.

- A1574 *Artemisia rigida* Steppe & Shrubland Alliance: is very similar but dominated by *Artemisia rigida*.

Diagnostic Characteristics: Sparse to dense herbaceous layer dominated by *Poa secunda* with a sparse to moderately dense layer of *Eriogonum* sp. occurring in the Columbia Basin steppe.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by a very sparse to moderately dense dwarf-shrub layer (2-40% cover) and a sparse to moderately dense herbaceous layer (10-60% cover). The herbaceous layer is dominated by perennial bunch grasses less than 0.5 m tall. There is also a sparse to moderate cover of perennial forbs. Scattered shrubs may be present. Annual forbs and grasses are seasonally present. Moss and lichen cover in undisturbed stands is often high and ranges from 5-60% cover.

Floristics: Stands have a sparse to moderately dense, short herbaceous layer (10-60% cover) with a very sparse to moderately dense dwarf-shrub layer (2-40% cover). The herbaceous layer is dominated or codominated by the cool-season, perennial bunchgrass *Poa secunda*. Codominant species may include one or more *Eriogonum* dwarf-shrub species such as *Eriogonum compositum*, *Eriogonum douglasii*, *Eriogonum niveum*, *Eriogonum sphaerocephalum*, *Eriogonum strictum*, and *Eriogonum thymoides*. Scattered dwarf-shrubs and shrubs such as *Artemisia rigida*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), and *Nestotus stenophyllus* (= *Stenotus stenophyllus*) may be present. Associates include perennial graminoids such as *Elymus elymoides* and *Pseudoroegneria spicata*; perennial forbs such as *Achillea millefolium*, *Antennaria dimorpha*, *Antennaria luzuloides*, *Balsamorhiza incana*, *Erigeron chrysopsidis*, *Erigeron disparipilus*, *Lomatium cous*, *Lomatium bicolor* var. *leptocarpum* (= *Lomatium leptocarpum*), *Phlox hoodii*, *Sedum lanceolatum*, *Sedum stenopetalum*; and the annual forbs *Collinsia parviflora*, *Epilobium brachycarpum* (= *Epilobium paniculatum*), *Idahoia scapigera*, *Microsteris gracilis*, and *Plantago patagonica*. Moss and lichen cover in undisturbed stands is often high and ranges from 5-60% cover.

ENVIRONMENT & DYNAMICS

Environmental Description: These grasslands are characteristic of the scablands in the Columbia Basin and portions of the Snake River plain, but extend east into Wyoming. Elevations range from 280-1650 m. Climate is temperate continental, with mean annual precipitation ranging from 33-60 cm. Precipitation primarily occurs in the winter as snow or rain. This moisture is stored in the soil profile and utilized during the typically dry summers. Stands are found on flat to undulating ridgetops, plateaus, plains, and benches on steep canyon slopes. Sites are nearly level to moderately sloping (to 15%), but these communities may also occur in soil pockets between rocks on cliffs lining the sides of ravines. They occur on all aspects, but are more common on southern slopes. Soils are shallow (less than 30 cm deep) with a high percentage of rock fragments (approximately 35%) and exposed rock (10-90%) (lithic soil).

They are moderately to well-drained, sandy to clay loams, and non-calcareous, with pH of 5.9-7.4. They are derived from alluvium, colluvium, residuum or loess. Parent materials include basalt lava.

Dynamics: Stands in this alliance are generally considered to be late-seral with species composition controlled by the harsh edaphic conditions of the site (Daubenmire 1970, Johnson and Simon 1987). With disturbance comes an increase in erosion pavement and bare ground, and a decrease in moss cover (Daubenmire 1970, Johnson and Simon 1987). These xeric grasslands have shallow rocky soils with limited water-holding capacity. The winter precipitation wets these soils, but they typically dry out completely to bedrock by mid-summer (Daubenmire 1970, 1992, Johnson and Simon 1987). *Poa secunda* is well-adapted to these conditions, initiating growth early in the spring and completing its reproductive cycle early while there is still moisture in the soil (Daubenmire 1970, 1992, Johnson and Simon 1987). If there is late-summer or fall precipitation, *Poa secunda* can respond quickly and green up (Daubenmire 1970). Johnson and Simon (1987) suggest that basalt bedrock present under these dwarf-shrub/grassland stands is fractured enough to support deeper-rooted dwarf-shrubs. In addition to drought tolerance, *Poa secunda* is also tolerant of grazing and trampling by livestock (Daubenmire 1970, Ganskopp 1979). Other disturbances include frost heaving and exotic species invasion. Frost heaving causes local soil disturbance in the winter when these thin, saturated soils freeze and push soil and plants up out of the ground. Exotic plants have invaded many stands especially where disturbed. Common exotics include annual grasses such as *Bromus tectorum*, *Bromus arvensis*, and *Bromus briziformis*, which may be abundant during wet years, and annual forbs such as *Epilobium brachycarpum*, *Erodium cicutarium*, *Lactuca serriola*, *Tragopogon dubius*, and the perennial forb *Hypericum perforatum*. Fire is thought to be unimportant because it is unlikely that the sparse vegetation in these stands could carry a fire.

DISTRIBUTION

Geographic Range: This alliance occurs in the Columbia Basin of eastern Washington, eastern Oregon, Idaho and into western Wyoming. Stands also likely occur in northeastern California.

Nations: US

States/Provinces: CA?, ID, OR, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< One-sided Bluegrass Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- C EGL001786 *Eriogonum niveum* / *Poa secunda* Dwarf-shrub Grassland
- C EGL001788 *Eriogonum strictum* / *Poa secunda* Dwarf-shrub Grassland
- C EGL001448 *Eriogonum sphaerocephalum* / *Poa secunda* Dwarf-shrub Grassland
- C EGL001785 *Eriogonum douglasii* / *Poa secunda* Dwarf-shrub Grassland
- C EGL001784 *Eriogonum compositum* / *Poa secunda* Dwarf-shrub Grassland
- C EGL001449 *Eriogonum thymoides* / *Poa secunda* Dwarf-shrub Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Daubenmire 1970, Daubenmire 1992, Faber-Langendoen et al. 2017b, Ganskopp 1979, Johnson and Simon 1987, Sawyer and Keeler-Wolf 1995

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G307. Columbia Plateau Scabland Dwarf-shrubland

A1129. *Salvia dorrii* Dwarf-shrubland Alliance

Type Concept Sentence: This alliance occurs in Oregon in the High Lava Plains, and the southern canyonlands of the Columbia Basin and at isolated spots throughout the Blue Mountains where *Salvia dorrii* is the dominant shrub.

OVERVIEW

Scientific Name: *Salvia dorrii* Dwarf-shrubland Alliance

Common Name (Translated Scientific Name): Purple Sage Dwarf-shrubland Alliance

Colloquial Name: Purple Sage Dwarf-shrubland

Type Concept: In Oregon, this is a somewhat common scabland alliance found from roughly 300-1670 m in elevation. The alliance is often in a mosaic with *Pseudoroegneria spicata* canyon grassland or shrub-steppe communities, but occasionally is found in *Juniperus* woodlands or *Pinus ponderosa* forests. *Salvia dorrii* is the dominant shrub, but cover or abundance information is not available. *Poa secunda* and *Pseudoroegneria spicata* are the dominant grasses, making up most of the herbaceous cover. *Achnatherum hendersonii* (= *Stipa hendersonii*) and *Danthonia unispicata* are occasionally important. Forb species can include *Lewisia rediviva*, *Physaria oregona*, *Trifolium macrocephalum*, *Viola trinervata*, and species of *Arenaria*, *Collomia*, *Erigeron*, and *Lomatium*, all early-blooming species. Many forb species are largely restricted to these environments. It occurs on barren, fairly young basalts or shallow loams over basalt. Sites include ridgetops and steeper sites with rock outcrops. Extreme topo-edaphic drought is the major process influencing these communities.

Classification Comments: This is a poorly documented alliance. The Oregon Natural Heritage Program reports they have plot data collected from a few stands (J. Kagan pers. comm.), and that the alliance occurs on the John Day Fossil Beds National Monument. Further inventory and documentation are needed. Information from California must be reviewed for inclusion in this description to determine if occurrences there represent the same alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Small-patch inclusions within matrix forests and woodlands characterized by dwarf-shrublands of *Salvia dorrii* typically with grassy understories occurring on barren, usually fairly young basalts or shallow loams over basalt.

VEGETATION

Physiognomy and Structure: This alliance is composed of low-shrub communities (<0.5 m) or shrub-bunchgrass mosaics, in which the shrubs are dominant or codominant with an understory of very short grasses and forbs. Soil cryptogams can be abundant in some stands, especially where undisturbed.

Floristics: This alliance is poorly documented, and the following information is from Chappell et al. (1997). *Salvia dorrii* is the dominant shrub, but cover or abundance information is not available. *Poa secunda* and *Pseudoroegneria spicata* are the dominant grasses, making up most of the herbaceous cover. *Achnatherum hendersonii* (= *Stipa hendersonii*) and *Danthonia unispicata* are occasionally important. Forb species can include *Lewisia rediviva*, *Physaria oregona*, *Trifolium macrocephalum*, *Viola trinervata*, and species of *Arenaria*, *Collomia*, *Erigeron*, *Lomatium*, and *Arenaria*, all early-blooming species. Many forb species are largely restricted to these environments.

ENVIRONMENT & DYNAMICS

Environmental Description: This is a somewhat common scabland shrubland alliance found from roughly 300-1670 m in elevation. It occurs on barren, usually fairly young basalts or shallow loams over basalt. Sites include ridgetops and steeper sites with rock outcrops. Extreme topo-edaphic drought is the major process influencing these communities.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance occurs in Oregon in the High Lava Plains, and the southern canyonlands of the Columbia Basin and at isolated spots throughout the Blue Mountains. The alliance has also been reported from the northeastern Mojave Desert in southern California. It may also be found in northern California and adjacent areas of Washington, but has not been documented from either area.

Nations: US

States/Provinces: CA?, OR, WA?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL**USNVC Confidence Level with Comments:** Low.**SYNONYMY**

- ? *Salvia dorrii* (Desert purple sage scrub) Alliance (Sawyer et al. 2009) [33.320.00]

LOWER LEVEL UNITS**Associations:**

- CEG001453 *Salvia dorrii* / *Pseudoroegneria spicata* Dwarf-shrubland
- CEG002965 *Salvia dorrii* Dwarf-shrubland

AUTHORSHIP**Primary Concept Source:** M.S. Reid, in Faber-Langendoen et al. (2013)**Author of Description:** M.E. Hall**Acknowledgments:****Version Date:** 2014/03/14**REFERENCES****References:** Chappell et al. 1997, Faber-Langendoen et al. 2017b, Kagan pers. comm., Sawyer et al. 2009

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.2.b. M170 Great Basin-Intermountain Dwarf Sagebrush Steppe & Shrubland

G308. Intermountain Low & Black Sagebrush Steppe & Shrubland

Type Concept Sentence: This broadly defined semi-arid sagebrush dwarf-shrubland and steppe occurs throughout much of the intermountain western U.S. and is characterized by an open to moderately dense shrub or dwarf-shrub layer that is typically dominated by one of the following: *Artemisia arbuscula ssp. arbuscula*, *Artemisia arbuscula ssp. longicaulis*, *Artemisia arbuscula ssp. longiloba*, *Artemisia arbuscula ssp. thermopola*, *Artemisia bigelovii*, *Artemisia frigida*, *Artemisia nova*, or *Artemisia tripartita ssp. rupicola* depending on environment and range of species.

OVERVIEW**Scientific Name:** *Artemisia arbuscula* - *Artemisia bigelovii* - *Artemisia nova* Steppe & Shrubland Group**Common Name (Translated Scientific Name):** Little Sagebrush - Bigelow's Sagebrush - Black Sagebrush Steppe & Shrubland Group**Colloquial Name:** Little Sagebrush Steppe & Shrubland

Type Concept: This broadly defined semi-arid dwarf-shrubland and steppe occurs throughout much of the intermountain western U.S. The vegetation in this broadly defined shrubland and steppe group includes an open to moderately dense shrub or dwarf-shrub layer with a sparse to dense herbaceous layer. Several different taxa of sagebrush may dominate depending on location and by habitat. *Artemisia nova* is most widespread, occurring throughout most of the region on mid- to low-elevation, gravelly, calcareous soils. *Artemisia arbuscula ssp. arbuscula* occurs on low- to high-elevation sites often on shallow, fine-textured soils with a dense clay layer that impedes drainage in spring. *Artemisia arbuscula ssp. longiloba* is widespread in the Columbia Basin and Great Basin into southwestern Wyoming and badlands in the western Great Plains. It occurs on shallow, alkaline, calcareous soils derived from shale. *Artemisia bigelovii* occurs throughout much of the Colorado Plateau and extends across northern New Mexico and southeastern Colorado on shallow soils on limestone hills and shale outcrops. Several other more restricted taxa include *Artemisia tripartita ssp. rupicola*, *Artemisia arbuscula ssp. longicaulis*, *Artemisia arbuscula ssp. thermopola*, and *Artemisia frigida*. Other shrubs present to codominant may include *Artemisia tridentata ssp. wyomingensis*, *Artemisia tridentata ssp. vaseyana*, *Ephedra torreyana*, *Ephedra viridis*, *Grayia spinosa*, or *Purshia tridentata*, depending on habitat. The herbaceous layer, if present, ranges from sparse cushion plants such as *Arenaria hookeri*, *Eriogonum brevicaulis*, and *Phlox hoodii* to moderate to dense cover of perennial grasses. Characteristic grasses include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Some stands have significant biological crust formation on the soil surface. Sites are generally xeric and may be wind-blown ridges and benches, gravelly alluvial fans, hilltops, canyons, gravelly draws, and dry flats. Substrates are typically shallow, gravelly or finer-textured alkaline, calcareous soils. Most stands occur from 1000 to 3000 m elevation with some extending to 3800 m in subalpine and alpine habitats of the Sierra Nevada. Substrates are variable, but are typically alluvium derived from limestone, shale, basalt, rhyolite or volcanics.

Classification Comments: Alliances in this group are distinguished largely by the predominant species: *Artemisia nova*, *Artemisia bigelovii*, and the nominal subspecies of *Artemisia arbuscula*, and by the importance of the perennial graminoid layer (>20% cover) in the shrub herbaceous alliances. The *Artemisia arbuscula* subspecies are distinguished by the nominal subspecies taxonomically and by the different environments which they occupy. *Artemisia arbuscula ssp. longicaulis* Shrubland Alliance (A2548) occurs in

more alkaline and less stony settings than *Artemisia arbuscula ssp. arbuscula* Steppe & Shrubland Alliance (A3219). *Artemisia arbuscula ssp. thermopola* - *Artemisia papposa* / *Festuca idahoensis* Steppe & Shrubland Alliance (A4122) occurs in more calcareous soils and has a restricted distribution. Beetle and Johnson (1982) report that *Artemisia arbuscula ssp. arbuscula* grows in soils with a high volume of gravel (even though soil may be in clay textural class, or contain a clay-rich layer that impedes drainage), and that *Artemisia arbuscula ssp. longiloba* grows in clay soils, often alkaline, that contain no gravels.

Similar NVC Types:

Diagnostic Characteristics: This group has an open to moderately dense shrub or dwarf-shrub layer with a sparse to dense herbaceous layer. Several different taxa of sagebrush are diagnostic depending on location and by habitat: *Artemisia nova*, *Artemisia arbuscula ssp. arbuscula*, *Artemisia arbuscula ssp. longiloba*, *Artemisia arbuscula ssp. longicaulis*, *Artemisia bigelovii*, *Artemisia tripartita ssp. rupicola*, *Artemisia arbuscula ssp. longicaulis*, *Artemisia arbuscula ssp. thermopola*, and *Artemisia frigida*. In all cases, these sagebrush taxa tend to occur in shallow, rocky, calcareous or alkaline soils, often fine-textured and sometimes with a claypan impeding drainage. Associated herbaceous taxa are semi-desert grasses and forbs.

VEGETATION

Physiognomy and Structure: The vegetation in this broadly defined shrubland and steppe group includes an open to moderately dense shrub or dwarf-shrub layer dominated by microphyllous evergreen shrubs with a sparse to dense herbaceous layer usually dominated by perennial graminoids (often bunch grasses).

Floristics: This broadly defined shrubland and steppe group includes an open to moderately dense shrub or dwarf-shrub layer with a sparse to dense herbaceous layer. Several different taxa of sagebrush may dominate depending on location and by habitat. *Artemisia nova* is most widespread, occurring throughout most of the region on mid- to low-elevation, gravelly, calcareous soils. *Artemisia arbuscula ssp. arbuscula* occurs on low- to high-elevation sites often on shallow, fine-textured soils with a dense clay layer that impedes drainage in spring. *Artemisia arbuscula ssp. longiloba* is widespread in the Columbia Basin and Great Basin into southwestern Wyoming and badlands in the western Great Plains. It occurs on shallow, alkaline, calcareous soils derived from shale. *Artemisia bigelovii* occurs throughout much of the Colorado Plateau and extends across northern New Mexico and southeastern Colorado on shallow soils on limestone hill and shale outcrops. Several other more restricted taxa may dominate, including *Artemisia tripartita ssp. rupicola* (central Wyoming), *Artemisia arbuscula ssp. longicaulis* (Lahontan Basin of northwestern Nevada, southeastern Oregon, and northeastern California), *Artemisia arbuscula ssp. thermopola* (ridgetops and benches in mountains at 1830 to 2690 m in southern Idaho), and *Artemisia frigida* (described from sites in the Rocky Mountains). Other shrubs present to codominant may include *Artemisia tridentata ssp. wyomingensis*, *Artemisia tridentata ssp. vaseyana*, *Ephedra torreyana*, *Ephedra viridis*, *Grayia spinosa*, or *Purshia tridentata*, depending on habitat. The herbaceous layer is variable. If present, it ranges from sparse cushion plants such as *Arenaria hookeri*, *Astragalus bisulcatus*, *Astragalus jejunus*, *Eriogonum brevicaulis*, *Minuartia nuttallii* (= *Arenaria nuttallii*), *Phlox hoodii*, *Stenotus acaulis*, and *Trifolium gymnocarpon* to moderate to dense cover of perennial grasses. Characteristic grasses may include *Achnatherum hymenoides*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Elymus elymoides*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus salinus*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Some stands have significant biological crust formation on soil surface.

ENVIRONMENT & DYNAMICS

Environmental Description: This broadly defined semi-arid dwarf-shrubland and steppe group occurs throughout much of the intermountain western U.S. Sites are generally xeric and may be on wind-blown, shallow, gravelly or finer-textured alkaline soils. Throughout eastern Oregon, northern Nevada, southern Idaho, western Montana, western Wyoming, and western Colorado, stands typically occur on mountain ridges and flanks and broad terraces, ranging from 1000 to 3000 m in elevation with stands extending to 3800 m elevation in subalpine and alpine habitats of the Sierra Nevada. Substrates are shallow, fine-textured soils, poorly drained clays, shallow-soiled areas, almost always very stony, characterized by recent rhyolite or basalt or are alkaline soils derived from shale (Zamora and Tueller 1973, Baker and Kennedy 1985). In central and southern Wyoming, typical sites are very windy, gently rolling hills and long, gently sloping pediments and fans with shallow, often rocky soils where this group forms the matrix vegetation and large patches on the margins of high-elevation basins. In higher elevation areas, it forms a mosaic with Intermountain Mountain Big Sagebrush Steppe & Shrubland Group (G304) and is restricted to wind-blown ridges. In the Colorado Plateau, Tavaputs Plateau and Uinta Basin, stands occur in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m. Soils are often rocky, shallow, and alkaline. This group also extends across northern New Mexico and Wyoming into the western Great Plains on limestone hills and shale outcrops.

Dynamics: This broadly defined semi-arid dwarf-shrubland and steppe group occurs throughout much of the intermountain western U.S. Sites are generally xeric and may be on wind-blown, shallow, gravelly or finer-textured alkaline soils. Throughout eastern Oregon, northern Nevada, southern Idaho, western Montana, western Wyoming, and western Colorado, stands typically occur on mountain ridges and flanks and broad terraces, ranging from 1000 to 3000 m in elevation with stands extending to 3800 m elevation

in subalpine and alpine habitats of the Sierra Nevada. Substrates are shallow, fine-textured soils, poorly drained clays, shallow-soiled areas, almost always very stony, characterized by recent rhyolite or basalt or are alkaline soils derived from shale (Zamora and Tueller 1973, Baker and Kennedy 1985). In central and southern Wyoming, typical sites are very windy, gently rolling hills and long, gently sloping pediments and fans with shallow, often rocky soils where this group forms the matrix vegetation and large patches on the margins of high-elevation basins. In higher elevation areas, it forms a mosaic with Intermountain Mountain Big Sagebrush Steppe & Shrubland Group (G304) and is restricted to wind-blown ridges. In the Colorado Plateau, Tavaputs Plateau and Uinta Basin, stands occur in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m. Soils are often rocky, shallow, and alkaline. This group also extends across northern New Mexico and Wyoming into the western Great Plains on limestone hills and shale outcrops.

DISTRIBUTION

Geographic Range: This broadly defined semi-arid dwarf-shrubland and steppe group occurs throughout much of the intermountain western U.S.

Spatial Scale & Pattern [optional]: Large patch

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WY

TNC Ecoregions [optional]: 6:C, 8:C, 9:C, 10:C, 11:C, 12:P, 17:P, 18:C, 19:C, 20:C, 21:P, 26:C, 27:C, 28:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313D:CC, 315A:C?, 315B:CC, 315H:CC, 321A:CC, 331A:CC, 331B:CC, 331F:CC, 331G:CC, 331K:CP, 331L:C?, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341E:CP, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CP, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:CC, M261G:CC, M313A:CC, M313B:CC, M331A:C?, M331B:CC, M331D:CC, M331E:CC, M331F:CP, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:??, M341A:CC, M341B:CC, M341C:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. USNVC Confidence from peer reviewer, not AE. This is a very broad group and further review may suggest splitting into two or three groups.

SYNONYMY

- = Great Basin-Colorado Plateau sagebrush semi-desert (West 1983a)

LOWER LEVEL UNITS

Alliances:

- A3221 *Artemisia arbuscula ssp. longiloba* Steppe & Shrubland Alliance
- A3223 *Artemisia bigelovii* Steppe & Shrubland Alliance
- A3222 *Artemisia nova* Steppe & Shrubland Alliance
- A2548 *Artemisia arbuscula ssp. longicaulis* Shrubland Alliance
- A3219 *Artemisia arbuscula ssp. arbuscula* Steppe & Shrubland Alliance
- A2565 *Artemisia frigida* Dwarf-shrubland Alliance
- A4122 *Artemisia arbuscula ssp. thermopola - Artemisia papposa / Festuca idahoensis* Steppe & Shrubland Alliance

AUTHORSHIP

Primary Concept Source: N.E. West (1983a)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: KAS 3-10, 11-15

REFERENCES

References: Baker and Kennedy 1985, Beetle and Johnson 1982, Brown 1982a, Brown et al. 1979, Dick-Peddie 1993, Faber-Langendoen et al. 2017a, Francis 1986, Jones 1992b, Knight 1994, Knight et al. 1987, Shiflet 1994, West 1983a, West 1983c, Zamora and Tueller 1973

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland
G308. Intermountain Low & Black Sagebrush Steppe & Shrubland

A3219. *Artemisia arbuscula* ssp. *arbuscula* Steppe & Shrubland Alliance

Type Concept Sentence: Shrublands dominated by *Artemisia arbuscula* ssp. *arbuscula* often in association with *Artemisia tridentata*. This widespread alliance is known from cold, dry areas of the Intermountain West, as well as in dry alpine and subalpine habitats of the Sierra Nevada.

OVERVIEW

Scientific Name: *Artemisia arbuscula* ssp. *arbuscula* Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Little Sagebrush Steppe & Shrubland Alliance

Colloquial Name: Little Sagebrush Steppe & Shrubland

Type Concept: Structurally, this alliance may be shrub-herbaceous or shrub-dominated. The woody layer consists mainly of the low shrub *Artemisia arbuscula* ssp. *arbuscula*, although *Artemisia tridentata* ssp. *vaseyana* or *Artemisia tridentata* ssp. *wyomingensis* may codominate some stands. Other shrub associates may include *Artemisia nova*, *Chrysothamnus* spp., *Ephedra viridis*, *Gutierrezia sarothrae*, *Juniperus occidentalis*, *Juniperus osteosperma*, *Purshia tridentata*, and *Tetradymia canescens*. Perennial grasses dominate the understory which may be sparse to very dense. Dominant to common grass species include *Achnatherum thurberianum* (= *Stipa thurberiana*), *Festuca idahoensis*, *Leymus salinus* ssp. *salmonis*, *Pascopyrum smithii*, *Poa secunda*, *Pseudoroegneria spicata*, and *Elymus elymoides* (in areas in poor condition). *Agoseris glauca*, *Allium* spp., *Antennaria rosea*, *Balsamorhiza sagittata*, *Castilleja angustifolia*, *Phlox hoodii*, and *Phlox longifolia* are common forb species. This widespread alliance is known from cold, dry areas of the Intermountain West, as well as in dry alpine and subalpine habitats of the Sierra Nevada. Stands typically occur on shallow, rocky, poorly drained soils on a variety of landforms, from flats and depressions to slopes, ridges or alpine fell-fields. Soils are usually shallow, rocky clays, often with an impenetrable layer at less than 60 cm depth. Poor drainage often leads to perched water tables in the spring, which may control the distribution of the vegetation in this alliance and explain its patchy distribution.

Classification Comments: This widespread alliance is poorly documented in northern Nevada, and additional fieldwork is needed there.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: This alliance occurs throughout the Intermountain West. Diagnostic of this alliance is the *Artemisia arbuscula* ssp. *arbuscula*-dominated low-shrub layer (or codominated with >40% relative shrub cover). Graminoids dominate the understory and cover may be open to very dense.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a sparse to moderate microphyllous evergreen dwarf-shrub canopy (0.1-0.4 m in height). Cespitose graminoids dominate the understory with cover ranging from 10-70% and 0.3-1.0 m tall.

Floristics: Structurally, these communities may be shrub- or shrub-herbaceous-dominated. The woody layer consists mainly of the low shrub *Artemisia arbuscula* ssp. *arbuscula*, although *Artemisia tridentata* ssp. *vaseyana* or *Artemisia tridentata* ssp. *wyomingensis* may codominate some stands. Other shrub associates may include *Artemisia nova*, *Chrysothamnus* spp., *Ephedra viridis*, *Gutierrezia sarothrae*, *Juniperus occidentalis*, *Juniperus osteosperma*, *Purshia tridentata*, and *Tetradymia canescens*. The understory vegetation is characterized by a moderate to dense herbaceous layer dominated by perennial graminoids with sparse to dense cover ranging from 10-70%. Dominant to common grass species include *Achnatherum thurberianum* (= *Stipa thurberiana*), *Danthonia californica*, *Festuca idahoensis*, *Leymus salinus* ssp. *salmonis*, *Pascopyrum smithii*, *Poa secunda*, *Pseudoroegneria spicata*, and *Elymus elymoides* (in areas in poor condition). Other grass species may include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bromus carinatus*, *Danthonia unispicata*, *Hesperostipa comata* (= *Stipa comata*), *Koeleria macrantha*, and *Leymus ambiguus*. Forbs are generally much less important, but occasionally frequent. Common species include *Achillea millefolium*, *Agoseris glauca*, *Allium* spp., *Antennaria rosea*, *Balsamorhiza sagittata*, *Castilleja angustifolia*, *Lupinus caespitosus*, *Penstemon speciosus*, *Phlox hoodii*, *Phlox longifolia*, *Polygonum* spp., and *Stenotus acaulis* (= *Haplopappus acaulis*).

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is widespread in the Intermountain West, as well as in dry alpine habitats of the Sierra Nevada between 1500 and 3800 m in elevation. Precipitation ranges from 15-50(150) cm annually, with a large proportion falling as winter snow. Sawyer and Keeler-Wolf (1995) report *Artemisia arbuscula* shrublands to be associated with flats, depressions, slopes, and ridges, and that soils are either very shallow or quite poorly drained. Soils are usually shallow, rocky clays, often with an impenetrable layer at less than 60 cm depth. Beetle and Johnson (1982) report that *Artemisia arbuscula* ssp. *arbuscula* grows in soils with a high volume of gravel (even though soil may be in clay textural class, or contain a clay-rich layer that impedes drainage). Poor

drainage often leads to elevated water tables in the spring, which may control the distribution of the vegetation in this alliance. Poor drainage may explain the occurrence of patches of *Artemisia arbuscula* shrublands in *Pinus ponderosa* woodlands or *Artemisia tridentata* shrublands. In alpine settings, the vegetation often occurs in xeric sites where snow cover is blown off or lost to sublimation.

Dynamics: Due to the low-shrub stature of *Artemisia arbuscula*, this dwarf-shrubland alliance is less susceptible to natural fire than taller *Artemisia* spp. shrublands. Grazing appears to have little effect on shrub densities, but tends to decrease the importance of tall bunch grasses and increase the cover of *Chrysothamnus* spp., forbs, and non-native grasses (*Poa bulbosa* and *Poa pratensis*). Heavy livestock grazing may deplete the perennial graminoid layer and convert stands that are shrub-herbaceous in structure to those which are strictly shrub-dominated.

DISTRIBUTION

Geographic Range: The vegetation in this alliance is presently reported from much of the Intermountain West as far west as California and Washington and south to Colorado.

Nations: US

States/Provinces: CA, CO, ID, MT, NM?, NV, OR, UT?, WA, WY

TNC Ecoregions [optional]: 4:C, 5:C, 6:C, 11:C, 12:C, 14:C

USFS Ecoregions (2007): 341D:CC, 341Fc:CCC, 341Ff:CCC, 342B:CC, M261A:CC, M261B:CC, M261D:CC, M261E:CC, M261G:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Great Basin)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Artemisia arbuscula* ssp. *arbuscula* (Little sagebrush scrub) Alliance (Sawyer et al. 2009) [35.120.00]
- = *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (Evens et al. 2014)
- = *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (CNPS 2017) [35.120.00]
- >< Low Sagebrush Series (Sawyer and Keeler-Wolf 1995)
- < SRM Cover Type #406 - Low Sagebrush (Shiflet 1994)
- >< Subalpine Sagebrush Scrub (#35220) (Holland 1986b)
- >< White Mountain Fell-Field (#91140) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEGLO02983 *Artemisia arbuscula* ssp. *arbuscula* - *Artemisia tridentata* ssp. *wyomingensis* / *Festuca idahoensis* Shrubland
- CEGLO03482 *Artemisia arbuscula* ssp. *arbuscula* / *Linanthus pungens* Shrubland
- CEGLO03483 *Artemisia arbuscula* ssp. *arbuscula* / *Eriogonum microthecum* Shrubland
- CEGLO01412 *Artemisia arbuscula* ssp. *arbuscula* / *Pseudoroegneria spicata* Shrub Grassland
- CEGLO01409 *Artemisia arbuscula* ssp. *arbuscula* / *Festuca idahoensis* Shrub Grassland
- CEGLO01518 *Artemisia arbuscula* ssp. *arbuscula* - *Purshia tridentata* / *Pseudoroegneria spicata* - *Festuca idahoensis* Shrub Grassland
- CEGLO01411 *Artemisia arbuscula* ssp. *arbuscula* / *Poa secunda* Shrub Grassland
- CEGLO02982 *Artemisia arbuscula* ssp. *arbuscula* - *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Shrubland
- CEGLO01413 *Artemisia arbuscula* ssp. *arbuscula* / *Achnatherum thurberianum* Shrub Grassland
- CEGLO05473 *Artemisia arbuscula* ssp. *arbuscula* / *Hesperostipa comata* Shrubland
- CEGLO01410 *Artemisia arbuscula* ssp. *arbuscula* / *Leymus salinus* ssp. *salmonis* Shrub Grassland

AUTHORSHIP

Primary Concept Source: D. Sarr, C. Jean, J. Kagan, P. Lyon, E. Peterson, K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Beetle and Johnson 1982, CNPS 2017, Cheng 2004, Evens et al. 2014, Faber-Langendoen et al. 2017b, Holland 1986b, Keeler-Wolf et al. 2003a, Major and Taylor 1977, Murray 1991, Sawyer and Keeler-Wolf 1995, Sawyer and Keeler-Wolf 2007, Sawyer et al. 2009, Shiflet 1994, Smith 1998b, Steinberg 2002a, Stillman 1980, Tisdale 1994b, West 1988, Young et al. 1977, Young et al. 2007b, Zamora and Tueller 1973

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G308. Intermountain Low & Black Sagebrush Steppe & Shrubland

A2548. *Artemisia arbuscula* ssp. *longicaulis* Shrubland Alliance

Type Concept Sentence: This shrubland alliance is dominated by a low-shrub layer of *Artemisia arbuscula* ssp. *longicaulis* and is known from cold, dry areas of the Intermountain West, in and around the Lahontan Basin of northwestern Nevada, southeastern Oregon, and northeastern California.

OVERVIEW

Scientific Name: *Artemisia arbuscula* ssp. *longicaulis* Shrubland Alliance

Common Name (Translated Scientific Name): Lahontan Sagebrush Shrubland Alliance

Colloquial Name: Lahontan Sagebrush Shrubland

Type Concept: The vegetation included in this shrubland alliance is dominated by a low-shrub layer that averages more than 5% cover of *Artemisia arbuscula* ssp. *longicaulis*. Little is known about this alliance, but shrub associates could presumably include *Artemisia arbuscula* ssp. *arbuscula*, *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex confertifolia*, *Chrysothamnus* spp., *Ephedra* spp., *Ericameria* spp., *Grayia spinosa*, *Lycium shockleyi*, *Picrothamnus desertorum*, *Sarcobatus vermiculatus* (= var. *baileyi*), and *Tetradymia* spp. The herbaceous layer is typically sparse, and perennial bunchgrasses may include *Achnatherum hymenoides*, *Achnatherum speciosum* (= *Stipa speciosa*), *Achnatherum thurberianum* (= *Stipa thurberiana*), *Elymus elymoides*, and *Poa secunda*. Forb cover is likely sparse. This alliance is known from cold, dry areas of the Intermountain West, in and around the Lahontan Basin of northwestern Nevada, southeastern Oregon, and northeastern California. Stands occur on alluvial fans, upland slopes and ridges. Soils are generally shallow and rocky.

Classification Comments: More survey and classification work are needed to fully describe this alliance. The information for this alliance comes entirely from the description of the subspecies (Winward and McArthur 1995) and is very brief. They provide the range of the subspecies, a number of frequent associates, and state that it often occurs in pure stands.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of this alliance is the *Artemisia arbuscula* ssp. *longicaulis*-dominated shrub layer that has over 5% cover of the nominal species that contributes at least 40% of the total shrub cover.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a sparse to moderately dense microphyllous evergreen dwarf-shrub canopy (0.1-0.4 m in height). Cespitose graminoids dominate the sparse understory.

Floristics: The vegetation included in this alliance is dominated by a low-shrub layer that averages more than 5% cover of *Artemisia arbuscula* ssp. *longicaulis*. Shrub associates could presumably include *Artemisia arbuscula* ssp. *arbuscula*, *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex confertifolia*, *Chrysothamnus* spp., *Ephedra* spp., *Ericameria* spp., *Grayia spinosa*, *Lycium shockleyi*, *Picrothamnus desertorum*, *Sarcobatus vermiculatus* (= var. *baileyi*), and *Tetradymia* spp. The herbaceous layer is likely sparse, and the perennial bunchgrasses may include *Achnatherum hymenoides*, *Achnatherum speciosum* (= *Stipa speciosa*), *Achnatherum thurberianum* (= *Stipa thurberiana*), *Elymus elymoides*, and *Poa secunda*. Forb cover is typically sparse.

ENVIRONMENT & DYNAMICS

Environmental Description: This shrubland alliance is known from cold, dry areas of the Intermountain West. Stands typically occur on alluvial fans, upland slopes and ridges from 1000-2000 m elevation. Precipitation ranges from 17-35 cm annually, with a large proportion falling as winter snow. The range of the subspecies corresponds strongly to the pluvial Lake Lahontan. *Artemisia arbuscula* ssp. *longicaulis* occurs primarily on Aridisols and Mollisols that are generally shallow and rocky.

Dynamics: Heavy grazing by livestock and other ground disturbance may increase the abundance of introduced annual grasses. Burning may result in conversion to a *Bromus tectorum* annual grassland.

DISTRIBUTION

Geographic Range: The diagnostic taxon for this alliance is known to occur in and around the Lahontan Basin in northwestern Nevada, southeastern Oregon, and northeastern California. The subspecies likely dominates the vegetation, forming this alliance, in all three states.

Nations: US

States/Provinces: CA, NV, OR

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Artemisia arbuscula ssp. longicaulis* (Lahontan sagebrush scrub) Provisional Alliance (Sawyer et al. 2009) [35.121.00]
- < SRM Cover Type #406 - Low Sagebrush (Shiflet 1994)

LOWER LEVEL UNITS

Associations:

- CEGL002986 *Artemisia arbuscula ssp. longicaulis* / *Elymus elymoides* Shrubland
- CEGL002984 *Artemisia arbuscula ssp. longicaulis* - *Grayia spinosa* Shrubland

AUTHORSHIP

Primary Concept Source: A.H. Winward and E.D. McArthur (1995)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b, Sawyer et al. 2009, Shiflet 1994, Winward and McArthur 1995

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G308. Intermountain Low & Black Sagebrush Steppe & Shrubland

A3221. Artemisia arbuscula ssp. longiloba Steppe & Shrubland Alliance

Type Concept Sentence: *Artemisia arbuscula ssp. longiloba* is dominant in the shrub canopy and is widespread in the Intermountain West, the southern Rocky Mountains, and in the western Great Plains.

OVERVIEW

Scientific Name: *Artemisia arbuscula ssp. longiloba* Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Alkali Sagebrush Steppe & Shrubland Alliance

Colloquial Name: Alkali Sagebrush Steppe & Shrubland

Type Concept: This shrub-herbaceous alliance occurs in the Intermountain West, into the southern Rocky Mountains and in the western Great Plains. The structure of these stands may be shrub-herbaceous or shrub-dominated. The shrub layer may be sparse to open and dominated by the low shrub *Artemisia arbuscula ssp. longiloba*. Shrub associates include *Artemisia nova*, *Artemisia tridentata ssp. vaseyana*, *Artemisia tridentata ssp. wyomingensis*, *Artemisia tripartita*, *Chrysothamnus viscidiflorus*, *Gutierrezia sarothrae*, and *Purshia tridentata*. Perennial grasses are dominant in the understory and may have sparse to very dense cover where they are more prominent than shrubs. Dominant to common grass species include *Danthonia parryi*, *Elymus lanceolatus*, *Festuca idahoensis*, *Festuca thurberi*, *Pascopyrum smithii*, *Poa secunda*, and *Pseudoroegneria spicata*. Other perennial grasses that may be present include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Elymus elymoides*, *Hesperostipa comata* (= *Stipa comata*), and *Koeleria macrantha*. Forb cover is typically minor. Stands occur on a variety of landforms, from flats and depressions to slopes and ridges. Soils are generally characterized by a heavy clay subsoil occurring within 25 cm of the soil surface, which restricts rooting depth. Soils are also alkaline and calcareous. Diagnostic of this alliance is a moderate (>20% cover) perennial graminoid layer with an *Artemisia arbuscula ssp. longiloba*-dominated low-shrub layer that has 10-40% cover. At least 40% of the total shrub cover is *Artemisia arbuscula ssp. arbuscula*.

Classification Comments: Stands included in this alliance occur in environments (climate or substrates) that limit the growth of perennial graminoids or may be the result of heavy livestock grazing depleting the perennial graminoid layer of stands of shrub-herbaceous vegetation. The range of this association is currently restricted to Nevada. More survey and classification work are needed to fully describe the range of this alliance.

Internal Comments:

Other Comments:**Similar NVC Types:**

Diagnostic Characteristics: Diagnostic of this alliance is the *Artemisia arbuscula* ssp. *longiloba*-dominated low-shrub layer (or codominated with >40% relative shrub cover of the nominal species).

VEGETATION

Physiognomy and Structure: This alliance is characterized by a sparse to moderate microphyllous evergreen dwarf-shrub canopy (0.1-0.4 m in height). Cespitose graminoids dominate the understory with cover ranging from 10-70% and 0.3-1.0 m tall.

Floristics: The structure of these stands may be shrub-herbaceous or shrub-dominated. The shrub layer may be sparse to open (10-40% cover) and dominated by the low shrub *Artemisia arbuscula* ssp. *longiloba*. Shrub associates include *Artemisia nova*, *Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tripartita*, *Chrysothamnus viscidiflorus*, *Gutierrezia sarothrae*, and *Purshia tridentata*. Perennial grasses are dominant in the understory and may have sparse to very dense cover where they are more prominent than shrubs. Dominant to common grass species include *Danthonia parryi*, *Elymus lanceolatus*, *Festuca idahoensis*, *Festuca thurberi*, *Pascopyrum smithii*, *Poa secunda*, and *Pseudoroegneria spicata*. Other perennial grasses that may be present include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Elymus elymoides*, *Hesperostipa comata* (= *Stipa comata*), and *Koeleria macrantha*. Forb cover is typically minor.

ENVIRONMENT & DYNAMICS

Environmental Description: This shrub-herbaceous alliance occurs in the Intermountain West, into the southern Rocky Mountains and in the western Great Plains from 1600-3200 m (5500-10,600 feet) elevation. Stands occur on a variety of landforms, from flats and depressions to slopes and ridges. Soils are generally characterized by a heavy clay subsoil occurring within 25 cm of the soil surface, which restricts rooting depth. Soils are also alkaline and calcareous. Beetle and Johnson (1982) report that *Artemisia arbuscula* ssp. *arbuscula* grows in soils with a high volume of gravel (even though soil may be in clay textural class, or contain a clay-rich layer that impedes drainage), and that *Artemisia arbuscula* ssp. *longiloba* grows in clay soils, often alkaline, that contain no gravels.

Dynamics: Due to the low-shrub stature of *Artemisia arbuscula* ssp. *longiloba*, this shrubland alliance is less susceptible to natural fire than taller *Artemisia* spp. shrublands. Grazing appears to have little effect on shrub densities, but tends to decrease the importance of tall bunch grasses and increase the cover of *Arenaria congesta* (Johnston 2001). Heavy livestock grazing may deplete the perennial graminoid layer and convert stands that are shrub-herbaceous in structure to those that are strictly shrub-dominated.

DISTRIBUTION

Geographic Range: This alliance is widespread in the western United States, occurring from the Intermountain West, into the southern Rocky Mountains and the western Great Plains.

Nations: US

States/Provinces: CO, ID, MT, NV, OR, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- < SRM Cover Type #406 - Low Sagebrush (Shiflet 1994)

LOWER LEVEL UNITS**Associations:**

- CEG001416 *Artemisia arbuscula* ssp. *longiloba* / *Pseudoroegneria spicata* Shrub Grassland
- CEG001415 *Artemisia arbuscula* ssp. *longiloba* / *Pascopyrum smithii* Shrub Grassland
- CEG001414 *Artemisia arbuscula* ssp. *longiloba* Shrubland
- CEG005997 *Artemisia arbuscula* ssp. *longiloba* / *Poa fendleriana* Shrubland
- CEG001522 *Artemisia arbuscula* ssp. *longiloba* / *Festuca idahoensis* Shrub Grassland
- CEG002585 *Artemisia arbuscula* ssp. *longiloba* / *Elymus lanceolatus* Shrubland
- CEG005996 *Artemisia arbuscula* ssp. *longiloba* / Cushion Plants Shrubland
- CEG001523 *Artemisia arbuscula* ssp. *longiloba* / *Poa secunda* Shrub Grassland

AUTHORSHIP

Primary Concept Source: C. Jean, J. Kagan, P. Lyon, E. Peterson, K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Beetle and Johnson 1982, Faber-Langendoen et al. 2017b, Johnston 2001, Shiflet 1994

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G308. Intermountain Low & Black Sagebrush Steppe & Shrubland

A4122. *Artemisia arbuscula* ssp. *thermopola* - *Artemisia papposa* / *Festuca idahoensis* Steppe & Shrubland Alliance [Low - Poorly Documented]

Type Concept Sentence:

OVERVIEW

Scientific Name: *Artemisia arbuscula* ssp. *thermopola* - *Artemisia papposa* / *Festuca idahoensis* Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Thermopola Little Sagebrush - Owyhee Sage / Idaho Fescue Steppe & Shrubland Alliance

Colloquial Name: Thermopola Little Sagebrush - Owyhee Sage / Idaho Fescue Steppe & Shrubland

Type Concept:

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics:

ENVIRONMENT & DYNAMICS

Environmental Description:

Dynamics:

DISTRIBUTION

Geographic Range:

Nations: US

States/Provinces: ID, NV?, OR, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG002991 *Artemisia papposa* / *Danthonia californica* - *Festuca idahoensis* Shrubland

- CEG001540 *Artemisia tripartita* ssp. *rupicola* / *Festuca idahoensis* Shrub Grassland
- CEG001519 *Artemisia arbuscula* ssp. *thermopola* / *Festuca idahoensis* Shrub Grassland

AUTHORSHIP

Primary Concept Source: M.S. Reid

Author of Description:

Acknowledgments:

REFERENCES

3. Desert & Semi-Desert
3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland
G308. Intermountain Low & Black Sagebrush Steppe & Shrubland

A3223. Artemisia bigelovii Steppe & Shrubland Alliance

Type Concept Sentence: Shrub and shrub-herbaceous vegetation dominated by *Artemisia bigelovii* occurring in the Tularosa Basin of southern New Mexico and the Colorado Plateau in southwestern Utah and northern Arizona and near canyon rims and along escarpments in southeastern Colorado.

OVERVIEW

Scientific Name: *Artemisia bigelovii* Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Bigelow's Sagebrush Steppe & Shrubland Alliance

Colloquial Name: Bigelow's Sagebrush Steppe & Shrubland

Type Concept: The structure of this vegetation may be shrub-herbaceous or shrub-dominated. The shrub layer is characterized by a sparse to moderately dense dwarf-shrub layer that is dominated or codominated by *Artemisia bigelovii*. Dwarf-shrub associates from the shortgrass steppe include *Frankenia jamesii*, *Glossopetalon spinescens* var. *meionandrum*, *Krascheninnikovia lanata*, and *Yucca glauca*, which may be present to codominant. On the Colorado Plateau, stands may be codominated by *Ephedra* spp., *Eriogonum corymbosum*, *Parryella filifolia*, or *Purshia stansburiana*. *Gutierrezia sarothrae* and species of *Atriplex* are common in most stands. Scattered *Juniperus* spp. and *Pinus edulis* trees are occasionally present. A sparse to dense graminoid layer is usually present. Dominant grasses include *Aristida purpurea*, *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua gracilis*, *Hesperostipa neomexicana* (= *Stipa neomexicana*), *Pleuraphis jamesii* (= *Hilaria jamesii*), *Sporobolus cryptandrus*, or less commonly *Pascopyrum smithii*. On the Colorado Plateau, forbs are generally sparse. However, cushion plants are common on shortgrass steppe slopes. Other forbs, such as *Astragalus missouriensis*, *Heterotheca villosa*, *Melampodium cinereum*, *Picradeniopsis oppositifolia*, *Stanleya pinnata*, and *Zinnia grandiflora*, may be present. Exotic annuals, such as *Bromus arvensis* (= *Bromus japonicus*), *Bromus tectorum*, *Descurainia sophia*, and *Salsola kali*, may be present to common depending on disturbance and the amount of seasonal precipitation. This alliance is reported from the Tularosa Basin of southern New Mexico and the Colorado Plateau in southwestern Utah and northern Arizona and near canyon rims and along escarpments in southeastern Colorado. Sites include gentle to moderately steep shale hillslopes and mesas in Arizona and Utah and escarpment and canyon breaks and shaly plains in the shortgrass steppe west to the foothills near the Colorado Front Range. Soils are typically shallow, well-drained, calcareous loams, clay loams, and clays derived from limestone, sandstone, shale and alluvium. The soil surface has high cover of bare soil and rock.

Classification Comments: The vegetation in some stands included in this alliance may be too sparse to be classified as dwarf-shrubland.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has sparse to moderately dense cover of microphyllous evergreen dwarf-shrubs less than 0.5 m tall. A sparse to dense graminoid layer dominated by perennial medium-tall bunch grasses and short grasses is also present and may be more prominent than the shrubs. Forb cover is generally sparse. Scattered scale-leaved and needle-leaved evergreen trees may be present.

Floristics: The vegetation is characterized by a sparse to moderately dense dwarf-shrub layer that is dominated or codominated by *Artemisia bigelovii*. Dwarf-shrub associates for the shortgrass steppe include *Frankenia jamesii*, *Glossopetalon spinescens* var. *meionandrum*, *Krascheninnikovia lanata*, and *Yucca glauca*, which may be present to codominant. Scattered shrubs such as *Atriplex*

canescens, *Cercocarpus montanus*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Lycium pallidum*, and *Rhus trilobata* are occasionally present. On the Colorado Plateau, stands may be codominated by *Atriplex confertifolia*, *Ephedra* spp., *Eriogonum corymbosum*, *Opuntia polyacantha* var. *polyacantha*, *Cylindropuntia whipplei* (= *Opuntia whipplei*), *Parryella filifolia*, or *Purshia stansburiana*. *Gutierrezia sarothrae* and species of *Atriplex* and *Yucca* are common in most stands. Scattered *Juniperus* spp. and *Pinus edulis* trees are occasionally present. A sparse to dense graminoid layer is usually present and may take prominence over shrubs. Dominant grasses include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa neomexicana* (= *Stipa neomexicana*), *Muhlenbergia torreyi*, *Pascopyrum smithii*, *Pleuraphis jamesii* (= *Hilaria jamesii*), *Poa fendleriana*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. On the Colorado Plateau, forbs are generally sparse. However, on shortgrass steppe slopes, cushion plants such as *Arenaria hookeri*, *Eriogonum lachnogynum*, *Tetranneuris acaulis* (= *Hymenoxys acaulis*), and *Paronychia sessiliflora* are common. Other forbs, such as *Astragalus missouriensis*, *Heterotheca villosa*, *Melampodium cinereum*, *Picradeniopsis oppositifolia*, *Stanleya pinnata*, and *Zinnia grandiflora*, are usually present. Exotic annuals, such as *Bromus arvensis* (= *Bromus japonicus*), *Bromus tectorum*, *Salsola kali*, and *Descurainia sophia*, may be present to common depending on disturbance, and amount and season of precipitation.

ENVIRONMENT & DYNAMICS

Environmental Description: Elevation ranges from 1350-1890 m. Climate is semi-arid with 22-35 cm of mean annual precipitation occurring during the growing season. Sites are nearly flat to moderate and include shale hillslopes and mesas in Arizona and breaks and shale plains in the shortgrass steppe west to the foothills near the Colorado Front Range. Soils are typically shallow, well-drained, calcareous loams, clay loams, and clays derived from limestone, sandstone, shale and alluvium. The soil surface has high cover of bare soil and rock.

Dynamics: Livestock grazing must be managed carefully to prevent the loss of highly palatable grasses such as *Schizachyrium scoparium*, *Bouteloua curtipendula*, *Hesperostipa neomexicana*, and *Achnatherum hymenoides*. The effects of fire on this vegetation are unknown. However, the vegetation is usually too sparse to carry a fire under most circumstances.

DISTRIBUTION

Geographic Range: Stands included in this shrubland alliance are found in Arizona, western Colorado and Utah on the Colorado Plateau and in southeastern Colorado.

Nations: US

States/Provinces: AZ, CO, NM, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< *Artemisia bigelovii*/*Bouteloua gracilis* Plant Community (Shaw et al. 1989)
- >< Limestone Breaks SCS Range Site #58 (Soil Conservation Service n.d.)
- < SRM Cover Type #408 - Other Sagebrush Types (Shiflet 1994)
- >< Sandstone Breaks SCS Range Site #53 (Soil Conservation Service n.d.)
- >< Shaley Plains SCS Range Site (Soil Conservation Service n.d.)

LOWER LEVEL UNITS

Associations:

- CEGLO00276 *Artemisia bigelovii* Shrubland
- CEGLO00990 *Artemisia bigelovii* / *Achnatherum hymenoides* Shrubland
- CEGLO01742 *Artemisia bigelovii* / *Bouteloua gracilis* Dwarf-shrub Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b, Shaw et al. 1989, Shiflet 1994, Soil Conservation Service 1978, Soil Conservation Service n.d.

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G308. Intermountain Low & Black Sagebrush Steppe & Shrubland

A2565. Artemisia frigida Dwarf-shrubland Alliance

Type Concept Sentence: This shrubland alliance is dominated by the dwarf-shrub *Artemisia frigida* and is described from the Colorado Plateau and western slope of the southern Rocky Mountains.

OVERVIEW

Scientific Name: *Artemisia frigida* Dwarf-shrubland Alliance

Common Name (Translated Scientific Name): Prairie Sagewort Dwarf-shrubland Alliance

Colloquial Name: Prairie Sagewort Dwarf-shrubland

Type Concept: This shrubland alliance is dominated by the dwarf-shrub *Artemisia frigida*. Total shrub cover ranges from 5-85%. Other common shrubs and dwarf-shrubs include *Artemisia nova*, *Chrysothamnus viscidiflorus*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Tetradymia canescens*, and the cactus *Pediocactus simpsonii*. The understory is dominated by perennial graminoids, including *Achnatherum hymenoides*, *Bouteloua gracilis*, and *Poa secunda*. Other herbaceous species often include low-growing cushion plants. Other herbaceous associates may include *Festuca brachyphylla*, *Hymenoxys richardsonii*, *Paronychia sessiliflora*, *Penstemon strictus*, *Poa fendleriana*, *Stenotus armerioides*, *Pleiacanthus spinosus* (= *Lygodesmia spinosa*), and *Tetraneuris torreyana*. Cryptogamic cover varies from low to moderate and is occasionally as high as 55%, mostly composed of crustose and foliose lichens. This alliance is described from the Colorado Plateau and western slope of the southern Rocky Mountains. Stands occur on mid to upper slopes and tops of mesas, hills and ridges, but also midslopes of mountains, active slopes and on valley terraces. Site are flat to moderately steep (to 53% slope) on all aspects between 2315 and 2965 m elevation.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Shrublands of the Colorado Plateau and western slope of the southern Rocky Mountains in which *Artemisia frigida* is dominant and has >50% of the total shrub cover, typically found on exposed, wind-blown sites. The other characteristic species are perennial graminoids.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a sparse to moderate cover of a suffrutescent plant that occurs as both a dwarf-shrub and forb. Cespitose graminoids dominate the understory.

Floristics: Vegetation is dominated by the suffrutescent dwarf-shrub *Artemisia frigida*. Total shrub cover ranges from 5-85%. Other common shrubs and dwarf-shrubs include *Artemisia nova*, *Chrysothamnus viscidiflorus*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Tetradymia canescens*, and the cactus *Pediocactus simpsonii*. The understory is dominated by perennial graminoids, including *Achnatherum hymenoides*, *Bouteloua gracilis*, and *Poa secunda*. Other herbaceous species often include low-growing cushion plants. Other herbaceous associates may include *Festuca brachyphylla*, *Hymenoxys richardsonii*, *Paronychia sessiliflora*, *Penstemon strictus*, *Poa fendleriana*, *Stenotus armerioides*, *Pleiacanthus spinosus* (= *Lygodesmia spinosa*), and *Tetraneuris torreyana*. Cryptogamic cover varies from low to moderate and is occasionally as high as 55%, mostly composed of crustose and foliose lichens.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands occur on mid to upper slopes and tops of mesas, hills and ridges, but also midslopes of mountains, active slopes and on valley terraces. Site are flat to moderately steep (to 53% slope) on all aspects between 2315 and 2965 m elevation. Various amounts of bedrock, large and small rocks, and bare soil compose the majority of the ground surface, with sparse to low cover of litter. Parent materials are frequently volcanic (basalt) rocks that are present as bedrock, boulders and gravel, Mesozoic shale, and Quaternary landslide deposits. Soils are shallow, rapidly drained and range from coarse sand and sandy loam to sandy clay loam and sandy clay.

Dynamics: Dry, windswept conditions appear to be important for this alliance.

DISTRIBUTION

Geographic Range: This shrubland is described from the Colorado Plateau and western slope of the southern Rocky Mountains.

NBR alliances

Nations: US

States/Provinces: CO, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG002344 *Artemisia frigida* - (*Bouteloua gracilis*, *Achnatherum hymenoides*, *Poa secunda*) - Lichens Rocky Mesa Dwarf-shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel and K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Faber-Langendoen et al. 2017b

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G308. Intermountain Low & Black Sagebrush Steppe & Shrubland

A3222. *Artemisia nova* Steppe & Shrubland Alliance

Type Concept Sentence: Associations within this alliance are dominated by *Artemisia nova* and occur at intermediate elevations (1400-2500 m) in the Intermountain West and Rocky Mountains.

OVERVIEW

Scientific Name: *Artemisia nova* Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Black Sagebrush Steppe & Shrubland Alliance

Colloquial Name: Black Sagebrush Steppe & Shrubland

Type Concept: Structurally, this alliance may occur as shrub-herbaceous or shrub-dominated vegetation. The shrub layer is characterized by the dominance of the dwarf-shrub *Artemisia nova*, which may have sparse to moderate cover of 10-60%. Associated shrub species that occur in stands of this alliance include *Artemisia arbuscula*, *Artemisia cana*, *Artemisia tridentata*, *Atriplex confertifolia*, *Chrysothamnus viscidiflorus*, *Grayia spinosa*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Purshia tridentata*, and *Symphoricarpos oreophilus*. The ground layer is dominated by perennial bunchgrasses which may exceed the height and cover of shrubs, ranging from sparse to dense cover. Recurrent species include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Achnatherum speciosum* (= *Stipa speciosa*), *Achnatherum thurberianum* (= *Stipa thurberiana*), *Elymus elymoides*, *Hesperostipa comata* (= *Stipa comata*), *Koeleria macrantha*, *Poa secunda*, and *Pseudoroegneria spicata*. In southern stands, *Bouteloua gracilis* and *Pleuraphis jamesii* (= *Hilaria jamesii*) may also be important. Common forbs include *Balsamorhiza sagittata*, *Castilleja angustifolia*, *Heterotheca villosa*, *Packera multilobata* (= *Senecio multilobatus*), *Phlox hoodii*, *Senecio integerrimus*, *Sphaeralcea coccinea*, and *Stenotus armerioides*. Associations within this alliance occur at intermediate elevations (1400-2500 m) in the Intermountain West and Rocky Mountains, a region of semi-arid, continental climate regime. Soils are typically young, shallow, coarse-textured, and often derived from calcareous parent materials. *Artemisia nova* associations occur on well-drained slopes and ridges and often grow with other *Artemisia* associations on deeper soils. In the Columbia River Basin, the vegetation in this alliance occupies the driest habitats of all the *Artemisia*-dominated alliances.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Shrublands of the Intermountain West and Rocky Mountains where *Artemisia nova* has <50% of the total shrub cover. Structurally, this alliance may occur as shrub-herbaceous or shrub-dominated vegetation. The herbaceous layer is graminoid-dominated and may be dominant over shrubs in some stands.

VEGETATION

Physiognomy and Structure: This shrubland alliance is characterized by sparse to moderate cover (10-60%) of a low-statured, microphyllous evergreen shrub, and a sparse to well-developed graminoid layer. The graminoids often exceed the shrubs in height, and ungrazed stands may have the appearance of perennial grasslands (Baker and Kennedy 1985). The shrubs may be pruned by livestock and native ungulate browsing into low, spreading cushion-like shrubs. Prostrate and, occasionally, upright forbs are present, but with very low cover.

Floristics: Associations within this alliance are characterized by the dominance of the dwarf-shrub *Artemisia nova*, which must contribute at least 40% of the total shrub cover in any stand. Structurally, this alliance may occur as shrub-herbaceous or shrub-dominated vegetation. Associated shrub species that occur in stands of this alliance include *Artemisia arbuscula*, *Artemisia cana*, *Artemisia tridentata*, *Atriplex confertifolia*, *Chrysothamnus viscidiflorus*, *Grayia spinosa*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Purshia tridentata*, and *Symphoricarpos oreophilus*. The ground layer is dominated by perennial bunchgrasses which may exceed the height and cover of the shrubs, but typically may be sparse to very dense. Recurrent species include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Achnatherum speciosum* (= *Stipa speciosa*), *Achnatherum thurberianum* (= *Stipa thurberiana*), *Elymus elymoides*, *Festuca idahoensis*, *Hesperostipa comata* (= *Stipa comata*), *Koeleria macrantha*, *Poa secunda*, and *Pseudoroegneria spicata*. In southern stands, *Bouteloua gracilis* and *Pleuraphis jamesii* (= *Hilaria jamesii*) may also be important. Common forbs include *Balsamorhiza sagittata*, *Castilleja angustifolia*, *Heterotheca villosa*, *Packera multilobata* (= *Senecio multilobatus*), *Phlox hoodii*, *Senecio integerrimus*, *Sphaeralcea coccinea*, and *Stenotus armerioides*.

ENVIRONMENT & DYNAMICS

Environmental Description: Associations within this alliance occur at intermediate elevations (1400-2500 m) in the Intermountain West and Rocky Mountains. The climate is semi-arid with 20-30 cm of annual precipitation. The temperature regime is continental, with cold winters, warm summers, a large diurnal temperature range, and a short frost-free season. Soils are typically young, shallow, coarse-textured, and often derived from calcareous parent materials. *Artemisia nova* associations occur on well-drained slopes and ridges and often grow with other *Artemisia* associations on deeper soils. In the Columbia River Basin, the vegetation in this alliance occupies the driest habitats of all the *Artemisia*-dominated alliances. At the edges of intermountain basins, this alliance is usually contiguous with *Atriplex confertifolia* shrublands (Hironaka 1978).

Dynamics: This shrubland alliance is associated with shallow, rocky soils which experience extreme drought in summer. The plants are low and widely spaced, which tends to decrease the risk of fire (Chappell et al. 1997). Barbour and Major (1977) report that *Artemisia nova* is utilized by livestock to a much greater degree than other species of *Artemisia*, resulting in low, pruned plants. *Artemisia nova* dwarf-shrublands grow in more xeric sites than other *Artemisia* shrublands. Blackburn and Tueller (1970) noted rapid invasion of these communities by *Juniperus osteosperma* and *Pinus monophylla* in Nevada, citing overgrazing coupled with fire suppression, and possibly climate change as causative variables.

DISTRIBUTION

Geographic Range: Associations in this alliance occur in the mountains of the Mojave Desert, throughout the Great Basin, and east into western and central Wyoming, Montana, Colorado, Utah, and northwestern New Mexico. It also occurs in the upper Columbia River Basin of southeastern Idaho.

Nations: US

States/Provinces: CA, CO, ID, MT, NM, NV, OR, UT, WY

TNC Ecoregions [optional]: 11:C, 16:C, 17:C

USFS Ecoregions (2007): 322A:CC, 341D:CC, 341Fc:CCC, M262B:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Great Basin)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- = *Artemisia nova* (Black sagebrush scrub) Alliance (Sawyer et al. 2009) [35.130.00]
- = *Artemisia nova* Shrubland Alliance (Evens et al. 2014)
- = *Artemisia nova* Shrubland Alliance (CNPS 2017) [35.130.00]
- >< Big Sagebrush Series (Sawyer and Keeler-Wolf 1995)
- >< Black Sagebrush Series (Sawyer and Keeler-Wolf 1995)
- >< Pebble Plain Community (Holland 1986b)

- > SRM Cover Type #320 - Black Sagebrush-Bluebunch Wheatgrass (Shiflet 1994)
- > SRM Cover Type #321 - Black Sagebrush-Idaho Fescue (Shiflet 1994)
- > SRM Cover Type #322 - Black Sagebrush-Rough Fescue (Shiflet 1994)
- = SRM Cover Type #405 - Black Sagebrush (Shiflet 1994)
- >< Subalpine Sagebrush Scrub (#35220) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEGLO01417 *Artemisia nova* Shrubland
- CEGLO02773 *Artemisia nova* - *Ericameria nana* Shrubland
- CEGLO01425 *Artemisia nova* / *Hesperostipa comata* Shrubland
- CEGLO02698 *Artemisia nova* / *Poa fendleriana* Shrubland
- CEGLO01422 *Artemisia nova* / *Achnatherum hymenoides* Shrubland
- CEGLO01423 *Artemisia nova* / *Poa secunda* Shrubland
- CEGLO01524 *Artemisia nova* / *Festuca idahoensis* Shrub Grassland
- CEGLO01419 *Artemisia nova* - *Gutierrezia sarothrae* / *Bouteloua gracilis* - *Pleuraphis jamesii* Shrubland
- CEGLO01420 *Artemisia nova* / *Pleuraphis jamesii* Shrubland
- CEGLO01424 *Artemisia nova* / *Pseudoroegneria spicata* Shrubland
- CEGLO01421 *Artemisia nova* / *Leymus salinus* Shrub Grassland
- CEGLO01418 *Artemisia nova* / *Elymus elymoides* Shrubland

AUTHORSHIP

Primary Concept Source: D. Sarr, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Baker 1983c, Baker 1983d, Baker and Kennedy 1985, Barbour and Major 1977, Blackburn and Tueller 1970, CNPS 2017, Chappell et al. 1997, Cheatham and Haller 1975, Derby and Wilson 1978, Derby and Wilson 1979, Evens et al. 2014, Faber-Langendoen et al. 2017b, Hironaka 1978, Holland 1986b, Krantz 1988, Krantz 1993, Milton and Purdy 1983, Paysen et al. 1980, Peterson 1984a, Peterson 1984b, Rickard and Beatley 1965, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shiflet 1994, Thomas et al. 2004, Thorne 1976, Tisdale 1994a, Turner 1982c, West 1988, Young et al. 1977, Young et al. 2007b, Zamora and Tueller 1973

M169. Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland

This macrogroup includes the big sagebrush shrubland and shrub-steppe that is a matrix and large-patch type throughout much of the intermountain western U.S. and that is dominated by *Artemisia tridentata*, *Purshia tridentata*, and several local dominants such as *Artemisia cana* and *Artemisia tripartita ssp. tripartita*.

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.3.a. M169 Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland

G303. Intermountain Dry Tall Sagebrush Steppe & Shrubland

Type Concept Sentence: This widely distributed, matrix-forming shrubland group is concentrated in the drier, more southerly portions of the interior western U.S., but extends into more xeric portions of the Columbia Plateau, Rocky Mountains, across Wyoming, then northeast into the northwestern Great Plains. Vegetation is typically dominated by *Artemisia tridentata ssp. wyomingensis* and *Artemisia tridentata ssp. tridentata*, sometimes codominated by xeric shrubs such as *Atriplex* spp., with a typically sparse to open herbaceous layer dominated by dry-site graminoids.

OVERVIEW

Scientific Name: *Artemisia tridentata ssp. wyomingensis* - *Artemisia tridentata ssp. tridentata* Steppe & Shrubland Group

Common Name (Translated Scientific Name): Wyoming Big Sagebrush - Basin Big Sagebrush Steppe & Shrubland Group

Colloquial Name: Big Sagebrush - Mixed Shrub Dry Steppe & Shrubland

Type Concept: This widely distributed, matrix-forming shrubland group is concentrated in the drier, more southerly portions of the interior western U.S., especially in the Great Basin and Colorado Plateau, but extends into more xeric portions of the Columbia Plateau, Wyoming steppe, Rocky Mountains, and northeast into the northwestern Great Plains. Stands are dominated by *Artemisia tridentata ssp. wyomingensis* and *Artemisia tridentata ssp. tridentata* and, in some cases, codominated by xeric shrubs such as *Atriplex canescens*, *Atriplex confertifolia*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria nauseosa*, *Grayia spinosa*, or *Sarcobatus*

vermiculatus. Other common shrubs include *Amelanchier utahensis*, *Artemisia frigida*, *Atriplex gardneri*, *Chrysothamnus* spp., *Ericameria* spp., *Peraphyllum ramosissimum*, *Purshia tridentata*, and *Tetradymia* spp. If present, the herbaceous layer ranges from sparse and patchy to moderately dense and is typically dominated by dry-site graminoids with low cover of forbs. Characteristic graminoids include *Achnatherum hymenoides*, *Achnatherum lettermanii* (= *Stipa lettermanii*), *Achnatherum pinetorum*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Bromus tectorum*, *Carex filifolia*, *Distichlis spicata*, *Elymus albicans*, *Elymus elymoides*, *Hesperostipa comata* (= *Stipa comata*), *Leymus ambiguus*, *Leymus salinus*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. A sparse layer of cold-deciduous needle-leaved or scale-leaved evergreen trees may occasionally be emergent over the shrubs. This group occurs on flat to steeply sloping upland slopes on alluvial fans and terraces, toeslopes, lower and middle slopes, draws, badlands, and foothills. Stands are found at elevations as low as 500 m in the northwestern Great Plains to 2500 m in the Rocky Mountains and Colorado Plateau. Sites with little slope tend to have deep soils, while those with steeper slopes have shallow to moderately deep soils. Climate is mostly semi-arid but ranges from semi-arid in the western Great Basin to subhumid in the northern Great Plains and Rocky Mountains with much of the precipitation falling primarily as snow. The amount and reliability of growing-season moisture increase eastward and with increasing elevation.

Classification Comments: This group tends to occur in drier biophysical settings than the two similar tall sagebrush groups (G302, G304). Hence, it tends to have a less abundant herbaceous component, with the predominant grasses being more adapted to drier conditions. In addition, the co-occurring shrub taxa will include more desert species as well as cacti. This is a slid group in concept, but the specific associations included in it need to be reviewed and will require some adjustment.

Similar NVC Types:

- G302 Intermountain Mesic Tall Sagebrush Steppe & Shrubland
- G304 Intermountain Mountain Big Sagebrush Steppe & Shrubland

Diagnostic Characteristics: Stands are dominated by *Artemisia tridentata* ssp. *wyomingensis* or *Artemisia tridentata* ssp. *tridentata* and, in some cases, codominated by dry-site shrubs such as *Atriplex canescens*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria nauseosa*, or *Sarcobatus vermiculatus*. If present, the herbaceous component layer ranges from sparse and patchy to moderately dense and is typically dominated by dry-site graminoids with low cover of forbs. Characteristic graminoids include *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Achnatherum pinetorum*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Bromus tectorum*, *Carex filifolia*, *Distichlis spicata*, *Elymus albicans*, *Elymus elymoides*, *Hesperostipa comata*, *Leymus ambiguus*, *Leymus salinus*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. Associated species tend to include more semi-desert taxa with core distribution in the Great Basin and Colorado Plateau regions. Warm-season grasses are common in the southern and eastern portions of its range.

VEGETATION

Physiognomy and Structure: This deciduous scrub and grassland group is structurally characterized by open to dense sagebrush with associated shrubs interspersed and/or a moderately dense understory of perennial grasses.

Floristics: Stands are dominated by *Artemisia tridentata* ssp. *wyomingensis* and *Artemisia tridentata* ssp. *tridentata* and, in some cases, codominated by *Atriplex canescens*, *Atriplex confertifolia*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria nauseosa*, *Grayia spinosa*, or *Sarcobatus vermiculatus*. Other common shrubs include *Artemisia frigida*, *Atriplex gardneri*, *Chrysothamnus* spp., *Ericameria* spp., *Krascheninnikovia lanata*, *Peraphyllum ramosissimum*, *Prunus virginiana*, *Purshia tridentata*, *Symphoricarpos longiflorus*, and *Tetradymia* spp. A sparse layer of cold-deciduous needle-leaved or scale-leaved evergreen trees may occasionally be emergent over the shrubs. The herbaceous layer may be sparse to strongly dominated by graminoids, including *Achnatherum hymenoides*, *Achnatherum lettermanii* (= *Stipa lettermanii*), *Achnatherum pinetorum*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Bromus tectorum*, *Carex filifolia*, *Elymus albicans*, *Elymus elymoides*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata* (= *Stipa comata*), *Leymus ambiguus*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. Trees found across the range include *Cercocarpus ledifolius*, *Juniperus monosperma*, *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus edulis*, *Pinus flexilis*, *Pinus jeffreyi*, *Pinus monophylla*, *Pinus ponderosa*, *Populus tremuloides*, *Quercus gambelii*, *Quercus garryana*, and *Yucca brevifolia*.

ENVIRONMENT & DYNAMICS

Environmental Description: This shrubland group is widely distributed in the western U.S., at elevations as low as 500 m in the northwestern Great Plains to 2500 m in the Rocky Mountains and Colorado Plateau. This group occurs on flat to steeply sloping upland slopes on alluvial fans and terraces, toeslopes, lower and middle slopes, draws, badlands, and foothills. *Climate:* Climate ranges from arid in the western Great Basin to subhumid in the northern plains and Rocky Mountains with much of the precipitation falling primarily as snow. The amount and reliability of growing-season moisture increase eastward and with increasing elevation. *Soil/substrate/hydrology:* Sites with little slope tend to have deep soils while those with steeper slopes have shallow to moderately

deep soils. Soil texture is loamy sand, loam, sandy loam, or clay loam (Hansen and Hoffman 1988), and there is often a significant amount of coarse fragments in the soil profile.

Dynamics: The natural fire regime of this group likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is that of a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Response to grazing can be variable depending on the type of grazer and the season in which grazing occurs. *Hesperostipa comata* can increase in abundance in response to either grazing or fire. Microphytic crust is very important in this group.

DISTRIBUTION

Geographic Range: This widely distributed, matrix-forming shrubland group is concentrated in the drier, more southerly portions of the interior western U.S., especially in the Great Basin and Colorado Plateau, but extends into more xeric portions of the Columbia Plateau, Wyoming steppe, Rocky Mountains, and northeast into the northwestern Great Plains.

Spatial Scale & Pattern [optional]: Matrix, Large patch

Nations: CA, US

States/Provinces: BC, CA, CO, ID, MT, ND, NV, OR, SD?, UT, WY

TNC Ecoregions [optional]: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 12:C, 18:C, 19:C, 20:C, 26:C, 27:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 322A:CC, 331A:CP, 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331J:C?, 341A:CC, 341B:CC, 341C:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, M242C:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333D:CC, M334A:CC, M341A:CC, M341B:CC, M341C:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Arches, Bighorn Canyon, Black Canyon of the Gunnison?, Bryce Canyon, Canyon de Chelly, Canyonlands, Capitol Reef, Colorado, Curecanti, Death Valley, Dinosaur, Fossil Butte, Glen Canyon, Golden Spike, Grand Canyon, Hovenweep, John Day Fossil Beds, Mesa Verde, Natural Bridges, Theodore Roosevelt, Zion); USFS (Arapaho-Roosevelt, Custer, Medicine Bow, Shoshone, Thunder Basin); USFWS (Ouray)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- >< Basin Big Sagebrush (401) (Shiflet 1994)
- = Great Basin-Colorado Plateau sagebrush semi-desert (West 1983a)
- >< Wyoming Big Sagebrush (403) (Shiflet 1994)

LOWER LEVEL UNITS

Alliances:

- A3194 *Artemisia tridentata* ssp. *tridentata* - *Artemisia tridentata* ssp. *xericensis* Dry Steppe & Shrubland Alliance
- A3198 *Artemisia tridentata* - Mixed Shrub Dry Steppe & Shrubland Alliance
- A3184 *Artemisia tridentata* ssp. *wyomingensis* Dry Steppe & Shrubland Alliance

AUTHORSHIP

Primary Concept Source: N.E. West (1983a)

Author of Description: M.E. Hall and K.A. Schulz

Acknowledgments:

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: MEH/KAS 3-10, mod. GK 8-15, mod. KAS 11-15

REFERENCES

References: Baker and Kennedy 1985, Barbour and Billings 1988, Barbour and Major 1988, Blackburn and Tueller 1970, Brown 1982a, Brown et al. 1979, Chappell et al. 1997, Daubenmire 1970, Ecosystems Working Group 1998, Faber-Langendoen et al. 2017a, Hansen and Hoffman 1988, Hironaka et al. 1983, Holland and Keil 1995, Knight 1994, Mueggler and Stewart 1980, Shiflet 1994, West 1983a, West 1983c

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G303. Intermountain Dry Tall Sagebrush Steppe & Shrubland

A3198. *Artemisia tridentata* - Mixed Shrub Dry Steppe & Shrubland Alliance

Type Concept Sentence: Stands in this alliance have a mixed shrub canopy codominated by *Artemisia tridentata* with dry-site shrub species such as *Atriplex canescens*, *Atriplex confertifolia*, *Ephedra aspera*, *Ephedra viridis*, *Ephedra nevadensis*, *Grayia spinosa*, *Sarcobatus vermiculatus*, or *Tetradymia canescens* present to codominant. The sparse to moderately dense herbaceous layer is dominated by perennial graminoids with lower cover of sometimes diverse forbs characteristic of semi-arid upland sites.

OVERVIEW

Scientific Name: *Artemisia tridentata* - Mixed Shrub Dry Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Big Sagebrush - Mixed Shrub Dry Steppe & Shrubland Alliance

Colloquial Name: Big Sagebrush - Mixed Shrub Dry Steppe & Shrubland

Type Concept: Stands in this alliance have a mixed shrub canopy codominated by *Artemisia tridentata* with dry-site shrub species such as *Atriplex canescens*, *Atriplex confertifolia*, *Ephedra aspera* (= *Ephedra fasciculata*), *Ephedra viridis*, *Ephedra nevadensis*, *Grayia spinosa*, *Sarcobatus vermiculatus*, or *Tetradymia canescens* present to codominant. The sparse to moderately dense herbaceous layer is dominated by perennial graminoids with lower cover of sometimes diverse forbs characteristic of semi-arid upland sites. Characteristic dry-site understory species include *Achnatherum hymenoides*, *Achnatherum speciosum*, *Bouteloua gracilis*, *Bromus tectorum*, *Elymus elymoides*, *Elymus lanceolatus*, *Hesperostipa comata* (= *Stipa comata*), *Leymus cinereus*, *Opuntia polyacantha*, *Phlox hoodii*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Sphaeralcea coccinea*, and *Sporobolus cryptandrus*. This dry-site shrubland alliance is distributed throughout the central and southern interior western U.S., especially in the Great Basin and Colorado Plateau regions. Stands occur on flat to steeply sloping upland sites, on a wide variety of landform positions such as alluvial fans and plains, plateaus, mesas and foothills. Soil texture is loamy sand, loam, sandy loam, or clay loam, and there is often a significant amount of coarse fragments in the soil profile.

Classification Comments: This is a weak artificial alliance. It would be better to further develop this alliance using more biogeographic or environmental (stabilized dunes) information, but the analysis is not done. Big sagebrush subspecies include *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *xericensis*, and *Artemisia tridentata* ssp. *wyomingensis*.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3194 *Artemisia tridentata* ssp. *tridentata* - *Artemisia tridentata* ssp. *xericensis* Dry Steppe & Shrubland Alliance: is not codominated by non-sagebrush shrubs.

Diagnostic Characteristics: Stands in this dry shrubland alliance have a mixed shrub canopy codominated by *Artemisia tridentata* with dry-site shrub species such as *Atriplex canescens*, *Atriplex confertifolia*, *Ephedra aspera*, *Ephedra viridis*, *Ephedra nevadensis*, *Grayia spinosa*, *Peraphyllum ramosissimum*, *Purshia tridentata*, *Sarcobatus vermiculatus*, or *Tetradymia canescens*. Characteristic dry shrubland understory species include *Achnatherum hymenoides*, *Achnatherum speciosum*, *Bouteloua gracilis*, *Elymus elymoides*, *Elymus lanceolatus*, *Hesperostipa comata*, *Leymus cinereus*, *Phlox hoodii*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Sphaeralcea coccinea*, and *Sporobolus cryptandrus*.

VEGETATION

Physiognomy and Structure: The vegetation in this alliance is characterized by a moderate to dense (25-70%) cover of microphyllous evergreen shrubs, usually 0.5-1 m in height. Cespitose graminoids are usually prominent, often matching the shrubs in height and cover. Forb species may be frequent, but usually contribute little canopy cover. With increasing summer rain in the eastern portion of the range, there is a corresponding increase in the abundance of sod-forming grasses as compared to bunchgrasses. There may be significant cover on the ground surface by mosses and lichens, or a cryptogamic soil crust.

Floristics: Stands in this alliance have a mixed shrub canopy codominated by *Artemisia tridentata* with dry-site shrub species such as *Atriplex canescens*, *Atriplex confertifolia*, *Ephedra aspera* (= *Ephedra fasciculata*), *Ephedra viridis*, *Ephedra nevadensis*, *Grayia spinosa*, *Sarcobatus vermiculatus*, or *Tetradymia canescens* present to codominant. The sparse to moderately dense herbaceous layer is dominated by perennial graminoids with lower cover of sometimes diverse forbs characteristic of semi-arid upland sites. Characteristic dry-site understory species include *Achnatherum hymenoides*, *Achnatherum speciosum*, *Bouteloua gracilis*, *Bromus tectorum*, *Elymus elymoides*, *Elymus lanceolatus*, *Hesperostipa comata* (= *Stipa comata*), *Leymus cinereus*, *Opuntia polyacantha*, *Phlox hoodii*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Sphaeralcea coccinea*, and *Sporobolus cryptandrus*.

ENVIRONMENT & DYNAMICS

Environmental Description: This dry-site shrubland alliance is distributed throughout the central and southern interior western U.S., especially in the Great Basin and Colorado Plateau regions. Climate is semi-arid with the amount and reliability of growing-season

moisture increasing eastward and with increasing elevation. Stands occur on flat to steeply sloping upland sites, on a wide variety of landform positions. These include alluvial fans and terraces, toeslopes, lower and middle slopes, draws, badly eroded badland slopes, and foothills. Sites with little slope tend to have deep soils, while those with steeper slopes have shallow to moderately deep soils. Sloping sites tend to have southerly aspects. Soil texture is loamy sand, loam, sandy loam, or clay loam, and there is often a significant amount of coarse fragments in the soil profile.

Dynamics: Complex ecological interactions between fire regimes, grazing history, and climate patterns result in equally complex patterns of species structure and composition in *Artemisia tridentata*. These present corresponding difficulties in the classification of these shrublands, which have been compounded by the influence of human settlement and agricultural patterns. What follows is a summary of some of the influences of altered fire regimes and grazing history on *Artemisia tridentata* shrublands and shrub-herbaceous vegetation.

Artemisia tridentata ssp. *wyomingensis* shrublands may represent either drier or more disturbed examples of the *Artemisia tridentata* ssp. *wyomingensis* shrubland and shrub-herbaceous alliances. Shrub densities typically increase with overgrazing of the bunchgrass component or with increasing summer drought (West 1983c). There is considerable debate over whether present shrub-dominated stands are actually degraded "steppe" (e.g., shrub-herbaceous physiognomy), and if the stands will return to steppe with changes in grazing and fire management. *Artemisia tridentata* is inhibited by fire, and excessive grazing may decrease fire frequency due to consumption of herbaceous forage, resulting in increased shrub density. Conversely, invasion by non-native annual grasses (e.g., *Bromus tectorum* or *Bromus arvensis*) may increase fire frequency sufficiently to eliminate the shrubs from the stands (Hironaka et al. 1983). With a change in fire frequency, species composition will be altered as well (West 1983c). With a high fire frequency (every 2-5 years), perennial grasses and shrubs are eliminated and non-native annual grasses dominate. At fire-return intervals of 10-30 years, short-lived resprouting shrubs such as *Chrysothamnus* or *Tetradymia* spp. dominate. At fire intervals of 30-70 years, a mixture of perennial bunchgrasses and shrubs is maintained. Finally, in the complete absence of fire, deep-rooted shrubs such as *Artemisia tridentata* become the theoretical dominants.

DISTRIBUTION

Geographic Range: This broadly distributed alliance is found in the western United States on dry steppes with core distribution in the Great Basin and Colorado Plateau regions.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NV, OR, UT, WY

TNC Ecoregions [optional]: 4:C, 5:C, 11:C, 12:C, 13:C, 15:C, 16:C, 17:C

USFS Ecoregions (2007): 262A:CC, 322A:CC, 341D:CC, 341F:CC, 342B:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M262A:CC, M262B:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Great Basin, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Artemisia tridentata* (Big sagebrush) Alliance (Sawyer et al. 2009) [35.110.00]
- = *Artemisia tridentata* Shrubland Alliance (Evens et al. 2014)
- = *Artemisia tridentata* Shrubland Alliance (CNPS 2017) [35.110.00]
- >< Big Sagebrush Scrub (#35210) (Holland 1986b)
- < Big Sagebrush Series (Sawyer and Keeler-Wolf 1995)
- >< Great Basin Mixed Scrub (#35100) (Holland 1986b)
- >< Sagebrush Steppe (#35300) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEG001040 *Artemisia tridentata* ssp. *wyomingensis* - *Atriplex confertifolia* Shrubland
- CEG000993 *Artemisia tridentata* - *Atriplex confertifolia* Shrubland
- CEG001054 *Purshia tridentata* - *Artemisia tridentata* ssp. *tridentata* Shrubland
- CEG001004 *Artemisia tridentata* ssp. *tridentata* - *Grayia spinosa* Shrubland
- CEPP005793 *Artemisia tridentata* - *Ericameria teretifolia* Shrubland
- CEG001355 *Artemisia tridentata* - *Atriplex canescens* - *Sarcobatus vermiculatus* / (*Achnatherum hymenoides*) Shrubland
- CEG005430 *Peraphyllum ramosissimum* - *Artemisia tridentata* Shrubland
- CEG001002 *Artemisia tridentata* - *Ephedra nevadensis* Shrubland
- CEG001056 *Purshia tridentata* - *Ericameria nauseosa* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Blackburn 1967, Blackburn et al. 1968a, Blackburn et al. 1968b, Blackburn et al. 1969a, Blackburn et al. 1969b, Blackburn et al. 1969c, Blackburn et al. 1969d, Blackburn et al. 1971, Brown 1971, CNPS 2017, Cheng 2004, Evens et al. 2014, Faber-Langendoen et al. 2017b, Ferren and Davis 1991, Francis 1983, Gordon and White 1994, Hanes 1976, Hironaka et al. 1983, Holland 1986b, Johnson 2000b, Keeler-Wolf et al. 2003a, Klein and Evens 2006, Paysen et al. 1980, Peterson 1984a, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Thomas et al. 2004, Tirmenstein 1999c, West 1983c, Wolfram and Martin 1965, Young et al. 1977, Young et al. 2007b

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G303. Intermountain Dry Tall Sagebrush Steppe & Shrubland

A3194. *Artemisia tridentata* ssp. *tridentata* - *Artemisia tridentata* ssp. *xericensis* Dry Steppe & Shrubland Alliance

Type Concept Sentence: Stands in this semi-arid shrubland alliance have a shrub canopy dominated by *Artemisia tridentata* ssp. *tridentata* or *Artemisia tridentata* ssp. *xericensis*. Other shrubs have low cover, except species that increase with disturbance such as *Gutierrezia sarothrae*, *Chrysothamnus viscidiflorus*, and *Ericameria nauseosa*. The understory, if present, is characterized by dry-site grass species.

OVERVIEW

Scientific Name: *Artemisia tridentata* ssp. *tridentata* - *Artemisia tridentata* ssp. *xericensis* Dry Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Basin Big Sagebrush - Foothill Big Sagebrush Dry Steppe & Shrubland Alliance

Colloquial Name: Basin Big Sagebrush - Foothill Big Sagebrush Dry Steppe & Shrubland

Type Concept: This semi-arid alliance occurs throughout much of the Intermountain West, especially in the Great Basin and Colorado Plateau. Stands in have a mixed shrub canopy dominated by *Artemisia tridentata* ssp. *tridentata* or *Artemisia tridentata* ssp. *xericensis*. Other shrubs have low cover, except species that increase with disturbance such as *Gutierrezia sarothrae*, *Chrysothamnus viscidiflorus*, and *Ericameria nauseosa*. Characteristic dry shrubland understory species include *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Bouteloua gracilis*, *Distichlis spicata*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa secunda*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. The non-native, invasive annual grass *Bromus tectorum* may be present and dominant in disturbed stands. Sites supporting this alliance include sloping fans, footslopes, rolling hills, swales, draws, and deep, well-drained alluvial bottomlands. Soils are deep, fine- to medium-textured alluvial soils with some source of subirrigation during the summer season, but moderately deep upland soils with ample moisture storage also support these shrublands. Some stands occur on deep, sandy soils, or soils that are highly calcareous.

Classification Comments: Associations with undetermined subspecies of *Artemisia tridentata* from former *Artemisia tridentata* Shrubland Alliance (A.829) were reviewed and placed into either *Artemisia tridentata* ssp. *wyomingensis* Dry Steppe & Shrubland Alliance (A3184) or *Artemisia tridentata* ssp. *tridentata* - *Artemisia tridentata* ssp. *xericensis* Dry Steppe & Shrubland Alliance (A3194). More review would increase confidence of placement. *Artemisia tridentata* / *Ericameria nauseosa* Shrubland (CEGL000998) is currently a broadly defined association that may need to be split into an *Artemisia tridentata* ssp. *wyomingensis* / *Ericameria nauseosa* shrubland association and an *Artemisia tridentata* ssp. *tridentata* / *Ericameria nauseosa* shrubland association after more data are available.

Internal Comments:

Other Comments:

Similar NVC Types:

- A3198 *Artemisia tridentata* - Mixed Shrub Dry Steppe & Shrubland Alliance: is codominated by non-sagebrush shrubs.

Diagnostic Characteristics: Stands in this semi-arid shrubland alliance are dominated by *Artemisia tridentata* ssp. *tridentata* or *Artemisia tridentata* ssp. *xericensis*. Characteristic herbaceous species include *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Bouteloua gracilis*, *Distichlis spicata*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa secunda*, *Sporobolus airoides*, and *Sporobolus cryptandrus*.

VEGETATION

Physiognomy and Structure: The shrublands in this alliance are characterized by a open to dense (10-75%) cover of microphyllous evergreen shrubs, usually 1-2 m in height. Cespitose graminoids are scattered in the shrub matrix and can occasionally match the shrubs in height. A sparse, emergent layer of scale-leaved or needle-leaved evergreen trees may also be present, but in many areas no trees are present. Forb species may be frequent, but are usually of low cover. With increasing summer rain in the southeastern edge of the range, there is an increase in the importance of sod-forming grasses in comparison to bunchgrasses. In many areas, undisturbed stands in this alliance will have a cryptogamic soil crust composed of a mix of lichens, tiny mosses, and bacteria.

Floristics: Stands in this semi-arid shrubland alliance have a mixed shrub canopy dominated by *Artemisia tridentata ssp. tridentata* or *Artemisia tridentata ssp. xericensis*. Other shrubs have low cover, except species that increase with disturbance such as *Gutierrezia sarothrae*, *Chrysothamnus viscidiflorus*, and *Ericameria nauseosa*. Characteristic dry shrubland understory species include *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Bouteloua gracilis*, *Distichlis spicata*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa secunda*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. The non-native, invasive annual grass *Bromus tectorum* may be present and dominant in disturbed stand. Forbs are generally of low importance and are highly variable across the range, but may be diverse in some stands. Common forbs include species of *Astragalus*, *Oenothera*, *Eriogonum*, and *Erigeron*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs throughout the Intermountain West from the western Great Basin to the Columbia Basin and Colorado Plateau at elevations ranging from 240 m in the Columbia Basin up to 2500 m. The climate where this alliance occurs is semi-arid with annual precipitation ranging from 18-40 cm and high inter-annual variation. Much of the precipitation falls as snow, and growing-season drought is characteristic. Temperatures are continental with large annual and diurnal variation. In drier regions, these shrublands are usually associated with perennial or ephemeral stream drainages with water tables less than 3 m from the soil surface. Sites supporting this alliance include sloping fans, footslopes, rolling hills, swales, draws, and deep, well-drained alluvial bottomlands. Soils are deep, fine- to medium-textured alluvial soils with some source of subirrigation during the summer season, but moderately deep upland soils with ample moisture storage also support these shrublands. Some stands occur on deep, sandy soils, or soils that are highly calcareous (Hironaka et al. 1983). Although this alliance may grade into sites with alkaline soils at the edge of internally drained basins, *Artemisia tridentata* is a non-halophyte and requires low salinity for optimum growth. The importance of perennial bunchgrasses, the most typical herbaceous associates, is favored with greater spring and summer rain, which increases northward and eastward. Because of the deep alluvial soils, stands have been converted to agriculture in much of the range of the alliance. Adjacent vegetation is highly variable, but some common adjacent communities include *Juniperus occidentalis*-, *Pinus ponderosa*-, and *Cercocarpus ledifolius*-dominated woodlands, as well as shrublands dominated by *Artemisia tridentata ssp. vaseyana*.

Dynamics: Complex ecological interactions between fire regimes, grazing history, and climate patterns result in equally complex patterns of species structure and composition in *Artemisia tridentata* stands. These present corresponding difficulties in the classification of these shrublands, which have been compounded by the influence of human settlement and agricultural patterns. What follows is a summary of some of the influences of altered fire regimes and grazing history on *Artemisia tridentata* shrublands and shrub-herbaceous vegetation.

Artemisia tridentata is inhibited by fire, and excessive grazing may decrease fire frequency due to consumption of herbaceous forage, resulting in increased shrub density. Conversely, invasion by non-native annual grasses (e.g., *Bromus tectorum*) may increase fire frequency sufficiently to eliminate the shrubs from the stands (Daubenmire 1970). With a change in fire frequency, species composition will be altered as well (West 1983c). With a high fire frequency (every 2-5 years), perennial grasses and shrubs are eliminated and non-native annual grasses dominate. At fire-return intervals of 10-30 years, short-lived resprouting shrubs such as *Chrysothamnus* or *Tetradymia* spp. dominate. At fire intervals of 30-70 years, a mixture of perennial bunchgrasses and shrubs is maintained. Finally, in the complete absence of fire, deep-rooted shrubs such as *Artemisia tridentata* become the dominant shrubs.

This alliance is often found in seasonal or intermittent stream drainages. Currently, it can often be found on the benches of perennial streams which have become restricted to a downcut channel, although these are generally in poor condition with a *Bromus tectorum* understory. It is likely that these habitats are a result of livestock grazing impacts.

DISTRIBUTION

Geographic Range: This broadly distributed alliance is found in the western United States on dry steppes with core distribution in the Great Basin and Colorado Plateau regions.

Nations: US

States/Provinces: AZ, CA, CO, ID, NM, NV, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL**USNVC Confidence Level with Comments:** Low.**SYNONYMY**

- > *Artemisia tridentata* / *Sporobolus cryptandrus* - *Oryzopsis hymenoides* Plant Community (Francis 1986)
- >< Big Sagebrush Scrub (#35210) (Holland 1986b)
- >< Big Sagebrush Series (Sawyer and Keeler-Wolf 1995)
- < SRM Cover Type #401 - Basin Big Sagebrush (Shiflet 1994)
- >< Western Shrub: 38: Great Basin Sagebrush (*Artemisia*) (Küchler 1964)

LOWER LEVEL UNITS**Associations:**

- CEGLO01545 *Artemisia tridentata* / *Sporobolus cryptandrus* - *Achnatherum hymenoides* Shrub Grassland
- CEGLO00999 *Artemisia tridentata* / *Chrysothamnus viscidiflorus* / (*Poa secunda*) Shrubland
- CEGLO01000 *Artemisia tridentata* ssp. *tridentata* / *Distichlis spicata* Shrubland
- CEGLO01008 *Artemisia tridentata* ssp. *tridentata* / *Poa secunda* Shrubland
- CEGLO00996 *Artemisia tridentata* / *Bouteloua gracilis* - *Pleuraphis jamesii* Shrubland
- CEGLO01006 *Artemisia tridentata* / *Achnatherum hymenoides* Shrubland
- CEGLO00995 *Artemisia tridentata* / *Bouteloua gracilis* Shrubland
- CEGLO00997 *Artemisia tridentata* / *Bouteloua gracilis* - *Pascopyrum smithii* Shrubland
- CEGLO01011 *Artemisia tridentata* / *Achnatherum lettermanii* Shrubland
- CEGLO00998 *Artemisia tridentata* / *Ericameria nauseosa* Shrubland
- CEGLO01013 *Artemisia tridentata* Upperzone Community Shrubland
- CEGLO00991 *Artemisia tridentata* Shrubland
- CEGLO02200 *Artemisia tridentata* ssp. *tridentata* / *Sporobolus airoides* Shrubland
- CEGLO03826 *Artemisia tridentata* ssp. *tridentata* / *Sporobolus cryptandrus* Shrubland
- CEGLO01015 *Artemisia tridentata* ssp. *tridentata* / *Pleuraphis jamesii* Shrubland

AUTHORSHIP**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2013)**Author of Description:** K.A. Schulz**Acknowledgments:****Version Date:** 2014/12/18**REFERENCES**

References: Baker 1982b, Baker 1983b, Baker 1984a, Barbour and Major 1988, Barrows et al. 1977, Blackburn 1967, Blackburn et al. 1968a, Blackburn et al. 1968c, Blackburn et al. 1969a, Blackburn et al. 1969b, Blackburn et al. 1969c, Blackburn et al. 1969d, Blackburn et al. 1971, Branson et al. 1976, Britton et al. 1981, Caicco and Wellner 1983f, Caicco and Wellner 1983k, Chappell et al. 1997, Daubenmire 1970, DeVelice and Lesica 1993, Donart et al. 1978b, Eddleman and Jaindl 1994, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Fenemore 1970, Francis 1983, Francis 1986, Francis and Aldon 1983, Franklin and Dyrness 1973, Hansen et al. 1984, Harper and Jaynes 1986, Heinze et al. 1962, Hess 1981, Hironaka 1978, Hironaka et al. 1983, Holecheck and Stephenson 1983, Holland 1986b, Jameson et al. 1962, Jensen et al. 1988a, Johnson and Payne 1968, Johnson and Simon 1987, Jorgensen 1979, Keammerer 1977, Kittel et al. 1994, Kittel et al. 1999a, Kurzius 1981, Küchler 1964, Leary and Peterson 1984, Lesica and DeVelice 1992, Loope 1969, McArthur and Welch 1986, McLean 1970, Mooney 1985, Moretti 1979, Moretti and Brotherson 1982, Mueggler and Stewart 1980, Northcutt 1978, ORNHP unpubl. data, Poulton 1955, Ralston 1969, Reid et al. 1994, Rickard and Beatley 1965, Robertson 1971, Savage 1968, Sawyer and Keeler-Wolf 1995, Sheehy and Winward 1981, Shiflet 1994, Strong 1980, Tiedemann et al. 1987, Tisdale 1986, Tisdale and Hironaka 1981, Tueller and Blackburn 1974, Tueller et al. 1966, Tweit and Houston 1980, USFS 1992, Warren et al. 1982, West 1983a, West 1983c

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G303. Intermountain Dry Tall Sagebrush Steppe & Shrubland

A3184. *Artemisia tridentata* ssp. *wyomingensis* Dry Steppe & Shrubland Alliance

Type Concept Sentence: This semi-arid shrubland alliance is found in the western United States on dry steppes with core distribution in the Great Basin, Colorado Plateau and Wyoming and is characterized by an open to moderately dense shrub canopy dominated by *Artemisia tridentata* ssp. *wyomingensis*. Other shrubs have low cover, except species that increase with disturbance such as *Gutierrezia sarothrae*, *Chrysothamnus viscidiflorus*, and *Ericameria nauseosa*. This understory is a sparse to moderately dense herbaceous layer characterized by dry-site perennial graminoids such as *Achnatherum hymenoides*, *Bouteloua gracilis*, *Carex filifolia*, *Distichlis spicata*, *Elymus elymoides*, *Hesperostipa comata*, *Pleuraphis jamesii*, and *Poa fendleriana*.

OVERVIEW

Scientific Name: *Artemisia tridentata* ssp. *wyomingensis* Dry Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Wyoming Big Sagebrush Dry Steppe & Shrubland Alliance

Colloquial Name: Wyoming Big Sagebrush Dry Steppe & Shrubland

Type Concept: This broadly distributed semi-arid shrubland alliance is found in the western United States on dry sites with core distribution in the Great Basin, Colorado Plateau and Wyoming. Stands have open to moderately dense shrub canopy dominated by *Artemisia tridentata* ssp. *wyomingensis*. *Artemisia tridentata* ssp. *tridentata* may be present in some stands. Other shrubs have low cover, except species that increase with disturbance such as *Gutierrezia sarothrae*, *Chrysothamnus viscidiflorus*, and *Ericameria nauseosa*. This understory is a sparse to moderately dense herbaceous layer characterized by dry-site graminoids such as *Achnatherum hymenoides*, *Achnatherum pinetorum*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Carex filifolia*, *Distichlis spicata*, *Elymus albicans*, *Elymus elymoides*, *Elymus lanceolatus*, *Hesperostipa comata*, *Leymus ambiguus*, *Leymus salinus*, *Pleuraphis jamesii*, and *Poa fendleriana*. The non-native, invasive species *Agropyron cristatum*, *Bromus tectorum*, and *Psathyrostachys juncea* may be present and dominant in disturbed stands. This alliance occurs on flat to steeply sloping sites with southerly aspects. Sites with little slope tend to have deep soils, while those with steeper slopes have shallow to moderately deep soils. Soil texture is loamy sand, loam, sandy loam, or clay loam.

Classification Comments: Associations with undetermined subspecies of *Artemisia tridentata* from former *Artemisia tridentata* Shrubland Alliance (A.829) were reviewed and placed into either *Artemisia tridentata* ssp. *wyomingensis* Dry Steppe & Shrubland Alliance (A3184) or *Artemisia tridentata* ssp. *tridentata* - *Artemisia tridentata* ssp. *xericensis* Dry Steppe & Shrubland Alliance (A3194). More review would increase confidence of placement.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Stands in this dry-site alliance are dominated by *Artemisia tridentata* ssp. *wyomingensis*. Characteristic herbaceous species include *Achnatherum hymenoides*, *Achnatherum pinetorum*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Carex filifolia*, *Distichlis spicata*, *Elymus albicans*, *Elymus elymoides*, *Elymus lanceolatus*, *Hesperostipa comata*, *Leymus ambiguus*, *Leymus salinus*, *Pleuraphis jamesii*, and *Poa fendleriana*.

VEGETATION

Physiognomy and Structure: The vegetation in this alliance is characterized by a moderate to dense (25-70%) cover of microphyllous evergreen shrubs, usually 0.5-1 m in height. Cespitose graminoids are usually prominent, often matching the shrubs in height and cover. Forb species may be frequent, but usually contribute little canopy cover. With increasing summer rain in the eastern portion of the range, there is a corresponding increase in the abundance of sod-forming grasses as compared to bunchgrasses. There may be significant cover on the ground surface by mosses and lichens, or a cryptogamic soil crust.

Floristics: Stands in this dry-site shrublands alliance have an open to moderately dense shrub canopy dominated by *Artemisia tridentata* ssp. *wyomingensis*. *Artemisia tridentata* ssp. *tridentata* may be present in some stands. Other shrubs have low cover, except species that increase with disturbance such as *Gutierrezia sarothrae*, *Chrysothamnus viscidiflorus*, and *Ericameria nauseosa*. Characteristic dry shrubland understory species include *Achnatherum hymenoides*, *Achnatherum pinetorum*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Carex filifolia*, *Distichlis spicata*, *Elymus albicans*, *Elymus elymoides*, *Elymus lanceolatus*, *Hesperostipa comata*, *Leymus ambiguus*, *Leymus salinus*, *Pleuraphis jamesii*, and *Poa fendleriana*. The non-native, invasive species *Agropyron cristatum*, *Bromus tectorum*, and *Psathyrostachys juncea* may be present and dominant in disturbed stands. Forbs form a minor and highly variable portion of this vegetation. Recurrent species include *Achillea millefolium*, *Balsamorhiza sagittata*, *Camelina microcarpa*, *Erigeron* spp., *Opuntia* spp., *Phlox* spp., and *Sphaeralcea coccinea*. Mosses and lichens, such as *Selaginella densa* and *Tortula ruralis*, may occur on bare ground, and in Washington and Idaho stands may cover up to 50% of the ground surface. Diagnostic of this dry-site shrubland alliance is the *Artemisia tridentata* ssp. *wyomingensis*-dominated shrub layer typically lacking a significant perennial graminoid layer (<20% cover).

ENVIRONMENT & DYNAMICS

Environmental Description: This broadly distributed alliance is found in the western United States on dry steppes with core distribution in the Great Basin, Colorado Plateau and Wyoming. Climate ranges from semi-arid in the western Great Basin and Colorado Plateau to subhumid in the northern plains. The amount and reliability of growing-season moisture increase eastward and with increasing elevation. These shrublands occur from less than 1000 m elevation in the Columbia Basin and northern Great Plains to over 2500 m in the Rocky Mountains and Great Basin ranges. The alliance occurs on flat to steeply sloping upland sites, on a wide variety of landform positions. These include alluvial fans and terraces, toeslopes, lower and middle slopes, draws, badly eroded

badland slopes, and foothills. Sites with little slope tend to have deep soils, while those with steeper slopes have shallow to moderately deep soils (USFS 1992). Sloping sites tend to have southerly aspects. Soil texture is loamy sand, loam, sandy loam, or clay loam (Hansen and Hoffman 1988), and there is often a significant amount of coarse fragments in the soil profile. Hironaka et al. (1983) reported that most of their *Artemisia tridentata* ssp. *wyomingensis* habitat types occurred on calcareous soils, often with some form of a cemented duripan or silica-hardpan at about 1 m in depth.

In eastern Idaho and western Wyoming, *Artemisia tridentata* ssp. *wyomingensis* occupies somewhat dry, low-elevation sites, while *Artemisia tridentata* ssp. *tridentata* or *Artemisia cana* occupy deep alluvial soils of drainage bottoms at low elevation, and *Artemisia tridentata* ssp. *vaseyana* occupies cooler, moister upland sites at higher elevation. In addition to *Artemisia tridentata* and *Artemisia cana*, other associated vegetation types include *Atriplex confertifolia*, *Ericameria* spp., or *Chrysothamnus* spp. shrublands, *Populus tremuloides*, *Pinus ponderosa*, *Pinus contorta*, *Abies grandis*, or *Pseudotsuga menziesii* forests, *Pinus* - *Juniperus* woodlands, or mesic herbaceous communities.

Dynamics: Complex ecological interactions between fire regimes, grazing history, and climate patterns result in equally complex patterns of species structure and composition in *Artemisia tridentata*. These present corresponding difficulties in the classification of these shrublands, which have been compounded by the influence of human settlement and agricultural patterns. What follows is a summary of some of the influences of altered fire regimes, and grazing history on *Artemisia tridentata* shrublands and shrub-herbaceous vegetation.

Artemisia tridentata ssp. *wyomingensis* shrublands may represent either drier or more disturbed examples of the *Artemisia tridentata* ssp. *wyomingensis* shrubland and shrub herbaceous alliances. Shrub densities typically increase with overgrazing of the bunchgrass component or with increasing summer drought (West 1983c). There is considerable debate over whether present shrub-dominated stands are actually degraded "steppe" (e.g., shrub-herbaceous physiognomy), and if the stands will return to steppe with changes in grazing and fire management. *Artemisia tridentata* is inhibited by fire, and excessive grazing may decrease fire frequency due to consumption of herbaceous forage, resulting in increased shrub density. Conversely, invasion by non-native annual grasses (e.g., *Bromus tectorum* or *Bromus arvensis*) may increase fire frequency sufficiently to eliminate the shrubs from the stands (Hironaka et al. 1983). With a change in fire frequency, species composition will be altered as well (West 1983c). With a high fire frequency (every 2-5 years), perennial grasses and shrubs are eliminated and non-native annual grasses dominate. At fire-return intervals of 10-30 years, short-lived resprouting shrubs such as *Chrysothamnus* or *Tetradymia* spp. dominate. At fire intervals of 30-70 years, a mixture of perennial bunchgrasses and shrubs is maintained. Finally, in the complete absence of fire, deep-rooted shrubs such as *Artemisia tridentata* become the theoretical dominants.

DISTRIBUTION

Geographic Range: This broadly distributed alliance is found in the western United States on dry steppes with core distribution in the Great Basin, Colorado Plateau and Wyoming.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, ND, NM, NV, OR, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- >< Big Sagebrush Scrub (#35210) (Holland 1986b)
- >< Big Sagebrush Series (Sawyer and Keeler-Wolf 1995)
- >< SRM Cover Type #314 - Big Sagebrush-Bluebunch Wheatgrass (Shiflet 1994)
- < SRM Cover Type #403 - Wyoming Big Sagebrush (Shiflet 1994)
- < SRM Cover Type #612 - Sagebrush - Grass (Shiflet 1994)
- >< Western Shrub and Grasslands Combinations: 55: Sagebrush-Steppe (*Artemisia-Agropyron*) (Küchler 1964)
- >< Western Shrub: 38: Great Basin Sagebrush (*Artemisia*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEG001534 *Artemisia tridentata* ssp. *wyomingensis* / Mixed Grasses Shrub Grassland
- CEG002761 *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Colorado Plateau Shrubland
- CEG001041 *Artemisia tridentata* ssp. *wyomingensis* / *Bouteloua gracilis* Shrubland
- CEG001001 *Artemisia tridentata* / *Elymus elymoides* Shrubland
- CEG001005 *Artemisia tridentata* / *Pleuraphis jamesii* Shrubland

- CEGLO01042 *Artemisia tridentata ssp. wyomingensis* / *Carex filifolia* Shrubland
- CEGLO02810 *Artemisia tridentata ssp. wyomingensis* / *Achnatherum pinetorum* Shrubland
- CEGLO01045 *Artemisia tridentata ssp. wyomingensis* / *Leymus ambiguus* Shrubland
- CEGLO01046 *Artemisia tridentata ssp. wyomingensis* / *Achnatherum hymenoides* Shrubland
- CEGLO01052 *Artemisia tridentata ssp. wyomingensis* / *Achnatherum thurberianum* Shrubland
- CEGLO02084 *Artemisia tridentata ssp. wyomingensis* / *Pleuraphis jamesii* Shrubland
- CEGLO02768 *Artemisia tridentata ssp. wyomingensis* / Sparse Understory Shrubland
- CEGLO02775 *Artemisia tridentata ssp. wyomingensis* / *Poa fendleriana* Shrubland
- CEGLO02813 *Artemisia tridentata ssp. wyomingensis* / *Leymus salinus* Shrubland
- CEGLO01043 *Artemisia tridentata ssp. wyomingensis* / *Elymus elymoides* Shrubland
- CEGLO01044 *Artemisia tridentata ssp. wyomingensis* / *Elymus albicans* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by D. Sarr.

Version Date: 2014/12/18

REFERENCES

References: Baker 1982b, Baker 1983c, Baker and Kennedy 1985, Bear Creek Uranium Mine Application n.d., Bighorn Coal Mine n.d., Blackburn 1967, Blackburn et al. 1968a, Blackburn et al. 1968b, Blackburn et al. 1968c, Blackburn et al. 1969a, Blackburn et al. 1969b, Blackburn et al. 1969c, Blackburn et al. 1969d, Blackburn et al. 1971, Britton et al. 1981, Brotherson and Brotherson 1981, Brown 1971, Caicco and Wellner 1983f, Caicco and Wellner 1983i, Caicco and Wellner 1983j, Caicco and Wellner 1983k, Caicco and Wellner 1983l, Chappell et al. 1997, Comer 1999, Cotter-Ferguson Project n.d., Daubenmire 1970, Day and Wright 1985, DeVelice and Lesica 1993, DeVelice et al. 1991, Doescher et al. 1986, Driese et al. 1997, Earth Resource Technology n.d., Eddleman and Jaindl 1994, Ellis and Hackney 1981, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Fenemore 1970, Ferchau 1973, Fisser 1964, Fisser 1970, Francis 1983, Francis 1986, Franklin and Dyrness 1973, Giese 1975, Gross 1955, Hall 1973, Hansen and Hoffman 1988, Hansen et al. 1984, Harper and Jaynes 1986, Heinze et al. 1962, Hess 1981, Hess and Wasser 1982, Hironaka 1978, Hironaka et al. 1983, Holecheck and Stephenson 1983, Holland 1986b, Jameson et al. 1962, Jensen et al. 1988a, Johnson and Payne 1968, Johnson and Simon 1987, Johnston 1987, Jorgensen 1979, Keammerer 1987, Knight 1994, Knight et al. 1987, Komarkova 1986, Kurzius 1981, Kuchler 1964, Leary and Peterson 1984, Lesica and DeVelice 1992, Leucite Hills Mine Application n.d., Lewis 1975a, Loope 1969, Lucky McMine Application n.d., Lundberg 1977, Marr et al. 1979, McArthur and Welch 1986, McLean 1970, Moretti 1979, Moretti and Brotherson 1982, Mueggler and Stewart 1980, Nichols 1964a, Nichols 1964b, Northwest Resources Co. 1981, ORNHP unpubl. data, Poulton 1955, Ralston 1969, Rickard and Beatley 1965, Robertson 1971, Savage 1968, Sawyer and Keeler-Wolf 1995, Seminoe I Mine Application n.d., Sheehy and Winward 1981, Shiflet 1994, Skull Point Mine Application n.d., Skull Point Mine Permit Renewal n.d., Smith n.d.b, Steger 1970, Stoecker-Keammerer Consultants n.d.a, Strong 1980, Sweetwater Uranium Project 1978, Sweetwater Uranium Project n.d., Terwilliger et al. 1979a, Thorne Ecological Institute 1973a, Thorne Ecological Institute 1973b, Tiedemann et al. 1987, Tisdale 1947, Tisdale and Hironaka 1981, Tueller and Blackburn 1974, Tueller et al. 1966, Tweit and Houston 1980, USFS 1992, Van Pelt 1978, Warren et al. 1982, West 1983c, West et al. 1984, Winward 1970

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.3.b. M169 Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland

G302. Intermountain Mesic Tall Sagebrush Steppe & Shrubland

Type Concept Sentence: This widespread matrix-forming sagebrush steppe and shrubland group occurs throughout the interior western U.S., Wyoming and the northwestern Great Plains and is characterized by an open to sparse shrub layer of *Artemisia tridentata* (*ssp. tridentata*, *ssp. xericensis*) or *Artemisia tripartita ssp. tripartita* with an often dense herbaceous layer dominated by perennial bunchgrasses such as *Achnatherum occidentale*, *Festuca campestris*, *Festuca idahoensis*, *Leymus cinereus*, *Poa secunda*, and *Pseudoroegneria spicata*.

OVERVIEW

Scientific Name: *Artemisia tridentata* - *Artemisia tripartita* - *Purshia tridentata* Big Sagebrush Steppe & Shrubland Group

Common Name (Translated Scientific Name): Basin Big Sagebrush - Threetip Sagebrush - Antelope Bitterbrush Big Sagebrush Steppe & Shrubland Group

Colloquial Name: Basin Big Sagebrush - Foothill Big Sagebrush Mesic Steppe & Shrubland

Type Concept: This widespread matrix-forming sagebrush steppe group occurs throughout much of the western U.S. in the Great Basin, Columbia Plateau, northwestern Great Plains, eastern Sierra Nevada, Wyoming Basins, Rocky Mountains, and Colorado

Plateau between elevations of 1200 and 2400 m. Stands are characterized by open to sparse shrublands dominated by *Artemisia tridentata* (*ssp. tridentata*, *ssp. xericensis*) or *Artemisia tripartita ssp. tripartita* which tend to occupy more mesic sites with well-developed soil, and *Purshia tridentata* which tends to occupy drier, rockier soils and positions, as well as sandy dune areas. Some *Artemisia tridentata ssp. wyomingensis* associations are included here, where they occur in biophysical settings conducive to an abundant herbaceous layer, and more mesic-indicator species. Herbaceous layers are often dense and dominated by perennial bunchgrasses, especially as *Festuca idahoensis* and *Pseudoroegneria spicata*. Other common graminoids include *Achnatherum hymenoides*, *Achnatherum occidentale*, *Carex pensylvanica*, *Festuca campestris*, *Hesperostipa comata*, *Leymus cinereus*, *Pascopyrum smithii*, and *Poa secunda*. In some cases scattered trees may form an emergent layer of individual trees; species include *Cercocarpus ledifolius*, *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, or *Pinus ponderosa*. Many perennial forb species are important in these shrublands, and microphytic crust is very important in this group. This group may occur on stream terraces, point bars, valley floors, alluvial fans, floodplains, washes, gullies, stabilized dunes, swales, and rocky slopes. Soils vary from deep and well-developed to shallow, rocky and poorly developed sandy loams, loamy sands, sand, silt loams, and clay loams derived from alluvium, loess, shale, and sandstone.

Classification Comments: This group is a solid concept at its core, although the associations considered "mesic tall sagebrush" probably need adjustment. These communities tend to occur in the northern Great Basin and Northern Rockies, or on somewhat more mesic settings than the dry tall sagebrush group. Slightly higher precipitation and less evapotranspiration stress combined with deeper soils allow for the significant bunchgrass and perennial forb component of the shrublands in this group.

Similar NVC Types:

- G303 Intermountain Dry Tall Sagebrush Steppe & Shrubland
- G304 Intermountain Mountain Big Sagebrush Steppe & Shrubland

Diagnostic Characteristics: Stands are characterized by open to sparse shrublands dominated by *Artemisia tridentata* (*ssp. tridentata*, *ssp. xericensis*) or *Artemisia tripartita ssp. tripartita* which tend to occupy more mesic sites with well-developed soil, and *Purshia tridentata* which tends to occupy drier, rockier soils and positions, as well as sandy dune areas. Herbaceous layers are often dense and dominated by perennial bunchgrasses and a significant perennial graminoid layer is diagnostic of this group. Common graminoids include *Achnatherum hymenoides*, *Achnatherum occidentale*, *Achnatherum thurberianum*, *Carex pensylvanica*, *Elymus lanceolatus*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Koeleria macrantha*, *Leymus cinereus*, *Pascopyrum smithii*, *Poa secunda*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: These are microphyllous evergreen or deciduous scrublands, with a significant component of perennial grasses. The group is structurally characterized by open to dense sagebrush or bitterbrush with associated shrubs interspersed and/or a dense understory of perennial bunch grasses.

Floristics: This shrub and shrub herbaceous group is characterized by communities dominated by *Artemisia tridentata ssp. tridentata*, *Artemisia tridentata ssp. xericensis*, *Artemisia tridentata ssp. wyomingensis*, *Artemisia tripartita ssp. tripartita*, and *Purshia tridentata*. Other associated shrubs and dwarf-shrubs may include *Arctostaphylos uva-ursi*, *Artemisia frigida*, *Chrysothamnus viscidiflorus*, *Ericameria* spp., *Peraphyllum ramosissimum*, *Philadelphus lewisii*, *Prunus virginiana*, *Ribes cereum*, *Symphoricarpos longiflorus*, and *Symphoricarpos rotundifolius*. Herbaceous layers are often dense and dominated by perennial bunchgrasses. Common graminoids include *Achnatherum hymenoides*, *Achnatherum nelsonii*, *Achnatherum occidentale*, *Achnatherum thurberianum*, *Carex pensylvanica*, *Elymus lanceolatus*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Koeleria macrantha*, *Leymus cinereus*, *Muhlenbergia montana*, *Pascopyrum smithii*, *Poa secunda*, and *Pseudoroegneria spicata*. Forbs are often diverse and have moderate to low cover. Species may include *Balsamorhiza sagittata*, *Eriogonum umbellatum*, or *Penstemon deustus*. In some cases scattered trees may form an emergent layer of individual trees; species include *Cercocarpus ledifolius*, *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, or *Pinus ponderosa*.

ENVIRONMENT & DYNAMICS

Environmental Description: This widespread matrix-forming group occurs throughout much of the western U.S. between elevations of 600 m in the northern extents to 2500 m in southern range limits. This group may occur on stream terraces, point bars, valley floors, alluvial fans, floodplains, washes, gullies, stabilized dunes, mesic uplands, swales, and rocky slopes. Slopes are variable from gentle to very steep. *Climate:* The climate where this group occurs is semi-arid with annual precipitation ranging from 18-40 cm and high inter-annual variation. Much of the precipitation falls as snow, and growing-season drought is characteristic. Temperatures are continental with large annual and diurnal variations. *Soil/substrate/hydrology:* Soils vary from deep and well-developed to rocky and poorly developed sandy loams, loamy sands, sand, silt loams, and clay loams derived from alluvium, loess, shale, and sandstone. In drier regions, these shrublands are usually associated with perennial or ephemeral stream drainages with water tables less than 3 m from the soil surface.

Dynamics: The natural fire regime of this group likely maintains a patchy distribution of shrubs so that the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions in the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Response to grazing can be variable depending on the type of grazer and the season in which grazing occurs. *Hesperostipa comata* can increase in abundance in response to either grazing or fire. In central and eastern Montana (and possibly elsewhere), complexes of prairie dog towns are common in this group. Microphytic crust is very important in this group.

DISTRIBUTION

Geographic Range: This widespread matrix-forming sagebrush steppe group occurs throughout much of the western U.S. in the Columbia Plateau, Great Basin, eastern Sierra Nevada, Colorado Plateau, Wyoming Basins, Rocky Mountains, and northwestern Great Plains.

Spatial Scale & Pattern [optional]: Matrix, Large patch

Nations: CA, US

States/Provinces: BC, CA, CO, ID, MT, ND, NV, OR, SD?, UT, WA, WY

TNC Ecoregions [optional]: 4:P, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 26:C, 68:C

USFS Ecoregions (2007): 313A:CC, 331D:CC, 331G:CC, 341A:CC, 341B:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:C?, 342I:CC, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:C?, M332D:CC, M332E:CC, M332F:CC, M332G:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Arches, Curecanti, Dinosaur, Fossil Butte, Golden Spike, Grand Teton?, John Day Fossil Beds, Mesa Verde, Natural Bridges, Zion); USFS (Arapaho-Roosevelt, Bridger-Teton, Shoshone); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- = Western Intermountain sagebrush steppe (West 1983c)

LOWER LEVEL UNITS

Alliances:

- A3179 *Purshia tridentata* - *Artemisia tridentata* Mesic Steppe & Shrubland Alliance
- A3183 *Artemisia tridentata ssp. tridentata* - *Artemisia tridentata ssp. xericensis* Mesic Steppe & Shrubland Alliance
- A1528 *Artemisia tripartita ssp. tripartita* - *Artemisia tridentata* Mesic Steppe & Shrubland Alliance
- A3182 *Artemisia tridentata ssp. wyomingensis* Mesic Steppe & Shrubland Alliance

AUTHORSHIP

Primary Concept Source: N.E. West (1983c)

Author of Description: M.E. Hall and K.A. Schulz

Acknowledgments:

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: MEH/KAS 3-10, mod. KAS 11-15

REFERENCES

References: Barbour and Billings 1988, Barbour and Major 1977, Barbour and Major 1988, Brown 1982a, Brown et al. 1979, Daubenmire 1970, Faber-Langendoen et al. 2017a, Hironaka et al. 1983, Holland and Keil 1995, Knight 1994, Mueggler and Stewart 1980, Shiflet 1994, West 1983a, West 1983c

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G302. Intermountain Mesic Tall Sagebrush Steppe & Shrubland

A3183. *Artemisia tridentata ssp. tridentata* - *Artemisia tridentata ssp. xericensis* Mesic Steppe & Shrubland Alliance

Type Concept Sentence: This mesic shrubland and steppe alliance occurs throughout the Intermountain West on sloping fans, footslopes, rolling hills, and especially deep, well-drained alluvial bottomlands with vegetation characterized by an open to moderately dense (10-70% cover) shrub layer of *Artemisia tridentata ssp. tridentata* or *Artemisia tridentata ssp. xericensis* and a sparse to dense herbaceous layer dominated by perennial bunchgrasses, especially *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus*, *Pascopyrum smithii*, and *Pseudoroegneria spicata*.

OVERVIEW

Scientific Name: *Artemisia tridentata* ssp. *tridentata* - *Artemisia tridentata* ssp. *xericensis* Mesic Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Basin Big Sagebrush - Foothill Big Sagebrush Mesic Steppe & Shrubland Alliance

Colloquial Name: Basin Big Sagebrush - Foothill Big Sagebrush Mesic Steppe & Shrubland

Type Concept: This mesic shrubland and steppe alliance occur throughout the Intermountain West from the western Great Basin to the northern Rocky Mountains, the Columbian Basin and Colorado Plateau. The vegetation included in this alliance is characterized by a somewhat sparse to moderately dense (10-70% cover) shrub layer of *Artemisia tridentata* ssp. *tridentata* or *Artemisia tridentata* ssp. *xericensis*. Shrub associates include *Ericameria nauseosa* (= *Chrysothamnus nauseosus*) or *Chrysothamnus viscidiflorus* which increase with disturbance. Other shrubs occasionally present include *Atriplex* spp., *Gutierrezia sarothrae*, and *Symphoricarpos longiflorus*. Occasionally individual trees are present in some stands. The sparse to dense herbaceous layer is dominated by bunchgrasses that occupy patches in the shrub matrix. The most widespread species is *Pseudoroegneria spicata*, which occurs from the Columbia Basin to the Northern Rockies. Other locally dominant or important species include *Elymus elymoides*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata* (= *Stipa comata*), *Koeleria macrantha*, *Leymus cinereus*, *Muhlenbergia richardsonis*, *Pascopyrum smithii*, *Pleuraphis jamesii* (= *Hilaria jamesii*), and *Poa secunda*. Forbs are generally of low importance and are highly variable across the range. Mosses and lichens are important ground cover in some stands. This mesic shrubland and steppe alliance occurs on sloping fans, footslopes, rolling hills, and especially deep, well-drained alluvial bottomlands.

Classification Comments: This mesic shrubland and steppe alliance occurs as large patch/matrix stands in relatively mesic northern latitudes. However, in semi-arid landscapes in more southern latitudes, it frequently occurs in smaller patch stands restricted to relatively mesic sites, such as swales and basins, that receive additional moisture from surrounding slopes, and at higher elevations.

The subspecies of *Artemisia tridentata* occurring in some associations included in this alliance are not determined, inconsistent or may be mixed. As the subspecies in stands in this alliance are determined, some associations can be moved or split and placed into these other alliances. Further study is needed to re-apportion communities within this alliance or justify the current classification. Mueggler and Stewart (1980) describe two *Artemisia tridentata* habitat types, one with *Festuca campestris* diagnostic and the other with *Festuca idahoensis*. The first one includes both ssp. *vaseyana* and ssp. *wyomingensis* depending on elevation. They cite an *Artemisia tridentata* ssp. *tridentata* / *Festuca idahoensis* Habitat Type from eastern Washington (Daubenmire 1970). Dick-Peddie (1993) described several vegetation types that may be classified in this alliance from four shrub-grass series in New Mexico. More complete descriptions of both alliances are needed to distinguish them.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: This mesic shrubland and steppe alliance is characterized by a somewhat sparse to moderately dense (10-70% cover) shrub layer of *Artemisia tridentata* ssp. *tridentata* or *Artemisia tridentata* ssp. *xericensis*. The open to moderately dense herbaceous layer is dominated by bunchgrasses. Characteristic species are *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus*, *Pascopyrum smithii*, *Poa secunda*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: The vegetation is characterized by a sparse cover of microphyllous evergreen shrubs, usually 1-2 m in height. Shrub cover can be variable, but on average is less than 25% for steppe sites and 10-70% cover for shrubland sites. Perennial caespitose graminoids form a matrix surrounding the shrubs in steppe, occasionally matching them in height, or form a sparse to moderately dense graminoid layer in shrublands. Forb species may be frequent, but are usually of low canopy cover. The ground surface is covered with mosses and lichens in good condition stands, except for fluvial sites.

Floristics: The vegetation included in this alliance is characterized by a somewhat sparse to moderately dense (10-70% cover) shrub layer of *Artemisia tridentata* ssp. *tridentata* or *Artemisia tridentata* ssp. *xericensis*. Shrub associates include *Ericameria nauseosa* (= *Chrysothamnus nauseosus*) or *Chrysothamnus viscidiflorus* which increase with disturbance. Other shrubs occasionally present include *Atriplex* spp., *Gutierrezia sarothrae*, and *Symphoricarpos longiflorus*. Occasionally individual trees are present in some stands. The open to dense herbaceous layer is dominated by bunchgrasses that occupy patches in the shrub matrix. The most widespread species is *Pseudoroegneria spicata*, which occurs from the Columbia Basin to the Northern Rockies. Other locally dominant or important species include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Elymus elymoides*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata* (= *Stipa comata*), *Koeleria macrantha*, *Leymus cinereus*, *Muhlenbergia richardsonis*, *Pascopyrum smithii*, *Pleuraphis jamesii* (= *Hilaria jamesii*), and *Poa secunda*. Forbs are generally of low importance and are highly variable across the range. Mosses and lichens are important ground cover in some stands. Diagnostic of this alliance is the *Artemisia tridentata* ssp. *tridentata*- or *Artemisia tridentata* ssp. *xericensis*-dominated shrub layer. The graminoid layer typically has >20% cover perennial graminoids or has over 40% total cover of shrubs.

ENVIRONMENT & DYNAMICS

Environmental Description: This mesic shrubland and steppe alliance occurs throughout the Intermountain West from the western Great Basin to the Colorado Plateau, northern Rocky Mountains and northwestern Great Plains. Elevation is mostly 1200-2500 m, but extends down to 240 m in the Columbia Basin. Mean annual precipitation ranges from 20-50 cm. Precipitation primarily occurs in the winter as snow or rain in the western portion of its range; however, spring and summer precipitation becomes important in the eastern portion of its range. This moisture is stored in the soil profile and utilized during the typically dry summers. Sites supporting this alliance include sloping fans, footslopes, rolling hills, and deep, well-drained alluvial bottomlands and swales. Soils are deep, fine- to medium-textured alluvial soils with some source of subirrigation during the summer season, but moderately deep upland soils with ample moisture storage also support these shrublands. Some stands occur on deep, sandy soils, or soils that are highly calcareous.

Dynamics: Complex ecological interactions between fire regimes, grazing history, and climate patterns result in equally complex patterns of species structure and composition in *Artemisia tridentata*. These present corresponding difficulties in the classification of these shrublands, which have been compounded by the influence of human settlement and agricultural patterns. What follows is a summary of some of the influences of altered fire regimes and grazing history on *Artemisia tridentata* shrublands and shrub-herbaceous vegetation that can result in the conversion of stands of this alliance into stands of exotic annual grassland. Exotic plants have invaded many stands, especially where disturbed (Daubenmire 1970). Common exotics may include annual grasses such as *Bromus tectorum*, *Bromus arvensis*, and *Bromus briziformis* which may be abundant during wet years; and annual forbs such as *Epilobium brachycarpum*, *Erodium cicutarium*, *Lactuca serriola*, *Tragopogon dubius*, and the perennial forb *Hypericum perforatum*. The winter precipitation recharges soil moisture, and the typically dry summers favor shrubs and deep-rooted grasses (West 1983c, 1988). The exotic annual grass *Bromus tectorum* competes favorably with these cool-season, perennial bunchgrasses in these stands by germinating in the fall, establishing a root system during the winter, then utilizing and depleting soil moisture early in the spring while the bunchgrasses are still mostly dormant (West 1983c).

Artemisia tridentata (*ssp. tridentata*, *ssp. xericensis*) shrub-herbaceous communities may represent either moister or less disturbed examples of the *Artemisia tridentata* (*ssp. tridentata*, *ssp. xericensis*) shrubland complex. Shrub densities typically increase with overgrazing of the bunchgrass component or with increasing summer drought (West 1983c). *Artemisia tridentata* is inhibited by fire, and excessive grazing may decrease fire frequency due to consumption of herbaceous forage, resulting in increased shrub density. Conversely, invasion by non-native annual grasses (e.g., *Bromus tectorum*) may increase fire frequency sufficiently to eliminate the shrubs from the stands (Daubenmire 1970). With a change in fire frequency, species composition will be altered as well (West 1983c). With a high fire frequency (every 2-5 years), perennial grasses and shrubs are eliminated and non-native annual grasses dominate. At fire-return intervals of 10-30 years, short-lived resprouting shrubs, such as *Chrysothamnus* or *Tetradymia* spp. dominate. At fire intervals of 30-70 years, a mixture of perennial bunchgrasses and shrubs is maintained. Finally, in the complete absence of fire, deep-rooted shrubs such as *Artemisia tridentata* become the dominant shrubs.

DISTRIBUTION

Geographic Range: This shrubland and steppe alliance occurs throughout the Intermountain West from the western Great Basin to the Colorado Plateau, northern Rocky Mountains and northwestern Great Plains.

Nations: CA, US

States/Provinces: BC?, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Artemisia tridentata ssp. tridentata* / *Festuca idahoensis* habitat type (Daubenmire 1970)
- >< *Artemisia tridentata ssp. tridentata* and *ssp. wyomingensis* Shrub Steppe (Chappell et al. 1997)
- > *Artemisia tridentata-Agropyron spicatum* habitat type (Daubenmire 1970)
- > *Artemisia tridentata/Agropyron spicatum* Habitat Type (Hironaka et al. 1983)
- < *Artemisia tridentata* Series (Mueggler and Stewart 1980)
- >< Big Sagebrush Scrub (#35210) (Holland 1986b)
- < Big Sagebrush Series (Sawyer and Keeler-Wolf 1995)
- < Great Basin Sagebrush (*Artemisia*), #32 (Küchler 1964)
- > SRM Cover Type #314 - Big Sagebrush-Bluebunch Wheatgrass (Shiflet 1994)
- < Sagebrush Steppe (*Artemisia-Agropyron*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEG001530 *Artemisia tridentata* / *Festuca idahoensis* Shrub Grassland
- CEG001017 *Artemisia tridentata* ssp. *tridentata* / *Pascopyrum smithii* - (*Elymus lanceolatus*) Shrubland
- CEG001019 *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) / *Pseudoroegneria spicata* - *Poa secunda* Shrub Grassland
- CEG001016 *Artemisia tridentata* ssp. *tridentata* / *Leymus cinereus* Shrubland
- CEG001012 *Artemisia tridentata* / *Symphoricarpos longiflorus* Shrubland
- CEG001014 *Artemisia tridentata* ssp. *tridentata* / *Festuca idahoensis* Shrubland
- CEG002966 *Artemisia tridentata* ssp. *tridentata* / *Hesperostipa comata* Shrubland
- CEG001458 *Artemisia tridentata* / *Leymus cinereus* Shrub Grassland
- CEG001018 *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) / *Pseudoroegneria spicata* Shrub Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Blackburn et al. 1968a, Blackburn et al. 1968c, Blackhawk Coal Company 1981, Brotherson and Brotherson 1979, Caicco and Wellner 1983k, Chappell et al. 1997, Dastrup 1963, Daubenmire 1970, Daubenmire 1992, Dick-Peddie 1993, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Graham 1937, Hall 1973, Hansen 1985, Hansen et al. 1984, Hironaka 1978, Hironaka et al. 1983, Hirsch 1985, Holland 1986b, Jensen et al. 1988a, Kuchler 1964, Mariah Associates 1981, McArthur and Welch 1986, McLean 1970, Mooney 1985, Mueggler and Stewart 1980, ORNHP unpubl. data, Poulton 1955, Ralston 1969, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Thilenius et al. 1995, Tisdale 1947, Tweit and Houston 1980, USFS 1992, Van Pelt 1978, West 1983c, West 1988

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G302. Intermountain Mesic Tall Sagebrush Steppe & Shrubland

A3182. *Artemisia tridentata* ssp. *wyomingensis* Mesic Steppe & Shrubland Alliance

Type Concept Sentence: This mesic shrubland and steppe alliance is found in the western United States and southwestern Canada and is characterized by an open to dense (10-70% cover) shrub layer that is dominated (or codominated with at least 40% relative cover in mixed stands) by *Artemisia tridentata* ssp. *wyomingensis*. Common associates include *Atriplex confertifolia*, *Artemisia frigida*, *Krascheninnikovia lanata*, *Purshia tridentata*, and *Symphoricarpos longiflorus*.

OVERVIEW

Scientific Name: *Artemisia tridentata* ssp. *wyomingensis* Mesic Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Wyoming Big Sagebrush Mesic Steppe & Shrubland Alliance

Colloquial Name: Wyoming Big Sagebrush Mesic Steppe & Shrubland

Type Concept: This mesic shrubland and steppe alliance is found in the western United States and southwestern Canada and is characterized by an open to dense (10-70% cover) shrub layer that is dominated (or codominated with at least 40% relative cover in mixed stands) by *Artemisia tridentata* ssp. *wyomingensis*. Common associates include *Atriplex confertifolia*, *Artemisia frigida*, *Krascheninnikovia lanata*, *Purshia tridentata*, and *Symphoricarpos longiflorus*. The herbaceous stratum can be diverse and have open to dense cover, but perennial graminoids typically total >20% cover. Characteristic dominant species are *Balsamorhiza sagittata*, *Hesperostipa comata*, *Pascopyrum smithii*, *Poa secunda*, and *Pseudoroegneria spicata*. Stands occur on flat to steeply sloping upland sites. Sites with little slope tend to have deep soils, while those with steeper slopes have shallow to moderately deep soils. Soil texture is loam, sandy loam, or clay loam with coarse fragments common in the soil profile.

Classification Comments: This mesic shrubland and steppe alliance occurs as large patch/matrix stands in relatively mesic northern latitudes. However, in semi-arid landscapes in more southern latitudes, it frequently occurs in smaller patch stands restricted to relatively mesic sites, such as swales and basins, that receive additional moisture from surrounding slopes and at higher elevations.

Associations with undetermined subspecies of *Artemisia tridentata* from old alliances *Artemisia tridentata* Shrubland Alliance (A.829) and *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521) were reviewed and placed into either *Artemisia tridentata* ssp. *wyomingensis* Mesic Steppe & Shrubland Alliance (A3182) or *Artemisia tridentata* ssp. *tridentata* - *Artemisia tridentata* ssp. *xericensis* Mesic Steppe & Shrubland Alliance (A3183). More review would increase confidence of placement. *Artemisia tridentata* ssp. *wyomingensis* - *Peraphyllum ramosissimum* / *Festuca idahoensis* Shrubland (CEGL001048) was placed in this alliance (A3182) instead of *Artemisia tridentata* - Mixed Shrub Dry Shrubland Alliance (A3198) because it is a relatively mesic shrubland, and the current concept of the association only requires *Peraphyllum ramosissimum* be present to codominant (1-20% cover), so it is not a

reliable *Artemisia tridentata* - mixed shrub stand. Currently, this alliance includes stands in North Dakota In the northwestern Great Plains.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: This mesic steppe and shrubland alliance has an open to moderately dense conspicuous shrub layer dominated by diagnostic shrub *Artemisia tridentata* ssp. *wyomingensis*. Associated shrubs include *Atriplex confertifolia*, *Artemisia frigida*, *Purshia tridentata*, and *Krascheninnikovia lanata*. The herbaceous layer ranges from open to moderate cover, but perennial graminoids typically total >20% cover. Characteristic dominant species are *Balsamorhiza sagittata*, *Hesperostipa comata*, *Pascopyrum smithii*, *Poa secunda*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: This alliance is characterized by an open to dense (10-70%) cover of microphyllous evergreen shrubs, usually 0.3-1 m in height, although in Washington the shrubs may be up to 2 m tall. Cespitose graminoids are usually dominant, often matching, and sometimes exceeding, the shrubs in height or cover. Forb species may be frequent, but are usually of low canopy cover. With increasing summer rain in the eastern portion of the range, there is a corresponding increase in the proportion of sod-forming grasses as compared to bunchgrasses. Undisturbed stands in Washington and Oregon may have a nearly continuous cryptogamic soil crust of mosses and lichens.

Floristics: Shrubs are conspicuous in this alliance, but herbaceous species usually have equal or greater cover. The vegetation included in this alliance is characterized by an open to moderately dense (10-70% cover) shrub layer that is dominated (or codominated with at least 40% relative cover in mixed stands) by *Artemisia tridentata* ssp. *wyomingensis*. Common associated shrubs are *Artemisia frigida*, *Chrysothamnus* spp., *Ericameria* spp., *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Peraphyllum ramosissimum*, and *Symphoricarpos longiflorus*. The herbaceous stratum can be diverse and have open to moderate cover, but perennial graminoids typically total <20% cover. The most widespread and common species are *Pseudoroegneria spicata*, which occurs from the Columbia Basin to the Northern Rockies, and *Pascopyrum smithii*, which is more common in the northwestern Great Plains. Other locally abundant grass associates include *Achnatherum thurberianum* (= *Stipa thurberiana*) (in the western portion of the range), *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Bouteloua curtipendula*, *Bouteloua gracilis*, *Carex filifolia*, *Elymus lanceolatus*, *Hesperostipa comata* (= *Stipa comata*), *Koeleria macrantha*, *Leymus ambiguus*, and *Poa secunda*. Forbs form a minor and highly variable portion of this vegetation. Recurrent species include *Achillea millefolium*, *Balsamorhiza sagittata*, *Camelina microcarpa*, *Erigeron* spp., *Opuntia* spp., *Phlox* spp., and *Sphaeralcea coccinea*. Mosses and lichens, such as *Selaginella densa* and *Tortula ruralis*, may occur on bare ground. Where there is supplemental moisture or where the vegetation grades into forest, emergent needle-leaved evergreen or cold-deciduous trees may be scattered through these shrub-steppe communities. Recurrent tree associates include *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus contorta*, *Pinus edulis*, *Pinus flexilis*, *Pinus ponderosa*, and *Populus tremuloides*.

ENVIRONMENT & DYNAMICS

Environmental Description: This mesic steppe and shrubland alliance is found in the western United States and southwestern Canada from the Columbia River Basin south and east across the Great Basin to the northern Rocky Mountains and northwestern Great Plains. Climates range from semi-arid in the western Great Basin to subhumid in the Rocky Mountains and northern plains. The amount and reliability of growing-season moisture increase eastward and with increasing elevation. The associations in this alliance occur in somewhat wetter areas of the range of *Artemisia tridentata* ssp. *wyomingensis*, generally with over 25 cm annual precipitation or with a significant proportion falling in the growing season. These communities occur at elevations of less than 1000 m in the Columbia Basin and northern Great Plains to over 2500 m in the Rocky Mountains and Great Basin ranges. The alliance occurs on flat to steeply sloping upland sites. Sites with little slope tend to have deep soils, while those with steeper slopes have shallow to moderately deep soils (USFS 1992). Soil texture is loam, sandy loam, or clay loam (Hansen and Hoffman 1988), which allows ample shallow rainfall storage and percolation of snowmelt. Coarse fragments are common in the soil profile. Hironaka et al. (1983) reported that most of their *Artemisia tridentata* ssp. *wyomingensis* habitat types occurred on calcareous soils, often with some form of a cemented duripan or silica-hardpan at about 1 m in depth.

In eastern Idaho and western Wyoming, *Artemisia tridentata* ssp. *wyomingensis* occupies somewhat dry, low-elevation sites, while *Artemisia tridentata* ssp. *tridentata* or *Artemisia cana* occupy deep alluvial soils of drainage bottoms at low elevation, and *Artemisia tridentata* ssp. *vaseyana* occupies cooler, moister upland sites at higher elevation. In addition to *Artemisia tridentata* and *Artemisia cana*, other associated vegetation types include *Atriplex confertifolia*, *Ericameria* spp., or *Chrysothamnus* spp. shrublands, *Abies grandis*, *Pinus contorta*, *Pinus ponderosa*, *Populus tremuloides*, or *Pseudotsuga menziesii* forests, *Pinus* - *Juniperus* woodlands, or mesic herbaceous communities.

Dynamics: Stands in this alliance represent the moister communities of the *Artemisia tridentata* ssp. *wyomingensis*-dominated communities in Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland Macrogroup (M169). Shrub densities typically increase with overgrazing of the bunchgrass component or with increasing summer drought (West 1983c). *Artemisia tridentata* is inhibited by fire, and excessive grazing may decrease fire frequency due to consumption of herbaceous forage, resulting in increased shrub density. Conversely, invasion by non-native annual grasses (e.g., *Bromus tectorum*, *Bromus arvensis*) may increase fire frequency sufficiently to eliminate the shrubs from the stands (Daubenmire 1970). With a change in fire frequency, species composition will be altered as well (West 1983c). With a high fire frequency (every 2-5 years), perennial grasses and shrubs are eliminated and non-native annual grasses dominate. At fire-return intervals of 10-30 years, short-lived resprouting shrubs such as *Chrysothamnus* or *Tetradymia* spp. dominate. At fire intervals of 30-70 years, a mixture of perennial bunchgrasses and shrubs is maintained. Finally, in the complete absence of fire, deep-rooted shrubs such as *Artemisia tridentata* become the theoretical dominants.

DISTRIBUTION

Geographic Range: This mesic alliance occurs from northeastern California and eastern Oregon across the Great Basin, Utah and habitats of the Rocky Mountains to the northern Great Plains of Montana, Wyoming, and into western North and South Dakota. Associations are also reported from the intermountain parks of Colorado, and from British Columbia, Canada. The alliance has not been reported from either Arizona or New Mexico but may occur there.

Nations: CA, US

States/Provinces: AZ?, BC?, CA, CO, ID, MT, ND, NM?, NV, OR, SD, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< Big Sagebrush Series (Sawyer and Keeler-Wolf 1995)
- >< SRM Cover Type #314 - Big Sagebrush-Bluebunch Wheatgrass (Shiflet 1994)
- >< SRM Cover Type #315 - Big Sagebrush-Idaho Fescue (Shiflet 1994)
- = SRM Cover Type #403 - Wyoming Big Sagebrush (Shiflet 1994)
- < SRM Cover Type #612 - Sagebrush - Grass (Shiflet 1994)
- >< Western Shrub and Grasslands Combinations: 55: Sagebrush-Steppe (*Artemisia-Agropyron*) (Küchler 1964)
- >< Western Shrub: 38: Great Basin Sagebrush (*Artemisia*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEG001535 *Artemisia tridentata* ssp. *wyomingensis* / *Pseudoroegneria spicata* Shrub Grassland
- CEG001050 *Artemisia tridentata* ssp. *wyomingensis* - *Purshia tridentata* / *Pseudoroegneria spicata* Shrubland
- CEG001051 *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Shrubland
- CEG005479 *Artemisia tripartita* ssp. *tripartita* / *Achnatherum thurberianum* Shrubland
- CEG000994 *Artemisia tridentata* ssp. *wyomingensis* / *Balsamorhiza sagittata* Shrubland
- CEG001009 *Artemisia tridentata* ssp. *wyomingensis* / *Pseudoroegneria spicata* Shrubland
- CEG001048 *Artemisia tridentata* ssp. *wyomingensis* - *Peraphyllum ramosissimum* / *Festuca idahoensis* Shrubland
- CEG005478 *Artemisia tridentata* ssp. *wyomingensis* / *Festuca idahoensis* Shrubland
- CEG001049 *Artemisia tridentata* ssp. *wyomingensis* / *Poa secunda* Shrubland
- CEG001047 *Artemisia tridentata* ssp. *wyomingensis* / *Pascopyrum smithii* Shrub Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by D. Sarr.

Version Date: 2014/12/18

REFERENCES

References: Baker 1982b, Baker 1983c, Baker and Kennedy 1985, Bear Creek Uranium Mine Application n.d., Bighorn Coal Mine n.d., Blackburn 1967, Blackburn et al. 1968a, Blackburn et al. 1968b, Blackburn et al. 1969a, Blackburn et al. 1969b, Blackburn et al. 1969c, Blackburn et al. 1969d, Blackburn et al. 1971, Brotherson and Brotherson 1981, Brown 1971, Caicco and Wellner 1983i, Caicco and Wellner 1983j, Caicco and Wellner 1983k, Caicco and Wellner 1983l, Chappell et al. 1997, Comer 1999, Cotter-Ferguson

Project n.d., Daubenmire 1970, Day and Wright 1985, DeVelice and Lesica 1993, DeVelice et al. 1991, Doescher et al. 1986, Driese et al. 1997, Earth Resource Technology n.d., Ellis and Hackney 1981, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Ferchau 1973, Fisser 1964, Fisser 1970, Francis 1983, Giese 1975, Gross 1955, Hall 1973, Hansen and Hoffman 1988, Heinze et al. 1962, Hess 1981, Hess and Wasser 1982, Hironaka 1978, Hironaka et al. 1983, Jensen et al. 1988a, Johnson and Simon 1987, Johnston 1987, Keammerer 1987, Knight 1994, Knight et al. 1987, Komarkova 1986, K uchler 1964, Leucite Hills Mine Application n.d., Lewis 1975a, Lucky McMine Application n.d., Lundberg 1977, Marr et al. 1979, McArthur and Welch 1986, McLean 1970, Moretti 1979, Moretti and Brotherson 1982, Mueggler and Stewart 1980, Nichols 1964a, Nichols 1964b, Northwest Resources Co. 1981, ORNHP unpubl. data, Poulton 1955, Sawyer and Keeler-Wolf 1995, Seminoe I Mine Application n.d., Shiflet 1994, Skull Point Mine Application n.d., Skull Point Mine Permit Renewal n.d., Smith n.d.b, Steger 1970, Stoecker-Keammerer Consultants n.d.a, Strong 1980, Sweetwater Uranium Project 1978, Sweetwater Uranium Project n.d., Terwilliger et al. 1979a, Thorne Ecological Institute 1973a, Thorne Ecological Institute 1973b, Tiedemann et al. 1987, Tisdale 1947, Tweit and Houston 1980, USFS 1992, Van Pelt 1978, West 1983c, West et al. 1984, Winward 1970

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G302. Intermountain Mesic Tall Sagebrush Steppe & Shrubland

A1528. *Artemisia tripartita* ssp. *tripartita* - *Artemisia tridentata* Mesic Steppe & Shrubland Alliance

Type Concept Sentence: This mesic alliance is distributed from the Columbia Basin east to the northern Rocky Mountains and is characterized by an open to moderately dense shrub layer dominated or codominated by *Artemisia tripartita* with 10-25% cover and with herbaceous species having equal or greater coverage than shrubs.

OVERVIEW

Scientific Name: *Artemisia tripartita* ssp. *tripartita* - *Artemisia tridentata* Mesic Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Threetip Sagebrush - Big Sagebrush Mesic Steppe & Shrubland Alliance

Colloquial Name: Threetip Sagebrush - Big Sagebrush Mesic Steppe & Shrubland

Type Concept: This mesic shrubland and steppe alliance is distributed from the Columbia Basin east to the northern Rocky Mountains and is characterized by an open to moderately dense shrub layer dominated or codominated by *Artemisia tripartita* with 10-25% cover and with herbaceous species having equal or greater coverage than shrubs. Common shrub associates include *Artemisia frigida*, *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *vaseyana*, *Chrysothamnus viscidiflorus*, *Krascheninnikovia lanata*, *Purshia tridentata*, or *Tetradymia canescens*. The herbaceous stratum is typically dominated by graminoids and of moderate to moderately high cover (20-70%). *Pseudoroegneria spicata* and *Festuca idahoensis* are the most common associates. Other locally abundant graminoid species include *Bouteloua curtipendula*, *Bouteloua gracilis*, *Carex filifolia*, *Festuca campestris*, *Hesperostipa comata* (= *Stipa comata*), and *Koeleria macrantha*. Forbs form a minor and highly variable portion of this vegetation. Recurrent species include *Achillea millefolium*, *Balsamorhiza sagittata*, *Camelina microcarpa*, *Erigeron* spp., *Opuntia* spp., *Phlox* spp., and *Sphaeralcea coccinea*. Climate ranges from semi-arid in intermountain basins to subhumid in higher elevations of the Rocky Mountains. Stands occur on flat to steeply sloping upland sites. Soil texture is loam, sandy loam, or clay loam, but is highly variable.

Classification Comments: This mesic shrubland and steppe alliance occurs as large patch/matrix stands in relatively mesic northern latitudes. However, in semi-arid landscapes in more southern latitudes, it frequently occurs in smaller patch stands restricted to relatively mesic sites, such as swales and basins, that receive additional moisture from surrounding slopes and at higher elevations.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Vegetation in this mesic shrubland and steppe is characterized by an open, conspicuous shrub layer with herbaceous species having equal or greater coverage with diagnostic species *Artemisia tripartita* dominant to codominant with 10-25% cover. Other characteristic shrubs include *Artemisia frigida*, *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *vaseyana*, *Chrysothamnus viscidiflorus*, *Krascheninnikovia lanata*, *Purshia tridentata*, or *Tetradymia canescens*. The herbaceous layer is dominated by graminoids with moderate to moderately high cover (25-70%). Characteristic and often dominant grasses are *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: This alliance is characterized by an open to moderately dense (10-25%) cover of microphyllous evergreen shrubs, usually 0.3-1 m in height. Cespitose graminoids are usually prominent, and exceed the shrubs in height and/or cover. Forb species may be frequent or not, but are usually of low canopy cover.

Floristics: This mesic shrubland and steppe alliance is characterized by an open to moderately dense shrub layer dominated or codominated by *Artemisia tripartita* with 10-25% cover and with herbaceous species having equal or greater coverage than shrubs. Common shrub associates include *Artemisia frigida*, *Artemisia tridentata ssp. tridentata*, *Artemisia tridentata ssp. vaseyana*, *Chrysothamnus viscidiflorus*, *Krascheninnikovia lanata*, *Purshia tridentata*, or *Tetradymia canescens*. The herbaceous stratum is typically dominated by graminoids of moderate to moderately high cover (20-70%). *Pseudoroegneria spicata* and *Festuca idahoensis* are the most common associates. Other locally abundant graminoid species include *Bouteloua curtipendula*, *Bouteloua gracilis*, *Carex filifolia*, *Festuca campestris*, *Hesperostipa comata* (= *Stipa comata*), and *Koeleria macrantha*. Forbs form a minor and highly variable portion of this vegetation. Recurrent species include *Achillea millefolium*, *Balsamorhiza sagittata*, *Camelina microcarpa*, *Erigeron* spp., *Opuntia* spp., *Phlox* spp., and *Sphaeralcea coccinea*.

ENVIRONMENT & DYNAMICS

Environmental Description: This mesic shrubland and steppe alliance is distributed from the Columbia Basin east to the northern Rocky Mountains. Climate ranges from semi-arid in intermountain basins to subhumid in higher elevations of the Rocky Mountains. The amount and reliability of growing-season moisture increase eastward and with increasing altitude, generally averaging 25-35 cm annually. These communities occur from elevations of less than 1000 m in the Columbia Basin to over 2500 m in the Rocky Mountains. The alliance occurs on flat to steeply sloping upland sites. Sites with little slope tend to have deeper soils, while those with steeper slopes have shallow to moderately deep soils. Soil texture is loam, sandy loam, or clay loam, but is highly variable (Hironaka et al. 1983). *Artemisia cana*- or *Artemisia tridentata ssp. wyomingensis*-dominated communities often occupy lower elevations, and *Artemisia tridentata ssp. vaseyana*-dominated communities occupy cooler, moister upland sites at higher elevation. Other adjacent vegetation types across the range of this alliance include *Atriplex confertifolia*, *Chrysothamnus* spp., or *Artemisia nova* shrublands, *Populus tremuloides*, *Pinus ponderosa*, *Pinus contorta*, *Abies grandis*, or *Pseudotsuga menziesii* forests, *Pinus - Juniperus* woodlands, shortgrass and mixed-grass prairie, or mesic montane meadow communities.

Dynamics: *Artemisia tripartita* is able to resprout following fire, and dominance by the shrub is favored in overgrazed ranges (Hironaka et al. 1983). Populations may have variation in this ability (Hironaka et al. 1983). *Artemisia tripartita ssp. tripartita* occurs from the Continental Divide of Wyoming to the Columbia Basin of Washington. This subspecies has an erect growth form and may reach 2 m in height. *Artemisia tripartita ssp. rupicola* occurs east of the Continental Divide in Wyoming and forms low, layered shrubs less than 0.3 m in height (Fisser 1962). Growth trials of the two subspecies under similar conditions have shown that these morphological characteristics are genetic rather than environmentally controlled (Fisser 1962).

DISTRIBUTION

Geographic Range: This alliance occurs from eastern Washington and British Columbia, across the upper Columbia Basin to various habitats in the Rocky Mountains of Montana, Wyoming, and Colorado.

Nations: CA, US

States/Provinces: BC, CO, ID, MT, OR, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = SRM Cover Type #404 - Threetip Sagebrush (Shiflet 1994)

LOWER LEVEL UNITS

Associations:

- CEGLO01538 *Artemisia tripartita ssp. tripartita* / *Pseudoroegneria spicata* Shrub Grassland
- CEGLO05482 *Artemisia tripartita ssp. tripartita* / *Pascopyrum smithii* Shrubland
- CEGLO02994 *Artemisia tripartita ssp. tripartita* / *Leymus cinereus* Shrub Grassland
- CEGLO01536 *Artemisia tripartita ssp. tripartita* / *Festuca idahoensis* Shrub Grassland
- CEGLO05483 *Artemisia tripartita ssp. tripartita* / *Poa secunda* Shrubland
- CEGLO01537 *Artemisia tripartita ssp. tripartita* / *Festuca campestris* Shrub Grassland
- CEGLO01539 *Artemisia tripartita ssp. tripartita* / *Hesperostipa comata* Shrub Grassland
- CEGLO05481 *Artemisia tripartita ssp. tripartita* / *Koeleria macrantha* Shrubland

AUTHORSHIP

Primary Concept Source: D. Sarr and M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by D. Sarr and M.S. Reid.

Version Date: 2014/12/18

REFERENCES

References: Caicco and Wellner 1983h, Caicco and Wellner 1983i, Caicco and Wellner 1983j, Chappell et al. 1997, Daubenmire 1970, Faber-Langendoen et al. 2017b, Fisser 1962, Hess 1981, Hironaka et al. 1983, Johnston 1987, McLean 1970, Mueggler and Stewart 1980, Shiflet 1994, Tweit and Houston 1980, WNHP unpubl. data

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G302. Intermountain Mesic Tall Sagebrush Steppe & Shrubland

A3179. *Purshia tridentata* - *Artemisia tridentata* Mesic Steppe & Shrubland Alliance

Type Concept Sentence: This mesic alliance occurs throughout the Intermountain West and is characterized by an open to moderately dense short-shrub layer dominated or codominated by *Purshia tridentata* with *Artemisia tridentata* and sometimes *Prunus virginiana* present to codominant. The understory is sparse to dense and typically dominated by perennial bunchgrasses such as *Achnatherum hymenoides*, *Achnatherum nelsonii*, *Achnatherum occidentale*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus*, *Poa secunda*, and *Pseudoroegneria spicata*.

OVERVIEW

Scientific Name: *Purshia tridentata* - *Artemisia tridentata* Mesic Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Antelope Bitterbrush - Big Sagebrush Mesic Steppe & Shrubland Alliance

Colloquial Name: Antelope Bitterbrush - Big Sagebrush Mesic Steppe & Shrubland

Type Concept: This mesic shrubland and steppe alliance occurs throughout the Intermountain West and occurs over a broad range of landforms and microhabitats. Stands are characterized by an open to moderately dense short-shrub layer dominated or codominated by *Purshia tridentata* with *Artemisia tridentata* and sometimes *Prunus virginiana* present to codominant. Other important shrubs include *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Eriogonum heracleoides*, *Ribes cereum*, and *Symphoricarpos oreophilus*. The understory is sparse to dense and typically dominated by perennial bunchgrasses such as *Achnatherum hymenoides*, *Achnatherum nelsonii*, *Achnatherum occidentale*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus*, *Poa secunda*, and *Pseudoroegneria spicata*. Some stands may have a well-developed forb component composed of *Arabis holboellii*, *Achillea millefolium*, *Balsamorhiza sagittata*, *Brodiaea* spp., *Eriogonum ovalifolium*, *Eriogonum umbellatum*, *Lithospermum ruderales*, and *Pteryxia terebinthina* (= *Cymopterus terebinthinus*). Mosses and lichens are important in some stands. Scattered trees may form an emergent layer of individual trees. Stands occur on flats to moderate slopes in foothills, on slopes of lakebeds with ash or pumice soils, and on drier sites within lower forest zones as shrub-steppe inclusions in forest. In Idaho, the alliance is reported from stabilized dunes. In general, it is an upland type associated with coarse, well-drained soils without high salinity or pH. Adjacent vegetation is typically *Artemisia* steppe, *Pseudoroegneria* - *Poa* - *Festuca* grasslands, or *Pinus flexilis* woodlands.

Classification Comments: This mesic shrubland and steppe alliance occurs as large patch/matrix stands in relatively mesic northern latitudes. However, in semi-arid landscapes in more southern latitudes, it frequently occurs in smaller patch stands restricted to relatively mesic sites, such as swales and basins, that receive additional moisture from surrounding slopes and at higher elevations.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Stands in this mesic shrubland and steppe alliance are dominated or codominated by *Purshia tridentata* with *Artemisia tridentata* and sometimes *Prunus virginiana* present to codominant. Characteristic herbaceous species are *Achnatherum hymenoides*, *Achnatherum nelsonii*, *Achnatherum occidentale*, *Carex pensylvanica*, *Eriogonum umbellatum*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus*, *Poa secunda*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: This alliance has a moderately dense to open (20-60% cover) microphyllous evergreen (or late cold-deciduous) shrublands with the dominant shrubs varying from 0.5-3 m in height. Maximum shrub height generally decreases with latitude and altitude, reaching a minimum in subalpine stands. A second tier of microphyllous evergreen or cold-deciduous shrubs may be present. Cespitose graminoids are typical herbaceous associates and may strongly dominate the ground layer. Some regional variants may have a substantial forb component as well. Lichens and mosses may cover the ground surface in good condition stands.

Floristics: This mesic shrubland and steppe alliance is characterized by an open to moderately dense short-shrub layer dominated or codominated by *Purshia tridentata* with *Artemisia tridentata* and sometimes *Prunus virginiana* present to codominant. Other important or occasional shrubs include *Artemisia frigida*, *Ceanothus velutinus*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Eriogonum heracleoides*, *Ribes cereum*, and *Symphoricarpos oreophilus*. Scattered trees may form an emergent layer of individual trees; species include *Cercocarpus ledifolius*, *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus ponderosa*, *Pinus jeffreyi*, *Pinus ponderosa* var. *washoensis* (= *Pinus washoensis*), *Quercus garryana*, or *Yucca brevifolia*. The understory is sparse to dense and typically dominated by perennial bunchgrasses such as *Achnatherum hymenoides*, *Achnatherum nelsonii*, *Achnatherum occidentale*, *Elymus lanceolatus*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Koeleria macrantha*, *Leymus cinereus*, , *Poa secunda*, and *Pseudoroegneria spicata*. Other graminoids include *Carex geyeri*, *Carex pennsylvanica*, and *Muhlenbergia montana*. Some stands may have a well-developed forb component composed of *Arabis holboellii*, *Achillea millefolium*, *Balsamorhiza sagittata*, *Brodiaea* spp., *Eriogonum ovalifolium*, *Eriogonum umbellatum*, *Lithospermum ruderales*, and *Pteryxia terebinthina* (= *Cymopterus terebinthinus*). Mosses and lichens are important in some stands. Diagnostic of this alliance is the dominance of *Purshia tridentata* in a shrub layer that is greater than 25% on average.

ENVIRONMENT & DYNAMICS

Environmental Description: This mesic shrubland and steppe alliance occurs throughout the Intermountain West over a broad range of landforms and microhabitats at elevations from 500-3000 m. Stands are often found on the margins of *Pinus ponderosa* woodlands or forests, forming the transition into sagebrush vegetation. Most of the region is arid to semi-arid with annual precipitation ranging from 15-75 cm. The entire range is under a continental temperature regime of cold winters, cool to warm summers and large diurnal variation. In the western portions of the alliance's range, summers are dry. Growing-season precipitation increases eastward and is the greatest in the Rocky Mountains. They also occur on flats to moderate slopes in foothills, on slopes of lakebeds with ash or pumice soils, and on drier sites within lower forest zones as shrub-steppe inclusions in forest. In Idaho, the alliance is reported from stabilized dunes (Chadwick and Dalke 1965). In Colorado, the alliance is found on exposed, steep (45-60% slope) mountain slopes with southerly aspects on the eastern slopes of the Front Range (Hess 1981). These sites are typically too xeric to support extensions of the surrounding coniferous forests. Parent materials are colluvial and residual metamorphic rocks which have developed into soils classified as Entisols. These soils are poorly developed and rocky, with loamy and sandy textures, and shallow A horizons over rocky C horizons. The soil surface is also moderately rocky. In general, it is an upland type associated with coarse, well-drained soils without high salinity or pH. Adjacent vegetation is typically *Artemisia* steppe, *Pseudoroegneria* - *Poa* - *Festuca* grasslands, or *Pinus flexilis* woodlands.

Dynamics: *Purshia tridentata* displays considerable plasticity in growth across its range. The variation in height and form of different populations appears to be related to ecotypic variation (Mozingo 1987). Although mycorrhizae are considered important in establishment and growth of individual plants, *Purshia tridentata* is one of the first species to colonize barren volcanic substrates following eruption. The species is valuable as winter browse for native ungulates and livestock and is used extensively. Moderate livestock utilization (<60% of the year's current growth) has been reported to stimulate twig growth the following spring (Mueggler and Stewart 1980). Sawyer and Keeler-Wolf (1995) report that stands of *Purshia tridentata* can reach 125 years of age on deep, well-drained sites, but more commonly become decadent at 30 years, and die at 40-50 years of age. Stands appear to result from either a disturbance event (such as fire), or from rare years when many seedlings survive. This results in even-aged stands (Sawyer and Keeler-Wolf 1995).

DISTRIBUTION

Geographic Range: This alliance is found in many western U.S. states and Canada, from California north and east into Oregon, Washington, Idaho, Colorado and British Columbia. The core of its range is the Columbia Basin and Columbia Plateau, Owyhee Uplands, Snake River Plain, and the Colorado Rockies. *Purshia tridentata* is one of the most widespread shrubs in the western United States.

Nations: CA, US

States/Provinces: BC, CA, ID, MT, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- > *Purshia tridentata* (Bitter brush scrub) Alliance (Sawyer et al. 2009) [35.200.00]
- >< Bitterbrush Series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEGLO01494 *Purshia tridentata* / *Festuca campestris* Shrub Grassland
- CEPP006746 *Purshia glandulosa* - *Artemisia tridentata* Shrubland
- CEGLO01497 *Purshia tridentata* / *Pseudoroegneria spicata* - *Leymus cinereus* Shrub Grassland
- CEGLO02674 *Purshia tridentata* / *Festuca idahoensis* Shrub Grassland
- CEGLO01058 *Purshia tridentata* / *Achnatherum hymenoides* Shrubland
- CEGLO01498 *Purshia tridentata* / *Hesperostipa comata* Shrub Grassland
- CEGLO01059 *Purshia tridentata* / *Poa secunda* Shrubland
- CEGLO01060 *Purshia tridentata* / *Prunus virginiana* Shrubland
- CEGLO03124 *Purshia tridentata* Shrubland [Placeholder]
- CEGLO01495 *Purshia tridentata* / *Pseudoroegneria spicata* Shrub Grassland
- CEGLO03477 *Purshia tridentata* - *Artemisia tridentata* / *Eriogonum umbellatum* Shrubland
- CEGLO03478 *Purshia tridentata* - *Artemisia tridentata* / *Achnatherum hymenoides* Shrubland
- CEGLO05610 *Purshia tridentata* - *Ericameria nana* / *Penstemon deustus* Shrubland
- CEGLO03479 *Purshia tridentata* - *Artemisia tridentata* / *Achnatherum nelsonii* Shrubland
- CEGLO03480 *Purshia tridentata* - *Artemisia tridentata* - *Symphoricarpos rotundifolius* Shrubland
- CEGLO03481 *Purshia tridentata* - *Artemisia tridentata* - *Tetradymia canescens* Shrubland
- CEGLO01492 *Purshia tridentata* / *Carex pensylvanica* - *Achnatherum occidentale* Shrub Grassland
- CEGLO05612 *Purshia tridentata* / *Achnatherum thurberianum* Shrubland
- CEGLO05613 *Purshia tridentata* / *Leymus cinereus* Shrub Grassland
- CEPP006747 *Purshia glandulosa* Shrubland
- CEGLO05611 *Purshia tridentata* - *Philadelphus lewisii* / *Poa secunda* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by D. Sarr.

Version Date: 2014/12/18

REFERENCES

References: Buttery 1955, Caicco and Wellner 1983e, Chadwick and Dalke 1965, Chappell et al. 1997, Copeland 1978, Daubenmire 1970, Daubenmire 1975, Day 1985, Day and Wright 1985, Evens et al. 2014, Faber-Langendoen et al. 2017b, Franklin and Dyrness 1973, Hall 1973, Hess 1981, Hess and Wasser 1982, Hironaka et al. 1983, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987, Lewis 1975a, Marr et al. 1980, Moseley 1987c, Mozingo 1987, Mueggler and Stewart 1980, Poulton 1955, Reid et al. 1994, Roughton 1966, Roughton 1972, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Tisdale 1947, Tweit and Houston 1980, Volland 1976, WNHP unpubl. data, Wasser and Hess 1982

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.3.c. M169 Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland

G304. Intermountain Mountain Big Sagebrush Steppe & Shrubland

Type Concept Sentence: This sagebrush shrubland and shrub-steppe group is found at montane and subalpine elevations across the western U.S. where the open to dense shrub layer is composed primarily of *Artemisia tridentata* ssp. *vaseyana*, *Artemisia cana* ssp. *bolanderi*, *Artemisia cana* ssp. *viscidula*, and related taxa such as *Artemisia tridentata* ssp. *spiciformis* and *Artemisia rothrockii* with *Symphoricarpos* spp. often codominant and there is usually an abundant perennial herbaceous layer (over 25% cover).

OVERVIEW

Scientific Name: *Artemisia tridentata* ssp. *spiciformis* - *Artemisia tridentata* ssp. *vaseyana* - *Artemisia cana* ssp. *viscidula* Steppe & Shrubland Group

Common Name (Translated Scientific Name): Spiked Big Sagebrush - Mountain Big Sagebrush - Mountain Silver Sagebrush Steppe & Shrubland Group

Colloquial Name: Silver Sagebrush Steppe & Shrubland

Type Concept: This group includes sagebrush communities occurring at foothills (in Wyoming) to montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the Southern Rockies. In Montana, it occurs on mountain "islands" in the north-central portion of the state and possibly along the Boulder River south of Absarokee and at higher elevations. In British Columbia, it occurs between 450 and 1650 m in the southern Fraser Plateau and the Thompson and

Okanagan basins. Across its range of distribution, this is a compositionally diverse group. It is composed primarily of *Artemisia tridentata* ssp. *vaseyana*, and related taxon *Artemisia tridentata* ssp. *spiciformis* often with *Symphoricarpos* spp. present to codominant. Also included, but less common, are stands dominated by *Artemisia cana* ssp. *bolanderi*, *Artemisia cana* ssp. *viscidula*, and *Artemisia rothrockii* (a California endemic). Additionally there are mixed shrub stands codominated by *Amelanchier* spp., *Chamaebatiaria millefolium*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Peraphyllum ramosissimum*, *Purshia tridentata*, and *Ribes cereum*. *Artemisia tridentata* ssp. *wyomingensis* may be present to codominant if the stand is clearly montane as indicated by montane indicator species such as *Artemisia tridentata* ssp. *vaseyana*, *Danthonia intermedia*, *Festuca thurberi*, or *Leucopoa kingii*.

Most stands have an abundant perennial herbaceous layer (over 25% cover, and in many cases over 50% cover), but this group also includes *Artemisia tridentata* ssp. *vaseyana* shrublands that lack a significant herbaceous layer. Other common graminoids include *Achnatherum lettermanii*, *Achnatherum occidentale*, *Achnatherum pinetorum*, *Bromus carinatus*, *Calamagrostis rubescens*, *Carex geyeri*, *Elymus trachycaulus*, *Festuca arizonica*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Leucopoa kingii*, *Muhlenbergia montana*, *Pascopyrum smithii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. In many areas, wildfires can maintain an open herbaceous-rich steppe condition, although at most sites, shrub cover can be unusually high for a steppe system (>40%), with the moisture providing equally high grass and forb cover.

Classification Comments: *Artemisia cana* is often found in mesic to wet swales and toeslopes. Some *Artemisia cana* ssp. *viscidula* communities are included in this group, when they are not composed of more obligate wetland taxa, such as *Juncus*, wetland Carices, and such.

Similar NVC Types:

- G303 Intermountain Dry Tall Sagebrush Steppe & Shrubland
- G302 Intermountain Mesic Tall Sagebrush Steppe & Shrubland

Diagnostic Characteristics: This montane and subalpine sagebrush shrubland and shrub-steppe group is dominated by diagnostic shrub species *Artemisia tridentata* ssp. *vaseyana*, *Artemisia cana* ssp. *bolanderi*, *Artemisia cana* ssp. *viscidula*, and related taxa such as *Artemisia tridentata* ssp. *spiciformis* and *Artemisia rothrockii* (a California endemic). *Symphoricarpos* spp. are often codominant, but other shrubs may be present, forming a mixed canopy. There is usually an abundant perennial herbaceous layer (over 25% cover). Characteristic montane and subalpine herbaceous species include *Achnatherum lettermanii*, *Achnatherum occidentale*, *Achnatherum pinetorum*, *Bromus carinatus*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex exserta*, *Danthonia intermedia*, *Danthonia parryi*, *Elymus trachycaulus*, *Festuca arizonica*, *Festuca campestris*, *Festuca idahoensis*, *Festuca thurberi*, *Leucopoa kingii*, and *Muhlenbergia montana*.

VEGETATION

Physiognomy and Structure: Microphyllous-leaved evergreen and broad-leaved, cold-deciduous shrub-steppe group with open to dense cover of sagebrush species and an abundant perennial herbaceous layer of graminoid and forb species.

Floristics: Vegetation types within this group are usually less than 1.5 m tall and dominated by *Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *spiciformis*, or *Artemisia cana* ssp. *viscidula*, often with *Symphoricarpos* spp. present to codominant. Also included, but less common, are stands dominated by *Artemisia cana* ssp. *bolanderi*, *Artemisia cana* ssp. *viscidula*, and *Artemisia rothrockii* (a California endemic). Additionally, there are mixed shrub stands codominated by *Amelanchier* spp., *Chamaebatiaria millefolium*, *Peraphyllum ramosissimum*, and *Purshia tridentata*. A variety of other shrubs can be found in some occurrences, but these are seldom dominant. They include *Amelanchier alnifolia*, *Artemisia arbuscula*, *Ceanothus velutinus*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Ribes cereum*, and *Rosa woodsii*. *Artemisia tridentata* ssp. *wyomingensis* may be present to codominant if the stand is clearly montane to subalpine as indicated by montane indicator species such as *Artemisia tridentata* ssp. *vaseyana*, *Danthonia intermedia*, *Festuca thurberi*, or *Leucopoa kingii*. The shrub canopy cover ranges from 10 to 80%. The herbaceous layer is usually well-represented (over 25% cover, and in many cases over 50% cover), but bare ground may be common in particularly arid or disturbed occurrences. Additional characteristic graminoids may include *Achnatherum lettermanii*, *Achnatherum occidentale*, *Achnatherum pinetorum*, *Bromus carinatus*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex exserta*, *Danthonia parryi*, *Elymus trachycaulus*, *Festuca arizonica*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Muhlenbergia montana*, *Pascopyrum smithii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Forbs are often numerous and an important indicator of health. Common forbs include *Achillea millefolium*, *Antennaria rosea*, *Artemisia ludoviciana*, *Balsamorhiza sagittata*, *Eriogonum umbellatum*, *Fragaria virginiana*, *Hymenoxys hoopesii* (= *Helenium hoopesii*), and several species of *Astragalus*, *Castilleja*, *Erigeron*, *Geum*, *Lupinus*, *Penstemon*, *Phlox*, and *Potentilla*.

ENVIRONMENT & DYNAMICS

Environmental Description: This group occurs in many of the western United States, usually at middle elevations (1000-2500 m). The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25 to 90 cm/year. Much of this precipitation falls as snow. Temperatures are continental with large annual and diurnal variation. In general, this group shows an

affinity for mild topography, fine soils, and some source of subsurface moisture. Soils generally are moderately deep to deep, well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes; soils often have a substantial volume of coarse fragments, and are derived from a variety of parent materials. This group primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, but the higher elevation occurrences may be restricted to south- or west-facing slopes.

Dynamics: Healthy sagebrush shrublands are very productive, are often grazed by domestic livestock, and are strongly preferred during the growing season (Padgett et al. 1989). Prolonged livestock use can cause a decrease in the abundance of native bunch grasses and increase in the cover of shrubs and non-native grass species such as *Poa pratensis*. *Artemisia cana* resprouts vigorously following spring fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance (Hansen et al. 1995). *Artemisia tridentata* is generally killed by fires and may take over ten years to form occurrences of some 20% cover or more. The condition of most sagebrush steppe has been degraded due to fire suppression and heavy livestock grazing. It is unclear how long restoration will take to restore degraded occurrences.

DISTRIBUTION

Geographic Range: This group is found at montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the Southern Rockies. In British Columbia, it occurs in the southern Fraser Plateau and the Thompson and Okanagan basins. This group also occurs in central Montana in the Rocky Mountain island ranges

Spatial Scale & Pattern [optional]: Matrix

Nations: CA, US

States/Provinces: AZ?, BC, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 6:C, 7:C, 8:C, 9:C, 12:C, 18:C, 19:C, 20:C, 26:C, 68:C

USFS Ecoregions (2007): 313A:CC, 313B:CP, 315A:CC, 315H:CC, 321A:??, 322A:CC, 331B:C?, 331F:CC, 331G:CC, 331J:CC, 331M:C?, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CC, M261E:CC, M261F:C?, M261G:CC, M313A:CP, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. USNVC Confidence from peer reviewer, not AE.

SYNONYMY

- = Mountain Big Sagebrush (402) (Shiflet 1994)
- = Western Intermountain sagebrush steppe (West 1983c)

LOWER LEVEL UNITS

Alliances:

- A3208 *Artemisia tridentata ssp. vaseyana* - Mixed Steppe & Shrubland Alliance
- A1098 *Artemisia rothrockii* Shrubland Alliance
- A3200 *Artemisia cana ssp. bolanderi* - *Artemisia cana ssp. viscidula* Steppe & Shrubland Alliance
- A3207 *Artemisia tridentata ssp. spiciformis* - *Artemisia tridentata ssp. vaseyana* Steppe & Shrubland Alliance

AUTHORSHIP

Primary Concept Source: N.E. West (1983c)

Author of Description: M.E. Hall and K.A. Schulz

Acknowledgments:

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: MEH 2-10, mod. KAS 11-15

REFERENCES

References: Faber-Langendoen et al. 2017a, Hansen et al. 1995, Hironaka et al. 1983, Johnston 2001, Mueggler and Stewart 1980, Padgett et al. 1989, Shiflet 1994, West 1983c

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G304. Intermountain Mountain Big Sagebrush Steppe & Shrubland

A3200. *Artemisia cana* ssp. *bolanderi* - *Artemisia cana* ssp. *viscidula* Steppe & Shrubland Alliance

Type Concept Sentence: This alliance occurs throughout the northern half of the Intermountain West and is characterized by an open to closed, medium-tall shrub canopy of *Artemisia cana* ssp. *viscidula* or *Artemisia cana* ssp. *bolanderi* with dry graminoids in the understory. Stands occur in relatively moist environments, including mesic alkaline or saline basins, but not wetland or riparian sites.

OVERVIEW

Scientific Name: *Artemisia cana* ssp. *bolanderi* - *Artemisia cana* ssp. *viscidula* Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Bolander's Silver Sagebrush - Mountain Silver Sagebrush Steppe & Shrubland Alliance

Colloquial Name: Silver Sagebrush Steppe & Shrubland

Type Concept: This shrubland and steppe alliance occurs throughout the northern half of the Intermountain West. The shrub layer ranges from 0.5-1.5 m tall, and shrub canopy cover ranges from 10-60%. In most stands, *Artemisia cana* ssp. *viscidula* or *Artemisia cana* ssp. *bolanderi* is the only dominant shrub, although other shrubs such as *Purshia tridentata* can be present. The understory is variable, ranging from a sparse to dense herbaceous layer that is typically dominated by dry to mesic, perennial graminoids with 20% cover. Species include *Elymus elymoides*, *Festuca thurberi*, *Poa cusickii*, *Poa fendleriana*, *Poa pratensis*, and *Poa secunda* (= *Poa nevadensis*). Wetland indicators such as species of *Eleocharis*, *Deschampsia*, *Juncus*, or *Salix* are absent or restricted to local microsites. This alliance occupies seasonally moist sites in broad meadows. Although it occurs in relatively moist environments and may be marginally riparian, including alkaline or saline basins, it is not a true riparian or wetland type. Soils are mostly well-developed with thick mollic epipedons and lack indicators of seasonally high water tables. Soil texture is variable and includes clayey, clayey skeletal, coarse-loamy and loamy skeletal. Depth to water table is over 75 to 100+ cm.

Classification Comments: There may be alliance range/taxonomic problems with the subspecies of *Artemisia cana*. For example, according to Kartesz (1999), ssp. *bolanderi* is not reported to occur in Oregon, but is reported to occur there by the Oregon Natural Heritage Program. Thus the distribution of this alliance is subject to change as updated information becomes available. Although there may be taxonomic issues with the subspecies, there are two other *Artemisia cana* alliances: (1) *Artemisia cana* Wet Shrubland Alliance (A2557) in Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland Group (G526) that is dominated by the same two subspecies of *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*), but is riparian, and (2) *Artemisia cana* ssp. *cana* Wet Shrubland Alliance (A3586) in Great Plains Riparian Wet Meadow & Shrubland Group (G337) that is dominated by *Artemisia cana* ssp. *cana* and occurs in riparian habitats (not upland) in the Great Plains. The subspecies will remain for now as more taxonomic and classification review is done.

Manning and Padgett (1995) include *Artemisia cana* / *Festuca ovina* c.t. (Padgett et al. 1989) and *Artemisia cana* / *Festuca idahoensis* c.t. (Youngblood et al. 1985) in the *Artemisia cana*/Dry Graminoid c.t. These community types are currently included in *Artemisia cana* Wet Shrubland Alliance (A2557) in Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland Group (G526) so additional review is warranted.

Internal Comments: KAS 12-14: Mike Jennings in the alliance review recommended that "references to the subspecies, for example but not limited to the title, should be minimized. The two subspecies (ssp. *bolanderi* and *viscidula*) are the only two subspecies of the species. While ssp. *viscidula* is more of the Great Basin/Rocky Mtn region and ssp. *bolanderi* is more of the Sierra/Cascades region, the compositions of the underlying associations are distinct regardless of the dominant subspecies. Relying on subspecific taxonomic differences as diagnostics at the alliance level is not good practice (though there are cases where this is unavoidable, like *A. tridentata* types). The name and description of this alliance should be revised accordingly. This is not to say that the biogeography of the dominant species should not be acknowledged and discussed in the comments section and elsewhere as appropriate, but the description as written reflects too much of a kluge" I decided to leave as is for now because the subspecies is important to distinguish between A3586. "Mesic-Riparian" was added to names of similar riparian *Artemisia cana* alliances: *Artemisia cana* Shrubland Alliance (A2557) in the Rocky Mountain & Great Basin Lowland & Foothill Riparian Shrubland (G526) group and *Artemisia cana* ssp. *cana* Shrub Herbaceous Alliance (A3586) in the Great Plains Shrub & Herb Riparian (G337) group to distinguish between this non-riparian *Artemisia cana* alliance.

Other Comments:

Similar NVC Types:

- A2557 *Artemisia cana* Wet Shrubland Alliance: is dominated by the same two subspecies of *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*), but occurs in riparian situation not upland.
- A3586 *Artemisia cana* ssp. *cana* Wet Shrubland Alliance: is dominated by *Artemisia cana* ssp. *cana* and occurs in riparian situation (not upland) in the Great Plains.

Diagnostic Characteristics: Stands in this mesic alliance are characterized by an open to closed, medium-tall shrub canopy of *Artemisia cana* ssp. *viscidula* or *Artemisia cana* ssp. *bolanderi*. *Purshia tridentata* may be present to codominant. The shrub layer

ranges from 0.5-1.5 m tall, and shrub canopy cover ranges from 10-60%. In most stands, herbaceous cover can be abundant to very sparse, but perennial graminoids generally total less than 20% cover. Characteristic herbaceous species include *Festuca idahoensis*, *Festuca thurberi*, *Poa secunda*, *Poa cusickii*, and *Poa fendleriana ssp. fendleriana*. Wetland indicators such as species of *Eleocharis*, *Deschampsia*, *Juncus*, and *Salix* are absent.

VEGETATION

Physiognomy and Structure: These are mesic shrubland and steppe communities characterized by moderately to widely spaced microphyllous evergreen shrubs. Widely spaced, often robust bunchgrasses usually dominate the understory, although rhizomatous species occasionally occur. The graminoids may exceed the shrubs in height and total cover. Prostrate and, occasionally, upright forbs may be present.

Floristics: The shrub layer ranges from 0.5-1.5 m tall, and shrub canopy cover ranges from 10-60%. In most stands, *Artemisia cana ssp. viscidula* or *Artemisia cana ssp. bolanderi* is the only dominant shrub, although other shrubs such as *Purshia tridentata*, *Rosa woodsii*, or *Symphoricarpos oreophilus* can be present. The understory is variable, ranging from a sparse to dense herbaceous layer that is typically dominated by dry to mesic, perennial graminoids with 20% cover. Species include *Bromus anomalus*, *Bromus porteri*, *Carex douglasii*, *Carex geyeri*, *Danthonia intermedia*, *Elymus elymoides*, *Elymus trachycaulus*, *Festuca idahoensis*, *Festuca thurberi*, *Poa cusickii*, *Poa fendleriana*, *Poa pratensis* (exotic), and *Poa secunda* (= *Poa nevadensis*) (Hess 1981, Francis 1983, Johnston 1987, Tiedemann et al. 1987, Manning and Padgett 1995). Forb associates include *Achillea millefolium*, *Eriogonum umbellatum*, *Geranium richardsonii*, *Potentilla gracilis*, and *Wyethia amplexicaulis*. Obligate and facultative wetland indicators such as species of *Eleocharis*, *Deschampsia*, *Juncus*, or *Salix* are generally absent or restricted to local microsites. One exception is the wide-ranging *Juncus arcticus*, a facultative wetland plant (usually occurs in wetlands, but may occur in non-wetlands) is often present but not dominant.

ENVIRONMENT & DYNAMICS

Environmental Description: This shrubland and steppe alliance occurs throughout the northern half of the Intermountain West in high mountain valleys, on broad flats and gently sloping to undulating alluvial outwash fans usually at middle elevations (1000-2500 m) and occasionally high elevations (to 3000 m) (Hess 1981, Francis 1983, Johnston 1987, Tiedemann et al. 1987, Manning and Padgett 1995). Climate is temperate. Precipitation varies across the range, from less than 25 cm in semi-arid basins of the western Great Basin, to over 90 cm in moister meadow habitats of the Sierra Nevada and central Rocky Mountains. Stands occupy seasonally moist sites in broad meadows that are flooded during snowmelt, but dry out by mid-late summer. Although it occurs in relatively moist environments and may be marginally riparian, including alkaline or saline basins, it is not a true riparian or wetland type. Substrates are mostly well-developed soils with thick mollic epipedons that lack indicators of seasonally high water tables. Soil texture is variable and includes clayey, clayey skeletal, coarse-loamy and loamy skeletal (Manning and Padgett 1995). Depth to water table is over 75 to 100+ cm.

Dynamics: *Artemisia cana ssp. viscidula* and *Artemisia cana ssp. bolanderi* both resprout vigorously after fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance (Hansen et al. 1995). These highly productive sites often attract heavy livestock use. Livestock grazing may shift the understory composition to increased abundance of early-seral species such as *Achillea millefolium*, *Potentilla gracilis*, or *Taraxacum officinale* and result in reduced abundance of native bunchgrass species such as *Festuca thurberi*, *Poa cusickii*, *Poa fendleriana*, or *Poa secunda*.

DISTRIBUTION

Geographic Range: This alliance is found west of the Continental Divide from the Rocky Mountains across the Great Basin to the Sierra Nevada and Cascade Range. Associations dominated by *Artemisia cana ssp. viscidula* occur mostly along streams or in areas with heavy snowpack. Associations dominated by *Artemisia cana ssp. bolanderi* occur mainly in the Sierra Nevada and Cascade Range, commonly in internally drained basins with poor drainage and/or alkaline conditions.

Nations: US

States/Provinces: CA, CO, ID, MT, NV?, OR, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- < *Artemisia cana* / *Festuca thurberi* Plant Association (Johnston 1987)
- < *Artemisia cana* (Silver sagebrush scrub) Alliance (Sawyer et al. 2009) [35.150.00]
- > *Artemisia cana* / Dry Graminoid Community Type (Manning and Padgett 1995)
- < SRM Cover Type #408 - Other Sagebrush Types (Shiflet 1994)

LOWER LEVEL UNITS

Associations:

- CEGLO01549 *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) - *Artemisia tridentata* ssp. *vaseyana* / *Poa cusickii* Shrub Grassland
- CEGLO01071 *Artemisia cana* ssp. *viscidula* / *Festuca thurberi* Shrubland
- CEGLO01073 *Artemisia cana* ssp. *viscidula* / *Purshia tridentata* Shrubland
- CEGLO01551 *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) / *Poa fendleriana* ssp. *fendleriana* Shrub Grassland

AUTHORSHIP

Primary Concept Source: M.E. Manning and W.G. Padgett (1995)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Bramble-Brodahl 1978, Chappell et al. 1997, Comer et al. 1999, Cunningham 1971, Daubenmire 1970, Dealy 1971, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Francis 1983, Franklin and Dyrness 1973, Hansen et al. 1995, Hess 1981, Hironaka et al. 1983, Jankovsky-Jones et al. 2001, Johnston 1987, Kartesz 1999, Kovalchik 1987, Manning and Padgett 1995, Mueggler and Stewart 1980, Mutz and Graham 1982, Mutz and Queiroz 1983, ORNHP unpubl. data, Padgett 1982, Padgett et al. 1988b, Padgett et al. 1989, Reid et al. 1994, Sarr 1995, Sawyer et al. 2009, Schlatterer 1972, Shiflet 1994, Soil Conservation Service 1978, Tiedemann et al. 1987, Tuhy 1981, Tuhy and Jensen 1982, Turner 1969, USFS 1992, Winward 1980b, Youngblood et al. 1985a

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G304. Intermountain Mountain Big Sagebrush Steppe & Shrubland

A1098. *Artemisia rothrockii* Shrubland Alliance

Type Concept Sentence: This dwarf-shrubland is heavily dominated by *Artemisia rothrockii*. The only shrubs which co-occur are *Symphoricarpos rotundifolius*, *Ribes montigenum*, and *Holodiscus discolor*. Graminoids dominate the open herbaceous layer. Stands occur on slopes and ridges in the subalpine regions of California.

OVERVIEW

Scientific Name: *Artemisia rothrockii* Shrubland Alliance

Common Name (Translated Scientific Name): Rothrock's Sagebrush Shrubland Alliance

Colloquial Name: Rothrock's Sagebrush Shrubland

Type Concept: This dwarf-shrubland is heavily dominated by *Artemisia rothrockii*. The only shrubs which co-occur in this association are *Symphoricarpos rotundifolius*, *Ribes montigenum*, and *Holodiscus discolor*. Emergent conifers, such as *Pinus balfouriana*, *Pinus contorta* var. *murrayana*, and *Pinus albicaulis*, may be present. Graminoids dominate the open herbaceous layer, and species composition may be highly variable among stands. *Carex filifolia*, *Danthonia intermedia*, and/or *Poa wheeleri* are the most common graminoid associates. Forbs only total a small amount of cover, typified by the diagnostic forb *Monardella odoratissima*. Other forbs which are often present at very low cover values may include *Antennaria rosea*, *Penstemon rydbergii*, *Juncus* sp., and/or *Horkelia fusca*. This dwarf-shrubland occurs on slopes and ridges in the subalpine regions of California. It is generally present in the zone between meadow and forest, growing on gravelly, carbonate-rich soils. Elevations range from 2000-3100 m. The nominal species' growth occurs mainly in early to mid summer, with flowering in late summer. The species is dormant in the fall, winter, and early spring due to cold.

Classification Comments: *Artemisia rothrockii* is a California endemic and grows on lower slopes and aprons between forests and valley bottom meadows (Benedict 1982, Ratliff 1985). Soils developed from granitic grus in the Sierra Nevada (Keeler-Wolf et al. 2003a) and from carbonate-rich dolomite and limestone in the Inyo and White mountains (Major and Taylor 1977) are droughty.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: This dwarf-shrubland is heavily dominated by diagnostic *Artemisia rothrockii*. Associated shrubs are *Symphoricarpos rotundifolius*, *Ribes montigenum*, and *Holodiscus discolor*. Graminoids dominate the open herbaceous layer. Characteristic herbaceous species include graminoids, *Carex filifolia*, *Danthonia intermedia*, and/or *Poa wheeleri*, and diagnostic forb *Monardella odoratissima*. Other forbs which are often present at very low cover values may include *Antennaria rosea*, *Penstemon rydbergii*, *Juncus* sp., and/or *Horkelia fusca*.

VEGETATION

Physiognomy and Structure: This extremely xeromorphic, subdesert dwarf-shrubland has an intermittent canopy of *Artemisia rothrockii* less than 1 m in height. Emergent conifers may be present. The herbaceous layer is sparse.

Floristics: In this California subalpine dwarf-shrubland *Artemisia rothrockii* is the sole or dominant shrub in the canopy. Other shrubs present may include *Ericameria discoidea*, *Ericameria suffruticosa*, *Penstemon heterodoxus*, and *Monardella odoratissima* (Sawyer et al. 2009). Emergent conifers such as *Pinus balfouriana*, *Pinus contorta* var. *murrayana*, and *Pinus albicaulis* may be present. Graminoids dominate the open herbaceous layer, and species composition may be highly variable among stands. *Carex filifolia*, *Danthonia intermedia*, and/or *Poa wheeleri* are the most common graminoid associates. Forbs only total a small amount of cover, typified by the diagnostic forb *Monardella odoratissima*. Other forbs which are often present at very low cover values may include *Antennaria rosea*, *Penstemon rydbergii*, *Juncus* sp., and/or *Horkelia fusca*. Twenty-five other species have been recorded on sampled plots, but none achieve more than 30% constancy. The forb *Castilleja miniata* and the graminoid *Poa wheeleri* each achieve 5% cover in 30% of plots. All other recorded species (mostly graminoids) only contribute a trace to the overall cover.

ENVIRONMENT & DYNAMICS

Environmental Description: This dwarf-shrubland occurs on slopes and ridges in the subalpine regions of California. It is generally present in the zone between meadow and forest, growing on gravelly, carbonate-rich soils. Elevations range from 2000 to 3500 m (Sawyer et al. 2009). The nominal species' growth occurs mainly early to mid-summer, with flowering in late summer. The species is dormant in the fall, winter, and early spring due to cold.

Dynamics: The soils that support this alliance are often carbonate-rich. These carbonates can form a hardpan 20-40 cm below the surface. Water runs downslope along this hardpan, reducing the amount of water available to plants, and making these sites droughty.

DISTRIBUTION

Geographic Range: This alliance occurs in California's Sierra Nevada at Yosemite National Park, and the Transverse and Peninsular ranges.

Nations: US

States/Provinces: CA

TNC Ecoregions [optional]: 11:C, 12:C, 16:C

USFS Ecoregions (2007): 341D:CC, M261E:CC, M262B:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Artemisia rothrockii* (Rothrock's sagebrush) Alliance (Sawyer et al. 2009) [35.140.00]
- = *Artemisia rothrockii* Shrubland Alliance (CNPS 2017) [35.140.00]
- = Rothrock sagebrush series (Sawyer and Keeler-Wolf 1995)
- ? Subalpine Sagebrush (Cheatham and Haller 1975)
- >< Subalpine Sagebrush Scrub (#35220) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEGLO08652 *Artemisia rothrockii* / *Monardella odoratissima* Shrubland
- CEGLO03014 *Artemisia rothrockii* Shrubland

AUTHORSHIP

Primary Concept Source: J.O. Sawyer, T. Keeler-Wolf, and J. Evens (2009)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by M. Schindel.

Version Date: 2014/12/18

REFERENCES

References: Bauer et al. 2002, Benedict 1982, Benedict 1983, CNPS 2017, Cheatham and Haller 1975, Faber-Langendoen et al. 2017b, Holland 1986b, Keeler-Wolf et al. 2003a, Major and Taylor 1977, Ratliff 1985, Reynolds and Berlow 2002, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Taylor 1984, West 1988

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G304. Intermountain Mountain Big Sagebrush Steppe & Shrubland

A3207. *Artemisia tridentata* ssp. *spiciformis* - *Artemisia tridentata* ssp. *vaseyana* Steppe & Shrubland Alliance

Type Concept Sentence: This alliance is widespread in mountainous areas across the western U.S. and is characterized by a moderate to dense shrub layer in which *Artemisia tridentata* ssp. *vaseyana* or *Artemisia tridentata* ssp. *spiciformis* dominates. If other shrubs are present, they have low cover and do not codominate. Stands form large, continuous stands on mid-elevation mountain slopes and foothills, and can extend above the lower treeline as patches within montane or subalpine coniferous forests.

OVERVIEW

Scientific Name: *Artemisia tridentata* ssp. *spiciformis* - *Artemisia tridentata* ssp. *vaseyana* Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Spiked Big Sagebrush - Mountain Big Sagebrush Steppe & Shrubland Alliance

Colloquial Name: Spiked Big Sagebrush - Mountain Big Sagebrush Steppe & Shrubland

Type Concept: This alliance is widespread in mountainous areas across the western U.S. and is characterized by a moderate to dense shrub layer in which *Artemisia tridentata* ssp. *vaseyana* or *Artemisia tridentata* ssp. *spiciformis* dominates. If other shrubs are present, they have low cover and do not codominate. Perennial graminoids typically dominate the open to dense herbaceous layer. The most widespread species are *Pseudoroegneria spicata* and *Festuca idahoensis*, which occur from the Columbia Basin to the Northern Rockies, although they may not be the most abundant species in individual stands. Other locally important species may include *Achnatherum occidentale* (= *Stipa occidentalis*), *Bouteloua gracilis*, *Bromus carinatus*, *Elymus trachycaulus*, *Festuca thurberi*, *Festuca viridula*, *Koeleria macrantha*, *Leucopoa kingii* (= *Festuca kingii*), *Leymus cinereus*, *Pascopyrum smithii*, *Poa fendleriana*, and *Poa secunda*. The forb layer is variable and can be very diverse. Species of *Castilleja*, *Potentilla*, *Erigeron*, *Phlox*, *Astragalus*, *Geum*, *Lupinus*, and *Eriogonum* are characteristic. Non-native grasses *Poa pratensis* and *Poa compressa* may be abundant. The alliance forms large, continuous stands on mid-elevation mountain slopes and foothills, and can extend above the lower treeline as patches within montane or subalpine coniferous forests. Sites are variable and range from flats to steep slopes to ridgetops with deep to shallow rocky soil.

Classification Comments: Diagnostic components of this alliance are phenotypically and genetically quite plastic species dominating a massive region spanning two floristic provinces, subspecies notwithstanding. There is enormous floristic variation within this alliance. Much work is needed to clarify the distribution and floristic characteristics of this alliance that will distinguish it clearly. *Artemisia tridentata* ssp. *spiciformis* as described by Shultz (1984) and Goodrich et al. (1985) includes *Artemisia rothrockii* as used by Bramble-Brodahl (1978) and described by Beetle and Johnson (1982). It does not include *Artemisia tridentata* ssp. *vaseyana* form. *spiciformis* as used by numerous authors, including Bramble-Brodahl (1978), Winward (1980b), Beetle and Johnson (1982), and Hironaka et al. (1983). Goodrich et al. (1985) reassign form. *spiciformis* to variety *vaseyana* of *Artemisia tridentata* ssp. *vaseyana*.

Internal Comments: KAS 12-24: comment from M. Jennings AE review: Users of this description might benefit from the insight that this is a case of a phenotypically and genetically quite plastic species dominating a massive region spanning two floristic provinces, subspecies notwithstanding. There is enormous floristic variation within this alliance.

Other Comments:

Similar NVC Types:

- A3208 *Artemisia tridentata* ssp. *vaseyana* - Mixed Steppe & Shrubland Alliance: is codominated by non-sagebrush shrubs.

Diagnostic Characteristics: Vegetation included in this alliance is characterized by a moderate to dense shrub layer in which diagnostic species *Artemisia tridentata* ssp. *vaseyana* or *Artemisia tridentata* ssp. *spiciformis* dominate. If other shrubs are present, then they have low cover and do not codominate. A variety of perennial graminoids typically dominate the open to dense herbaceous layer. Characteristic herbaceous species are *Achnatherum lettermanii*, *Achnatherum occidentale*, *Achnatherum pinetorum*, *Balsamorhiza sagittata*, *Bromus carinatus*, *Carex exserta*, *Carex geyeri*, *Elymus lanceolatus*, *Festuca campestris*, *Festuca idahoensis*, *Festuca thurberi*, *Hesperostipa comata*, *Koeleria macrantha*, *Leucopoa kingii*, *Leymus cinereus*, *Monardella odoratissima*, *Pascopyrum smithii*, *Phlox condensata*, *Poa fendleriana*, *Poa glauca*, *Poa secunda*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: The vegetation in this alliance is characterized by a sparse (<25%) cover of microphyllous evergreen shrubs, usually 0.5-1 m in height. In one association, bunchgrasses form a matrix surrounding the shrubs, occasionally matching or exceeding the shrubs in height. In another association, a sod-forming short graminoid is dominant in the herbaceous layer. Forb species are often frequent and diverse, and can be prominent in some stands.

Floristics: This alliance is characterized by a moderate to dense shrub layer in which *Artemisia tridentata* ssp. *vaseyana* or *Artemisia tridentata* ssp. *spiciformis* dominates. If other shrubs are present, they have low cover and do not codominate. Perennial graminoids typically dominate the open to dense herbaceous layer. The most widespread species are *Pseudoroegneria spicata* and *Festuca idahoensis*, which occur from the Columbia Basin to the Northern Rockies, although they may not be the most abundant species in individual stands. Other locally important species may include *Achnatherum occidentale* (= *Stipa occidentalis*), *Bouteloua gracilis*, *Bromus carinatus*, *Elymus trachycaulus*, *Festuca thurberi*, *Festuca viridula*, *Koeleria macrantha*, *Leucopoa kingii* (= *Festuca kingii*), *Leymus cinereus*, *Pascopyrum smithii*, *Poa fendleriana*, and *Poa secunda*. The forb layer is variable and can be very diverse. *Balsamorhiza sagittata*, *Monardella odoratissima*, and *Phlox condensata* are often prominent. Species of *Astragalus*, *Castilleja*, *Erigeron*, *Eriogonum*, *Geum*, *Lupinus*, *Phlox*, and *Potentilla* are characteristic. Non-native grasses *Poa pratensis* and *Poa compressa* may be abundant. Trees are uncommon in stands of this alliance, but *Abies lasiocarpa*, *Cercocarpus ledifolius*, *Juniperus occidentalis*, *Juniperus scopulorum*, *Pinus albicaulis*, *Pinus ponderosa*, and *Populus tremuloides* may occasionally occur.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is widespread in mountainous areas across the western U.S. and forms large, continuous stands on mid-elevation mountain slopes and foothills, and can extend above the lower treeline as patches within montane or subalpine coniferous forests. The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 18-90 cm. Much of the yearly precipitation falls as snow, which may cover the ground for long periods in winter. Temperatures are continental with large annual and diurnal variation. The elevation range for this alliance is large, from about 1060 m in eastern Oregon and Washington, to well over 3200 m in the mountains of northern Nevada, Idaho, and Colorado. Landscape positions are variable as well, but primarily are deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, and slopes range from nearly flat to very steep. Soils generally are moderately deep to deep, somewhat well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes, often having a substantial volume of coarse fragments. The soils are derived from a variety of parent materials (although sandstones, limestones, basalts, and crystalline rocks are common). In some cases, soils supporting stands of this alliance are unstable and prone to mass movement (Bramble-Brodahl 1978, Hironaka et al. 1983). In subalpine environments, these shrub-herbaceous communities are found on deeper soils than *Artemisia arbuscula* subalpine shrublands.

Dynamics: Complex ecological interactions between fire regimes, grazing history, and climate patterns result in equally complex patterns of species structure and composition in *Artemisia tridentata* shrublands. These present corresponding difficulties in the classification of these shrublands, which have been compounded by the influence of human settlement and agricultural patterns. What follows is a summary of some of the influences of altered fire regimes and grazing history on *Artemisia tridentata* shrublands and shrub herbaceous vegetation.

Artemisia tridentata ssp. *vaseyana* shrub-herbaceous plant associations may represent either more moist or less disturbed communities within the complex of *Artemisia tridentata* ssp. *vaseyana* shrublands and shrub-steppe. Shrub densities typically increase with overgrazing of the bunchgrass component or with increasing summer drought (West 1983c). There is considerable debate over whether present shrub-dominated stands are actually degraded "steppe" (e.g., shrub-herbaceous physiognomy), and if the stands will return to steppe with changes in grazing and fire management. *Artemisia tridentata* is inhibited by fire, and excessive grazing may decrease fire frequency due to consumption of herbaceous forage, resulting in increased shrub density. Conversely, invasion by non-native annual grasses (e.g., *Bromus tectorum* at lower elevations) may increase fire frequency sufficiently to eliminate the shrubs from the stands (Hironaka et al. 1983). With a change in fire frequency, species composition will be altered as well (West 1983c). With a high fire frequency (every 2-5 years), perennial grasses and shrubs are eliminated and non-native annual grasses dominate. At fire-return intervals of 10-30 years, short-lived resprouting shrubs such as *Chrysothamnus* or *Tetradymia* spp. dominate. At fire intervals of 30-70 years, a mixture of perennial bunchgrasses and shrubs is maintained. Finally, in the complete absence of fire, deep-rooted shrubs such as *Artemisia tridentata* may become dominant.

Artemisia tridentata ssp. *spiciformis* communities have a natural fire frequency averaging between 20 and 40 years. Presettlement fires burned unevenly, resulting in an ever-changing mosaic of different densities and ages of sagebrush plants (Winward 1991). However, *Artemisia tridentata* ssp. *spiciformis* resprouts vigorously after fire (Goodrich et al. 1985) and can return to pre-burn canopy cover very quickly (Winward 1991).

DISTRIBUTION

Geographic Range: This shrubland alliance occurs in mountainous regions from eastern California, Oregon and Washington, across the Great Basin in Nevada, the northern Rocky Mountain foothills of Idaho, and in Colorado, Wyoming and Montana. It has not been reported from Utah, Arizona or New Mexico, but it is very likely to occur in these states at high elevations. In addition, the alliance probably extends north into Alberta, Canada.

Nations: CA?, US

States/Provinces: AB?, CA, CO, ID, MT, NV, OR, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- < *Artemisia tridentata ssp. vaseyana* (Mountain big sagebrush) Alliance (Sawyer et al. 2009) [35.111.00]
- >> Big Sagebrush Series (Sawyer and Keeler-Wolf 1995)
- >> SRM Cover Type #314 - Big Sagebrush-Bluebunch Wheatgrass (Shiflet 1994)
- >> SRM Cover Type #315 - Big Sagebrush-Idaho Fescue (Shiflet 1994)
- >> SRM Cover Type #316 - Big Sagebrush-Rough Fescue (Shiflet 1994)
- < SRM Cover Type #402 - Mountain Big Sagebrush (Shiflet 1994)
- < SRM Cover Type #408 - Other Sagebrush Types (Shiflet 1994)
- < SRM Cover Type #612 - Sagebrush - Grass (Shiflet 1994)
- >> Western Shrub and Grasslands Combinations: 55: Sagebrush-Steppe (*Artemisia-Agropyron*) (Küchler 1964)
- >> Western Shrub: 38: Great Basin Sagebrush (*Artemisia*) (Küchler 1964)

LOWER LEVEL UNITS

Associations:

- CEG001531 *Artemisia tridentata ssp. vaseyana* / *Festuca campestris* Shrub Grassland
- CEG005423 *Artemisia tridentata ssp. vaseyana* / *Poa (glauca, secunda)* Shrubland
- CEG002990 *Artemisia tridentata ssp. spiciformis* / *Carex geyeri* Shrubland
- CEG002931 *Artemisia tridentata ssp. vaseyana* / *Hesperostipa comata* Shrubland
- CEG001033 *Artemisia tridentata ssp. vaseyana* / *Achnatherum occidentale* Shrubland
- CEG008651 *Artemisia tridentata ssp. vaseyana* / *Carex exserta* Shrubland
- CEG001023 *Artemisia tridentata ssp. vaseyana* / *Festuca idahoensis* - *Bromus carinatus* Shrubland
- CEG002993 *Artemisia tridentata ssp. spiciformis* Shrub Grassland
- CEG001026 *Artemisia tridentata ssp. vaseyana* / *Leucopoa kingii* - *Koeleria macrantha* Shrubland
- CEG001024 *Artemisia tridentata ssp. vaseyana* / *Festuca thurberi* Shrubland
- CEG001029 *Artemisia tridentata ssp. vaseyana* / *Poa secunda* Shrubland
- CEG001030 *Artemisia tridentata ssp. vaseyana* / *Pseudoroegneria spicata* Shrubland
- CEG001532 *Artemisia tridentata ssp. vaseyana* / *Carex geyeri* Shrub Grassland
- CEG001028 *Artemisia tridentata ssp. vaseyana* / *Pascopyrum smithii* Shrubland
- CEG001020 *Artemisia tridentata ssp. vaseyana* / *Balsamorhiza sagittata* Shrubland
- CEG003476 *Artemisia tridentata ssp. vaseyana* / *Monardella odoratissima* Shrubland
- CEG001021 *Artemisia tridentata ssp. vaseyana* / *Bromus carinatus* Shrubland
- CEG001027 *Artemisia tridentata ssp. vaseyana* / *Leymus cinereus* Shrubland
- CEG002770 *Artemisia tridentata ssp. vaseyana* / *Phlox condensata* Shrubland
- CEG001533 *Artemisia tridentata ssp. vaseyana* / *Festuca idahoensis* Shrub Grassland
- CEG001031 *Artemisia tridentata ssp. vaseyana* / *Pseudoroegneria spicata* - *Poa fendleriana* Shrubland
- CEG002812 *Artemisia tridentata ssp. vaseyana* / *Poa fendleriana* Shrubland
- CEG002806 *Artemisia tridentata ssp. vaseyana* / *Achnatherum pinetorum* Shrubland
- CEG002811 *Artemisia tridentata ssp. vaseyana* / *Achnatherum lettermanii* Shrubland
- CEG005318 *Artemisia tridentata ssp. vaseyana* / *Elymus lanceolatus* Shrubland
- CEG001025 *Artemisia tridentata ssp. vaseyana* / *Leucopoa kingii* Shrubland
- CEG002989 *Artemisia tridentata ssp. spiciformis* / *Bromus carinatus* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by D. Tart and D. Sarr.

Version Date: 2014/12/18

REFERENCES

References: Beetle and Johnson 1982, Bramble-Brodahl 1978, Despain 1973a, Faber-Langendoen et al. 2017b, Francis 1983, Goodrich et al. 1985, Hess 1981, Hess and Wasser 1982, Hironaka et al. 1983, Hurd 1961, Jensen et al. 1988a, Johnson and Clausnitzer 1992, Johnston 1987, Komarkova 1986, Küchler 1964, Lewis 1971, Lewis 1975a, Mooney 1985, Mueggler and Stewart 1980, Sabinske 1978, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shiflet 1994, Smith 1966, Strong 1980, Tart 1996, Terwilliger and Smith 1978, Tiedemann et al. 1987, Tweit and Houston 1980, West 1983c, Winward 1980b, Winward 1991

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G304. Intermountain Mountain Big Sagebrush Steppe & Shrubland

A3208. *Artemisia tridentata* ssp. *vaseyana* - Mixed Steppe & Shrubland Alliance

Type Concept Sentence: This alliance is widespread in mountainous areas across the western U.S. The vegetation is characterized by a moderate to dense shrub layer in which *Artemisia tridentata* ssp. *vaseyana* is codominant with non-sagebrush shrub species *Amelanchier utahensis*, *Holodiscus dumosus*, *Purshia tridentata*, or *Symphoricarpos oreophilus*. Perennial graminoids typically dominate the open to moderately dense herbaceous layer. This alliance forms large, continuous stands on mid-elevation mountain slopes and foothills, and can extend above the lower treeline as patches within montane or subalpine coniferous forests.

OVERVIEW

Scientific Name: *Artemisia tridentata* ssp. *vaseyana* - Mixed Steppe & Shrubland Alliance

Common Name (Translated Scientific Name): Mountain Big Sagebrush - Mixed Steppe & Shrubland Alliance

Colloquial Name: Mountain Big Sagebrush - Mixed Steppe & Shrubland

Type Concept: This alliance is widespread in mountainous areas across the western U.S. The vegetation included in this alliance is characterized by an open to dense (10-70% cover) shrub layer in which *Artemisia tridentata* ssp. *vaseyana* is codominant, usually with 40-60% relative cover with non-sagebrush shrub species such as *Amelanchier utahensis*, *Holodiscus dumosus*, *Purshia tridentata*, or *Symphoricarpos oreophilus*. Perennial graminoids typically dominate the open to moderately dense herbaceous layer. The most widespread species are *Pseudoroegneria spicata* and *Festuca idahoensis*, which occur from the Columbia Basin to the northern Rockies, although they may not be the most abundant species in individual stands. Other locally important species may include *Achnatherum occidentale* (= *Stipa occidentalis*), *Bouteloua gracilis*, *Bromus carinatus*, *Elymus trachycaulus*, *Festuca thurberi*, *Festuca viridula*, *Koeleria macrantha*, *Leucopoa kingii* (= *Festuca kingii*), *Leymus cinereus*, *Pascopyrum smithii*, *Poa fendleriana*, and *Poa secunda*. The forb layer is variable and can be very diverse. Species of *Castilleja*, *Potentilla*, *Erigeron*, *Phlox*, *Astragalus*, *Geum*, *Lupinus*, and *Eriogonum* are characteristic. The alliance forms large, continuous stands on mid-elevation mountain slopes and foothills, and can extend above the lower treeline as patches within montane or subalpine coniferous forests. Sites are variable and range from flats to steep slopes to ridgetops with deep to shallow rocky soil.

Classification Comments: Although the dominant species is shared with the different *Artemisia tridentata* ssp. *spiciformis* - *Artemisia tridentata* ssp. *vaseyana* Steppe & Shrubland Alliance (A3207), Young et al. (2007) show that there are substantial compositional and environmental differences which warrant separation into two different alliances. Much of the area occupied by this widespread alliance has been moderately to severely degraded by livestock grazing and subsequent invasion by *Bromus tectorum* with a consequent alteration of its fire regime. Individuals of the dominant species do not usually survive fire and usually take a decade or more to reestablish (Tirmenstein 1999c).

Internal Comments:

Other Comments:

Similar NVC Types:

- A3207 *Artemisia tridentata* ssp. *spiciformis* - *Artemisia tridentata* ssp. *vaseyana* Steppe & Shrubland Alliance: is not codominated by non-sagebrush shrubs.

Diagnostic Characteristics: This sagebrush mixed shrub alliance is widespread in mountainous areas across the western U.S. The vegetation included in this alliance is characterized by a moderate to dense shrub layer in which *Artemisia tridentata* ssp. *vaseyana* is codominant with non-sagebrush shrub species *Amelanchier utahensis*, *Holodiscus dumosus*, *Purshia tridentata*, or *Symphoricarpos oreophilus*. Perennial graminoids typically dominate the open to moderately dense herbaceous layer. Characteristic grasses are *Bromus carinatus*, *Elymus trachycaulus* ssp. *trachycaulus*, *Festuca idahoensis*, *Hesperostipa comata*, *Muhlenbergia montana*, *Poa secunda*, and *Pseudoroegneria spicata*.

VEGETATION

Physiognomy and Structure: The shrublands in this alliance are characterized by a open to dense (10-75%) cover of microphyllous evergreen shrubs, usually 1-2 m in height. Cespitose graminoids are scattered in the shrub matrix and can occasionally match the shrubs in height. A sparse, emergent layer of scale-leaved or needle-leaved evergreen trees may also be present, but in many areas no trees are present. Forb species may be frequent, but are usually of low cover. With increasing summer rain in the southeastern edge of the range, there is an increase in the importance of sod-forming grasses in comparison to bunchgrasses. In many areas, undisturbed stands in this alliance will have a cryptogamic soil crust composed of a mix of lichens, tiny mosses, and bacteria.

Floristics: The vegetation included in this alliance is characterized by a open to dense (10-70% cover) short-shrub layer in which *Artemisia tridentata ssp. vaseyana* is codominant, usually with 40-60% relative cover, with non-sagebrush shrub species such as *Amelanchier utahensis*, *Holodiscus dumosus*, *Purshia tridentata*, or *Symphoricarpos oreophilus*. Perennial graminoids typically dominate the open to moderately dense herbaceous layer. The most widespread species are *Pseudoroegneria spicata* and *Festuca idahoensis*, which occur from the Great Basin to the Rocky Mountains, although they may not be the most abundant species in individual stands. Other locally important species may include *Bromus carinatus*, *Elymus trachycaulus*, *Hesperostipa comata*, *Koeleria macrantha*, *Muhlenbergia montana*, *Poa fendleriana*, and *Poa secunda*. The forb layer is variable and can be very diverse. Species of *Castilleja*, *Potentilla*, *Erigeron*, *Phlox*, *Astragalus*, *Geum*, *Lupinus*, and *Eriogonum* are characteristic.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance is widespread in mountainous areas across the western U.S. and forms large, continuous stands on mid-elevation mountain slopes and foothills, and can extend above the lower treeline as patches within montane or subalpine coniferous forests. The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 18-60 cm. Much of the yearly precipitation falls as snow, which may cover the ground for long periods in winter. Temperatures are continental with large annual and diurnal variation. The elevation range for this alliance is large, from about 1060 m in eastern Oregon and Washington, to well over 3500 m in the mountains of northern Nevada, Idaho, and Colorado. Landscape positions are variable as well, but primarily are deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, but the higher elevation occurrences may be mainly on south- or west-facing slopes. Soils generally are moderately deep to deep, well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes; they often have a substantial volume of coarse fragments. The soils are derived from a variety of parent materials (although sandstones, limestones, and crystalline rocks are common). In some cases, soils supporting stands of this alliance are unstable and prone to mass movement (Bramble-Brodahl 1978, Hironaka et al. 1983). In subalpine environments, these shrublands are found on deeper soils than *Artemisia arbuscula* subalpine shrublands. Although the vegetation may grow in alkaline soils at the edge of internally drained basins, *Artemisia tridentata* is a non-halophyte and requires low salinity for optimum growth.

Dynamics: Complex ecological interactions between fire regimes, grazing history, and climate patterns result in equally complex patterns of species structure and composition in *Artemisia tridentata*. These present corresponding difficulties in the classification of these shrublands, which have been compounded by the influence of human settlement and agricultural patterns. What follows is a summary of some of the influences of altered fire regimes, and grazing history on *Artemisia tridentata* shrublands and shrub herbaceous vegetation.

Artemisia tridentata ssp. vaseyana shrublands may represent either drier or more disturbed examples of the *Artemisia tridentata ssp. vaseyana* shrubland complex. Shrub densities typically increase with overgrazing of the bunchgrass component or with increasing summer drought (West 1983c). There is considerable debate over whether present shrub-dominated stands are actually degraded "steppe" (e.g., shrub-herbaceous physiognomy), and if the stands will return to steppe with changes in grazing and fire management. *Artemisia tridentata* is inhibited by fire, and excessive grazing may decrease fire frequency due to consumption of herbaceous forage, resulting in increased shrub density. Conversely, invasion by non-native annual grasses (e.g., *Bromus tectorum* at lower elevations) may increase fire frequency sufficiently to eliminate the shrubs from the stands (Hironaka et al. 1983). With a change in fire frequency, species composition will be altered as well (West 1983c). With a high fire frequency (every 2-5 years), perennial grasses and shrubs are eliminated and non-native annual grasses dominate. At fire-return intervals of 10-30 years, short-lived resprouting shrubs such as *Chrysothamnus* or *Tetradymia* spp. dominate. At fire intervals of 30-70 years, a mixture of perennial bunchgrasses and shrubs is maintained. Finally, in the complete absence of fire, deep-rooted shrubs such as *Artemisia tridentata* become the theoretical dominants.

DISTRIBUTION

Geographic Range: This shrubland alliance occurs in mountainous regions from eastern California, Oregon, and Washington, across the Great Basin in Nevada, the northern Rocky Mountain foothills of Idaho, and in Colorado, Wyoming, and Montana. It has not been reported from Utah, Arizona, or New Mexico, but it is very likely to occur in these states at high elevations. In addition, the alliance probably extends north into Alberta, Canada.

Nations: CA?, US

States/Provinces: AB?, CA, CO, ID, MT, NV, OR, UT, WY

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007): 322Ac:CCC, 322Ad:CCC, 341Fa:CCC, 341Fb:CCC, 341Fc:CCC, 341Fd:CCC, 341Ff:CCC, 341Fg:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Great Basin)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- < *Artemisia tridentata* ssp. *vaseyana* (Mountain big sagebrush) Alliance (Sawyer et al. 2009) [35.111.00]
- = *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance (Evens et al. 2014) [probably equivalent]
- >> Big Sagebrush Scrub (#35210) (Holland 1986b)
- >> Big Sagebrush Series (Sawyer and Keeler-Wolf 1995)
- < SRM Cover Type #402 - Mountain Big Sagebrush (Shiflet 1994)
- >> Western Shrub and Grasslands Combinations: 55: Sagebrush-Steppe (*Artemisia-Agropyron*) (Küchler 1964)
- >> Western Shrub: 38: Great Basin Sagebrush (*Artemisia*) (Küchler 1964)

LOWER LEVEL UNITS**Associations:**

- CEGLO02820 *Amelanchier utahensis* - *Artemisia tridentata* (ssp. *vaseyana*, ssp. *wyomingensis*) Shrubland
- CEPP006855 *Artemisia tridentata* ssp. *vaseyana* - *Ephedra viridis* Shrubland
- CEGLO02951 *Symphoricarpos oreophilus* Shrubland
- CEGLO05484 *Chamaebatiaria millefolium* / *Penstemon deustus* Sparse Vegetation
- CEGLO01034 *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Elymus trachycaulus* ssp. *trachycaulus* Shrubland
- CEGLO01036 *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Festuca idahoensis* Shrubland
- CEGLO05474 *Artemisia tridentata* ssp. *vaseyana* - *Chamaebatiaria millefolium* / *Penstemon deustus* Shrubland
- CEGLO01035 *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Bromus carinatus* Shrubland
- CEGLO01038 *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Pseudoroegneria spicata* Shrubland
- CEGLO05827 *Artemisia tridentata* ssp. *vaseyana* - (*Purshia tridentata*) / *Muhlenbergia montana* - (*Hesperostipa comata* ssp. *comata*) Shrubland
- CEGLO01037 *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Poa secunda* Shrubland
- CEGLO01039 *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Hesperostipa comata* Shrubland
- CEGLO02807 *Artemisia tridentata* ssp. *vaseyana* - *Holodiscus dumosus* Shrubland
- CEPP005794 *Artemisia tridentata* ssp. *vaseyana* Shrubland
- CEGLO01003 *Artemisia tridentata* - *Ephedra* spp. Shrubland
- CEGLO01032 *Artemisia tridentata* ssp. *vaseyana* - *Purshia tridentata* / *Pseudoroegneria spicata* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments: We have incorporated significant descriptive information previously compiled by D. Sarr.

Version Date: 2014/12/18

REFERENCES

References: Baker 1983c, Baker and Kennedy 1985, Blackburn 1967, Blackburn et al. 1968a, Blackburn et al. 1968c, Blackburn et al. 1969a, Blackburn et al. 1969b, Blackburn et al. 1969c, Blackburn et al. 1969d, Blackburn et al. 1971, Boyce 1977, Bramble-Brodahl 1978, Britton et al. 1981, Caicco and Wellner 1983a, Caicco and Wellner 1983f, Caicco and Wellner 1983k, Chappell et al. 1997, Cheng 2004, Cooper et al. 1999, Current 1984, Daubenmire 1970, Eddleman and Jandl 1994, Evens et al. 2014, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b, Fenemore 1970, Francis 1983, Francis 1986, Franklin and Dyrness 1973, Giese 1975, Hansen et al. 1984, Harper and Jaynes 1986, Heinze et al. 1962, Hess 1981, Hess and Wasser 1982, Hironaka et al. 1983, Holecheck and Stephenson 1983, Holland 1986b, Jameson et al. 1962, Jensen et al. 1988a, Johnson and Clausnitzer 1992, Johnson and Payne 1968, Johnson and Simon 1987, Johnston 1987, Jorgensen 1979, Komarkova 1986, Kurzius 1981, Küchler 1964, Leary and Peterson 1984, Lesica and DeVelice 1992, Lewis 1971, Lewis 1975a, Loope 1969, McArthur and Welch 1986, McLean 1970, Mooney 1985, Moretti 1979, Moretti and Brotherson 1982, Nelson and Jensen 1987, ORNHP unpubl. data, Poulton 1955, Ralston 1969, Rickard and Beatley 1965, Robertson 1971, Rzedowski 1981, Savage 1968, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Sheehy and Winward 1981, Shiflet 1994, Smith 1966, Tart 1996, Terwilliger and Smith 1978, Terwilliger and Tiedemann 1978, Tiedemann et al. 1987, Tirmenstein 1999c, Tisdale and Hironaka 1981, Tueller and Blackburn 1974, Tueller and Eckert 1987, Tueller et al. 1966, Twit and Houston 1980, USFS 1992, Warren et al. 1982, West 1983c, Winward 1970

M095. Great Basin-Intermountain Xeric-Riparian Scrub

This macrogroup covers shrublands along dry washes and valley floors dominated by *Atriplex canescens*, *Ericameria nauseosa*, *Artemisia tridentata* ssp. *tridentata*, and other species within the cool temperate desert of western North America.

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.4.a. M095 Great Basin-Intermountain Xeric-Riparian Scrub

G559. Great Basin-Intermountain Shrub & Herb Wash-Arroyo

Type Concept Sentence: This group includes sparsely to densely vegetated shrublands that occur along dry watercourses that experience periodic flash flooding, and is dominated by *Atriplex canescens*, *Atriplex confertifolia*, *Brickellia* spp., *Ephedra* spp., *Ericameria nauseosa*, and/or *Fraxinus anomala*, found throughout interior western deserts.

OVERVIEW

Scientific Name: *Atriplex canescens* - *Ericameria nauseosa* Shrub & Herb Wash-Arroyo Group

Common Name (Translated Scientific Name): Fourwing Saltbush - Rubber Rabbitbrush Shrub & Herb Wash-Arroyo Group

Colloquial Name: Fourwing Saltbush - Rubber Rabbitbrush Desert Wash

Type Concept: This is a sparsely to densely vegetated group that occurs along dry watercourses that experience periodic flash flooding. These are shrublands dominated by *Atriplex canescens*, *Atriplex confertifolia*, *Brickellia* spp., *Ephedra* spp., *Ericameria nauseosa*, and/or *Fraxinus anomala*. Other associated shrubs include *Artemisia filifolia*, *Artemisia tridentata*, *Atriplex gardneri*, *Gutierrezia sarothrae*, *Lycium andersonii*, *Purshia stansburiana*, *Quercus havardii*, *Rhus trilobata*, *Sarcobatus vermiculatus*, and/or *Suaeda moquinii* (= *Suaeda torreyana*). Herbaceous cover is sparse (<10% cover) with a variety of grasses and forbs; non-native annuals can be abundant. This group is known from eastern Washington, eastern Oregon, the Columbia Basin, and throughout the Great Basin. Elevations range from 500-2500 m. Stands occur along the banks or edges of, in or near temporary watercourses (aka washes, dry streambeds, gullies and the like). Surfaces occupied include sandy terraces, wash bottoms, point bars, as well as basin floors that are flat or gently sloping. Substrates are rapidly drained and coarse, such as sandy or gravelly soils derived from alluvium, gneiss, shale, cinder and sandstone, that are often very rocky as well.

Classification Comments: These associations can be difficult to differentiate from surrounding upland communities.

Similar NVC Types:

- G541 Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope: occurs in warmer regions of the West.

Diagnostic Characteristics: This shrubland group is characterized by a sparse to dense (1-65% cover) shrub layer dominated by *Atriplex canescens*, *Atriplex confertifolia*, *Brickellia* spp., *Ephedra* spp., *Ericameria nauseosa*, and/or *Fraxinus anomala*. Stands occur in or near temporary watercourses on sandy terraces, wash bottoms, point bars, and basin floors that are flat or gently sloping.

VEGETATION

Physiognomy and Structure: This group is defined as a broadleaf deciduous shrubland with 1-65% cover. Herbaceous cover is generally low to sparse and characterized by a mixed composition of graminoids.

Floristics: Stands are sparse to dense (1-65% cover) and dominated by *Atriplex canescens*, *Atriplex confertifolia*, *Brickellia* spp., *Ephedra* spp., *Ericameria nauseosa*, and/or *Fraxinus anomala*. Associated shrubs include *Artemisia filifolia*, *Artemisia tridentata*, *Atriplex gardneri*, *Gutierrezia sarothrae*, *Lycium andersonii*, *Purshia stansburiana*, *Quercus havardii*, *Rhus trilobata*, *Sarcobatus vermiculatus*, and/or *Suaeda moquinii* (= *Suaeda torreyana*). Herbaceous cover is sparse (<10% cover) with a variety of grasses and forbs such as *Achnatherum hymenoides*, *Artemisia dracunculus*, *Descurainia pinnata*, *Elymus elymoides*, *Glycyrrhiza lepidota*, *Hesperostipa comata*, *Hordeum jubatum*, *Muhlenbergia porteri*, *Pleuraphis jamesii*, *Sphaeralcea parvifolia*, *Sporobolus contractus*, *Sporobolus cryptandrus*, *Stanleya pinnata*, and *Scabrethia scabra* (= *Wyethia scabra*). Non-native annuals such as *Bromus tectorum* and *Salsola tragus* are sometimes present to abundant.

ENVIRONMENT & DYNAMICS

Environmental Description: *Soil/substrate/hydrology:* Substrates are rapidly drained, sandy or gravelly soils derived from alluvium, gneiss, shale, cinder and sandstone. Scattered large rocks, gravel and bare ground cover most of the unvegetated surface, although some litter is typically present.

Dynamics: This group is often associated with a combination of dry conditions, coarse-textured substrates and intermittent severe disturbance by flash floods. The vegetation is usually scattered, occurring in parts of the channel protected from the worst flooding, and shrubs have extensive root systems to allow them to resprout quickly when damaged or partially uprooted by flooding.

DISTRIBUTION

Geographic Range: This group is known from eastern Washington, eastern Oregon, the Columbia Basin, and throughout the Great Basin.

Spatial Scale & Pattern [optional]: Linear

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313D:CC, 315H:PP, 331B:CC, 331H:C?, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342E:CC, 342F:CC, 342G:CC, M313A:CC, M313B:CP, M331I:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A3266 *Atriplex canescens* - *Ericameria nauseosa* Desert Wash Alliance

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2011)

Author of Description: K.A. Schulz and G. Kittel

Acknowledgments:

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: MEH 10-10, mod. GK 8-15, mod. KAS 11-15

REFERENCES

References: Comer et al. 2003, Faber-Langendoen et al. 2017a, Knight 1994, Shiflet 1994, West 1983b

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G559. Great Basin-Intermountain Shrub & Herb Wash-Arroyo

A3266. *Atriplex canescens* - *Ericameria nauseosa* Desert Wash Alliance

Type Concept Sentence: This alliance consists of shrublands, generally dominated by *Atriplex canescens* and/or *Ericameria nauseosa*. Several other shrub species may appear in the stand. These are shrublands of cold desert washes of Arizona, Colorado, Nevada and Utah with low cover of mixes of short shrubs.

OVERVIEW

Scientific Name: *Atriplex canescens* - *Ericameria nauseosa* Desert Wash Alliance

Common Name (Translated Scientific Name): Fourwing Saltbush - Rubber Rabbitbrush Desert Wash Alliance

Colloquial Name: Fourwing Saltbush - Rubber Rabbitbrush Desert Wash

Type Concept: This alliance covers desert wash shrublands dominated by *Atriplex canescens* and/or *Ericameria nauseosa*. Associated shrubs include *Artemisia filifolia*, *Artemisia tridentata*, *Atriplex confertifolia*, *Atriplex gardneri*, *Brickellia longifolia*, *Ephedra torreyana*, *Ephedra viridis*, *Fraxinus anomala*, *Gutierrezia sarothrae*, *Lycium andersonii*, *Purshia stansburiana*, *Rhus trilobata*, *Sarcobatus vermiculatus*, and *Suaeda moquinii* (= *Suaeda torreyana*). The herbaceous stratum has sparse to moderate cover of *Achnatherum hymenoides*, *Artemisia dracunculul*, *Descurainia pinnata*, *Elymus elymoides*, *Glycyrrhiza lepidota*, *Hesperostipa comata*, *Hordeum jubatum*, *Sphaeralcea parvifolia*, *Sporobolus contractus*, and *Sporobolus cryptandrus*. These shrubland are short-statured (<2 m in height), mixed species with fairly open canopy coverage. They can be found in cold desert washes of northern Arizona, Colorado, Nevada and Utah.

Classification Comments: Alliance of cold desert washes with sparsely scattered cover of either of the three shrub species.

Internal Comments: MSR 1-16: this alliance does not hold up; should be archived. mjr 12-14: CA added for MOJN.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Open to scattered cover (1-25%) of short shrubs lining arroyos and intermittent drainages.

VEGETATION

Physiognomy and Structure: Shrublands of facultatively deciduous, extremely xeromorphic shrubs with open to moderately dense canopy that is less than 2 m tall. The herbaceous layer is relatively sparse (20-30% cover) and is usually less than 0.5 m tall. It is codominated by perennial grasses and forbs. Annual graminoids and forbs are seasonally present.

Floristics: These shrublands lining desert washes are dominated by *Atriplex canescens* and/or *Ericameria nauseosa*. Associated shrubs may include scattered *Chrysothamnus viscidiflorus*, *Ephedra viridis*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Parthenium confertum*, *Prunus virginiana*, *Purshia stansburiana* (= *Purshia mexicana* var. *stansburiana*), *Rhus trilobata*, *Sarcobatus vermiculatus*, *Symphoricarpos occidentalis*, *Tetradymia glabrata*, and occasional *Artemisia tridentata*. The herbaceous layer can vary from moderately dense and dominated by graminoids to absent. Common native grasses include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Distichlis spicata*, *Elymus elymoides*, *Elymus trachycaulus* ssp. *trachycaulus*, *Leymus flavescens* (= *Elymus flavescens*), *Pseudoroegneria spicata*, *Sporobolus airoides*, *Sporobolus cryptandrus*, *Sporobolus flexuosus*, *Sporobolus nealleyi*, and *Sporobolus wrightii*. Native forbs generally have low cover, but may include species such as *Abronia fragrans*, *Cleome lutea*, *Gayophytum ramosissimum*, *Lygodesmia grandiflora*, *Machaeranthera canescens* (= *Aster canescens*), *Mentzelia multiflora*, *Navarretia* sp., *Phacelia hastata* (= *Phacelia leucophylla*), *Phacelia* spp., *Psoralidium lanceolatum* (= *Psoralea lanceolata*), and *Sphaeralcea coccinea*. Disturbed stands typically have high cover of introduced annual *Bromus* species such as *Bromus tectorum*, *Bromus arvensis* (= *Bromus japonicus*), and *Bromus rubens*. Introduced forbs may include *Melilotus officinalis*, *Salsola kali*, and *Bassia scoparia* (= *Kochia scoparia*).

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs in areas of high natural disturbance such as on steep colluvial slopes, along drainages or in floodplains and washes. The soils are well-drained, moderately deep and coarse-textured with a sandy surface over sandy loams. Soils are derived from sandy/gravelly alluvium. Elevations range from 670-2250 m (2198-7381 feet). Substrates may be eolian, alluvial, colluvial or derived from sandstone residuum. Soils are variable but are generally well-drained and coarse-textured.

Shrublands included in this alliance occur on lowland and upland sites throughout much of the arid and semi-arid western U.S. with elevations ranging from 75 m below sea level to 2400 m. Lowland sites include alluvial flats, drainage terraces, playas, washes and interdunal basins. The lowland sites may be moderately saline or alkaline. Bare ground usually dominates the ground surface.

Dynamics: This alliance occurs in washes and therefore experiences flash floods from time to time. Shrubs generally resprout after severe flood scour.

DISTRIBUTION

Geographic Range: This alliance is found in Arizona, Colorado, Nevada and Utah.

Nations: US

States/Provinces: AZ, CA, CO, NV, UT

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007): 322Av:CCC, 322Ay:CCC, 322Az:CCC, 341Fc:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Joshua Tree, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Atriplex canescens* Association (153.272) (Brown 1982a) [included within Chihuahuan Desertscrub, Saltbush Series.]
- > *Ericameria nauseosa* (Rubber rabbitbrush scrub) Alliance (Sawyer et al. 2009) [35.310.00]
- > *Ericameria nauseosa* Shrubland Alliance (Evens et al. 2014)
- > *Lepidospartum squamatum* (Scale broom scrub) Alliance (Sawyer et al. 2009) [32.070.00]
- > *Lepidospartum squamatum* Alliance (Scale broom scrub) (Buck-Diaz et al. 2012)

LOWER LEVEL UNITS

Associations:

- CEGLO02261 *Ericameria nauseosa* Desert Wash Shrubland
- CEGLO03470 *Atriplex canescens* Desert Wash Shrubland

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2015/12/19

REFERENCES

References: Aldous and Shantz 1924, BIA 1979, Brown 1982a, Buck-Diaz et al. 2012, Culver et al. 1996, Evens et al. 2012, Evens et al. 2014, Faber-Langendoen et al. 2017b, Hyder et al. 1966, Maxwell 1975, Miller et al. 1977, Peterson 2008, Reid et al. 1994, Roberts et al. 1992, Sawyer et al. 2009, Shaw et al. 1989, Shute and West 1978, Soil Conservation Service 1978, Soil Conservation Service n.d., Stout et al. 2013, USBOR 1976, USFS 1937, VegCAMP and AIS 2013, Vest 1962a, Warren et al. 1982

M093. Great Basin Saltbush Scrub

This widespread cool semi-desert macrogroup centers in the Intermountain West of the U.S. and is typically composed of saltbush shrublands. Dominants include *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex corrugata*, *Atriplex cuneata*, *Atriplex gardneri*, *Atriplex lentiformis*, *Atriplex obovata*, *Atriplex polycarpa*, and *Atriplex spinifera*, either singly or mixed, sometimes codominated by other associated species. Substrates are typically saline, alkaline, fine-textured soils developed from shale or alluvium.

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.5.a. M093 Great Basin Saltbush Scrub

G301. Intermountain Dwarf Saltbush - Sagebrush Scrub

Type Concept Sentence: This dwarf-shrub scrub group occurs on gentle slopes and rolling plains in the Colorado Plateau and Uinta Basin on Mancos shale and arid, windswept basins and plains across parts of Wyoming and Montana. It is characterized by an open canopy of dwarf-shrubs composed of relatively pure stands of *Artemisia pedatifida*, *Atriplex corrugata*, or *Atriplex gardneri* sometimes with *Artemisia longifolia*, *Artemisia pygmaea*, or *Picrothamnus desertorum* dominant or codominant.

OVERVIEW

Scientific Name: *Atriplex corrugata* - *Atriplex gardneri* - *Artemisia pedatifida* Dwarf-Scrub Group

Common Name (Translated Scientific Name): Mat Saltbush - Gardner's Saltbush - Birdfoot Sagebrush Dwarf-Scrub Group

Colloquial Name: Birdfoot Sagebrush Low Scrub

Type Concept: This semi-arid dwarf-shrub scrub group occurs in the interior western U.S. and is found on windswept basins and plains, often on marine shales. The vegetation is characterized by an open canopy of dwarf-shrubs composed of relatively pure stands of *Artemisia pedatifida* (important in Wyoming), *Atriplex corrugata* (western Colorado and Utah), or *Atriplex gardneri* (Wyoming and Montana into Canada). Other dominant or codominant dwarf-shrubs may include *Artemisia longifolia*, *Artemisia pygmaea*, or *Picrothamnus desertorum*, sometimes with a mix of other low shrubs, such as *Krascheninnikovia lanata* or *Tetradymia spinosa*. Occasional individuals or small clumps of *Atriplex confertifolia*, *Atriplex canescens*, or *Artemisia tridentata* ssp. *wyomingensis* may be present in some stands within this group but do not codominate. The herbaceous layer is typically sparse. Scattered perennial forbs occur, such as *Xylorhiza glabriuscula* and *Sphaeralcea grossulariifolia*; perennial grasses *Achnatherum hymenoides*, *Bouteloua gracilis* (not in Wyoming), *Elymus elymoides*, *Elymus lanceolatus* ssp. *lanceolatus*, *Pascopyrum smithii*, *Poa secunda*, or *Sporobolus airoides* may dominate the herbaceous layer. In less saline areas, there may be inclusions of grasslands dominated by *Hesperostipa comata*, *Leymus salinus*, *Pascopyrum smithii*, or *Pseudoroegneria spicata*. Stands occur on gentle slopes and rolling plains. Substrates are shallow, typically saline, alkaline, fine-textured soils developed from shale or alluvium that may be associated with shale badlands. Infiltration rate is typically low. In Wyoming and possibly elsewhere, inclusions of non-saline, gravelly barrens or rock outcrops dominated by cushion plants such as *Arenaria hookeri* and *Phlox hoodii* without dwarf-shrubs may be present (these are not restricted to this group and larger patches would likely be classified in a sparse vegetation group).

Classification Comments: This group is more broadly defined than just low, mat-forming saltbush on shaly sites (*Atriplex corrugata*, *Atriplex gardneri*), but includes few dwarf sagebrush species that occur with similar habits and in similar habitats. Generally, it does not include stands mixed with taller species of saltbush or sagebrush. Stands in this group may grade into sparse vegetation groups on shale barrens/badlands. Welsh (1957) observed that *Atriplex corrugata* stands were restricted to north and east aspects on Mancos shale, with south and west aspects nearly barren. In Montana, *Atriplex gardneri* also occurs associated with badlands, and determining which group it falls into may be difficult. Scrub stands dominated by *Picrothamnus desertorum* are placed in Intermountain Shadscale - Saltbush Scrub Group (G300) because they often codominate with the widespread shrub *Atriplex confertifolia*. However, *Picrothamnus desertorum* is often short (10-25 cm tall) so it could also be classified as a dwarf-shrubland.

Similar NVC Types:

Diagnostic Characteristics: This open dwarf-shrubland is typically dominated by relatively pure stands of *Atriplex corrugata* (in Colorado and Utah) or *Atriplex gardneri* (Wyoming and Montana into Canada). Other dominant or codominant dwarf-shrubs may include *Artemisia longifolia*, *Artemisia pedatifida* (very important in Wyoming, rare in Colorado stands), or *Artemisia pygmaea*,

sometimes with a mix of other low shrubs, such as *Krascheninnikovia lanata* or *Tetradymia spinosa*. Occasional individuals or small clumps of *Atriplex confertifolia*, *Atriplex canescens*, or *Artemisia tridentata ssp. wyomingensis* may be present in some stands within this group but do not codominate.

VEGETATION

Physiognomy and Structure: This group is a facultatively deciduous, subdesert dwarf-shrubland. It typically has an open woody canopy of clumps of low, mat-forming dwarf-shrubs and a sparse herbaceous layer.

Floristics: This dwarf-shrubland group is characterized by an open canopy of dwarf-shrubs typically composed of relatively pure stands of *Atriplex* spp., such as *Atriplex corrugata* (in Colorado and Utah), *Atriplex gardneri* (Wyoming and Montana into Canada), or *Artemisia pedatifida* (very important in Wyoming, rare in Colorado stands). Other dominant or codominant dwarf-shrubs may include *Artemisia longifolia*, *Artemisia pygmaea*, or *Picrothamnus desertorum*, sometimes with a mix of other low shrubs, such as *Krascheninnikovia lanata* or *Tetradymia spinosa*. Occasional individuals or small clumps of *Atriplex confertifolia*, *Atriplex canescens*, or *Artemisia tridentata ssp. wyomingensis* may be present in some stands within this group but do not codominate. The herbaceous layer is typically sparse. Scattered perennial forbs occur, such as *Xylorhiza glabriuscula* and *Sphaeralcea grossulariifolia*; perennial grasses *Achnatherum hymenoides*, *Bouteloua gracilis* (not in Wyoming), *Elymus elymoides*, *Elymus lanceolatus ssp. lanceolatus*, *Pascopyrum smithii*, *Poa secunda*, or *Sporobolus airoides* may dominate the herbaceous layer. In less saline areas, there may be inclusions of grasslands dominated by *Hesperostipa comata*, *Leymus salinus*, *Pascopyrum smithii*, or *Pseudoroegneria spicata*. In Wyoming and possibly elsewhere, inclusions of non-saline, gravelly barrens or rock outcrops dominated by cushion plants such as *Arenaria hookeri* and *Phlox hoodii* without dwarf-shrubs may be present (these are not restricted to this group and larger patches would likely be classified in a sparse vegetation group). Annuals are seasonally present and may include *Eriogonum inflatum*, *Plantago tweedyi*, *Monolepis nuttalliana*, and the introduced annual grass *Bromus tectorum*.

ENVIRONMENT & DYNAMICS

Environmental Description: This group occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos shale and arid, windswept plains and basins across parts of Wyoming. On Mancos shale (and possibly other saline marine shales), stands may be restricted to gentler slopes and cooler north and east aspects, with steeper south and west aspects nearly barren (Welsh 1957). **Climate:** Climate is temperate and semi-arid. Summers are generally hot, and freezing temperatures are common in the winter. Mean annual precipitation ranges from 13-33 cm. In Montana and Wyoming, approximately two-thirds of the annual precipitation falls in spring and early summer. In Colorado and Utah, over half the precipitation occurs in the late-summer monsoons as high-intensity thunderstorms. **Soil/substrate/hydrology:** Substrates are typically saline, alkaline, fine-textured soils developed from shale or alluvium and may be associated with shale badlands. Infiltration rate is typically low. In Wyoming and possibly elsewhere, inclusions of non-saline, gravelly barrens or rock outcrops may be present.

Dynamics: *Atriplex corrugata*-dominated shrublands are the most saline-tolerant of the Mancos shale plant communities studied by Branson et al. (1976). *Atriplex corrugata* can completely dominate these extremely saline sites (Branson et al. 1976). It is a true evergreen dwarf-shrub retaining leaves for several years, and branches are capable of rooting at the nodes. This plant utilizes winter soil moisture, beginning new growth in March when the soils are relatively warm and moist. It flowers in April, and by mid-July fruits are shattered (Branson et al. 1976). If the soils dry out in mid-summer, it can go dormant until the late-summer monsoon rains begin. Large areas of *Atriplex corrugata* died during the extreme drought of 2002 in the Four Corners area. By 2004, new seedlings were established and spreading; shrub cover recovered to approximately 50% of what it was before the drought. *Atriplex gardneri*-dominated vegetation is another saline/drought-tolerant example of the Mancos Shale plant communities studied by Branson et al. (1976). Although very slow-growing, it can completely dominate these extremely saline sites (Branson et al. 1976).

DISTRIBUTION

Geographic Range: This group occurs on gentle slopes and rolling plains in the Colorado Plateau and Uinta Basin on Mancos shale and arid, windswept basins and plains across parts of Wyoming and Montana, and into Canada.

Spatial Scale & Pattern [optional]: Matrix

Nations: CA, US

States/Provinces: AZ, CO, MT, NM, NV, UT, WY

TNC Ecoregions [optional]: 10:C, 11:P, 19:C, 20:P, 26:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 341B:CC, 341C:CC, 342E:C?, 342F:C?, 342G:CC, 342J:C?, M331B:CC, M331D:C?, M331E:CC, M331G:CC, M331H:CC, M331J:C?, M341B:CC, M341C:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. The distinction between this group and Intermountain Basins Cliff, Scree & Badland Sparse Vegetation Group (G570) is unclear, as both occur on shale "badlands" and are floristically quite similar. The differences possibly relate more to total biomass, as opposed to floristic shifts.

SYNONYMY

- = Mat-*Atriplex* Association (Graham 1937)
- >< Other Sagebrush Types (408) (Shiflet 1994)
- >< Saltbush - Greasewood (501) (Shiflet 1994)
- = Vegetation on Manco Shale (Welsh 1957)

LOWER LEVEL UNITS**Alliances:**

- A1127 *Artemisia pedatifida* Low Scrub Alliance
- A1110 *Atriplex gardneri* Low Scrub Alliance
- A1109 *Atriplex corrugata* Low Scrub Alliance
- A1106 *Artemisia pygmaea* Low Scrub Alliance

AUTHORSHIP

Primary Concept Source: S.L. Welsh (1957)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: KAS 2-10, 11-15

REFERENCES

References: Branson et al. 1976, Faber-Langendoen et al. 2017a, Graham 1937, Knight 1994, Knight et al. 1987, Potter et al. 1985, Shiflet 1994, Welsh 1957

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G301. Intermountain Dwarf Saltbush - Sagebrush Scrub

A1127. Artemisia pedatifida Low Scrub Alliance

Type Concept Sentence: This dwarf-shrub alliance is dominated by *Artemisia pedatifida* and is reported from the Pryor Mountains in the northern portion of the Bighorn Basin of south-central Montana.

OVERVIEW

Scientific Name: *Artemisia pedatifida* Low Scrub Alliance

Common Name (Translated Scientific Name): Birdfoot Sagebrush Low Scrub Alliance

Colloquial Name: Birdfoot Sagebrush Low Scrub

Type Concept: The vegetation of this alliance is characterized by a moderately dense dwarf-shrub layer that is dominated by *Artemisia pedatifida*. *Atriplex gardneri* may codominate in some stands. Other woody species may include scattered *Artemisia tridentata*, *Atriplex confertifolia*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Eriogonum pauciflorum*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, or *Suaeda moquinii* (= *Suaeda nigra*). The moderately sparse herbaceous layer is often dominated by cool-season graminoids such as *Pascopyrum smithii* or *Elymus elymoides* with lesser amounts of *Bouteloua gracilis*, *Carex filifolia*, *Elymus lanceolatus* ssp. *lanceolatus*, *Poa secunda* (= *Poa juncifolia*), or *Pseudoroegneria spicata*. Forbs are generally sparse and may include scattered *Allium textile*, *Astragalus* spp., *Comandra umbellata*, *Machaeranthera tanacetifolia*, *Musineon divaricatum*, *Phlox hoodii*, *Platyschuhria integrifolia*, *Vicia americana*, *Xylorhiza glabriuscula*, or the cactus *Opuntia polyacantha*. Annual grasses and forbs are seasonally present. This dwarf-shrub alliance is reported from the Pryor Mountains in the northern portion of the Bighorn Basin of south-central Montana and dissected uplands of the Cheyenne River Basin in northeastern Wyoming. Stands typically occur in slight depressions on alluvial fans and terraces, dissected outwash or rolling plains, lower foothills, and badlands. Sites are flat to moderately steep, often highly eroded slopes with southern or western aspects. Soils are deep, poorly drained, and typically alkaline and saline with silt-loam to clay texture. The soil surface is mostly bare ground. Substrate is derived from shale or sandstone interbedded with shale, claystone or clay.

Classification Comments: This description is based on stands in northeastern Wyoming (Thilenius et al. 1995) and south-central Montana (Kratz 1988, DeVelice and Lesica 1993). The other Wyoming references were not available. Similar habitats in Wyoming in

the Bighorn Canyon National Recreation Area were surveyed by Knight et al. (1987), but these shrublands were not described there. Some stands have very sparse vegetation cover and may be better classified in a sparsely vegetated alliance (Kratz 1988).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Dwarf-shrublands found on shale breaks in dissected alluvial fans and terraces, outwash and rolling plains, and foothills in Montana and Wyoming with mixed species where *Artemisia pedatifida* is the most consistent dominant.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance has a moderately dense, deciduous dwarf-shrub layer (<0.5 m). There is also a sparse to moderately dense herbaceous layer dominated by perennial graminoids with scattered perennial forbs. Annual forbs and grasses may be seasonally present.

Floristics: Stands have a moderately dense dwarf-shrub layer that is dominated by *Artemisia pedatifida*. *Atriplex gardneri* codominates in some stands. Other woody species may include scattered *Artemisia tridentata*, *Atriplex confertifolia*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Eriogonum pauciflorum*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, or *Suaeda moquinii* (= *Suaeda nigra*). The moderately sparse herbaceous layer is often dominated by cool-season graminoids such as *Elymus elymoides* or *Pascopyrum smithii* with lesser amounts of *Bouteloua gracilis*, *Carex filifolia*, *Elymus lanceolatus ssp. lanceolatus*, *Poa secunda* (= *Poa juncifolia*), or *Pseudoroegneria spicata*. Forbs are typically sparse and may include scattered *Allium textile*, *Astragalus* spp., *Comandra umbellata*, *Machaeranthera tanacetifolia*, *Musineon divaricatum*, *Phlox hoodii*, *Platyschukhria integrifolia*, *Vicia americana*, *Xylorhiza glabriuscula*, or the cactus *Opuntia polyacantha*. Annual grasses and forbs are present seasonally.

ENVIRONMENT & DYNAMICS

Environmental Description: Vegetation included in this alliance is reported from the Pryor Mountains in the northern portion of the Bighorn Basin of south-central Montana (1250-1525 m elevation), and dissected uplands of the Cheyenne River Basin in northeastern Wyoming (1830-1600 m elevation). The climate is temperate and semi-arid, with hot and dry summers. Mean annual precipitation ranges from 25-35 cm with two-thirds occurring in the spring and early summer. Stands typically occur in slight depressions on alluvial fans and terraces, dissected outwash or rolling plains, lower foothills, and badlands. Sites are generally flat to gently sloping, or moderately steep, and often highly eroded with southern or western aspects. Soils are deep, poorly drained, and typically alkaline and saline with silt-loam to clay texture. The soil surface is mostly bare ground. Substrate is derived from shale or sandstone interbedded with shale, claystone or clay.

Dynamics: Harsh environmental conditions limit the abundance and species diversity of plants. Because of the poor subsurface soil drainage, the upper horizons are saturated and then completely dry out between summer rainstorms. The alternating soil-moisture extremes help create these distinctive plant communities (Thilenius et al. 1995).

DISTRIBUTION

Geographic Range: Stands in this alliance are restricted to shale breaks and badlands terrain in south-central Montana and northeastern Wyoming.

Nations: US

States/Provinces: MT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< *Artemisia pedatifida*-*Atriplex nuttallii* Community Type (DeVelice and Lesica 1993)
- ? *Artemisia pedatifida*/*Agropyron spicatum* plant community type (Kratz 1988)
- ? *Artemisia pedatifida* Vegetation Type (Thilenius et al. 1995)

LOWER LEVEL UNITS

Associations:

- CEG001527 *Artemisia pedatifida* / *Pseudoroegneria spicata* Shrubland

NBR alliances

- CEGLO01451 *Artemisia pedatifida* / *Pascopyrum smithii* Shrubland
- CEGLO01525 *Artemisia pedatifida* - *Atriplex gardneri* Shrubland
- CEGLO01526 *Artemisia pedatifida* / *Festuca idahoensis* Shrubland
- CEGLO01450 *Artemisia pedatifida* / *Elymus elymoides* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: DeVelice and Lesica 1993, Faber-Langendoen et al. 2017b, Knight et al. 1987, Kratz 1988, Thilenius et al. 1995

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G301. Intermountain Dwarf Saltbush - Sagebrush Scrub

A1106. *Artemisia pygmaea* Low Scrub Alliance

Type Concept Sentence: These communities are characterized by a sparse dwarf-shrub layer of *Artemisia pygmaea* and occur in relatively dry areas of the sagebrush desert of Nevada and Utah, from 1200-1800 m in elevation.

OVERVIEW

Scientific Name: *Artemisia pygmaea* Low Scrub Alliance

Common Name (Translated Scientific Name): Pygmy Sagebrush Low Scrub Alliance

Colloquial Name: Pygmy Sagebrush Low Scrub

Type Concept: This alliance is characterized by a sparse dwarf-shrub layer of *Artemisia pygmaea*, with other shrubs scattered through the stands. Only one association from central Nevada is presently described for this alliance. In addition to *Artemisia pygmaea*, that association included *Artemisia nova*, *Atriplex confertifolia*, *Chrysothamnus viscidiflorus*, and *Ephedra nevadensis* in the shrub layer. According to the authors, none of these associated shrubs is constant or characteristic of these communities. A sparse graminoid layer is usually present, including *Achnatherum hymenoides* (= *Oryzopsis hymenoides*) and *Elymus elymoides*. Forbs include *Astragalus* spp., *Eriogonum caespitosum*, and *Sphaeralcea coccinea*. Adjacent vegetation types are most often dominated by *Artemisia nova*, which often forms the vegetation matrix surrounding these unique communities. These communities often harbor regionally rare plant species. They occur in relatively dry areas of the sagebrush desert of Nevada and Utah, from 1200-1800 m in elevation. Precipitation averages 15-20 cm annually, with a significant proportion arriving as snow. Growing-season drought is characteristic. Soils are usually shallow and often unique, including Green River shale, heavy clays, or calcareous outcrops or gravels.

Classification Comments: Although these communities are classified as dwarf-shrublands, examination of stand data for the one association linked to this alliance indicates this vegetation may be better classified as sparsely vegetated. Total shrub cover is less than 15% and total vegetation cover is less than 25% for all species. Further inventory and classification work are needed to document this alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Nearly sparsely vegetated low shrublands of the Nevada and Utah deserts where *Artemisia pygmaea* has <15% total cover, but remains the dominant shrub species.

VEGETATION

Physiognomy and Structure: These are sparse dwarf-shrublands dominated by a microphyllous evergreen shrub from 0.05-0.2 m in height. Larger shrubs are often scattered through these communities, but are of low cover and constancy. Scattered caespitose graminoids are also usually present, but of low cover (<10%).

Floristics: This alliance is characterized by a sparse dwarf-shrub layer of *Artemisia pygmaea*, with other shrubs scattered through the stands. Only one association from central Nevada is presently described for this alliance (Blackburn et al. 1968c). In addition to *Artemisia pygmaea*, that association includes *Artemisia nova*, *Atriplex confertifolia*, *Chrysothamnus viscidiflorus*, and *Ephedra nevadensis* in the shrub layer. According to the authors, none of these associated shrubs is constant or characteristic of these

communities. A sparse graminoid layer is usually present, including *Achnatherum hymenoides* (= *Oryzopsis hymenoides*) and *Elymus elymoides*. Forbs include *Astragalus* spp., *Eriogonum caespitosum*, and *Sphaeralcea coccinea*.

ENVIRONMENT & DYNAMICS

Environmental Description: These communities occur in relatively dry areas of the sagebrush desert of Nevada and Utah, from 1200-1800 m in elevation. Precipitation averages 15-20 cm annually, with a significant proportion arriving as snow. Growing-season drought is characteristic. Soils are usually shallow and often unique, including Green River shale, heavy clays, or calcareous outcrops or gravels.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance has been quantitatively described from Nevada and also occurs in Utah (Welsh et al. 1993).

Nations: US

States/Provinces: NV, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- < SRM Cover Type #408 - Other Sagebrush Types (Shiflet 1994)

LOWER LEVEL UNITS

Associations:

- CEGLO01436 *Artemisia pygmaea* / *Elymus elymoides* - *Achnatherum hymenoides* Shrubland

AUTHORSHIP

Primary Concept Source: D. Sarr, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Blackburn et al. 1968c, Faber-Langendoen et al. 2017b, Shiflet 1994, Welsh et al. 1987, Welsh et al. 1993

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G301. Intermountain Dwarf Saltbush - Sagebrush Scrub

A1109. *Atriplex corrugata* Low Scrub Alliance

Type Concept Sentence: Shrublands in this alliance are dominated by the halophytic, evergreen dwarf-shrub *Atriplex corrugata* and found on lower hillslopes and alkaline flats on the Colorado Plateau portions of northwestern New Mexico, western Colorado and Utah.

OVERVIEW

Scientific Name: *Atriplex corrugata* Low Scrub Alliance

Common Name (Translated Scientific Name): Mat Saltbush Low Scrub Alliance

Colloquial Name: Mat Saltbush Low Scrub

Type Concept: Stands have very sparse to moderate cover (5-30%) of woody vegetation that is dominated by the halophytic, evergreen dwarf-shrub *Atriplex corrugata*. Sparse stands are often completely dominated by this plant. Stands typically have very low species diversity. Depending on soil salinity and moisture, other plants may be present, including the shrubs *Krascheninnikovia lanata*, *Picrothamnus desertorum* (= *Artemisia spinescens*), and *Tetradymia spinosa*. The herbaceous layer is very sparse. Scattered perennial forbs, such as *Sphaeralcea grossulariifolia* and *Xylorhiza glabriuscula*, and the perennial grass *Achnatherum hymenoides* (= *Oryzopsis hymenoides*) have been reported. Annuals are seasonally present and may include *Eriogonum inflatum*, *Plantago tweedyi*, and the exotics *Bromus tectorum*, *Malcolmia africana*, and *Salsola kali*. Shrublands in this alliance are found on lower hillslopes and alkaline flats on the Colorado Plateau portions of northwestern New Mexico, western Colorado and Utah. Climate is semi-arid with most of the highly variable precipitation falling in July and August as high-intensity thunderstorms. Mean annual precipitation is

NBR alliances

approximately 23 cm. Elevation ranges from 1300-1820 m. Sites are nearly flat to moderately steep, and have soils typically derived from Mancos shale. Soils are moderately deep, strongly saline, moderately alkaline, fine-textured (clayey), poorly developed and typically have high erosion rates.

Classification Comments: Vegetation cover in this alliance may vary greatly depending on soil chemistry and slope. Some stands should be classified as shrublands with 25-30% shrub cover (Branson et al. 1976, Potter et al. 1985). Most stands are in the 3-20% shrub cover range and should be classified in a sparsely vegetated alliance (West and Ibrahim 1968, Ibrahim et al. 1972, Harper and Jaynes 1986). Further investigation is needed throughout its range.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Sparse to open dwarf-shrublands (5-30%) of alkaline flats in the Colorado Plateau portions of northwestern New Mexico, western Colorado and Utah dominated by *Atriplex corrugata* occupying substrates typically derived from Mancos shale.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is characterized by sparse to moderate cover of xeromorphic evergreen dwarf-shrubs (<0.3 m tall). A sparse herbaceous layer may be present that is dominated by perennial graminoids with scattered perennial forbs. Annual forbs and grasses are seasonally present.

Floristics: Stands have very sparse to moderate cover (5-30%) of woody vegetation that is dominated by the halophytic evergreen dwarf-shrub *Atriplex corrugata*. Sparse stands are often completely dominated by this plant. Stands typically have very low species diversity. Depending on soil salinity and moisture, other plants may be present, including the shrubs *Krascheninnikovia lanata*, *Picrothamnus desertorum* (= *Artemisia spinescens*), and *Tetradymia spinosa*. The herbaceous layer is very sparse. Scattered perennial forbs, such as *Xylorhiza glabriuscula* and *Sphaeralcea grossulariifolia*, and the perennial grass *Achnatherum hymenoides* (= *Oryzopsis hymenoides*) have been reported. Annuals are seasonally present and may include *Eriogonum inflatum*, *Plantago tweedyi*, and the exotics *Bromus tectorum*, *Malcolmia africana*, and *Salsola kali*.

ENVIRONMENT & DYNAMICS

Environmental Description: Shrublands included in this alliance are found on the lower slopes of shale outcrops and alkaline flats on the Colorado Plateau portions of northwestern New Mexico, western Colorado and Utah. Climate is semi-arid with most of the highly variable precipitation falling in July and August as high-intensity thunderstorms. Mean annual precipitation is approximately 23 cm. Elevation ranges from 1300-1700 m. Sites are nearly flat to moderately steep. Soils are typically derived from Mancos shale. They are moderately deep, strongly saline, moderately alkaline, fine-textured (clayey), poorly developed and typically have high erosion rates. The soil surface is mostly barren.

Dynamics: *Atriplex corrugata*-dominated shrublands are the most saline-tolerant of the Mancos shale plant communities studied by Branson et al. (1976). Although very slow-growing, *Atriplex corrugata* can completely dominate these extremely saline sites (Branson et al. 1976). It is a true evergreen dwarf-shrub retaining leaves for several years. This plant utilizes winter soil moisture, beginning new growth in March when the soils are relatively warm and moist. It flowers in April and by mid-July fruits are shattered (Branson et al. 1976). If the soils dry out in mid-summer, it can go dormant until the late-summer monsoon rains begin.

DISTRIBUTION

Geographic Range: Dwarf-shrublands included in this alliance occur on lower slopes and in basins in western Colorado, northwestern New Mexico and Utah, on Mancos shale.

Nations: US

States/Provinces: CO, NM, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Atriplex corrugata* Shrub Association (Baker 1984b) [*Atriplex corrugata* Shale Barren is listed as a synonym.]

- ? Badlands (Dastrup 1963) [*Atriplex corrugata* can be found on the "buckskin" knolls in the Uinta Basin of Utah.]
- ? Mat *Atriplex-Hilaria* Community (Dastrup 1963) [includes two other species of *Atriplex* plus significant *Artemisia nova* cover]
- ? Mat *Atriplex* Association (Graham 1937)
- ? Mat saltbush association (Shantz 1925)

LOWER LEVEL UNITS

Associations:

- CEG001437 *Atriplex corrugata* Dwarf-shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Baker 1984b, Branson et al. 1976, Dastrup 1963, Faber-Langendoen et al. 2017b, Graham 1937, Harper and Jaynes 1986, Ibrahim et al. 1972, Potter et al. 1985, Shantz 1925, West and Ibrahim 1968

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G301. Intermountain Dwarf Saltbush - Sagebrush Scrub

A1110. *Atriplex gardneri* Low Scrub Alliance

Type Concept Sentence: This dwarf-shrubland alliance has a very sparse to moderately dense cover of dwarf-shrubs that is dominated by *Atriplex gardneri* and occurs in western Colorado and eastern Utah, Wyoming and Montana on mesas, plateaus, plains, low hills and eroded "badlands."

OVERVIEW

Scientific Name: *Atriplex gardneri* Low Scrub Alliance

Common Name (Translated Scientific Name): Gardner's Saltbush Low Scrub Alliance

Colloquial Name: Gardner's Saltbush Low Scrub

Type Concept: Stands of this alliance have a very sparse to moderately dense cover of dwarf-shrubs that is dominated by *Atriplex gardneri*. *Artemisia tridentata* and *Picrothamnus desertorum* (= *Artemisia spinescens*) are codominants in some stands. Many other shrubs and dwarf-shrubs may be present, including *Atriplex* spp., *Krascheninnikovia lanata*, *Sarcobatus vermiculatus*, *Suaeda* spp., and *Tetradymia spinosa*. The herbaceous layer, if present, may be dominated by graminoids or forbs. Common species include *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Eriogonum pauciflorum*, *Leymus salinus*, *Monolepis nuttalliana*, *Pascopyrum smithii*, *Pleuraphis jamesii* (= *Hilaria jamesii*), or *Xylorhiza venusta*. This dwarf-shrubland alliance occurs in western Colorado and eastern Utah, Wyoming and Montana. Stands occur on mesas, plateaus, plains, low hills and eroded "badlands." Sites are nearly flat to moderately steep with moderately deep to deep, usually saline, alkaline soils. Soils are typically fine-textured and often have high erosion rates because of poor infiltration and high runoff. The soil surface is often mostly barren.

Classification Comments: Vegetation cover in this alliance may vary greatly depending on soil chemistry and slope. Some stands could be classified as dwarf-shrublands with 25-60% dwarf-shrub cover (Branson et al. 1976, DeVelice and Lesica 1993, DeVelice et al. 1995). Other stands are in the 3-20% shrub cover range and could be classified in a sparsely vegetated or dwarf-shrub herbaceous alliance (West and Ibrahim 1968, Ibrahim et al. 1972, Baker and Kennedy 1985, Knight et al. 1987, DeVelice and Lesica 1993, DeVelice et al. 1995). In addition, heavy grazing by livestock has impacted some of these stands by nearly eliminating herbaceous species.

There is taxonomic confusion in some of the research done on these vegetation types. Some of the studies report the name *Atriplex nuttallii* to describe the taxon that is now called *Atriplex gardneri*, and yet *Atriplex nuttallii* is still a valid name (Kartesz 1999). Also, Welsh et al. (1987) described six varieties of *Atriplex gardneri*, most of which are now separate species of *Atriplex*. Further investigation is needed throughout the range of these taxa to clarify these taxonomic questions. New associations may need to be described or perhaps the concepts of these associations and the alliance need to be broadened to include the other species. DeVelice et al. (1995) have described two new *Atriplex gardneri*-dominated plant associations that have not yet been included in the U.S. National Vegetation Classification (named by DeVelice et al. (1995) as *Atriplex nuttallii* / perennial grass and *Atriplex nuttallii* / *Eriogonum pauciflorum*). The first plant association is very similar to current plant associations with the herbaceous layer dominated by either *Pascopyrum smithii*, *Pseudoroegneria spicata*, or *Sporobolus airoides*.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Diagnostic of this dwarf-shrubland alliance is the dominance or codominance of *Atriplex gardneri* in western Colorado and eastern Utah, Wyoming and Montana on mesas, plateaus, plains, low hills and eroded "badlands."

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is dominated by sparse to moderate cover of xeromorphic evergreen dwarf-shrubs (<0.3 m tall). A sparse to moderately dense herbaceous layer that is dominated by perennial graminoids or forbs may be present. Annual forbs and grasses are seasonally present.

Floristics: Stands have a very sparse to moderately dense cover of woody species that is dominated by the halophytic evergreen dwarf-shrub *Atriplex gardneri*. Some stands are completely dominated by this plant and have very low species diversity. Depending on soil salinity and moisture, other plants may be present. *Artemisia tridentata* and *Picrothamnus desertorum* (= *Artemisia spinescens*) are codominants in some stands. Other shrubs and dwarf-shrubs may include *Atriplex* spp., *Krascheninnikovia lanata*, *Sarcobatus vermiculatus*, *Suaeda* spp. and *Tetradymia spinosa*. The herbaceous layer is very sparse to moderately dense. It may be dominated by graminoids such as *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Leymus salinus*, *Pascopyrum smithii*, *Pleuraphis jamesii* (= *Hilaria jamesii*), or the by forbs *Eriogonum pauciflorum*, *Monolepis nuttalliana* (an annual), or *Xylorhiza venusta*. Other frequent plants include *Allium textile*, *Aristida* spp., *Elymus elymoides*, *Eriogonum inflatum*, *Lappula* spp., *Opuntia polyacantha*, *Plantago patagonica*, *Poa secunda*, *Sphaeralcea coccinea*, and *Sporobolus* spp.

ENVIRONMENT & DYNAMICS

Environmental Description: Dwarf-shrublands in this alliance are found on mesas, plateaus, plains, low hills and eroded "badlands" in western Colorado and eastern Utah, Wyoming and Montana. Elevation ranges from 1150-2200 m. Climate is temperate and semi-arid. Summers are generally hot and freezing temperatures are common in the winter. Mean annual precipitation ranges from 13-33 cm. In Montana and Wyoming, approximately two-thirds of the annual precipitation falls in spring and early summer. In Colorado and Utah, over half the precipitation occurs in the late-summer monsoons as high-intensity thunderstorms. Sites are nearly flat to moderately steep. Soils are moderately deep to deep, usually saline, moderately alkaline, poorly developed and typically have high erosion rates because of poor infiltration and high runoff. Soil texture is typically fine, but ranges from sandy loam to clay and may be gravelly. Parent material is typically shale, alluvium and bentonite. The soil surface is often mostly barren. In the Badger Wash basin in Colorado, the soil surface has 74% bare ground and 6% litter (Branson et al. 1976).

Dynamics: *Atriplex gardneri*-dominated vegetation is the most saline/drought-tolerant of the Mancos shale plant communities studied by Branson et al. (1976). Although very slow-growing, it can completely dominate these extremely saline sites (Branson et al. 1976). This plant utilizes winter soil moisture, beginning new growth in March when the soils are relatively warm and moist. It flowers in April and by mid-July fruits are shattered (Branson et al. 1976).

DISTRIBUTION

Geographic Range: Dwarf-shrublands included in this alliance occur on mostly alkaline and barren plains and hills in western Colorado, eastern Utah, Wyoming and Montana.

Nations: US

States/Provinces: CO, MT, OR?, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- ? *Atriplex gardnerae* association (Ibrahim et al. 1972)
- ? *Atriplex nuttallii* Community Type (Cooper et al. 1995)
- ? *Atriplex nuttallii* plant community (Branson et al. 1976)
- ? *Atriplex* spp. Series (Johnston 1987) [includes *Atriplex gardneri*/*Elytrigia smithii* plant association.]
- >< Saltbush Desert Shrubland (Knight et al. 1987)

LOWER LEVEL UNITS

Associations:

- CEG001441 *Atriplex gardneri* / *Pleuraphis jamesii* Dwarf-shrubland

- CEGLO01443 *Atriplex gardneri* / *Monolepis nuttalliana* Dwarf-shrubland
- CEGLO01439 *Atriplex gardneri* - *Picrothamnus desertorum* Dwarf-shrubland
- CEGLO01440 *Atriplex gardneri* / *Artemisia tridentata* Dwarf-shrubland
- CEGLO01446 *Atriplex gardneri* / *Xylorhiza venusta* Dwarf-shrubland
- CEGLO01438 *Atriplex gardneri* Dwarf-shrubland
- CEGLO01445 *Atriplex gardneri* / *Pascopyrum smithii* Dwarf-shrubland
- CEGLO01442 *Atriplex gardneri* / *Leymus salinus* Dwarf-shrubland
- CEGLO01444 *Atriplex gardneri* / *Achnatherum hymenoides* Dwarf-shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/03/14

REFERENCES

References: Baker and Kennedy 1985, Branson et al. 1976, Cooper et al. 1995, DeVelice and Lesica 1993, DeVelice et al. 1995, Faber-Langendoen et al. 2017b, Ibrahim et al. 1972, Johnston 1987, Kartesz 1999, Knight et al. 1987, Welsh et al. 1987, West and Ibrahim 1968

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.5.b. M093 Great Basin Saltbush Scrub

G300. Intermountain Shadscale - Saltbush Scrub

Type Concept Sentence: This widespread semi-arid scrub group is found in basins, plains, alluvial flats and slopes in the intermountain western U.S. and western Great Plains and is characterized by a typically open to moderately dense shrub layer dominated or codominated by *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex cuneata*, *Atriplex hymenelytra*, *Atriplex obovata*, *Atriplex polycarpa*, *Grayia spinosa*, and/or *Picrothamnus desertorum* often with other shrubs present to codominant.

OVERVIEW

Scientific Name: *Atriplex confertifolia* - *Atriplex canescens* - *Grayia spinosa* Scrub Group

Common Name (Translated Scientific Name): Shadscale Saltbush - Fourwing Saltbush - Spiny Hopsage Scrub Group

Colloquial Name: Fourwing Saltbush Scrub

Type Concept: This extensive group includes open-canopied shrublands of typically saline basins, alluvial slopes and plains across the intermountain western U.S. and western Great Plains. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more *Atriplex* species, such as *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex cuneata*, *Atriplex hymenelytra*, *Atriplex obovata*, or *Atriplex polycarpa*. Other shrubs present to codominant may include *Artemisia tridentata ssp. wyomingensis*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Ephedra nevadensis*, *Krascheninnikovia lanata*, *Grayia spinosa*, *Lycium spp.*, *Picrothamnus desertorum*, or *Tetradymia spp.* Northern occurrences lack *Atriplex* species and are typically dominated by *Grayia spinosa*. In Wyoming, occurrences are typically a mix of *Artemisia tridentata ssp. wyomingensis*, *Atriplex confertifolia*, *Grayia spinosa*, *Krascheninnikovia lanata*, *Sarcobatus vermiculatus*, and various *Ericameria* or *Chrysothamnus* species. Some places are a mix of *Atriplex confertifolia* and *Artemisia tridentata ssp. wyomingensis*. In the Great Basin, *Sarcobatus vermiculatus* is generally absent but, if present, does not codominate. The herbaceous layer varies from sparse to moderately dense and is dominated by perennial graminoids such as *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus lanceolatus ssp. lanceolatus*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Pleuraphis rigida*, *Poa secunda*, or *Sporobolus airoides*. Various forbs are also present. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils.

Classification Comments: Some *Grayia spinosa*-dominated stands tends to occur on coppice dunes that have a silty component to them. If they occur on deep sand or dunes, then consider a dune group. Scrub stands dominated by *Picrothamnus desertorum* are placed in this group because *Picrothamnus desertorum* is frequently present to codominant with the widespread shrub *Atriplex confertifolia* in the Great Basin (Mozingo 1987). However, *Picrothamnus desertorum* is often short (10-25 cm tall) so could also be classified as Intermountain Dwarf Saltbush - Sagebrush Scrub Group (G301).

Similar NVC Types:

- G299 Chihuahuan Desert Lowland Basin Scrub

Diagnostic Characteristics: The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more shrub species, such as *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex cuneata*, *Atriplex hymenelytra*, *Atriplex obovata*, *Atriplex polycarpa*, *Grayia spinosa*, and/or *Picrothamnus desertorum*.

VEGETATION

Physiognomy and Structure: This group is a facultatively deciduous, extremely xeromorphic, subdesert short shrubland with a typically open shrub canopy and sparse to moderately dense herbaceous layer dominated by perennial graminoids.

Floristics: This widespread cool semi-desert scrub group is highly variable and ranges from almost pure occurrences of a single species to fairly complex mixtures. The characteristic mix of low shrubs and grasses is sparse, with large open spaces between the plants (Blaisdell and Holmgren 1984). Occurrences have a sparse to moderately dense cover of woody species that is often dominated by one of several shrubs such as *Atriplex canescens* (also codominated by *Artemisia tridentata*, *Ephedra viridis*, or *Krascheninnikovia lanata*), *Atriplex confertifolia* (also codominated by several species of *Lycium* and *Ephedra*, *Picrothamnus desertorum*, or *Sarcobatus vermiculatus*), *Atriplex cuneata*, *Atriplex obovata*, *Atriplex hymenelytra*, *Atriplex polycarpa*, *Grayia spinosa*, or *Picrothamnus desertorum* (= *Artemisia spinescens*). Other shrubs may be present, especially in transition areas with desert or montane scrub. Species include *Acacia greggii*, *Artemisia frigida*, *Chrysothamnus* spp., *Encelia frutescens*, *Ericameria nauseosa*, *Ephedra nevadensis*, *Frankenia salina*, *Larrea tridentata*, *Lycium andersonii*, *Lycium pallidum*, *Parthenium confertum*, *Psoralea polydenius*, *Purshia stansburiana*, *Suaeda* spp., *Tetradymia glabrata*, *Tetradymia spinosa*, *Tiquilia latior*, and *Yucca glauca*. Dwarf-shrubs include *Gutierrezia sarothrae* and several species of *Eriogonum*, but generally do not form a distinct layer as the main shrub layer is often >0.5 m tall.

Warm-season medium-tall and short perennial grasses dominate in the sparse to moderately dense graminoid layer. The species present depend on the geographic range of the grasses, soil alkalinity/salinity, and past land use. Species may include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Distichlis spicata*, *Elymus elymoides*, *Hesperostipa comata*, *Leymus ambiguus*, *Leymus salinus*, *Muhlenbergia torreyi*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. A number of annual species may also grow in association with the shrubs and grasses, although they are usually rare and confined to areas of recent disturbance (Blaisdell and Holmgren 1984). Forb cover is generally sparse. Perennial forbs that might occur include *Chaetopappa ericoides*, *Descurainia* spp., *Mentzelia* spp., *Sphaeralcea coccinea*, and *Xylorhiza venusta*. Annual natives include *Monolepis nuttalliana*, *Plantago* spp., or *Vulpia octoflora*. Associated halophytic annuals include *Salicornia bigelovii*, *Salicornia rubra*, and *Suaeda* species. Exotic annuals that may occur include *Salsola kali*, *Bromus rubens*, and *Bromus tectorum*. Cacti such as species of *Opuntia* and *Echinocereus* may be present in some occurrences. Trees are not usually present but some scattered *Juniperus* spp. may be found.

ENVIRONMENT & DYNAMICS

Environmental Description: This salt-desert shrubland group is matrix-forming in the Intermountain West. This group composes arid to semi-arid shrublands on lowland and upland sites usually at elevations between 1520 and 2200 m (4987-7218 feet). Sites can be found on all aspects and include valley bottoms, alluvial and alkaline flats, mesas and plateaus, playas, drainage terraces, washes and interdune basins, bluffs, and gentle to moderately steep sandy or rocky slopes. Slopes are typically gentle to moderately steep but are sometimes unstable and prone to surface movement. Many areas within this group are degraded due to erosion and may resemble "badlands." Soil surface is often very barren and interspaces between the characteristic plant clusters are commonly covered by a microphytic crust (West 1982).

Climate: This is typically a vegetation group of extreme climatic conditions, with warm to hot summers and freezing winters. Annual precipitation ranges from approximately 13-33 cm. In much of the group, the period of greatest moisture will be mid to late summer, although in the more northern areas, a moist period is to be expected in the cold part of the year. However, plotted seasonality of occurrence is probably of less importance on this desert vegetation than in other types because desert precipitation comes with an extreme irregularity that does not appear in graphs of long-term seasonal or monthly averages (Blaisdell and Holmgren 1984). **Soil/substrate/hydrology:** Soils are shallow to moderately deep, poorly developed, and a product of an arid climate and little precipitation. Soils are often alkaline or saline. Vegetation within this group is tolerant of these soil conditions but not restricted to it. The shallow soils of much of the area are poorly developed Entisols. Vegetation within this group can occur on level pediment remnants where coarse-textured and well-developed soil profiles have been derived from sandstone gravel and are alkaline, or on Mancos shale badlands, where soil profiles are typically fine-textured and non-alkaline throughout (West and Ibrahim 1968). They can also occur in alluvial basins where parent materials from the other habitats have been deposited over Mancos shale and the soils are heavy-textured and saline-alkaline throughout the profile (West and Ibrahim 1968).

Dynamics: West (1982) stated that "salt desert shrub vegetation occurs mostly in two kinds of situations that promote soil salinity, alkalinity, or both. These are either at the bottom of drainages in enclosed basins or where marine shales outcrop." However, salt-desert shrub vegetation may be an indication of climatically dry as well as physiologically dry soils (Blaisdell and Holmgren 1984). Not all salt-desert shrub soils are salty, and their hydrologic characteristics may often be responsible for the associated vegetation (Naphan 1966). Species of the salt-desert shrub complex have different degrees of tolerance to salinity and aridity, and they tend to

sort themselves out along a moisture/salinity gradient (West 1982). Species and communities are apparently sorted out along physical, chemical, moisture, and topographic gradients through complex relations that are not understood and are in need of further study (Blaisdell and Holmgren 1984).

The winter months are a good time for soil moisture accumulation and storage within stands in this group. There is generally at least one good snowstorm per season that will provide sufficient moisture to the vegetation. The winter moisture accumulation amounts will affect spring plant growth. Plants may grow as little as a few inches to 1 m. Unless more rains come in the spring, the soil moisture will be depleted in a few weeks, growth will slow and ultimately cease, and the perennial plants will assume their various forms of dormancy (Blaisdell and Holmgren 1984). If effective rain comes later in the warm season, some of the species will renew their growth from the stage at which it had stopped. Others, having died back, will start over as if emerging from winter dormancy (Blaisdell and Holmgren 1984). *Atriplex confertifolia* shrubs often develop large leaves in the spring, which increase the rate of photosynthesis. As soil moisture decreases, the leaves are lost, and the plant takes on a dead appearance. During late fall, very small overwintering leaves appear which provide some photosynthetic capability through the remainder of the year. Other communities are maintained by intra- or inter-annual cycles of flooding followed by extended drought, which favor accumulation of transported salts. The moisture supporting these intermittently flooded wetlands is usually derived off-site, and they are dependent upon natural watershed function for persistence (Reid et al. 1999).

In summary, desert communities of perennial plants are dynamic and changing. The composition within this group may change dramatically and may be both cyclic and unidirectional. Superimposed on the compositional change is great variation from year to year in growth of all the vegetation, the sum of varying growth responses of individual species to specific conditions of different years (Blaisdell and Holmgren 1984). Desert plants grow when temperature is satisfactory, but only if soil moisture is available at the same time. Because the amount of moisture is variable from year to year and because different species flourish under different seasons of soil moisture, seldom do all components of the vegetation thrive in the same year (Blaisdell and Holmgren 1984).

DISTRIBUTION

Geographic Range: The distribution of this widespread group centers in the Intermountain West of the U.S., and extends in limited distribution across northern New Mexico into the southern Great Plains. In Wyoming, this group occurs in the Great Divide and Bighorn basins.

Spatial Scale & Pattern [optional]: Large patch

Nations: MX?, US

States/Provinces: AZ, CA, CO, ID, KS, MT, NM, NV, OR, TX, UT, WA, WY

TNC Ecoregions [optional]: 4:?, 6:C, 8:?, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C, 26:C, 27:C, 28:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315B:CP, 315H:CC, 321A:CC, 322A:CC, 331A:CP, 331B:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:PP, M261D:CP, M261E:CP, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332A:CP, M332E:CC, M332F:CC, M332G:CP, M341A:CC, M341B:CC, M341C:CC, M341D:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Arches)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

- < Biotic Matrix of the Shadscale and Associated Communities (Fautin 1946)
- = Intermountain salt desert shrublands (West 1983b)
- < Salt Desert Shrub (414) (Shiflet 1994)

LOWER LEVEL UNITS

Alliances:

- A3174 *Atriplex polycarpa* Scrub Alliance
- A0869 *Atriplex canescens* Scrub Alliance
- A3180 *Atriplex obovata* - *Atriplex cuneata* Scrub Alliance
- A0870 *Atriplex confertifolia* Scrub Alliance
- A3171 *Grayia spinosa* Scrub Alliance

AUTHORSHIP

Primary Concept Source: N.E. West (1983b)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 11/06/2015

REFERENCES

References: Barbour and Major 1988, Blaisdell and Holmgren 1984, Branson et al. 1967, Branson et al. 1976, Brown 1982a, Brown et al. 1979, Campbell 1977, Faber-Langendoen et al. 2017a, Fautin 1946, Francis 1986, Holland and Keil 1995, Knight 1994, Knight et al. 1987, Mozingo 1987, Naphan 1966, Reid et al. 1999, Shiflet 1994, Stout et al. 2013, West 1979, West 1982, West 1983b, West and Ibrahim 1968

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G300. Intermountain Shadscale - Saltbush Scrub

A0869. *Atriplex canescens* Scrub Alliance

Type Concept Sentence: Stands typically have a sparse to moderately dense (10-60% cover) short-shrub canopy (approximately 1.5 m tall) that is dominated by the facultative deciduous, xeromorphic shrub *Atriplex canescens*.

OVERVIEW

Scientific Name: *Atriplex canescens* Scrub Alliance

Common Name (Translated Scientific Name): Fourwing Saltbush Scrub Alliance

Colloquial Name: Fourwing Saltbush Scrub

Type Concept: This alliance occurs primarily in arid and semi-arid areas of the southwestern U.S. from western Texas to southern and eastern California and into Chihuahua, Mexico. It is also found in the western Great Plains to the Great Basin from western Kansas, Colorado, and Wyoming to Utah, Nevada and eastern Oregon. Stands typically have a sparse to moderately dense short-shrub canopy that is dominated by *Atriplex canescens*. Associated shrubs may include *Artemisia bigelovii*, *Artemisia tridentata*, *Ephedra viridis*, *Krascheninnikovia lanata*, *Purshia stansburiana* (= *Purshia mexicana* var. *stansburiana*), *Psoralea polydenius*, *Parthenium confertum*, *Sarcobatus vermiculatus*, and species of *Chrysothamnus*, *Ericameria*, and *Lycium*. The herbaceous layer is sparse to moderately dense and dominated by warm-season, medium-tall and short grasses depending on geographic range of the grasses. Species may include *Bouteloua gracilis*, *Distichlis spicata*, *Elymus elymoides*, *Hesperostipa comata*, *Pleuraphis jamesii* (= *Hilaria jamesii*), *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Muhlenbergia porteri*, *Scleropogon brevifolius*, *Pascopyrum smithii*, and *Sporobolus* spp. Overall, shrublands in this alliance occur on lowland and upland sites with elevation ranging from 75 m below sea level to 2400 m. Lowland sites include alluvial flats, drainage terraces, playas, washes and interdune basins. Upland sites include bluffs and gentle to moderately steep, sandy or rocky slopes. Stands occur on all aspects. Soils are variable with depths ranging from shallow to moderately deep, and texture ranging from sand to loam to clay.

Classification Comments: Shrublands in this alliance can grade into grasslands dominated by *Sporobolus airoides* or *Pleuraphis mutica*, or occur within a matrix of other desert shrublands. Further review of this alliance is necessary before comparisons can be made with other vegetation types. Some of the stands referenced, such as in Francis (1986), may not have enough vegetation cover to be classified as shrublands.

Given the geographic extent of this alliance, it may be warranted to split this into two alliances that reflect ecoregional variation.

Internal Comments:**Other Comments:****Similar NVC Types:**

- A3151 *Atriplex canescens* Lowland Basin Desert Scrub Alliance

Diagnostic Characteristics: Nearly sparse to moderately dense stands of short shrubs dominated by *Atriplex canescens*. Due to the wide geographic range of this alliance, associated species composition is highly variable.

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a sparse to moderately dense layer of facultatively deciduous, extremely xeromorphic shrubs up to 2 m in height. A sparse to dense graminoid layer of warm-season grasses may be present.

Floristics: Stands have a sparse to moderately dense (10-60% cover) short-shrub canopy (to approximately 1.5 m tall) that is dominated by the facultatively deciduous, xeromorphic shrub *Atriplex canescens*. Associated shrubs may include *Artemisia tridentata*, *Artemisia bigelovii*, *Krascheninnikovia lanata*, *Purshia stansburiana* (= *Purshia mexicana* var. *stansburiana*), *Psoralea polydenius*, *Ephedra viridis*, *Parthenium confertum*, *Sarcobatus vermiculatus*, and species of *Chrysothamnus* and

Lycium. Dwarf-shrubs such as *Gutierrezia sarothrae* or *Eriogonum* spp. may be common in some stands. Warm-season, medium-tall and short grasses typically dominate the sparse to moderately dense (1-60% cover) graminoid layer. The species present depend on geographic range of the grasses, alkalinity/salinity and past land use. Species may include *Bouteloua gracilis*, *Distichlis spicata*, *Elymus elymoides*, *Hesperostipa comata*, *Pleuraphis jamesii* (= *Hilaria jamesii*), *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Pascopyrum smithii*, *Muhlenbergia porteri*, *Scleropogon brevifolius*, *Sporobolus airoides*, *Sporobolus cryptandrus*, *Sporobolus flexuosus*, *Sporobolus nealleyi*, and *Sporobolus wrightii*. Forb cover is generally sparse, but annual forbs such as *Calycoseris parryi* may be abundant in wet years. Common forbs include species of *Sphaeralcea*, *Dalea*, *Cymopterus*, *Chenopodium*, *Bassia* (= *Kochia*), *Iva*, *Picradeniopsis*, and *Ratibida*. Cacti from the genus *Opuntia* are associated species in some stands. Trees are typically not present, but occasionally scattered *Juniperus* spp. may occur.

ENVIRONMENT & DYNAMICS

Environmental Description: Shrublands included in this alliance occur on lowland and upland sites throughout much of the arid and semi-arid western U.S. with elevations ranging from 75 m below sea level to 2400 m. Lowland sites include alluvial flats, drainage terraces, playas, washes and interdune basins. Upland sites include bluffs and gentle to moderately steep, sandy or rocky slopes. Stands occur on all aspects. Soils are variable with depths ranging from shallow to moderately deep, and textures ranging from sands to loams to clay. The lowland sites may be moderately saline or alkaline. Bare ground usually dominates the ground surface. Francis (1986) described stands in northwestern New Mexico with approximately 80% bare soil and 15% litter.

Dynamics: *Atriplex canescens* is tolerant of saline or alkaline soils, but is not restricted to those soils. Therefore, it is not a reliable indicator of those conditions (USFS 1937). This shrub is considered good forage for deer and many classes of livestock because it is highly nutritious and palatable (USFS 1937).

DISTRIBUTION

Geographic Range: Shrublands included in this alliance occur primarily in arid and semi-arid areas of the southwestern U.S. from west Texas to southern and eastern California and into Chihuahua, Mexico. They also are found in the western Great Plains to the Great Basin, from western Kansas, Colorado, and Wyoming to Utah, Nevada and eastern Oregon.

Nations: MX, US

States/Provinces: AZ, CA, CO, ID, KS, MXCH, NM, NV, OR, TX, UT, WY

TNC Ecoregions [optional]: 6:C, 11:C, 13:C, 15:C, 17:C, 23:C

USFS Ecoregions (2007): 262A:CC, 322Ab:CCC, 322Ai:CCC, 322Aj:CCC, 322Az:CCC, 322B:CC, 322C:CC, 341Fb:CCC, 341Fc:CCC, 341Fe:CCC, 341Ff:CCC, 342B:CC, M262A:CC, M262B:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Joshua Tree, Lake Mead, Mojave); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Atriplex canescens* (Fourwing saltbush scrub) Alliance (Sawyer et al. 2009) [36.310.00]
- = *Atriplex canescens* Shrubland Alliance (Evens et al. 2014)
- = *Atriplex canescens* Shrubland Alliance (Evens et al. 2012)
- = *Atriplex canescens* Shrubland Alliance (CNPS 2017) [36.310.00]
- >< Desert Saltbush Scrub (#36110) (Holland 1986b)
- = Fourwing saltbush series (Sawyer and Keeler-Wolf 1995)
- >< Interior Coast Range Saltbush Scrub (#36320) (Holland 1986b)
- >< Relictual Interior Dunes (#23200) (Holland 1986b)
- >< Sierra-Tehachapi Saltbush Scrub (#36310) (Holland 1986b)
- >< Valley Saltbush Scrub (#36220) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEGLO01283 *Atriplex canescens* / *Bouteloua gracilis* Shrubland
- CEGLO01285 *Atriplex canescens* - *Krascheninnikovia lanata* Shrubland
- CEGLO01286 *Atriplex canescens* / *Purshia stansburiana* Shrubland
- CEGLO01284 *Atriplex canescens* / *Calycoseris parryi* Shrubland
- CEGLO01291 *Atriplex canescens* / *Sporobolus airoides* Shrubland
- CEGLO05385 *Atriplex canescens* / *Muhlenbergia porteri* Shrubland
- CEGLO01289 *Atriplex canescens* / *Achnatherum hymenoides* Shrubland
- CEGLO01288 *Atriplex canescens* / *Pleuraphis jamesii* Shrubland
- CEGLO01281 *Atriplex canescens* Shrubland

- CEGLO03828 *Atriplex canescens* - *Ephedra viridis* Shrubland
- CEGLO01282 *Atriplex canescens* - *Artemisia tridentata* Shrubland

AUTHORSHIP

Primary Concept Source: K.A. Schulz after Sawyer et al. (2009)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Aldous and Shantz 1924, BIA 1979, BLM 1979a, BLM 1979b, Baker 1984a, Beatley 1976, Beatley 1993, Betancourt and Van Devender 1981, Brown 1982a, Burk 1977, CNPS 2017, Chappell et al. 1997, Culver et al. 1996, Diamond 1993, Dick-Peddie 1993, Donart et al. 1978a, Evens and Hartman 2007, Evens et al. 2012, Evens et al. 2014, Faber-Langendoen et al. 2017b, Francis 1986, Holland 1986b, Howard 2003, Hyder et al. 1966, Johnson 1976, Johnston 1987, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998a, Klipple and Costello 1960, MacMahon 1988, MacMahon and Wagner 1985, Maxwell 1975, McHargue 1973, Miller et al. 1977, Muldavin and Mehlhop 1992, Muldavin et al. 2000b, Paysen et al. 1980, Peterson 1984a, Peterson 1984b, Price et al. 1981, Roberts et al. 1992, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shaw et al. 1989, Shute and West 1978, Soil Conservation Service 1978, Soil Conservation Service n.d., Stout et al. 2013, Thomas et al. 2004, USBOR 1976, USFS 1937, Vasek and Barbour 1988, VegCAMP and AIS 2013, Vest 1962a, Warren et al. 1982

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G300. Intermountain Shadscale - Saltbush Scrub

A0870. *Atriplex confertifolia* Scrub Alliance

Type Concept Sentence: Shrublands occurring across the western U.S. characterized by a sparse to moderately dense shrub layer dominated or codominated by *Atriplex confertifolia* and/or *Picrothamnus desertorum*.

OVERVIEW

Scientific Name: *Atriplex confertifolia* Scrub Alliance

Common Name (Translated Scientific Name): Shadscale Saltbush Scrub Alliance

Colloquial Name: Shadscale Saltbush Scrub

Type Concept: This shrubland alliance occurs across the western U.S. from the eastern Mojave Desert and Great Basin east to the western Great Plains and north to Montana. The vegetation included in this alliance is characterized by a sparse to moderately dense shrub layer dominated or codominated by *Atriplex confertifolia* and/or *Picrothamnus desertorum*. Shrub associates may include *Atriplex polycarpa*, *Ephedra nevadensis*, *Chrysothamnus* spp., *Krascheninnikovia lanata*, *Lycium* spp., *Sarcobatus vermiculatus*, and *Tetradymia* spp. The usually sparse herbaceous layer is dominated by graminoids such as *Elymus elymoides*, *Pleuraphis jamesii* (= *Hilaria jamesii*), *Pleuraphis rigida* (= *Hilaria rigida*), *Leymus salinus*, *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Pseudoroegneria spicata*, *Hesperostipa* spp., and other perennial bunchgrasses. These shrublands are usually associated with margins of large playas, valley bottoms or alluvial slopes with medium- to fine-textured soils but may occur on coarser soils of erosional slopes with calcareous substrates. In most cases, the soils are alkaline and may have substantial salt accumulation.

Classification Comments: One of the associations in this alliance, *Picrothamnus desertorum* Shrubland (CEGL001452), is very poorly documented. There is only one reference source presently known for this association, Montana Natural Heritage Program, Data on File (n.d.). The Montana Heritage Program ecologist was consulted and could find no data for this association in the files. The alliance is also reported from Oregon, as described above, but further data collection and inventory efforts are needed to confirm this alliance and its characteristics as described here.

Some associations currently placed in this alliance are likely to be sparsely vegetated and would be better placed into the sparse vegetation class.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Nearly sparse to moderately dense stands of short shrubs dominated by *Atriplex confertifolia* or codominated by *Picrothamnus desertorum*. Due to the wide geographic range of this alliance, associated species composition is highly variable.

VEGETATION

Physiognomy and Structure: These are broad-leaved deciduous shrublands of somewhat sparse to moderate cover (15-60%). The deciduous character is as much drought-related as cold-related. The interstices between the shrubs may be very sparsely vegetated (<10% cover) in low desert or highly alkaline habitats or moderately vegetated (20-40%) with cespitose graminoids and forbs. In addition, these communities often harbor an ephemeral ground layer of short-lived annual forbs and graminoids which vary in abundance with local precipitation.

Floristics: *Atriplex confertifolia* and/or *Picrothamnus desertorum* (= *Artemisia spinescens*) are the dominant shrubs. Other codominant or associate shrub species may include *Atriplex canescens*, *Atriplex polycarpa*, *Ephedra nevadensis*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Grayia spinosa*, *Krascheninnikovia lanata*, *Lycium* sp., *Tetradymia glabrata*, and *Tetradymia axillaris*. There is typically a depauperate understory of perennial bunchgrasses, including *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Elymus elymoides*, *Hesperostipa* spp., *Pleuraphis jamesii* (= *Hilaria jamesii*), *Pleuraphis rigida* (= *Hilaria rigida*), *Pseudoroegneria spicata*, and *Psoralea polydenius*. *Yucca brevifolia* may form a scattered emergent tree layer in these stands.

ENVIRONMENT & DYNAMICS

Environmental Description: Extensive stands of the vegetation types in this alliance occur in the transition between the Mojave and Great Basin deserts of North America. Outlying stands also occur northward and eastward in valley bottom sites that have substantial salt accumulation. This alliance occurs at middle elevations (1000-1950 m [3300-6400 feet]) with annual precipitation averaging 10-25 cm. These shrublands are usually associated with margins of large playas, valley bottoms or alluvial slopes with medium- to fine-textured soils but may occur on coarser soils of erosional slopes with calcareous substrates. In most cases, the soils are alkaline (pH 7.5-8.5).

Dynamics: Many of the plant species commonly present in stands of this alliance grow from late winter to late spring or early summer, when soil moisture becomes depleted. *Atriplex confertifolia* shrubs often develop large leaves in the spring which increase the rate of photosynthesis. As soil moisture decreases, the leaves are lost, and the plant takes on a dead appearance. During late fall, very small overwintering leaves appear which provide some photosynthetic capability through the remainder of the year. The species is valued as winter range for native herbivores and livestock. During winter or drought periods, minor defoliation from herbivory may actually increase drought tolerance by lowering leaf area and transpiration losses.

DISTRIBUTION

Geographic Range: The plant associations in this alliance occur throughout the eastern Mojave and Great Basin deserts, northward to southern Idaho, north-central Wyoming, and south-central Montana. Stands have also been reported from the Colorado Plateau of western Colorado, Arizona, New Mexico and Utah.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WY

TNC Ecoregions [optional]: 6:C, 11:C, 12:C, 13:C, 15:C, 17:C

USFS Ecoregions (2007): 262A:CC, 322Ab:CCC, 322Ad:CCC, 322Ae:CCC, 322Az:CCC, 341D:CC, 341Fa:CCC, 341Fb:CCC, 341Fc:CCC, 341Fd:CCC, 341Fe:CCC, 341Ff:CCC, 341Fg:CCC, 342B:CC, M261E:CC, M262A:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Lake Mead)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Atriplex confertifolia* (Shadscale scrub) Alliance (Sawyer et al. 2009) [36.320.00]
- = *Atriplex confertifolia* Shrubland Alliance (Evens et al. 2014)
- = *Atriplex confertifolia* Shrubland Alliance (CNPS 2017) [36.320.00]
- < Shadscale Scrub (#36140) (Holland 1986b)
- = Shadscale series (Sawyer and Keeler-Wolf 1995)

LOWER LEVEL UNITS

Associations:

- CEG001294 *Atriplex confertifolia* Great Basin Shrubland
- CEPP005797 *Atriplex confertifolia* - *Suaeda moquinii* Shrubland
- CEG001313 *Atriplex confertifolia* - *Sarcobatus vermiculatus* Shrubland
- CEG001299 *Atriplex confertifolia* - *Atriplex polycarpa* Shrubland
- CEG001309 *Atriplex confertifolia* - *Lycium pallidum* / *Mirabilis pudica* Shrubland
- CEG001310 *Atriplex confertifolia* - *Lycium shockleyi* Shrubland
- CEG001302 *Atriplex confertifolia* / *Elymus elymoides* Shrubland

- CEGLO01311 *Atriplex confertifolia* / *Achnatherum hymenoides* Shrubland
- CEGLO01307 *Atriplex confertifolia* / *Leymus salinus* Shrubland
- CEGLO01297 *Atriplex confertifolia* - *Picrothamnus desertorum* / *Achnatherum hymenoides* Shrubland
- CEGLO01301 *Atriplex confertifolia* - *Krascheninnikovia lanata* Shrubland
- CEGLO01314 *Atriplex confertifolia* / *Hesperostipa comata* Shrubland
- CEGLO01296 *Atriplex confertifolia* - *Picrothamnus desertorum* / *Krascheninnikovia lanata* Shrubland
- CEGLO01306 *Atriplex confertifolia* / *Leymus salinus* ssp. *salmonis* Shrubland
- CEGLO01300 *Atriplex confertifolia* / *Ericameria nauseosa* Shrubland
- CEGLO01452 *Picrothamnus desertorum* Shrubland
- CEGLO01312 *Atriplex confertifolia* / *Pseudoroegneria spicata* Shrubland
- CEGLO01315 *Atriplex confertifolia* / *Tetradymia glabrata* Shrubland
- CEGLO01295 *Atriplex confertifolia* - *Picrothamnus desertorum* Shrubland
- CEGLO01305 *Atriplex confertifolia* / *Bassia americana* Shrubland
- CEGLO01298 *Atriplex confertifolia* - *Picrothamnus desertorum* / *Sarcobatus vermiculatus* Shrubland
- CEGLO01308 *Atriplex confertifolia* - *Lycium andersonii* Shrubland
- CEGLO01304 *Atriplex confertifolia* / *Pleuraphis jamesii* Shrubland
- CEGLO02992 *Picrothamnus desertorum* / *Elymus elymoides* Shrubland
- CEGLO03762 *Atriplex confertifolia* / *Sporobolus cryptandrus* Shrubland
- CEGLO03830 *Atriplex confertifolia* Sparse Shrubland
- CEPP005685 *Atriplex confertifolia* - (*Acamptopappus sphaerocephalus*, *Picrothamnus desertorum*) / (*Pleuraphis jamesii*) Scrub
- CEPP005795 *Atriplex confertifolia* - *Atriplex canescens* Shrubland
- CEGLO05739 *Atriplex confertifolia* - *Ambrosia dumosa* Shrubland
- CEPP005796 *Atriplex confertifolia* - *Lepidium fremontii* Shrubland
- CEGLO01293 *Atriplex confertifolia* Wyoming Basins Shrubland
- CEGLO01303 *Atriplex confertifolia* - *Ephedra nevadensis* Shrubland

AUTHORSHIP

Primary Concept Source: D. Sarr, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Annable 1985, BLM 1979a, Baker 1982b, Baker 1983b, Baker 1983c, Baker and Kennedy 1985, Barbour and Major 1977, Beatley 1975, Beatley 1976, Billings 1949, Blackburn et al. 1968a, Blackburn et al. 1969b, Blackburn et al. 1969d, Bradley 1964, Branson and Owen 1970, Branson et al. 1976, Brotherson and Brotherson 1979, Burk 1977, CNPS 2017, Caicco and Wellner 1983c, Caicco and Wellner 1983g, Campbell 1977, Charlton 2000a, Dastrup 1963, Empire Engineering and Land Surveying 1986, Evens et al. 2014, Faber-Langendoen et al. 2017b, Faden 1977, Fautin 1946, Fenemore 1970, Graham 1937, Harper and Jaynes 1986, Holland 1986b, Ibrahim et al. 1972, Keammerer 1974b, Keammerer 1977, Keeler-Wolf and Thomas 2000, Leary and Peterson 1984, Lesica and DeVelice 1992, Lusby et al. 1963, MTNHP unpubl. data, MacMahon 1988, MacMahon and Wagner 1985, McHargue 1973, Miller et al. 1977, ORNHP unpubl. data, Paysen et al. 1980, Peterson 1984a, Potter et al. 1985, Rickard and Beatley 1965, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Schramm 1982, Simonin 2001a, Singh and West 1971, Soil Conservation Service 1978, Thomas et al. 2004, Thorne 1982, Tuhy and MacMahon 1988, Turner 1982b, USBOR 1976, Vasek and Barbour 1988, VegCAMP and AIS 2013, Vest 1962b, Ward et al. 1974, Warren et al. 1982, West 1983b, West and Ibrahim 1968, Young et al. 1977, Young et al. 1986

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G300. Intermountain Shadscale - Saltbush Scrub

A3180. *Atriplex obovata* - *Atriplex cuneata* Scrub Alliance

Type Concept Sentence: This alliance occurs in the northern Chihuahuan Desert and Colorado Plateau from western Texas, south-central and northwestern New Mexico, and northeastern Arizona and is dominated or codominated by *Atriplex obovata*.

OVERVIEW

Scientific Name: *Atriplex obovata* - *Atriplex cuneata* Scrub Alliance

Common Name (Translated Scientific Name): Mound Saltbush - Valley Saltbush Scrub Alliance

Colloquial Name: Mound Saltbush - Valley Saltbush Scrub

Type Concept: This alliance occurs in the northern Chihuahuan Desert and Colorado Plateau from western Texas, south-central and northwestern New Mexico, and northeastern Arizona. The vegetation is characterized by a sparse to moderately dense dwarf-shrub

layer that is dominated or codominated by *Atriplex obovata*. Some occurrences may have a dense understory of perennial grasses. Shrub associates may include scattered *Atriplex confertifolia*, *Ericameria nauseosa*, *Isocoma drummondii*, *Gutierrezia sarothrae*, *Prosopis glandulosa* var. *torreyana*, *Opuntia* spp., or *Suaeda* spp. The herbaceous layer ranges from moderately dense to absent, and is usually dominated by perennial grasses such as *Sporobolus airoides* and *Pleuraphis jamesii*. Other associated species may include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus elymoides*, and *Sporobolus cryptandrus*. Stands are known from mesas, plains, floodplains, valley bottoms, alluvial flats, lower to upper hillslopes, often in a "badlands" landscape. Soils are generally shallow, poorly developed, and alkaline.

Classification Comments: This alliance includes associations which are considered shrub-dominated, as well as one that is considered shrub-herbaceous which was previous attributed to former *Sporobolus airoides* - (*Pleuraphis jamesii*) Shrub Herbaceous Alliance (A.1532).

This alliance often occurs in "badlands" landscapes adjacent to barren and sparsely vegetated areas and may include vegetation that may be too sparse to be classified as a dwarf-shrubland. Further study is needed throughout its range, especially to assess the effects of livestock grazing on vegetation structure.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Shrub and shrub-herbaceous scrub vegetation where *Atriplex obovata* is the principal shrub with cover of 10-60%. *Pleuraphis jamesii* and *Sporobolus airoides* typically form an open to dense herbaceous layer.

VEGETATION

Physiognomy and Structure: Vegetation in this alliance is dominated by sparse to moderate cover of facultatively deciduous dwarf-shrubs with a sparse to dense perennial graminoid layer.

Floristics: The vegetation is characterized by a sparse to locally moderately dense dwarf-shrub layer (10-60% cover) that is dominated or codominated by *Atriplex obovata* (3-40% cover). Shrub associates may include scattered *Atriplex confertifolia*, *Atriplex canescens*, *Artemisia bigelovii*, *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Isocoma drummondii*, *Opuntia* spp., *Prosopis glandulosa* var. *torreyana*, or *Suaeda* spp. The herbaceous layer ranges from moderately dense to absent (0-50% cover) and is usually dominated by perennial grasses such as *Sporobolus airoides* and *Pleuraphis jamesii*. Other associated species may include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus elymoides*, and *Muhlenbergia torreyi*. Forb cover is sparse and typically includes *Astragalus* spp. and *Sphaeralcea coccinea*.

ENVIRONMENT & DYNAMICS

Environmental Description: Elevation ranges from 1500-1850 m. Stands are known from mesas, plains, floodplains, valley bottoms, alluvial flats, lower to upper hillslopes, often in a "badlands" landscape. Soils are generally shallow, poorly developed, and alkaline. Textures range from fine sandy loam to silty clay loam and clay (Henrickson 1974, Francis 1986, TNC 1997b) which are often saline or gypseous. Parent materials include alluvium and colluvium derived from igneous or sedimentary materials such as basalt, shale, and clay. There is high cover of bare soil. Typically, areas have been severely degraded by erosion.

Dynamics: Grazing has significantly impacted much of the vegetation in the Rio Puerco basin of northwestern New Mexico, which has had a long history of settlement and heavy livestock use. With proper livestock management and time, palatable species such as *Sporobolus airoides* may increase and *Opuntia* spp. may decline (Francis 1986).

DISTRIBUTION

Geographic Range: Communities in this alliance are described from the southeastern part of the Colorado Plateau in the upper Rio Puerco watershed in northwestern New Mexico and Arizona; the Trans-Pecos region in Brewster County, western Texas; and in south-central New Mexico. The alliance probably also occurs in Utah and Chihuahua and Coahuila, Mexico.

Nations: MX?, US

States/Provinces: AZ, MXCH?, MXCO?, NM, TX, UT?

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGLO01789 *Atriplex obovata* Talus Dwarf-shrubland
- CEGLO01316 *Atriplex cuneata* - *Frankenia jamesii* / *Sporobolus airoides* Shrubland
- CEGLO01775 *Atriplex obovata* / *Sporobolus airoides* - *Pleuraphis jamesii* Shrub Grassland
- CEGLO02928 *Atriplex obovata* Badland Sparse Vegetation
- CEGLO01447 *Atriplex obovata* / *Sporobolus airoides* - *Sporobolus cryptandrus* Dwarf-shrubland

AUTHORSHIP

Primary Concept Source: M. Hall, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Faber-Langendoen et al. 2017b, Francis 1986, Henrickson 1974, Reid et al. 1994, TNC 1997b, Thomas et al. 2003b, Welsh et al. 1987, West et al. 1972

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G300. Intermountain Shadscale - Saltbush Scrub

A3174. *Atriplex polycarpa* Scrub Alliance

Type Concept Sentence: Shrublands in this alliance occur in desert valleys, basins, playas, bajadas, foothills and plains characterized by a sparse to moderately dense shrub layer dominated or codominated by *Atriplex polycarpa*.

OVERVIEW

Scientific Name: *Atriplex polycarpa* Scrub Alliance

Common Name (Translated Scientific Name): Cattle Saltbush Scrub Alliance

Colloquial Name: Cattle Saltbush Scrub

Type Concept: Shrublands in this alliance occur in desert valleys, basins, playas, bajadas, foothills and plains in southern New Mexico, Nevada and southern California. The vegetation included in this alliance is characterized by a sparse to moderately dense shrub layer dominated or codominated by *Atriplex polycarpa*. Shrub associates may include *Larrea tridentata*, *Ambrosia dumosa*, *Eriogonum fasciculatum*, *Hymenoclea salsola*, *Atriplex canescens*, *Atriplex confertifolia*, *Gutierrezia sarothrae*, and *Suaeda moquinii*. Perennial graminoids are present to abundant in some habitats and may include *Distichlis spicata*, *Pleuraphis mutica* (= *Hilaria mutica*), and *Sporobolus* spp. Sites are generally flat to gently sloping and moderately saline, but the alliance also occurs on rolling to hilly fans and slopes.

Classification Comments: This alliance has been segregated from the previously defined *Atriplex lentiformis*-A. *polycarpa* alliance (Sawyer and Keeler-Wolf 1995). Based on plot data collected over the past 10 years, both of these species apparently segregate and form their own alliances with frequently different environmental and species characteristics.

Brown (1982a) describes stands in the Saltbush Series that are dominated by *Atriplex polycarpa*. No *Atriplex polycarpa* associations have yet been described in Arizona by ecologists. The stands described by Peterson (1984a) are too sparse to be classified as shrublands. Little other quantitative data were available.

Whitfield and Anderson (1938) describe *Atriplex polycarpa*-dominated stands in the Chihuahuan Desert where other characteristic shrubs include *Atriplex canescens*, *Atriplex confertifolia*, *Ambrosia dumosa*, *Larrea tridentata*, *Gutierrezia sarothrae*, the phreatophyte *Suaeda moquinii*, and perennial grasses such as *Sporobolus airoides*, *Pleuraphis mutica*, *Sporobolus cryptandrus*, and *Muhlenbergia porteri*. The perennial grass cover is possible because of the late summer rains. In the Mojave Desert, grass cover is sparse. In Death Valley (Peterson 1984a) described stands with 10% aerial cover of *Atriplex polycarpa* and 1% or less of *Ambrosia dumosa*, *Larrea tridentata*, and *Hymenoclea salsola*. Total shrubs cover was 13%. In addition to *Atriplex polycarpa*, stands in the California Central Valley include a variety of dune, playa or uplands species such as *Distichlis spicata*, *Ephedra californica*, *Eriogonum fasciculatum*, *Hymenoclea salsola*, *Cleome isomeris* (= *Isomeris arborea*), *Isocoma acradenia*, and *Prosopis glandulosa* (Sawyer and Keeler-Wolf 1995).

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: *Atriplex polycarpa* >2% absolute cover in the shrub canopy; >50% relative cover in the shrub canopy (Keeler-Wolf et al. 1998, Thomas et al. 2004).

VEGETATION

Physiognomy and Structure: Vegetation included in this alliance has a sparse to moderately dense woody layer dominated by facultative deciduous and microphyllous evergreen shrubs. The usually sparse herbaceous layer has a few perennial species of grasses and forbs with sometimes abundant cover of seasonally present annual grasses and forbs.

Floristics: The vegetation has a sparse to moderately dense woody layer usually less than 1 m tall, but occasionally over 2 m tall in mixed-shrub stands. *Atriplex polycarpa*, a facultative deciduous xeromorphic shrub, is the dominant species and may occur in nearly pure stands. Other characteristic shrubs may include *Larrea tridentata*, *Ambrosia dumosa*, and *Hymenoclea salsola*. Perennial graminoids such as *Distichlis spicata*, *Pleuraphis mutica* (= *Hilaria mutica*), and *Sporobolus* spp. may be present and abundant in some habitats. Exotic annual grasses may dominate the understory in stands in California. Secondary species vary widely depending on site characteristics and geographic location.

ENVIRONMENT & DYNAMICS

Environmental Description: Shrublands in this alliance occur in desert valleys, basins, playas, bajadas, foothills and plains in southern New Mexico, Nevada and southern California. Climate is arid to semi-arid with hot summers. Sites are generally flat to gently sloping and moderately saline, but the alliance also occurs on rolling to hilly fans and slopes. Other characteristics vary by site and region. In the Chihuahuan Desert (1200-1500 m elevation), annual precipitation has a bimodal distribution with about half the precipitation occurring during the late summer months. Sites occur on lower foothills and plains. Soils are fine-textured, alkaline and typically saline.

Dynamics: *Atriplex polycarpa* is a facultative phreatophyte and occurs on moderately saline soil (<2%) just above the water table or xeric non-saline upland sites (Barbour and Major 1977). It has limited salt tolerance and is very drought-tolerant (Barbour and Major 1977). These two factors interact to control water stress in plants and define habitat boundaries.

DISTRIBUTION

Geographic Range: This alliance includes shrublands from valleys and basins in the Chihuahuan, Mojave and Sonoran deserts, and in the southern part of the Great Central Valley of California.

Nations: US

States/Provinces: CA, NM, NV

TNC Ecoregions [optional]: 11:C, 17:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Lake Mead, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Atriplex polycarpa* (Allscale scrub) Alliance (Sawyer et al. 2009) [36.340.00]
- = *Atriplex polycarpa* Alliance (Allscale scrub) (Buck-Diaz et al. 2012)
- = *Atriplex polycarpa* Shrubland Alliance (Evens et al. 2014)

LOWER LEVEL UNITS

Associations:

- CEG001319 *Atriplex polycarpa* / *Pleuraphis mutica* Shrubland
- CEG001318 *Atriplex polycarpa* Shrubland

AUTHORSHIP

Primary Concept Source: M.E. Hall, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/01/08

REFERENCES

References: Barbour and Major 1977, Beatley 1976, Brown 1982a, Buck-Diaz et al. 2012, Evens et al. 2014, Faber-Langendoen et al. 2017b, Faden 1977, Holland 1986b, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998a, Peterson 1984a, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Stout et al. 2013, Thomas et al. 2004, VegCAMP and AIS 2013, Whitfield and Anderson 1938

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G300. Intermountain Shadscale - Saltbush Scrub

A3171. Grayia spinosa Scrub Alliance

Type Concept Sentence: This alliance occurs in the Great Basin and the eastern Mojave Desert, and is characterized by a sparse to moderately dense shrub layer of *Grayia spinosa*. Other shrubs are species of Mojavean or Great Basin affinities.

OVERVIEW

Scientific Name: *Grayia spinosa* Scrub Alliance

Common Name (Translated Scientific Name): Spiny Hopsage Scrub Alliance

Colloquial Name: Spiny Hopsage Scrub

Type Concept: Vegetation in this alliance occurs throughout the lower to middle elevations (600-1600 m) of the Great Basin and the eastern Mojave Desert. The vegetation is more drought-tolerant than *Artemisia tridentata*-dominated communities and typically occurs where local climate or salty soils create high moisture stress. This alliance is characterized by a sparse to moderately dense shrub layer of *Grayia spinosa*. Shrub associates include *Artemisia nova*, *Artemisia tridentata*, *Atriplex confertifolia*, *Atriplex canescens*, *Chrysothamnus* spp., *Coleogyne ramosissima*, *Ephedra nevadensis*, *Ephedra viridis*, *Larrea tridentata*, *Picrothamnus desertorum* (= *Artemisia spinescens*), and *Prunus andersonii*. The herbaceous layer is typically sparse with *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Achnatherum speciosum* (= *Stipa speciosa*), *Elymus elymoides*, *Navarretia* spp., *Pleuraphis jamesii* (= *Hilaria jamesii*), and *Poa secunda* being common associates. Stands usually occur on mountain slopes or alluvial fans bordering intermountain basins. Soils are highly variable, but are generally coarse-textured and well-drained, and often alkaline.

Classification Comments: During the ecological group revision, all *Grayia spinosa* associations were placed across several groups. The associations within this alliance had been split across Intermountain Shadscale - Saltbush Scrub Group (G300) and Mojave Mid-Elevation Mixed Desert Scrub Group (G296). They have been combined within G300 and this alliance as they appear to represent inclusions within the greater matrix-forming communities of the shadscale - saltbush communities.

Currently there are no associations placed in this alliance from California. Sawyer and Keeler-Wolf (1995) do report a Hopsage Series that is included as part of this alliance. Further classification and inventory work are needed to develop the association-level classification of this alliance.

Internal Comments: KAS 11-16: CEG001349 *Grayia spinosa* - *Menodora spinescens* Shrubland Association was moved from A3171 *Grayia spinosa* Scrub Alliance to A2515 *Menodora spinescens* Scrub Alliance because *Menodora spinescens* is considered to be more diagnostic than the ubiquitous *Grayia spinosa* and reference citation for CEG001349 is from the Grapevine Mountains in Death Valley NP.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Vegetation in this alliance can be differentiated from other alliances by the strong dominance of *Grayia spinosa* in the shrub layer, and its broad distribution in non-wetland locations.

VEGETATION

Physiognomy and Structure: These communities are characterized by somewhat low to moderate cover (15-40%) of cold-deciduous or evergreen shrubs. The herbaceous layer is typically sparse (<20% cover) and dominated by cespitose perennial grasses or annual forbs and grasses. Scattered trees may form a sparse (0-10%) emergent layer in some stands, especially at the upper elevation margin and in the southwestern part of the range.

Floristics: Species found in southern stands include *Atriplex canescens*, *Atriplex confertifolia*, *Coleogyne ramosissima*, *Ephedra nevadensis*, *Larrea tridentata*, and *Picrothamnus desertorum* (= *Artemisia spinescens*). Occasionally, scattered individuals of *Yucca brevifolia* may be emergent through the shrub layer. The herbaceous layer in these xeric southern stands is typically sparse with *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Achnatherum speciosum* (= *Stipa speciosa*), *Eriogonum* spp., *Navarretia* spp., and *Pleuraphis jamesii* (= *Hilaria jamesii*) being common associates. Northward, and at higher elevations, the Mojavean element drops out and common shrub associates include *Artemisia nova*, *Artemisia tridentata*, *Chrysothamnus* spp., *Ephedra viridis*, and *Prunus andersonii*. Herbaceous associates include *Elymus elymoides*, *Festuca* spp., and *Poa secunda*.

ENVIRONMENT & DYNAMICS

Environmental Description: Vegetation in this alliance occurs throughout the lower to middle elevations (600-1600 m) of the Great Basin and the eastern Mojave Desert, usually on mountain slopes or alluvial fans bordering intermountain basins. The climate is arid to semi-arid with precipitation ranging from 15-30 cm annually. Winter precipitation dominates in the western area, with summer

rain becoming more important eastward. Temperatures are continental, with large annual and diurnal ranges. Soils are highly variable, but are generally coarse-textured and well-drained, and often alkaline.

Dynamics: *Grayia spinosa* shrubs concentrate chemical elements in their leaves and fruits, and soils beneath the shrubs often show high levels of magnesium and potassium. Seeds remain viable for long periods (4 years or more) before germination (Mozingo 1987). Due to its wide geographic range, the species may demonstrate considerable ecotypic variation. For example, seeds from Mojave Desert individuals can germinate at 40°C, but seeds from Great Basin plants can not germinate at that high temperature (Mozingo 1987).

DISTRIBUTION

Geographic Range: This alliance occurs throughout the Great Basin, Columbia Plateau, and eastern Mojave regions of Colorado, Utah, Nevada, Oregon, Washington, and eastern California. It is most extensive in the southwestern portion of the Great Basin.

Nations: US

States/Provinces: CA, CO, NV, OR, UT, WA

TNC Ecoregions [optional]: 4:C, 6:C, 11:C, 12:C, 17:C

USFS Ecoregions (2007): 322Ad:CCC, 322Af:CCC, 322Aj:CCC, 322Al:CCC, 341D:CC, 341Fa:CCC, 341Fb:CCC, 341Fc:CCC, 341Fe:CCC, 341Ff:CCC, 341Fg:CCC, 342B:CC, M261E:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Joshua Tree, Mojave)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Grayia spinosa* (Spiny hop sage scrub) Alliance (Sawyer et al. 2009) [33.180.00]
- = *Grayia spinosa* Shrubland Alliance (Evens et al. 2014)
- = *Grayia spinosa* Shrubland Alliance (Evens et al. 2012)
- = *Grayia spinosa* Shrubland Alliance (CNPS 2017) [33.180.00]
- = Hop-sage series (Sawyer and Keeler-Wolf 1995)
- < Shadscale Scrub (#36140) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

- CEGLO02681 *Grayia spinosa* / *Achnatherum thurberianum* Shrubland
- CEGLO01345 *Grayia spinosa* / *Picrothamnus desertorum* Shrubland
- CEGLO01350 *Grayia spinosa* / *Achnatherum hymenoides* Shrubland
- CEGLO01352 *Grayia spinosa* - *Prunus andersonii* Shrubland
- CEGLO01351 *Grayia spinosa* / *Poa secunda* Shrubland
- CEGLO02358 *Grayia spinosa* Shrubland
- CEGLO01344 *Grayia spinosa* / *Artemisia nova* / *Achnatherum speciosum* Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid, D. Sarr, G. Kittel, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2016/11/11

REFERENCES

References: Beatley 1975, Blackburn et al. 1968a, Blackburn et al. 1968c, Blackburn et al. 1969d, Blaisdell and Holmgren 1984, CNPS 2017, Daubenmire 1970, Evens et al. 2012, Evens et al. 2014, Faber-Langendoen et al. 2017b, Holland 1986b, Keeler-Wolf 2007, Keeler-Wolf and Thomas 2000, Kurzius 1981, Mozingo 1987, Paysen et al. 1980, Peterson 1984a, Ralston 1969, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shaw et al. 2002, Shiflet 1994, Thomas et al. 2004, Thorne 1976, Thorne 1982, VegCAMP and AIS 2013, Webb et al. 1987, Young et al. 1977, Young et al. 2007b

M118. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation

This sparsely vegetated macrogroup occurs in a variety of landscapes and a variety of exposed rock and badland substrates the interior western U.S. from the Columbia Plateau south to the Great Basin and Colorado Plateau, and east into Wyoming basins. Characteristic species are variable depending on substrate and other environmental condition and most of the species also occur in non-sparse vegetation macrogroups, although some of the sites with harsh soil properties may have of endemic species.

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.6.a. M118 Intermountain Basins Cliff, Scree & Badland Sparse Vegetation

G570. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation

Type Concept Sentence: This group consists of barren and sparsely vegetated cliffs, scree slopes, badlands and other similar harsh habitats from low to high elevations, with a wide variety of trees or shrubs, such as species of *Artemisia*, *Atriplex*, *Cercocarpus*, *Eriogonum*, *Fallugia*, *Grayia*, *Juniperus*, *Pinus*, *Purshia*, and others, distributed throughout the interior western U.S.

OVERVIEW

Scientific Name: *Atriplex* spp. - *Cercocarpus* spp. - *Ephedra* spp. Intermountain Basins Sparse Vegetation Group

Common Name (Translated Scientific Name): Saltbush species - Mountain-mahogany species - Joint-fir species Intermountain Basins Sparse Vegetation Group

Colloquial Name: Intermountain Shale Badlands Cold Desert Sparse Vegetation

Type Concept: This group consists of barren and sparsely vegetated cliffs, scree slopes, badlands and other similar areas from a variety of landscapes in the interior western U.S. from eastern Washington and Oregon, the Columbia Plateau south to the Great Basin and Colorado Plateau, east into Wyoming basins and plains. Characteristic shrub species in lower elevation semi-desert, lava field, and badland areas include *Artemisia pedatifida*, *Artemisia tridentata*, *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex corrugata*, *Atriplex gardneri*, *Ephedra* spp., *Eriogonum corymbosum*, *Eriogonum heermannii*, *Eriogonum ovalifolium*, *Fallugia paradoxa*, *Grayia spinosa*, *Purshia tridentata*, *Salvia dorrii*, and *Sarcobatus vermiculatus*. Characteristic herbs include species of *Achnatherum*, *Camissonia*, *Cleome*, *Eriogonum*, and *Mentzelia*. Foothill sites include *Pinus edulis* and *Pinus ponderosa* (Colorado Plateau), *Pinus monophylla*, *Pinus longaeva* (Great Basin), *Juniperus osteosperma*, *Cercocarpus intricatus*, and *Cercocarpus ledifolius*. At montane and subalpine elevations, scattered trees may be present, such as *Abies concolor*, *Picea engelmannii*, *Pinus flexilis*, *Pinus ponderosa*, and *Pseudotsuga menziesii*. Shrubs may include *Arctostaphylos patula*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Ephedra* spp., *Holodiscus* spp., *Ivesia* sp., and *Purshia tridentata*. Landforms include cliffs and canyon sides, mesas and plateaus, and mountains. Sparse vegetation also occurs on special substrates such as shale outcrops, badlands and volcanic deposits such as lava, cinder, ash, tuff and basalt dikes. Rock substrates include bedrock, slickrock, and unstable talus and scree slopes. Some substrates, such as marine shales, are strongly alkaline and/or saline which chemically limits plant growth. Active substrates such as scree slopes are difficult sites for plants to grow. Physical properties of substrates may also limit plant growth. Some massive rock substrates lack cracks where vascular plants can root. Badland sites often have heavy clay soils that reduce water infiltration increasing erosion rates and reducing soil moisture for plants. Vegetation is variable depending on environmental variables of the sites, which range from relatively low-elevation semi-desert to subalpine cliffs and rock outcrops. Lower elevation sites often have herbaceous or shrub species present, whereas foothill, montane and subalpine sites may also include trees. Most of the species also occur in non-sparse vegetation groups. However, some of the sites with harsh soil properties have a high number of endemic perennial species.

Classification Comments: This group is very diverse floristically and so it is difficult to determine indicator species. More diagnostic is the sparse cover of vascular plants and/or presence and sometimes dominance of nonvascular (lichen) species. This broadly defined lithomorphic group was developed by NatureServe. M. Reid (9-13): I am removing dune communities from this group; they are now placed in Intermountain Sparsely Vegetated Dune Scrub & Grassland Group (G775). We need to revisit and get clear on criteria for differentiating this group from other vegetated groups. Generally this group is conceived of as sparsely vegetated associations occurring on rocky or badland substrates.

Similar NVC Types:

- G569 North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation
- G567 Great Plains Cliff, Scree & Rock Vegetation
- G565 Rocky Mountain Cliff, Scree & Rock Vegetation

Diagnostic Characteristics: Diagnostic characteristics of this lithomorphic group are barren to sparsely vegetation substrates and its geographic location, which is the intermountain western U.S. However, it is often composed of a mix of woody vegetation, especially shrubs and herbs (particularly cushion plants), although either may be absent on a given site.

VEGETATION

Physiognomy and Structure: This lithomorphic group may be composed of woody plants, including both trees and shrubs, herbaceous plants, and/or nonvascular plants. Shrubs are especially common and were chosen as indicator species, however, herbs, especially cushion plants, and nonvasculars such as mosses or lichens may be more common.

Floristics: This group consists of sparsely vegetated substrates which are variable depending on environmental factors of the sites. Sites range from relatively low-elevation semi-desert to subalpine cliffs and rock outcrops. Lower elevation sites often have herbaceous or shrub species present, whereas foothill, montane and subalpine sites may also include trees. Most of the species also occur in non-sparse vegetation groups. However, some of the sites with harsh soil properties have a high number of endemic perennial species (Welsh 1979, Welsh and Chatterly 1985). Characteristic shrub species in lower elevation semi-desert, lava field, and badland areas include *Artemisia pedatifida*, *Artemisia tridentata*, *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex corrugata*, *Atriplex gardneri*, *Ephedra* spp., *Eriogonum corymbosum*, *Eriogonum heermannii*, *Eriogonum ovalifolium*, *Fallugia paradoxa*, *Grayia spinosa*, *Purshia tridentata*, *Salvia dorrii*, and *Sarcobatus vermiculatus*. Characteristic herbs include species of *Achnatherum*, *Camissonia*, *Cleome*, *Eriogonum*, and *Mentzelia*. Foothill sites include *Pinus edulis* and *Pinus ponderosa* (Colorado Plateau), *Pinus monophylla*, *Pinus longaeva* (Great Basin), *Juniperus osteosperma*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, and *Ephedra* spp. At montane and subalpine elevations, scattered trees may be present, such as *Pinus ponderosa*, *Pinus flexilis*, *Abies concolor*, *Pseudotsuga menziesii*, and *Picea engelmannii*. Shrubs may include *Arctostaphylos patula*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Ephedra* spp., *Holodiscus* spp., and *Purshia tridentata*.

ENVIRONMENT & DYNAMICS

Environmental Description: This group consists of barren and sparsely vegetated substrates from a variety of landscapes in the interior western U.S. from the Columbia Plateau south to the Great Basin and Colorado Plateau, east into Wyoming basins and plains. Landforms include cliffs and canyon sides, mesas and plateaus, and mountains. Sparse vegetation also occurs on special substrates such as shale outcrops, active sand dunes, badlands and volcanic deposits such as lava, cinder, ash, tuff and basalt dikes. Rock substrates include bedrock and unstable talus and scree slopes. Some substrates, such as marine shales, are strongly alkaline and/or saline which chemically limits plant growth. Active substrates such as scree slopes are difficult sites for plants to grow. Physical properties of substrates may also limit plant growth. Some massive rock substrates lack cracks where vascular plants can root. Badland sites often have heavy clay soils that reduce water infiltration increasing erosion rates and reducing soil moisture for plants.

Dynamics: Following wildfire, various associations which are typically woodland and shrubland will have transitional stages that are sparsely vegetated. *Populus tremuloides* will slowly re-colonize steep, unstable talus and scree slopes following ten-year-old forest fires in Great Basin National Park, although the seral community is transitional.

DISTRIBUTION

Geographic Range: This sparsely vegetated group occurs in the interior western U.S. from the Columbia Plateau south to the Great Basin and Colorado Plateau, east into Wyoming basins and plains.

Spatial Scale & Pattern [optional]: Large patch

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 12:?, 18:C, 19:C, 20:C, 21:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: BLM (Grand Staircase-Escalante); NPS (Arches, Canyonlands, Capitol Reef, Glen Canyon, Great Basin, Petrified Forest); USFS (Spring Mountains)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- >< Littleleaf Mountain-Mahogany (417) (Shiflet 1994)
- >< Pinyon - Juniper: 239 (Eyre 1980)

LOWER LEVEL UNITS

Alliances:

- A4053 *Eriogonum ovalifolium* - *Fallugia paradoxa* - *Andropogon hallii* Lava & Cinder Sparse Vegetation Alliance
- A4051 *Pinus ponderosa* - *Cercocarpus intricatus* Bedrock Cliff & Canyon Wooded Scrub Alliance
- A4052 *Ephedra* spp. - *Leymus salinus* - *Eriogonum corymbosum* Badlands Cold Desert Sparse Vegetation Alliance
- A4050 *Ephedra viridis* - *Chrysothamnus viscidiflorus* - *Rhus trilobata* Talus Sparse Scrub Alliance

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al.

Author of Description: K.A. Schulz, M.S. Reid and G. Kittel

Acknowledgments:

Version Date: 11/06/2015

Classif Resp Region: West

Internal Author: KAS 12-10, 11-15, mod. MSR 9-13, mod. GK 8-15

REFERENCES

References: Barbour and Billings 2000, Brodo et al. 2001, Day and Wright 1985, ENTRIX, Inc. 2007, Eyre 1980, Faber-Langendoen et al. 2017a, Graybosch and Buchanan 1983, Hansen et al. 2004c, Logan Simpson Design 2011, Nachlinger and Reese 1996, Shiflet 1994, Tisdale et al. 1965, Welsh 1979, Welsh and Chatterly 1985

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G570. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation

A4052. Ephedra spp. - Leymus salinus - Eriogonum corymbosum Badlands Cold Desert Sparse Vegetation Alliance

Type Concept Sentence: This alliance consists of sparsely vegetated (<10% vascular cover) areas with varied characteristic species such as *Enceliopsis nudicaulis*, *Eriogonum brevicaule*, *Leymus salinus ssp. salinus*, *Leymus salinus ssp. salmonis*, *Lupinus argenteus*, *Pseudoroegneria spicata*, and/or *Zuckia brandegeei*. This alliance occurs throughout the Intermountain West on badlands of shales, siltstones or mudstones on typically rounded hills and plains that form a rolling topography that can be steep and highly eroded.

OVERVIEW

Scientific Name: *Ephedra* spp. - *Leymus salinus* - *Eriogonum corymbosum* Badlands Cold Desert Sparse Vegetation Alliance

Common Name (Translated Scientific Name): Joint-fir species - Saline Wildrye - Crispleaf Buckwheat Badlands Cold Desert Sparse Vegetation Alliance

Colloquial Name: Intermountain Shale Badlands Cold Desert Sparse Vegetation

Type Concept: This alliance consists of sparsely vegetated (<10% vascular cover) areas with varied characteristic species such as *Enceliopsis nudicaulis*, *Eriogonum brevicaule*, *Leymus salinus ssp. salinus*, *Leymus salinus ssp. salmonis*, *Lupinus argenteus*, *Pseudoroegneria spicata*, and/or *Zuckia brandegeei*. Other species include dwarf-shrubs such as *Atriplex confertifolia*, *Gutierrezia* spp., and *Chrysothamnus viscidiflorus var. stenophyllus*. Characteristic forbs and grasses include *Achnatherum hymenoides*, *Arenaria hookeri*, *Astragalus* spp., *Cryptantha* spp., *Eriogonum pauciflorum*, *Machaeranthera grindelioides*, *Pleuraphis jamesii*, *Platyschkuhria integrifolia*, *Poa secunda*, and/or *Xylorhiza venusta*. This alliance occurs throughout the Intermountain West. Habitats are badlands of marine shales, siltstones and mudstones (clay). Landforms are typically rounded hills and plains that form a rolling topography, but at time can be steep and highly eroded. The harsh soil properties and high rate of erosion and deposition are driving environmental variables.

Classification Comments: Exactly where this transitions to ecological system Western Great Plains Badlands (CES303.663) in central Wyoming needs to be clarified.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure: Vegetation in this alliance has a sparse herbaceous layer codominated by perennial bunchgrasses and forbs. There are also sparsely scattered short shrubs and scale-leaved trees. Annual forbs and grasses are seasonally present.

Floristics: This alliance consists of sparsely vegetated (<10% vascular cover) areas with varied characteristic species such as *Enceliopsis nudicaulis*, *Eriogonum brevicaule*, *Leymus salinus ssp. salinus*, *Leymus salinus ssp. salmonis*, *Lupinus argenteus*, *Pseudoroegneria spicata* and/or *Zuckia brandegeei*. Other species include dwarf-shrubs such as *Atriplex confertifolia*, *Gutierrezia* spp., and *Chrysothamnus viscidiflorus var. stenophyllus*. Characteristic forbs and grasses include *Achnatherum hymenoides*, *Arenaria hookeri*, *Astragalus* spp., *Cryptantha* spp., *Eriogonum pauciflorum*, *Machaeranthera grindelioides*, *Pleuraphis jamesii*, *Platyschkuhria integrifolia*, *Poa secunda*, and/or *Xylorhiza venusta*.

ENVIRONMENT & DYNAMICS

Environmental Description: This alliance occurs on steep slopes composed of fine volcanic tuffs or clays at low elevations, from roughly 1280 to 1890 m. This substrate is typically unstable, with constant downslope movement of soil surface layers, and a high shrink-swell ratio. Chronic soil disturbance is therefore a major factor in the species composition of the alliance. Soil textures range

from sandy clay, clay to clay loam, and may be alkaline. The effects of shrink-swell action and sheet erosion in these soils are evident in the high percentage of bare ground.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found in the cool semi-desert region of the intermountain western U.S., from Arizona and New Mexico north to Idaho and Montana. It is confirmed by Oregon and Washington reviewers to not occur in either of those states.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, UT, WY

TNC Ecoregions [optional]: 6:P, 9:C, 10:C, 11:C, 12:?, 18:C, 19:C, 20:C, 21:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: NPS (Lake Mead)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Chrysothamnus nauseosus*/*Eriogonum brevicaule* Community Type (DeVelice and Lesica 1993) [synonym for the sole association in this alliance.]
- ? *Ephedra torreyana*-*Psorothamnus fremontii* Sparsely Vegetated Alliance (Evens et al. 2014)
- ? Mixed Desert Shrubland (Knight et al. 1987) [This alliance may correspond to this general type if *Eriogonum brevicaule* is substituted for *Eriogonum pauciflorum*.]

LOWER LEVEL UNITS

Associations:

- CEGLO02745 *Leymus salinus* Shale Sparse Vegetation
- CEPP006743 *Psorothamnus fremontii* / Cryptogamic Crust (Gypsum) Sparse Vegetation
- CEGLO01643 *Leymus salinus* ssp. *salmonis* - *Lupinus argenteus* Sparse Vegetation
- CEGLO02979 *Eriogonum corymbosum* Badlands Sparse Vegetation
- CEGLO01642 *Leymus salinus* ssp. *salmonis* - *Enceliopsis nudicaulis* Sparse Vegetation
- CEGLO01343 *Eriogonum corymbosum* / *Leymus salinus* Dwarf-shrubland
- CEGLO02493 *Zuckia brandegeei* Sparse Vegetation
- CEGLO02349 *Ephedra torreyana* - (*Atriplex* spp.) / Nonvascular Gypsum Sparse Vegetation
- CEGLO02350 *Ephedra torreyana* - *Artemisia bigelovii* Sparse Vegetation
- CEGLO02353 *Ephedra torreyana* Sparse Vegetation
- CEGLO04013 *Eriogonum leptophyllum* Sparse Vegetation
- CEGLO05319 *Eriogonum brevicaule* - Cushion Plants Sparse Vegetation
- CEGLO05116 *Ephedra trifurca* Badlands Shrubland
- CEGLO01667 *Pseudoroegneria spicata* - *Eriogonum brevicaule* Sparse Vegetation
- CEGLO02976 *Ephedra nevadensis* / Lichens Sparse Vegetation

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: DeVelice and Lesica 1993, Evens et al. 2014, Faber-Langendoen et al. 2017b, Knight et al. 1987, Lesica and DeVelice 1992, Moseley 1987b, Tiedemann et al. 1987

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G570. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation

A4050. *Ephedra viridis* - *Chrysothamnus viscidiflorus* - *Rhus trilobata* Talus Sparse Scrub Alliance

Type Concept Sentence: This alliance consists of very open to sparse shrubs; typical species include *Artemisia bigelovii*, *Atriplex canescens*, *Brickellia* spp., *Chrysothamnus viscidiflorus*, *Ephedra viridis*, *Ericameria nauseosa*, *Fallugia paradoxa*, and/or *Rhus trilobata*. It occupies sparsely vegetated (<10% vascular plant cover) talus and colluvial slopes in the intermountain western U.S.

OVERVIEW

Scientific Name: *Ephedra viridis* - *Chrysothamnus viscidiflorus* - *Rhus trilobata* Talus Sparse Scrub Alliance

Common Name (Translated Scientific Name): Mormon-tea - Yellow Rabbitbrush - Skunkbush Sumac Talus Sparse Scrub Alliance

Colloquial Name: Intermountain Talus Sparse Scrub

Type Concept: This alliance consists of very open to sparse shrubs (<10% vascular plant cover); typical species include *Artemisia bigelovii*, *Atriplex canescens*, *Brickellia* spp., *Chrysothamnus viscidiflorus*, *Ephedra viridis*, *Ericameria nauseosa*, *Fallugia paradoxa*, and/or *Rhus trilobata*. It occupies sparsely vegetated talus and colluvial slopes. Sites range from dry and warm through some cooler aspects. Many types occur on tablelands and cliffs with talus and colluvial slopes below them. Substrates are predominantly sedimentary rocks, such as sandstone, shale, and limestone. These species are utilizing moisture from cracks and pockets where soil accumulates, and can tolerate rock-fall and movement since generally these are unstable substrates. This alliance occurs throughout the intermountain western U.S.

Classification Comments: Other associations in the west occur on talus and scree slopes from subalpine into the intermountain basins or low-elevation canyons. Most of these are currently placed into other groups. For now this alliance is constrained to generally sparsely vegetated talus, scree and colluvial slopes, but this treatment will need further review.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure: Sparsely vegetated with <10% vascular plant cover of evergreen and deciduous shrubs, generally <2 m in height.

Floristics: This alliance consists of very open to sparse shrubs (<10% vascular plant cover); typical species include *Artemisia bigelovii*, *Atriplex canescens*, *Brickellia* spp., *Chrysothamnus viscidiflorus*, *Ephedra viridis*, *Ericameria nauseosa*, *Fallugia paradoxa*, and/or *Rhus trilobata*.

ENVIRONMENT & DYNAMICS

Environmental Description: Sites occur predominantly on talus and colluvial slopes. Aspects are mostly dry and warm but range to cool. Many types occur on tablelands and cliffs with talus and colluvial slopes below them. Substrates are predominantly sedimentary rocks, such as sandstone, shale, and limestone. Plants are utilizing moisture from cracks and pockets where soil accumulates, and can tolerate rockfall and movement, since generally these are unstable substrates.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance occurs on the Colorado Plateau and extends west throughout the Great Basin and northeast into Wyoming.

Nations: US

States/Provinces: AZ, CO, ID, NM, NV, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG001287 *Atriplex canescens* - *Ephedra viridis* Talus Shrubland
- CEG003496 *Fallugia paradoxa* - *Brickellia* spp. - (*Holodiscus dumosus*) Scree Shrubland
- CEG002927 *Atriplex canescens* - (*Ephedra viridis*) / (*Muhlenbergia porteri*) Sandstone Sparse Vegetation

- CEPP006704 *Ericameria cuneata* var. *spathulata* Shrubland
- CEGLO03755 *Artemisia bigelovii* - *Ephedra (viridis, torreyana)* Talus Shrubland
- CEGLO03961 *Ericameria nauseosa* - (*Xylorhiza tortifolia*) Talus Sparse Shrubland
- CEGLO03776 *Rhus trilobata* - *Ephedra (viridis, torreyana)* Talus and Slickrock Shrubland
- CEGLO02347 *Chrysothamnus viscidiflorus* Talus Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Faber-Langendoen et al. 2017b, Hansen et al. 2004b

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G570. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation

A4053. Eriogonum ovalifolium - Fallugia paradoxa - Andropogon hallii Lava & Cinder Sparse Vegetation

Alliance

Type Concept Sentence: This alliance consists of woody, scrub and subshrub-dominated sparse vegetation (<10% cover) with species such as *Artemisia filifolia*, *Atriplex canescens*, *Ephedra* spp., *Eriogonum corymbosum*, *Eriogonum ovalifolium*, and/or *Fallugia paradoxa*. This alliance occurs in the intermountain western U.S. on lava flows, cinder fields, and sand dunes.

OVERVIEW

Scientific Name: *Eriogonum ovalifolium* - *Fallugia paradoxa* - *Andropogon hallii* Lava & Cinder Sparse Vegetation Alliance

Common Name (Translated Scientific Name): Cushion Buckwheat - Apache Plume - Sand Bluestem Lava & Cinder Sparse Vegetation Alliance

Colloquial Name: Intermountain Basins Lava & Cinder Sparse Vegetation

Type Concept: This alliance consists of woody, scrub and subshrub-dominated sparse vegetation (<10% cover) with either trees such as *Pinus ponderosa*, *Pinus flexilis*, or *Juniperus* spp. or shrubs such as *Artemisia filifolia*, *Atriplex canescens*, *Ephedra* spp., *Eriogonum corymbosum*, *Eriogonum ovalifolium*, and/or *Fallugia paradoxa*. The grass *Andropogon hallii* may be dominant (yet sparse) on some sites. Other forbs present may include *Chaenactis douglasii*, *Cryptantha interrupta*, *Machaeranthera canescens*, *Phacelia hastata*, *Stephanomeria minor* (= *Stephanomeria tenuifolia*), and *Pleiacanthus spinosus* (= *Stephanomeria spinosa*). *Allium simillimum*, *Lewisia rediviva*, *Mimulus nanus*, and *Mimulus suksdorfii* may be present in the spring. This alliance occurs in the intermountain western U.S. Sites are lava flows, cinder fields and sand dunes. Volcanic substrates include basalt lava and dikes with associated colluvium, basalt cliff faces and uplifted "backbones," tuff, and cinder cones or cinder fields. It may occur as large-patch, small-patch and linear (dikes) spatial patterns.

Classification Comments: Other associations occur on volcanic substrates throughout the western U.S., and are placed into other groups and alliances. This alliance is restricted to sparsely vegetated situations, but distinguishing it from others where the vegetation is more dense may be difficult. Rules will need to be determined.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure: This alliance has sparsely vegetated (<10%) vascular cover and includes conifer trees, evergreen and deciduous shrubs, subshrubs, and graminoids.

Floristics: Stands have either trees such as *Pinus ponderosa*, *Pinus flexilis*, or *Juniperus* spp. or shrubs such as *Artemisia filifolia*, *Atriplex canescens*, *Ephedra* spp., *Eriogonum corymbosum*, *Eriogonum ovalifolium*, and/or *Fallugia paradoxa*. The grass *Andropogon hallii* may be dominant (yet sparse) on some sites. Other forbs present may include *Chaenactis douglasii*, *Cryptantha interrupta*,

Machaeranthera canescens, *Phacelia hastata*, *Stephanomeria minor* (= *Stephanomeria tenuifolia*), and *Pleiacanthus spinosus* (= *Stephanomeria spinosa*). *Allium simillimum*, *Lewisia rediviva*, *Mimulus nanus*, and *Mimulus suksdorfii* may be present in the spring.

ENVIRONMENT & DYNAMICS

Environmental Description:

Dynamics:

DISTRIBUTION

Geographic Range: This alliance occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates. It occurs in Montana along the Rocky Mountain Front (east of the Continental Divide).

Nations: US

States/Provinces: AZ, ID, MT, NM, NV, OR, UT, WY

TNC Ecoregions [optional]: 4:C, 6:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG001401 *Eriogonum ovalifolium* var. *depressum* Dwarf-shrubland
- CEG005803 *Eriogonum corymbosum* Cinder Sparse Vegetation
- CEG002785 *Andropogon hallii* Colorado Plateau Open Rock Vegetation
- CEG005807 *Juniperus monosperma* Cinder Open Scrub Rock Vegetation
- CEG002929 *Pinus ponderosa* - (*Populus tremuloides*) / *Fallugia paradoxa* - (*Holodiscus dumosus*) Lava Bed Sparse Vegetation
- CEG005806 *Fallugia paradoxa* - (*Atriplex canescens*, *Ephedra torreyana*) Cinder Shrubland

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Day 1985, Day and Wright 1985, Faber-Langendoen et al. 2017b, Hansen et al. 2004c, Reid et al. 1994

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G570. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation

A4051. *Pinus ponderosa* - *Cercocarpus intricatus* Bedrock Cliff & Canyon Wooded Scrub Alliance [Low - Poorly Documented]

Type Concept Sentence: This alliance consists of widely scattered trees and shrubs (with <10% vascular plant cover), including *Atriplex* spp., *Cercocarpus intricatus*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Juniperus* spp., and *Pinus ponderosa*. It ranges from Wyoming and Utah west across the intermountain western U.S., is found from foothill to lower montane elevations and includes steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types.

OVERVIEW

Scientific Name: *Pinus ponderosa* - *Cercocarpus intricatus* Bedrock Cliff & Canyon Wooded Scrub Alliance

Common Name (Translated Scientific Name): Ponderosa Pine - Littleleaf Mountain-mahogany Bedrock Cliff & Canyon Wooded Scrub Alliance

Colloquial Name: Intermountain Bedrock Cliff & Canyon Wooded Scrub

Type Concept: This alliance consists of widely scattered trees and shrubs (with <10% vascular plant cover), including *Atriplex* spp., *Cercocarpus intricatus*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Juniperus* spp., and *Pinus ponderosa*. Other shrubs present

NBR alliances

may include *Amelanchier utahensis*, *Arctostaphylos patula*, *Artemisia bigelovii*, *Cercocarpus montanus*, *Glossopetalon spinescens* var. *meionandrum* (= *Forsellesia meionandra*), or *Ephedra viridis*. The herbaceous layer is diverse, variable and low in cover. Occasional dwarfed individuals (often only 1-1.5 m tall) of *Pinus edulis* or *Juniperus osteosperma* may occur. Colorful lichens may cover much of the surface of the exposed bedrock. This alliance ranges from Wyoming and Utah west across the intermountain western U.S. Sites are found from foothill to lower montane elevations and include steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types.

Classification Comments: Needs to be reviewed and additional floristics added. Other associations from different groups may belong in this alliance.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics: This alliance consists of widely scattered trees and shrubs (with <10% vascular plant cover), including *Atriplex* spp., *Cercocarpus intricatus*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Juniperus* spp., and *Pinus ponderosa*. Other shrubs present may include *Amelanchier utahensis*, *Arctostaphylos patula*, *Artemisia bigelovii*, *Cercocarpus montanus*, *Glossopetalon spinescens* var. *meionandrum* (= *Forsellesia meionandra*), or *Ephedra viridis*. The herbaceous layer is diverse, variable and low in cover. Occasional dwarfed individuals (often only 1-1.5 m tall) of *Pinus edulis* or *Juniperus osteosperma* may occur. Colorful lichens may cover much of the surface of the exposed bedrock.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands occur on a variety of exposed parent materials, rocky exposed sites, and massive sandstones, such as the Navajo, Weber, Cedar Mesa, White Rim, Kayenta and Wingate formations on the Colorado Plateau. Elevations range between 1412 and 2348 m (4630-7700 feet). Slopes range from level to vertical, and all aspects are possible. The vegetation roots in crevices where sandy soil collects.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance ranges from Colorado and Utah west but occurs predominantly in the Colorado Plateau region.

Nations: US

States/Provinces: AZ, CO, NM, NV, UT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG002741 *Pinus (ponderosa, jeffreyi)* Sparse Vegetation
- CEG003767 *Atriplex* spp. Desert Pavement Sparse Vegetation
- CEG002977 *Cercocarpus intricatus* Slickrock Sparse Vegetation
- CEG003834 *Coleogyne ramosissima* Sparse Shrubland
- CEG002978 *Cercocarpus montanus* Rock Pavement Sparse Vegetation
- CEG002972 *Pinus ponderosa* Slickrock Sparse Vegetation

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: M.S. Reid

Acknowledgments:**Version Date:** 2014/12/18**REFERENCES****References:** Faber-Langendoen et al. 2017b**M499. Western North American Cool Semi-Desert Ruderal Scrub & Grassland**

This upland cool semi-desert scrub and grassland macrogroup contains disturbed dry grasslands and shrublands dominated by non-native species or ruderal native species and is found from low-elevation basins to foothills throughout the western U.S. and Canada.

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

3.B.1.Ne.90.a. M499 Western North American Cool Semi-Desert Ruderal Scrub & Grassland

G600. Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

Type Concept Sentence: This semi-desert interior western U.S. ruderal shrubland and grassland group includes shrubland, shrub-steppe and grassland stands that are strongly dominated (>90% relative canopy cover) by invasive, exotic species. Additionally, this group contains shrubland and shrub-steppe that are dominated or codominated by native shrub species (>10% relative cover) with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species.

OVERVIEW**Scientific Name:** Great Basin-Intermountain Ruderal Dry Shrubland & Grassland Group**Common Name (Translated Scientific Name):** Great Basin-Intermountain Ruderal Dry Shrubland & Grassland Group**Colloquial Name:** Western Ruderal Crested Wheatgrass Grassland

Type Concept: This semi-desert interior western U.S. ruderal shrubland and grassland group includes shrubland, shrub-steppe and grassland stands that are strongly dominated (>90% relative canopy cover) by invasive, exotic species. Diagnostic invasive shrubs include *Alhagi maurorum*, *Cytisus striatus*, *Zygophyllum fabago*, or other exotic shrubs. Herbaceous stands include open to dense grasslands and forblands composed of either exotic annual or biennial grasses or forbs with low cover of perennial species (<10% absolute cover) or stands with a significant perennial herbaceous layer (>10% absolute cover) strongly dominated by exotics (>90% relative cover) with or without annuals and biennials present to dominant. There are relatively few cool, semi-arid invasive perennial graminoids such as *Agropyron cristatum*. Relatively mesic, invasive perennial hay grasses such as *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense* are typically absent or have low cover and are restricted to mesic microsites as they are more common in higher elevation or higher latitude, temperate climates or relatively mesic sites. Numerous exotic perennial herbaceous species may compose these stands, such as *Acroptilon repens*, *Cardaria draba*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea iberica*, *Centaurea stoebe* ssp. *micranthos*, *Centaurea virgata*, *Euphorbia esula*, *Hypericum perforatum*, *Lepidium latifolium*, *Peganum harmala*, or a mixture of other exotic forbs and graminoids. Stands dominated by annuals may be composed of annual grasses such as *Bromus arvensis* (= *Bromus japonicus*), *Bromus hordeaceus*, *Bromus madritensis*, *Bromus tectorum*, *Taeniatherum caput-medusae*, or annual forbs, including *Bassia scoparia* (= *Kochia scoparia*), *Brassica nigra*, *Centaurea melitensis*, *Centaurea solstitialis*, *Crupina vulgaris*, *Cynoglossum officinale*, *Descurainia sophia*, *Erodium cicutarium*, *Hyoscyamus niger*, *Isatis tinctoria*, *Salsola tragus*, *Sisymbrium altissimum*, *Taraxacum officinale*, or a mixture of other exotic annual forbs and grasses. Additionally, this group contains semi-desert shrublands and shrub-steppe that are dominated or codominated by native shrub species such as *Artemisia tridentata* with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species such as *Agropyron cristatum* or *Bromus tectorum*. Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills elevations up to 2200 m and are restricted to areas with the cool, semi-arid climate found in the intermountain western U.S. region. Stands can be large areas or narrow strips adjacent to roadsides or under powerlines and other disturbed areas. Soils are mostly mineral and well-drained. Due to disturbance, soils may be compacted. It is an early-successional type that may occur in areas disturbed by fire, grazing or mining. This group may grade into wetter areas and may have transition zones where mesic forbs intermix with wetter forbs and graminoids found in Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (G524). This group does not include the mesic introduced hay grasses such as *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense* that have escaped from improved pasture and irrigated meadow to invade montane grasslands. These grasslands are classified in the more temperate Western North American Interior Ruderal Grassland & Shrubland Group (G624).

Classification Comments: This group may be difficult to determine from native degraded shrublands and grasslands when non-native species codominate. The test is that the non-native species, especially invasive species, far outweigh (>90% relative cover) native species in abundance and richness, such that a well-trained observer cannot tell what the native counterpart may have been or to do so is only speculation. Dominant and diagnostic semi-arid exotic species *Agropyron cristatum* can be present to codominant in Western North American Interior Ruderal Grassland & Shrubland Group (G624) when codominated by relatively mesic species

such as *Bromus inermis* or exotic forage grasses such as *Agrostis stolonifera*, *Dactylis glomerata*, *Phleum pratense*, and *Poa pratensis* that are characteristic of more temperate climates.

This group may grade into wetter areas and may have transition zones where mesic forbs intermix with wetter forbs and graminoids found in Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (G524). This group does not include the mesic introduced hay grasses such as *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense* that have escaped from improved pasture and irrigated meadow to invade montane grasslands. These grasslands are classified in the more temperate Western North American Interior Ruderal Grassland & Shrubland Group (G624).

Similar NVC Types:

- G648 Southern Vancouverian Lowland Ruderal Grassland & Shrubland: may include similar alliances, but is restricted to lowlands west of the Cascade Range.
- G624 Western North American Interior Ruderal Grassland & Shrubland: has similar ruderal alliances but rather than occurring in cool, semi-arid sites, stands occur in cool, temperate regions and include montane, subalpine and alpine areas. Vegetation lacks obligate wetland species and is not dominated by facultative wetland species.
- G524 Western North American Ruderal Marsh, Wet Meadow & Shrubland: has similar ruderal alliances but occurs on mesic to wet sites and vegetation either includes obligate wetland species or is dominated by facultative wetland species.
- G819 North American Warm Desert Ruderal Scrub
- G677 North American Warm Desert Ruderal Grassland: may include similar alliances, but is restricted warm, semi-arid desert regions.

Diagnostic Characteristics: This ruderal shrubland and grassland group occurs in the semi-arid interior western U.S. and includes shrubland, shrub-steppe and grassland stands that are strongly dominated (>90% relative canopy cover) by invasive, exotic species. Additionally, this group contains shrubland and shrub-steppe that is dominated or codominated by native shrub species (>10% relative cover) with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species.

VEGETATION

Physiognomy and Structure: This group includes shrubland and shrub-steppe stands that have an open to dense shrub canopy, and annual and perennial grasslands and forblands with an open to dense herbaceous layer.

Floristics: This ruderal shrubland and grassland group includes shrubland and shrub-steppe stands that have an open to dense shrub canopy (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by invasive, introduced shrub species such as *Alhagi maurorum*, *Cytisus striatus*, *Zygophyllum fabago*, or other exotic shrubs. Additionally, this group includes shrubland and shrub-steppe that is dominated or codominated by native shrub species (>10% relative cover) with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species. Herbaceous layers are composed of either exotic annuals with low cover of perennial species, or high cover of exotic perennials. Also included in this group are open to dense ruderal herbaceous stands without a shrub layer (<10% absolute cover). The herbaceous understory (>10% absolute cover) is strongly dominated (>90% relative canopy cover) by exotic herbaceous species. Herbaceous layers are composed of either exotic annuals with low cover of perennial species (<5% absolute cover), or moderate perennial cover (>10% absolute cover) dominated by of exotic perennials, either graminoids or forbs or a combination. There are relatively few cool, semi-arid perennial graminoids such as *Agropyron cristatum* (which has frequently been purposefully seeded to prevent soil erosion or provide livestock forage). The relatively mesic, invasive perennial hay grasses such as *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense* are typically absent or have low cover and are restricted to mesic microsites as they are more common in higher elevation or higher latitude, temperate climates or relatively mesic sites. Numerous exotic perennial herbaceous species may compose these stands such as *Acroptilon repens*, *Cardaria draba*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea iberica*, *Centaurea stoebe ssp. micranthos*, *Centaurea virgata*, *Hypericum perforatum*, *Lepidium latifolium*, *Peganum harmala*, or a mixture of other exotic forbs and graminoids. Stands dominated by annuals may be composed of annual grasses such as *Bromus arvensis* (= *Bromus japonicus*), *Bromus hordeaceus*, *Bromus madritensis*, *Bromus tectorum*, *Taeniatherum caput-medusae*, or annual forbs, including *Bassia scoparia* (= *Kochia scoparia*), *Brassica nigra*, *Centaurea melitensis*, *Centaurea solstitialis*, *Crupina vulgaris*, *Cynoglossum officinale*, *Descurainia sophia*, *Erodium cicutarium*, *Hyoscyamus niger*, *Isatis tinctoria*, *Lepidium perfoliatum*, *Salsola tragus*, *Sisymbrium altissimum*, *Taraxacum officinale*, or a mixture of other exotic annual forbs and grasses.

ENVIRONMENT & DYNAMICS

Environmental Description: This interior western U.S. ruderal shrubland and grassland group is found on disturbed dry to mesic, basins, alluvial fans, and foothills elevations (up to 2200 m). Stands can be large areas or narrow strips adjacent to roadsides or under powerlines, in waste places such as abandoned agricultural fields that are no longer irrigated, oil and gas development areas, and other disturbed areas. *Climate:* This group occurs in the cool, semi-arid, continental, climate found intermountain western U.S. region. *Soil/substrate/hydrology:* Soils are mostly mineral and well-drained. Due to disturbance, soils may be compacted. It is an

early-successional type that may occur in areas disturbed by fire, grazing or mining. However, it also occurs over vast acres of heavily overgrazed lands in the arid west, where livestock such as cows and horses have broken soil biotic crust, compacted soil and reduced native plant vigor.

Dynamics: Most of the invasive diagnostic species are cool-season (C3) plants such as *Agropyron cristatum* and *Bromus tectorum*. Cheatgrass expansion has radically changed fire regimes and vegetation over large areas in the Intermountain West. Cheatgrass invades native vegetation such as big sagebrush shrubland, then produces large amounts of fine fuels that readily carry fire, increasing the number, size and frequency of burns (fire-return interval = 3-5 year) which reduces cover of perennial vegetation and favors dominance by annual grasses (Young and Evans 1978, Zouhar 2003). Crested wheatgrass burns quickly and is therefore less susceptible to damage by fire than some native bunchgrass species that have a thick cespitose growth form. The fire may stay longer in the culms, resulting in heat transfer to the ground and the death of the plant (DePuit 1986). In crested wheatgrass, there is usually little heat transfer into the soil, so the tillers and root system are usually undamaged (DePuit 1986). Thus the more frequent fire regime caused by the introduction of *Bromus tectorum* also favors the maintenance of *Agropyron cristatum* over the establishment or survival of native bunchgrasses (S. Rust pers. comm. 2014).

DISTRIBUTION

Geographic Range: This ruderal group contains disturbed semi-arid grasslands, meadows, shrublands and shrub-steppe found in the interior western U.S. on disturbed dry to mesic, basins, alluvial fans, and foothills elevations (up to 2200 m). Stands do not extend up into the cool, temperate zone in included mountain ranges. This group does not extend south to the warm deserts or east into the Great Plains or west into cismontane California or the west side of the Cascades.

Spatial Scale & Pattern [optional]:

Nations: CA, US

States/Provinces: AZ, CA, CO, ID, MT, ND, NV, OR, SD, SK, UT, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A4213 *Artemisia* spp. - Mixed Shrub Ruderal Understory Shrubland Alliance
- A3257 *Centaurea solstitialis* - *Isatis tinctoria* - *Salsola tragus* Ruderal Annual Forb Alliance
- A3253 *Alhagi maurorum* - *Zygophyllum fabago* Ruderal Shrubland Alliance
- A1814 *Bromus tectorum* - *Taeniatherum caput-medusae* Ruderal Annual Grassland Alliance
- A3255 *Cardaria draba* - *Centaurea* spp. - *Lepidium latifolium* Ruderal Perennial Forb Alliance
- A4148 *Agropyron cristatum* Western Ruderal Perennial Grassland Alliance

AUTHORSHIP

Primary Concept Source: Faber-Langendoen et al. (2015)

Author of Description: G. Kittel and K.A. Schulz

Acknowledgments:

Version Date: 04/16/2015

Classif Resp Region: West

Internal Author: GK 5-12, mod. KAS 4-13, 4-15

REFERENCES

References: DePuit 1986, Faber-Langendoen et al. 2017a, Johnson and O'Neil 2000, Maser et al. 1984, Rust pers. comm., Young and Evans 1978, Zouhar 2003

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G600. Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

A4148. *Agropyron cristatum* Western Ruderal Perennial Grassland Alliance

Type Concept Sentence: This semi-arid interior western U.S. ruderal perennial grassland alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic perennial grasses, especially *Agropyron cristatum*, which can occur as a near-monoculture or mixed grassland with other exotic perennial grasses such as *Poa pratensis* and exotic perennial forbs and annuals.

OVERVIEW

Scientific Name: *Agropyron cristatum* Western Ruderal Perennial Grassland Alliance

Common Name (Translated Scientific Name): Crested Wheatgrass Western Ruderal Perennial Grassland Alliance

Colloquial Name: Western Ruderal Crested Wheatgrass Grassland

Type Concept: This ruderal perennial grassland alliance occurs in the interior western U.S. The vegetation is strongly dominated (>90% relative canopy cover) by invasive, exotic perennial grasses, especially *Agropyron cristatum*, which can occur as a near-monoculture or mixed grassland with other exotic perennial species such as *Poa pratensis*, and exotic perennial forbs and annuals. *Agropyron cristatum* has been purposefully seeded to prevent soil erosion and provide livestock forage in many areas and has naturalized outside these plantings. Scattered shrubs may be present but have low cover (<10% absolute cover). Native perennial graminoid species may be present but cover is low (<10% relative cover). Highly invasive and wind- and animal-distributed exotic forb and annual grass species may be present, including *Sisymbrium altissimum*, *Descurainia sophia*, *Halogeton glomeratus*, and *Salsola tragus*. Although exotic forbs and annual grasses may be abundant in the herbaceous layer and contribute to its ruderal nature, exotic perennial graminoids characterize the site. Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m throughout the cool, semi-arid interior western U.S. Vegetation dominated by relatively mesic, invasive perennial hay grasses such as *Bromus inermis*, *Dactylis glomerata*, *Phleum pratense*, and *Poa pratensis* generally occurs at higher elevations, higher latitudes or mesic microsites such as north slopes and generally has a more temperate climate and relatively mesic site conditions.

Classification Comments: *Agropyron cristatum* is an Old World introduction that grows in many alliances, especially on disturbed sites. Ranchers have planted thousands of hectares in the arid and semi-arid West to improve forage for use by livestock; it is palatable to wildlife, including antelope, deer, elk, birds, and small rodents. It naturalizes and dominates large areas, especially from northern parts of transmontane California east to the northwestern Great Plains (Ogle 2001, Kittel et al. 2012a). In conjunction with plantings, grazing pressures and changes in fire regime have caused shifts in native sagebrush stands with native understories of *Achnatherum hymenoides*, *Elymus elymoides*, *Festuca idahoensis*, *Leymus cinereus*, and *Poa secunda* into non-native understories or stands of *Agropyron cristatum* and/or *Bromus tectorum*.

Internal Comments:

Other Comments:

Similar NVC Types: Western North American Interior Ruderal Grassland & Shrubland Group (G624) has similar ruderal alliances but rather than occurring in cool, semi-arid sites, stands occur in cool, temperate regions and includes montane, subalpine and alpine areas. Vegetation lacks obligate wetland species and is not dominated by facultative wetland species. Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (G524) has similar ruderal alliances but occurs on mesic to wet sites and vegetation either includes obligate wetland species or is dominated by facultative wetland species. Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group (G648) may include similar alliances, but is restricted to lowlands west of the Cascade Range. North American Warm Desert Ruderal Grassland Group (G677) may include similar alliances, but is restricted warm, semi-arid desert regions.

- A3254 *Agropyron cristatum* - *Bromus inermis* - *Poa pratensis* Ruderal Grassland Alliance: is very similar floristically, but is restricted to the western Great Plains.

Diagnostic Characteristics: Dominant diagnostic species for this alliance are invasive, perennial grass species such as *Agropyron cristatum*. There are relatively few cool, semi-arid perennial exotic grasses, but there are usually abundant annual exotic species present, seasonally.

VEGETATION

Physiognomy and Structure: This ruderal alliance is characterized by sparse to dense herbaceous layer dominated by perennial grasses with low cover of shrubs or annual graminoids and forbs (<5% absolute cover).

Floristics: The vegetation is strongly dominated (>90% relative canopy cover) by invasive, exotic perennial grasses, especially *Agropyron cristatum*, which can occur as a near-monoculture or mixed grassland with other exotic perennial species such as *Poa pratensis*, and exotic perennial forbs and annuals. *Agropyron cristatum* has been purposefully seeded to prevent soil erosion and provide livestock forage in many areas and has naturalized outside these plantings. Scattered shrubs may be present but have low cover (<10% absolute cover). Native perennial graminoid species such as *Hesperostipa comata* may be present but cover is low

(<10% relative cover). Highly invasive and wind- and animal-distributed exotic forb and annual grass species may be present, including *Sisymbrium altissimum*, *Descurainia sophia*, *Halogeton glomeratus*, and *Salsola tragus*. Although exotic forbs and annual grasses may abundant in the herbaceous layer and contribute to its ruderal nature, exotic perennial graminoids characterize the site. Relatively mesic, invasive perennial hay grasses such as *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense* are absent or have low cover as they are more common in at higher elevations, higher latitudes or mesic microsites and generally occur in more temperate climates or relatively mesic sites.

ENVIRONMENT & DYNAMICS

Environmental Description: This ruderal perennial grassland alliance occurs in the interior western U.S. Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to approximately 2200 m throughout the cool, semi-arid interior western U.S. Vegetation dominated by relatively mesic, invasive perennial hay grasses generally occurs at higher elevations, higher latitudes or mesic microsites such as north slopes and generally has a more temperate climate and relatively mesic site conditions. Stands can occur in a wide variety of human-disturbed habitats, including highway rights-of-way, revegetation projects, etc.

Dynamics: *Agropyron cristatum* burns quickly and is less susceptible to fire damage than native bunchgrasses. Its heat transfer is minimal into the soil, so the tillers and root system are usually undamaged. Tracks of *Agropyron cristatum* carry fires easily; they may promote the expansion and persistence of the type (Johnson 1986c). Managers plant *Agropyron cristatum* extensively in the Great Basin after burns and for erosion control. Its persistence following plantings involves shifts in the ecological function. Established plants replace natives; some plantings have resulted in pure stands (Johnson 1986c). Bakker et al. (2003) found that the control of *Agropyron cristatum* was possible without suppressing native bunchgrasses by both annual and early spring spraying with a generalist herbicide (glyphosate). This herbicide selectively killed the cool-season *Agropyron cristatum*. Bakker et al. (2003) found *Agropyron cristatum* persisting over 4 years in spite of annual herbicide application, and cover in control plots particularly increased with increased summer precipitation. They suggested that management focus on controlling *Agropyron cristatum* during dry years and on establishing native species during wet years.

DISTRIBUTION

Geographic Range: This alliance occurs at plains, basins, and foothill elevations (up to 2200 m) throughout the cool, semi-arid interior western U.S.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 4:C, 11:C

USFS Ecoregions (2007): 341D:CC, 341F:CC, 342B:CC, M261G:CC

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- = *Agropyron cristatum* (Crested wheatgrass rangelands) Semi-natural Stands (Sawyer et al. 2009) [42.030.00]
- = *Agropyron cristatum* Herbaceous Semi-Natural Alliance (CNPS 2017) [42.030.00]
- < Crested wheatgrass series (Sawyer and Keeler-Wolf 1995)
- < Great Basin Grassland (#43000) (Holland 1986b)

LOWER LEVEL UNITS

Associations:

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2014)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Allen-Diaz and Bartolome 1998, Asay and Knowles 1985, Bakker et al. 2003, CNPS 2017, Coffin et al. 1996, Dillman 1946, Eckert et al. 1961, Faber-Langendoen et al. 2017b, Garrison et al. 1977, Holland 1986b, Johnson 1986c, Kittel et al. 2012a, Ogle 2001, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, USFS 1937, Whitson et al. 2000, Zlatnik 1999d

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G600. Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

A3253. *Alhagi maurorum* - *Zygophyllum fabago* Ruderal Shrubland Alliance

Type Concept Sentence: This cool, semi-arid interior western U.S. ruderal shrubland alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic shrub species such as *Alhagi maurorum*, *Cytisus striatus*, or *Zygophyllum fabago* and occurs in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m.

OVERVIEW

Scientific Name: *Alhagi maurorum* - *Zygophyllum fabago* Ruderal Shrubland Alliance

Common Name (Translated Scientific Name): Camelthorn - Syrian Bean-caper Ruderal Shrubland Alliance

Colloquial Name: Ruderal Camelthorn - Syrian Bean-caper Shrubland

Type Concept: This interior western U.S. ruderal shrubland alliance has an open to dense shrub canopy (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by invasive, introduced shrub species such as *Alhagi maurorum*, *Cytisus striatus*, or *Zygophyllum fabago*. Additionally, this alliance includes shrublands dominated or codominated by native shrub species (>10% relative cover) with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species. Herbaceous layers are composed of either exotic annuals with low cover of perennial species, or high cover of exotic perennials. Numerous exotic herbaceous species may compose the introduced herbaceous layer such as *Bromus tectorum*, *Brassica nigra*, and *Agropyron cristatum*. Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills from sea level to 2200 m elevation throughout the cool, semi-arid intermountain western U.S. region. It is an early-successional type that may occur in areas disturbed by fire, grazing or mining.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types: Western North American Interior Ruderal Grassland & Shrubland Group (G624) has similar ruderal alliances but rather than occurring in cool, semi-arid sites, stands occur in cool, temperate regions and includes montane, subalpine and alpine areas. Vegetation lacks obligate wetland species and is not dominated by facultative wetland species. Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (G524) has similar ruderal alliances but occurs on mesic to wet sites and vegetation either includes obligate wetland species or is dominated by facultative wetland species. Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group (G648) may include similar alliances, but is restricted to lowlands west of the Cascade Range. North American Warm Desert Ruderal Grassland Group (G677) may include similar alliances, but is restricted warm, semi-arid desert regions.

Diagnostic Characteristics: Dominant diagnostic species for this alliance are invasive shrubs such as *Alhagi maurorum*, *Cytisus striatus*, or *Zygophyllum fabago*. Additionally, this alliance includes shrublands dominated or codominated by native shrub species (>10% absolute shrub cover) with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species.

VEGETATION

Physiognomy and Structure: This ruderal alliance is characterized by an open to dense shrub canopy (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by invasive, introduced shrub and sparse to dense herbaceous layer dominated by perennial forbs with low cover of shrubs or annual graminoids and forbs (<5% absolute cover).

Floristics: This interior western U.S. ruderal shrubland alliance has an open to dense shrub canopy (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by invasive, introduced shrub species such as *Alhagi maurorum*, *Cytisus striatus*, or *Zygophyllum fabago*. Additionally, this alliance includes shrublands dominated or co-dominated by native shrub species (>10% relative cover) with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species. Herbaceous layers are composed of either exotic annuals with low cover of perennial species, or high cover of exotic perennials. Numerous exotic herbaceous species may compose the introduced herbaceous layer such as *Agropyron cristatum*, *Bromus tectorum*, *Cardaria draba*, or *Centaurea solstitialis*.

ENVIRONMENT & DYNAMICS

Environmental Description: This ruderal shrubland alliance occurs in the cool, semi-arid interior western U.S. Elevations range from sea level up to 2200 m. Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills. Substrates are variable. Disturbance is important to initiating and maintaining many of these stands.

Dynamics:

DISTRIBUTION

Geographic Range: This ruderal shrubland alliance occurs in the cool, semi-arid interior western U.S.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGL002784 *Alhagi maurorum* Ruderal Scrub

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Faber-Langendoen et al. 2017b, USFS 1937, Whitson et al. 2000

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G600. Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

A4213. Artemisia spp. - Mixed Shrub Ruderal Understory Shrubland Alliance [Low - Poorly Documented]

Type Concept Sentence: Sagebrush shrublands with native shrubs in the overstory canopy and non-native herbaceous species in the understory; a wide spread example is *Artemisia tridentata* / *Bromus tectorum* shrubland.

OVERVIEW

Scientific Name: *Artemisia* spp. - Mixed Shrub Ruderal Understory Shrubland Alliance

Common Name (Translated Scientific Name): Sagebrush species - Mixed Shrub Ruderal Understory Shrubland Alliance

Colloquial Name: Great Basin-Intermountain Ruderal Understory Shrubland

Type Concept: This alliance covers those native shrublands that have had their herbaceous component completely replaced by non-native, invasive herbaceous species. Overstory shrubs include *Artemisia tridentata* (all subspecies), *Artemisia tridentata* ssp. *spiciformis* (= *Artemisia spiciformis*), *Artemisia arbuscula*, and *Artemisia tripartita*. Understory dominant herbaceous non-native species include graminoids *Bromus tectorum*, *Agropyron cristatum*, *Agrostis stolonifera*, *Taeniatherum caput-medusae*, *Poa bulbosa*, *Bromus diandrus*, and forbs *Sisymbrium altissimum*, *Descurainia pinnata*, *Onopordum acanthium*, *Cirsium* spp., *Centaurea* spp., *Lepidium* spp., and many others. Native herbaceous species may be present, but occur in very low abundance, less than 10% relative cover of all herbaceous cover. These stands occur in all areas where native sagebrush stands occur throughout the western US.

Classification Comments:

Internal Comments: GK 9-16: CA & OR confirmed and MT & NM added.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Stands are dominated in the understory layer by non-natives, such that the native association cannot be determined.

VEGETATION

Physiognomy and Structure:

Floristics:

ENVIRONMENT & DYNAMICS

Environmental Description:

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found throughout the western U.S.

Nations: US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGLO05480 *Artemisia tripartita ssp. tripartita* / *Bromus tectorum* Ruderal Shrubland
- CEGLO02528 *Artemisia tridentata ssp. vaseyana* / *Poa pratensis* Ruderal Shrubland
- CEGLO05593 *Chrysothamnus viscidiflorus* / *Poa secunda* - *Bromus tectorum* Ruderal Shrubland
- CEGLO05591 *Chrysothamnus viscidiflorus* / *Bromus tectorum* Ruderal Shrubland
- CEGLO02985 *Artemisia arbuscula ssp. longicaulis* / *Bromus tectorum* Ruderal Shrubland
- CEGLO02699 *Artemisia tridentata* - (*Ericameria nauseosa*) / *Bromus tectorum* Ruderal Shrubland
- CEGLO02937 *Ericameria nauseosa* / *Bromus tectorum* Ruderal Shrubland
- CEGLO05472 *Artemisia arbuscula ssp. arbuscula* / *Bromus tectorum* Ruderal Shrubland
- CEGLO05475 *Artemisia tridentata ssp. vaseyana* / *Bromus tectorum* Ruderal Shrubland
- CEGLO05590 *Chrysothamnus viscidiflorus* / *Agropyron cristatum* Ruderal Shrubland
- CEGLO05477 *Artemisia tridentata ssp. wyomingensis* / *Bromus tectorum* Ruderal Shrubland
- CEGLO02083 *Artemisia tridentata ssp. wyomingensis* / Disturbed Understory Ruderal Shrubland
- CEGLO02339 *Artemisia tridentata ssp. vaseyana* / *Poa (pratensis, compressa)* Ruderal Shrub Grassland
- CEGLO02355 *Ephedra viridis* / *Bromus tectorum* Ruderal Shrubland
- CEGLO02185 *Artemisia tridentata ssp. wyomingensis* / (*Agropyron cristatum*, *Psathyrostachys juncea*) Seeded Grasses Ruderal Shrubland
- CEGLO02933 *Chrysothamnus viscidiflorus* / *Poa pratensis* Ruderal Shrub Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2015)

Author of Description: G. Kittel

Acknowledgments:

Version Date: 2016/09/28

REFERENCES

References: Faber-Langendoen et al. 2017b, Hickman 1993, Sawyer et al. 2009

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G600. Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

A1814. *Bromus tectorum* - *Taeniatherum caput-medusae* Ruderal Annual Grassland Alliance

Type Concept Sentence: This cool, semi-arid interior western U.S. ruderal annual grassland alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic annual grass species such as *Bromus tectorum*, and less commonly *Bromus arvensis*, *Bromus hordeaceus*, *Bromus madritensis*, or *Taeniatherum caput-medusae*. It occurs in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m.

OVERVIEW

Scientific Name: *Bromus tectorum* - *Taeniatherum caput-medusae* Ruderal Annual Grassland Alliance

Common Name (Translated Scientific Name): Cheatgrass - Medusa-head Ruderal Annual Grassland Alliance

Colloquial Name: Ruderal Cheatgrass - Medusa-head Annual Grassland

Type Concept: This interior western U.S. ruderal annual grassland alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic annual grass species such as *Bromus tectorum*, and less commonly *Bromus arvensis* (= *Bromus japonicus*), *Bromus hordeaceus*, *Bromus madritensis*, *Onopordum acanthium*, *Taeniatherum caput-medusae*, or a mixture of other exotic annual grasses. Cover of perennials is low (<5% absolute cover). Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m throughout the cool, semi-arid interior western U.S. region. It is an early-successional type that may occur in areas disturbed by fire, grazing or mining.

Classification Comments: This alliance includes grasslands dominated by other Eurasian introduced annual *Bromus* species. It is distinct from the annual *Bromus* communities found along the Pacific coast with Mediterranean or maritime climates because it does not have the introduced annual oatgrass (*Avena barbata* and *Avena fatua*), or other species typical of the California annual grassland (Sawyer and Keeler-Wolf 1995).

Internal Comments:

Other Comments:

Similar NVC Types: Western North American Interior Ruderal Grassland & Shrubland Group (G624) has similar ruderal alliances but rather than occurring in cool, semi-arid sites, stands occur in cool, temperate regions and includes montane, subalpine and alpine areas. Vegetation lacks obligate wetland species and is not dominated by facultative wetland species. Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (G524) has similar ruderal alliances but occurs on mesic to wet sites and vegetation either includes obligate wetland species or is dominated by facultative wetland species. Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group (G648) may include similar alliances, but is restricted to lowlands west of the Cascade Range. North American Warm Desert Ruderal Grassland Group (G677) may include similar alliances, but is restricted warm, semi-arid desert regions.

Diagnostic Characteristics: This disturbed grassland alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic annual grass species such as *Bromus tectorum*, and less commonly *Bromus arvensis*, *Bromus hordeaceus*, *Bromus madritensis*, *Taeniatherum caput-medusae*, or a mixture of other exotic annual grasses. Cover of perennials is low (<5% absolute cover). Stands are restricted lower elevation sites (up to 2200 m) throughout the cool, semi-arid interior western U.S.

VEGETATION

Physiognomy and Structure: This alliance is characterized by sparse to dense annual grasslands with low cover of shrub or perennial graminoids or forbs (<5% absolute cover).

Floristics: This interior western U.S. ruderal annual grassland alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic annual grass species such as *Bromus tectorum*, and less commonly *Bromus arvensis* (= *Bromus japonicus*), *Bromus hordeaceus*, *Bromus madritensis*, *Taeniatherum caput-medusae*, or a mixture of other exotic annual grasses. Cover of perennials is low (<5% absolute cover).

ENVIRONMENT & DYNAMICS

Environmental Description: Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m. Climate is cool, semi-arid. Substrates are variable.

Dynamics: *Bromus tectorum* is an annual grass and is able to complete its lifecycle in the spring before drying out mid-summer. Its fine structure makes it extremely flammable when dry, and it will increase the fire frequency of a site (FEIS 2001). Frequent fires favor *Bromus tectorum* because they eliminate competing perennial vegetation and increase soil nitrogen, but do not kill all the *Bromus tectorum* seeds, which survive in the unburned organic material (FEIS 2001). This altered ecological process has promoted the spread of *Bromus tectorum* and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. (Young and Evans 1973, 1978, Daubenmire 1975).

T. Naumann (pers. comm. 2005) reported successful restoration of cheatgrass-invaded systems by the use of prescribed fire, timed and controlled so as to destroy the seeds of *Bromus tectorum* while stimulating growth in remnant native warm-season grasses. She also reported that prescribed fire was least successful in areas of shallow soils, presumably because native grasses cannot develop sufficient root mass to compete with cheatgrass. Work by Redente and others (e.g., Redente et al. 1992) indicates that, under some circumstances, native grass and shrub species can regain competitive advantage over annuals such as *Bromus tectorum* if a source of carbon, such as sugar or sawdust, is added to the system. Amending the soil with carbon increases the activity of soil microbes and results in the reduction of plant-available nitrogen.

This type is most common where disturbances have eliminated or largely set back the native vegetation. Where the brome grasses are invading native vegetation, the types may still be tracked as native types, since the native species may still persist. A recent study (Karl et al. 1999) found that, despite strong seed and seedling production by the exotic brome grasses (*Bromus arvensis*, *Bromus tectorum*), the large amount of herbaceous biomass produced by the two vegetatively propagating native grasses *Bouteloua gracilis* and *Pascopyrum smithii* suggests that these native grasses may well maintain their ecological importance in the stands.

Evans et al. (2001) studied the invasion by cheatgrass of an undisturbed native grassland in Canyonlands National Park (Virginia Park). Their study showed that *Bromus* may cause a short-term decrease in nitrogen loss by decreasing substrate availability and denitrification enzyme activity, but in the long term, nitrogen loss is likely to be greater in invaded sites because of increased fire frequency and greater nitrogen volatilization during fire. A study by Englund (2004) at the same site showed decreasing levels of soil organic carbon as *Bromus tectorum*, with its shallow root systems, replaced perennial grasses with their more massive root systems.

In Nevada, Beatley (1976) found dense stands of the introduced winter annual grass *Bromus tectorum* growing in disturbed *Artemisia* shrublands. *Bromus rubens* is more common in lower elevation sites and *Bromus tectorum* is most common in higher elevation sagebrush and pinyon-juniper communities.

DISTRIBUTION

Geographic Range: This exotic annual grassland is restricted to the cool, semi-arid interior western U.S.

Nations: CA?, US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]: 11:C

USFS Ecoregions (2007): 341Fd:CCC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Death Valley, Joshua Tree); USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Bromus tectorum* (Cheatgrass grassland) Semi-natural Stands (Sawyer et al. 2009) [42.020.00]
- > *Bromus tectorum* Semi-Natural Herbaceous Stands (Evens et al. 2012)
- > *Bromus tectorum* Semi-natural Herbaceous Alliance (Evens et al. 2014)

LOWER LEVEL UNITS

Associations:

- CEGLO03019 *Bromus tectorum* Ruderal Grassland
- CEGLO05614 *Sisymbrium altissimum* - *Bromus tectorum* Ruderal Grassland
- CEGLO05604 *Poa secunda* - *Bromus tectorum* Ruderal Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Beatley 1976, Daubenmire 1975, Englund 2004, Evans et al. 2001, Evens and San 2006, Evens et al. 2012, Evens et al. 2014, FEIS 2001, Faber-Langendoen et al. 2017b, Karl et al. 1999, Naumann pers. comm., Redente et al. 1992, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Thompson 2001, USFS 1937, VegCAMP and AIS 2013, Von Loh 2000, Whitson et al. 2000, Young and Evans 1973, Young and Evans 1978

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G600. Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

A3255. *Cardaria draba* - *Centaurea* spp. - *Lepidium latifolium* Ruderal Perennial Forb Alliance

Type Concept Sentence: This cool, semi-arid interior western U.S. ruderal herbaceous alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic perennial forbs such as *Acroptilon repens*, *Cardaria draba*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea iberica*, *Centaurea stoebe* ssp. *micranthos*, *Centaurea virgata*, *Euphorbia esula*, *Hypericum perforatum*, *Lepidium latifolium*, *Linaria dalmatica*, *Linaria vulgaris*, or *Peganum harmala* and occurs in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m.

OVERVIEW

Scientific Name: *Cardaria draba* - *Centaurea* spp. - *Lepidium latifolium* Ruderal Perennial Forb Alliance

Common Name (Translated Scientific Name): Whitetop - Knapweed species - Broadleaf Pepperweed Ruderal Perennial Forb Alliance

Colloquial Name: Ruderal Perennial Forb Meadow & Grassland

Type Concept: This interior western U.S. ruderal perennial herbaceous alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic perennial forbs such as *Acroptilon repens*, *Cardaria draba*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea iberica*, *Centaurea stoebe* ssp. *micranthos*, *Centaurea virgata*, *Euphorbia esula*, *Hypericum perforatum*, *Lepidium latifolium*, *Linaria dalmatica*, *Linaria vulgaris*, *Peganum harmala*, or a mixture of other exotic perennial forbs. Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m throughout the cool, semi-arid intermountain western U.S. region. It is an early-successional type that may occur in areas disturbed by fire, grazing or mining.

Classification Comments:

Internal Comments:

Other Comments:

Similar NVC Types: Western North American Interior Ruderal Grassland & Shrubland Group (G624) has similar ruderal alliances but rather than occurring in cool, semi-arid sites, stands occur in cool, temperate regions and includes montane, subalpine and alpine areas. Vegetation lacks obligate wetland species and is not dominated by facultative wetland species. Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (G524) has similar ruderal alliances but occurs on mesic to wet sites and vegetation either includes obligate wetland species or is dominated by facultative wetland species. Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group (G648) may include similar alliances, but is restricted to lowlands west of the Cascade Range. North American Warm Desert Ruderal Grassland Group (G677) may include similar alliances, but is restricted warm, semi-arid desert regions.

Diagnostic Characteristics: This disturbed ruderal herbaceous alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic perennial forb species such as *Acroptilon repens*, *Cardaria draba*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea iberica*, *Centaurea stoebe* ssp. *micranthos*, *Centaurea virgata*, *Euphorbia esula*, *Hypericum perforatum*, *Lepidium latifolium*, *Linaria dalmatica*, *Linaria vulgaris*, *Peganum harmala*, or a mixture of other exotic perennial forbs.

VEGETATION

Physiognomy and Structure: This ruderal alliance is characterized by sparse to dense herbaceous layer dominated by annual forbs with low cover of shrubs or perennial graminoids and forbs (<5% absolute cover).

Floristics: This interior western U.S. ruderal perennial herbaceous alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic perennial forbs such as *Acroptilon repens*, *Cardaria draba*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea iberica*, *Centaurea stoebe* ssp. *micranthos*, *Centaurea virgata*, *Euphorbia esula*, *Hypericum perforatum*, *Lepidium latifolium*, *Linaria dalmatica*, *Linaria vulgaris*, *Peganum harmala*, or a mixture of other exotic perennial forbs.

ENVIRONMENT & DYNAMICS

Environmental Description: This ruderal perennial herbaceous alliance occurs in the interior western U.S. Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m throughout the cool, semi-arid intermountain western U.S. region. It is an early-successional type that may occur in areas disturbed by fire, grazing or mining.

Dynamics:

DISTRIBUTION

Geographic Range: This ruderal herbaceous alliance occurs in lowland and foothill sites throughout the cool, interior western U.S.

Nations: CA, US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- > *Lepidium latifolium* (Perennial pepper weed patches) Semi-natural Stands (Sawyer et al. 2009) [52.205.00]
- > *Lepidium latifolium* Semi-Natural Stands (Perennial pepper weed patches) (Buck-Diaz et al. 2012)

LOWER LEVEL UNITS**Associations:****AUTHORSHIP**

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Buck-Diaz et al. 2012, Faber-Langendoen et al. 2017b, Sawyer et al. 2009, Sproul et al. 2011, USFS 1937, Whitson et al. 2000

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

G600. Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

A3257. Centaurea solstitialis - Isatis tinctoria - Salsola tragus Ruderal Annual Forb Alliance

Type Concept Sentence: This cool, semi-arid interior western U.S. ruderal annual herbaceous alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic annual forb species such as *Brassica nigra*, *Centaurea melitensis*, *Centaurea solstitialis*, *Crupina vulgaris*, *Cynoglossum officinale*, *Hyoscyamus niger*, *Isatis tinctoria*, or *Salsola tragus* and occurs in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m.

OVERVIEW

Scientific Name: *Centaurea solstitialis* - *Isatis tinctoria* - *Salsola tragus* Ruderal Annual Forb Alliance

Common Name (Translated Scientific Name): Yellow Star-thistle - Dyer's Woad - Prickly Russian-thistle Ruderal Annual Forb Alliance

Colloquial Name: Ruderal Annual Forb Meadow & Grassland

Type Concept: This ruderal herbaceous alliance occurs in the interior western U.S. Vegetation is strongly dominated (>90% relative canopy cover) by invasive, exotic annual forb species such as *Brassica nigra*, *Centaurea melitensis*, *Centaurea solstitialis*, *Crupina vulgaris*, *Cynoglossum officinale*, *Hyoscyamus niger*, *Isatis tinctoria*, *Salsola tragus* or a mixture of other exotic annual forbs. Other exotic annual forbs are often present to dominant in disturbed stands, including *Bassia scoparia* (= *Kochia scoparia*), *Descurainia sophia*, *Erodium cicutarium*, *Lepidium perfoliatum*, *Onopordum acanthium*, *Sisymbrium altissimum*, and *Taraxacum officinale*. Cover of perennials is low (<5% absolute cover). Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m throughout the cool, semi-arid intermountain western U.S. region. It is an early-successional type that may occur in areas disturbed by fire, grazing or mining.

Classification Comments: The aggressive invasive species are an obvious problem resulting from conversion of native vegetation types. However, the less aggressive species such as *Salsola tragus* can be disruptive ecological processes when they flush after large precipitation events, stabilizing active dunes or providing fine fuels that can carry fire through fire-sensitive vegetation types similar to the annual bromes.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Dominant diagnostic species for this alliance are invasive species such as *Brassica nigra*, *Centaurea melitensis*, *Centaurea solstitialis*, *Crupina vulgaris*, *Cynoglossum officinale*, *Hyoscyamus niger*, *Isatis tinctoria*, *Salsola tragus*, or a mixture of other exotic annual forbs. Other less aggressive non-native herbaceous species often present in these disturbed stands include *Erodium cicutarium*, *Bassia scoparia*, and *Taraxacum officinale*.

VEGETATION

Physiognomy and Structure: This ruderal alliance is characterized by sparse to dense herbaceous layer dominated by annual grasses with low cover of shrubs or perennial graminoids and forbs (<5% absolute cover).

Floristics: Vegetation in this alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic annual forb species such as *Brassica nigra*, *Centaurea melitensis*, *Centaurea solstitialis*, *Crupina vulgaris*, *Cynoglossum officinale*, *Hyoscyamus niger*, *Isatis tinctoria*, *Salsola tragus*, or a mixture of other exotic annual forbs. Other exotic annual forbs are often present to dominant in disturbed stands, including *Bassia scoparia* (= *Kochia scoparia*), *Descurainia sophia*, *Erodium cicutarium*, *Lepidium perfoliatum*, *Sisymbrium altissimum*, and *Taraxacum officinale*. Cover of perennials is low (<5% absolute cover).

ENVIRONMENT & DYNAMICS

Environmental Description: This ruderal herbaceous alliance occurs in the interior western U.S. Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m. Climate is cool, semi-arid. Substrates are variable. It is an early-successional type that may occur in areas disturbed by fire, grazing or mining.

Dynamics:

DISTRIBUTION

Geographic Range: This ruderal herbaceous alliance occurs in lowland and foothill sites throughout the cool, interior western U.S. and Canada.

Nations: CA, US

States/Provinces: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]: USFWS (Minidoka)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- < *Centaurea (solstitialis, meletensis)* (Yellow star-thistle fields) Semi-natural Stands (Sawyer et al. 2009) [42.042.00]

LOWER LEVEL UNITS

Associations:

- CEGLO04004 *Salsola* spp. Ruderal Grassland
- CEGLO02085 *Erodium cicutarium* Ruderal Annual Grassland

AUTHORSHIP

Primary Concept Source: K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: K.A. Schulz

Acknowledgments:

Version Date: 2014/12/18

REFERENCES

References: Bentley and Talbot 1948, Faber-Langendoen et al. 2017b, Sawyer et al. 2009, USFS 1937, Wagner et al. 1978, Whitson et al. 2000

6. OPEN ROCK VEGETATION

Tropical, temperate, and boreal habitats are characterized or dominated by plant growth forms, such as *lichen*, *bryophyte*, *alga*, or *fern*, that have structural adaptations for living on stable rock surfaces or on unstable rocky substrates, such as cliffs, talus, scree, pavement, cobble, lava or boulderfields, and with associated mesomorphic grass, shrub and tree growth forms.

6.B. Temperate & Boreal Open Rock Vegetation

Rocky habitats (such as cliffs, talus, scree, pavement, cobbles, recent lava flows, or large rock outcrops) characterized by temperate, including Mediterranean, and boreal lithomorphic and lithophilic growth forms, including saxicolous *lichens*, *bryophytes*, *algae*, and/or *ferns* and other pteridophytes. Tree growth forms typically have <10% cover, are very sparse; woody growth forms, when present, include cold-deciduous broad-leaved and needle-leaved trees and shrubs. Vegetation found on temperate and boreal rocky habitats (such as cliffs, talus, recent lava flows, or rock outcrops) at low to moderate elevations at mid-latitudes from 23° to 70°N or S latitude around the globe that are characterized by nonvascular plant growth forms that have structural adaptations for living on these habitats.

6.B.1. Temperate & Boreal Cliff, Scree & Other Rock Vegetation

Vegetation in temperate and boreal habitats found in rocky or rocklike habitats (such as cliffs, talus, scree, pavement, cobbles, lava, boulderfields, or badlands) at low elevations at mid-latitudes around the globe characterized by nonvascular plant growth forms that have structural adaptations for living on stable rock surfaces or in unstable rocky substrates. A sparse cover of vascular mesomorphic growth forms, including needle-leaved and cold-deciduous broad-leaved woody plants, may be present.

6.B.1.Nb. Western North American Temperate & Boreal Cliff, Scree & Rock Vegetation

This division is characterized by the vegetation of rocky or rock-like habitats, including outcrops, cliffs, talus, or scree, in low- to mid-elevation, temperate and boreal climatic areas of western North America. Cryptogam vegetation tends to dominate, with vascular plants species of low cover.

M887. Western North American Cliff, Scree & Rock Vegetation

This sparsely vegetated rock outcrop and cliff face macrogroup is found in temperate and boreal climates, on the Alaska peninsula and Aleutian Islands, boreal Alaska and Yukon Territory, the Coast Mountains of British Columbia, in Washington and northwestern Oregon. Stands include patchy vegetated fractures in the rock surface and less steep or more stable slopes that are composed of scattered trees and/or shrubs. Mosses or lichens may be very dense, well-developed and display cover well over 10%.

6. Open Rock Vegetation

6.B.1.Nb. Western North American Temperate & Boreal Cliff, Scree & Rock Vegetation

6.B.1.Nb.1.a. M887 Western North American Cliff, Scree & Rock Vegetation

G563. Californian Cliff, Scree & Rock Vegetation

Type Concept Sentence: This cliff, scree and rock vegetation is scattered across California's Coast, Transverse, and Peninsular ranges, Klamath Mountains, southern Sierra Nevada, and the northern coast of Baja California.

OVERVIEW

Scientific Name: *Pinus contorta* var. *murrayana* / *Ceanothus megacarpus* - *Cercocarpus montanus* var. *minutiflorus* Cliff, Scree & Rock Vegetation Group

Common Name (Translated Scientific Name): Sierra Lodgepole Pine / Bigpod Ceanothus - Smooth Mountain-mahogany Cliff, Scree & Rock Vegetation Group

Colloquial Name: Jeffrey Pine / Bigberry Manzanita - Chaparral Whitethorn Sparse Shrubland

Type Concept: This group is scattered across California's Coast, Transverse, and Peninsular ranges, Klamath Mountains, southern Sierra Nevada, and the northern coast of Baja California. Sites include barren and sparsely vegetated areas of steep cliff faces, narrow canyons, smaller rock outcrops of various igneous, sedimentary, serpentinite, and metamorphic bedrock. This group also includes unstable scree and talus slopes typically occurring below cliff faces. Scattered vegetation may include trees such as *Pseudotsuga menziesii*, *Pinus contorta* var. *murrayana*, *Pinus ponderosa*, and *Pinus jeffreyi*. Shrubs may include *Ceanothus megacarpus*, *Ceanothus leucodermis*, *Cercocarpus montanus* var. *glaber* (= *Cercocarpus betuloides*), *Cercocarpus montanus* var. *minutiflorus* (= *Cercocarpus minutiflorus*), *Arctostaphylos glauca*, and *Xylococcus bicolor*. Soil development is limited as is herbaceous cover, but may include *Allium falcifolium*, *Allium cratericola*, *Streptanthus* spp., *Hesperolinon* spp., *Asclepias solanoana*, *Eriogonum ursinum*, *Eriogonum nudum*, *Eriogonum luteolum*, *Erigeron* spp., *Dudleya cymosa*, *Dudleya lanceolata*, *Lewisia rediviva*, *Pentagramma triangularis*, *Selaginella bigelovii*, *Bromus rubens*, *Vulpia* spp., and others. Moss and lichen can be well-developed, and needs better characterization.

Classification Comments: This type may overlap with Western North American Cliff, Scree & Rock Vegetation Macrogroup (M887), especially Southern Vancouverian Cliff, Scree & Rock Vegetation Group (G573). Further review is needed.

Similar NVC Types:

- G573 Southern Vancouverian Cliff, Scree & Rock Vegetation

Diagnostic Characteristics: This is a sparsely vegetated and barren group characterized by patchy vegetation that does not exceed 10% total cover. Species occupying these sites may be opportunistic and/or adapted to such conditions. Woody species may include *Pseudotsuga menziesii*, *Pinus contorta* var. *murrayana*, *Pinus ponderosa*, *Pinus jeffreyi*, *Ceanothus megacarpus*, *Ceanothus leucodermis*, *Cercocarpus montanus* var. *minutiflorus*, *Arctostaphylos glauca*, and *Xylococcus bicolor*. Soil development is limited as is herbaceous cover, but may include *Allium falcifolium*, *Allium cratericola*, *Streptanthus* spp., *Hesperolinon* spp., *Asclepias*

NBR alliances

solanoana, *Eriogonum ursinum*, *Eriogonum nudum*, *Eriogonum luteolum*, *Erigeron* spp., *Dudleya cymosa*, *Dudleya lanceolata*, *Lewisia rediviva*, *Pentagramma triangularis*, *Selaginella bigelovii*, *Bromus rubens*, *Vulpia* spp., and others. Moss and lichen can be well-developed.

VEGETATION

Physiognomy and Structure: Vegetation of the group is variable in physiognomy and structure due to harsh substrate conditions and exposure, but is composed of a patchy assemblage of needleleaf trees, broadleaf deciduous shrubs, and sporadic herbaceous cover.

Floristics: Scattered vegetation may include trees such as *Pseudotsuga menziesii*, *Pinus contorta* var. *murrayana*, *Pinus ponderosa*, and *Pinus jeffreyi*. Shrubs may include *Ceanothus megacarpus*, *Ceanothus leucodermis*, *Cercocarpus montanus* var. *minutiflorus* (= *Cercocarpus minutiflorus*), *Arctostaphylos glauca*, and *Xylococcus bicolor*. Herbaceous cover is limited but may include *Streptanthus* spp., *Hesperolinon* spp., *Allium falcifolium*, *Allium cratericola*, *Asclepias solanoana*, *Eriogonum ursinum*, *Eriogonum nudum*, *Eriogonum luteolum*, *Erigeron* spp., *Dudleya cymosa*, *Dudleya lanceolata*, *Lewisia rediviva*, *Pentagramma triangularis*, *Selaginella bigelovii*, *Bromus rubens*, *Vulpia* spp., and others. Moss and lichen can be well-developed, and needs better characterization.

ENVIRONMENT & DYNAMICS

Environmental Description: This group is known from California's Coast, Transverse, and Peninsular ranges, Klamath Mountains, southern Sierra Nevada, and the northern coast of Baja California. Sites include barren and sparsely vegetated areas of steep cliff faces, narrow canyons, smaller rock outcrops of various igneous, sedimentary, serpentinite, and metamorphic bedrock. This group also includes unstable scree and talus slopes typically occurring below cliff faces. *Soil/substrate/hydrology:* Soils are poorly developed, rocky, and loosely consolidated. Parent materials include igneous, sedimentary, serpentinite, and metamorphic bedrock and scree.

Dynamics: Poor, rocky, loosely consolidated soils help maintain stands of this group by limiting the establishment of species from adjacent communities. Not all serpentinite outcrops support distinct vegetation. Only those with very low Ca:Mg ratio impact biotic composition.

DISTRIBUTION

Geographic Range: This group is known from California's Coast, Transverse, and Peninsular ranges, Klamath Mountains, southern Sierra Nevada, and the northern coast of Baja California.

Spatial Scale & Pattern [optional]: Large patch, Small patch

Nations: MX, US

States/Provinces: CA, MXBC

TNC Ecoregions [optional]: 5:C, 12:C, 14:C, 15:C, 16:C

USFS Ecoregions (2007): 261B:PP, 262A:PP, 322C:PP, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Alliances:

- A3784 *Sedum spathulifolium* Sparse Rock Vegetation Alliance
- A3785 *Selaginella bigelovii* Rock Alliance
- A3782 *Pinus jeffreyi* / *Arctostaphylos glauca* - *Ceanothus leucodermis* Sparse Shrubland Alliance
- A4073 *Dudleya cymosa* - *Dudleya lanceolata* - Lichen/Moss Sparse Rock Vegetation Alliance
- A3783 *Allium* spp. - *Streptanthus* spp. - *Hesperolinon* spp. Serpentinite Sparse Rock Vegetation Alliance

AUTHORSHIP

Primary Concept Source: P. Comer and T. Keeler-Wolf, in Faber-Langendoen et al. (2011)

Author of Description: M.E. Hall and J. Evens

Acknowledgments: J. Evens

Version Date: 10/08/2014

Classif Resp Region: West

Internal Author: MEH 11-10, mod. DFL/JE 10-13, mod. DFL 10-14

REFERENCES

References: Barbour and Major 1988, Comer et al. 2003, Faber-Langendoen et al. 2017a, Holland and Keil 1995, Kittel et al. 2012a, Rodriguez et al. 2017, Sawyer and Keeler-Wolf 1995

6. Open Rock Vegetation

6.B.1.Nb. Western North American Temperate & Boreal Cliff, Scree & Rock Vegetation

G563. Californian Cliff, Scree & Rock Vegetation

G565. Rocky Mountain Cliff, Scree & Rock Vegetation

Type Concept Sentence: This group consists of dry barren and sparsely vegetated rock outcrops and cliff faces of the Rocky Mountains and Cascade Range in North America, where there is often very high cover of nonvascular lichens and, in wetter places, mosses.

OVERVIEW

Scientific Name: Nonvascular Rocky Mountain Cliff, Scree & Rock Vegetation Group

Common Name (Translated Scientific Name): Nonvascular Rocky Mountain Cliff, Scree & Rock Vegetation Group

Colloquial Name: Rocky Mountain Indian-parsley - Rockspirea - Raspberry Cliff, Scree & Rock

Type Concept: This group consists of barren and sparsely vegetated rock outcrops and cliff faces located throughout the Rocky Mountains and northeastern Cascade Range in North America. These sparsely vegetated surfaces (generally <10% plant cover) are found from foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous (intrusives), sedimentary, and metamorphic bedrock types. It also occurs on unstable scree and talus slopes that can occur below cliff faces. In general these are the dry, sparsely vegetated places. The biota reflects what is surrounding them, unless it is an extreme parent material. There is often very high cover of nonvascular lichens and, in wetter places, mosses. There may be small patches of dense vascular vegetation and can include scattered trees and/or shrubs. Characteristic trees include species from the surrounding landscape, such as *Pseudotsuga menziesii*, *Pinus ponderosa*, *Pinus flexilis*, *Populus tremuloides*, *Abies concolor*, *Abies lasiocarpa*, or *Pinus edulis* and *Juniperus* spp. at lower elevations. There may be scattered shrubs present, such as species of *Holodiscus*, *Ribes*, *Physocarpus*, *Rosa*, *Juniperus*, and *Jamesia americana*, *Mahonia repens*, *Rhus trilobata*, or *Amelanchier alnifolia*. Soil development is limited, as is herbaceous cover. Characteristic nonvascular species information is not available

Classification Comments: Need moss and other nonvascular species information. Cliff, scree and rock vegetation in Alaska is placed into North Vancouverian Montane Bedrock, Cliff & Talus Vegetation Group (G318), Western North American Boreal Cliff & Rock Vegetation Group (G822), or North American Arctic Cliff, Scree & Rock Vegetation Group (G375).

Similar NVC Types:

- G569 North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation
- G570 Intermountain Basins Cliff, Scree & Badland Sparse Vegetation
- G571 Rocky Mountain & Sierran Alpine Bedrock & Scree: occurs above treeline.
- G319 North Pacific Alpine-Subalpine Bedrock & Scree: occurs above treeline in the Pacific Northwest mountains.
- G567 Great Plains Cliff, Scree & Rock Vegetation
- G318 North Vancouverian Montane Bedrock, Cliff & Talus Vegetation: occurs in the Pacific Northwest mountains.

Diagnostic Characteristics: Dense covering of mosses and/or nonvasculars and sparse cover of herbaceous and woody vascular plants on exposed bedrock or talus.

VEGETATION

Physiognomy and Structure: Nonvascular, woody and herbaceous vascular plants.

Floristics: Herbaceous cover is limited. Characteristic trees include species from the surrounding landscape, such as *Pseudotsuga menziesii*, *Pinus ponderosa*, *Pinus flexilis*, *Populus tremuloides*, *Abies concolor*, *Abies lasiocarpa*, or *Pinus edulis* and *Juniperus* spp. at lower elevations. There may be scattered shrubs present, such as species of *Holodiscus*, *Ribes*, *Physocarpus*, *Rosa*, *Juniperus*, and *Jamesia americana*, *Mahonia repens*, *Rhus trilobata*, or *Amelanchier alnifolia*. Characteristic nonvascular species information is not available. Floristic information compiled from Hess and Wasser (1982), Andrews and Righter (1992), Ecosystem Working Group (1998), and Larson et al. (2000).

ENVIRONMENT & DYNAMICS

Environmental Description: *Climate:* Temperate. *Soil/substrate/hydrology:* Foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous (intrusives), sedimentary, and metamorphic bedrock types. Also

included are unstable scree and talus slopes that typically occur below cliff faces. In general these are the dry, sparsely vegetated places. Soil development is limited. Environmental information compiled from Hess and Wasser (1982), Andrews and Righter (1992), Ecosystem Working Group (1998), and Larson et al. (2000).

Dynamics:

DISTRIBUTION

Geographic Range: This group is located throughout the Rocky Mountain, including the isolated island ranges of central Montana, and northeastern Cascade Ranges in North America.

Spatial Scale & Pattern [optional]: Large patch

Nations: CA, US

States/Provinces: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

TNC Ecoregions [optional]: 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 25:C, 26:C, 68:C

USFS Ecoregions (2007): 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 331A:C?, 331B:CC, 331D:C?, 331G:CC, 331H:CC, 331I:CP, 331J:CC, 331K:CP, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341F:CC, 341G:CC, 342A:CP, 342B:CC, 342C:CC, 342D:CP, 342E:CC, 342F:CP, 342G:CP, 342H:CP, 342I:CP, 342J:CC, M242B:CP, M242C:CC, M242D:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341A:CC, M341B:CC, M341C:CC

Omernik Ecoregions:

Federal Lands [optional]: NPS (Great Basin)

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate. Need moss and other nonvascular species information.

SYNONYMY

- < CL Cliff (Ecosystems Working Group 1998)
- < RO Rock (Ecosystems Working Group 1998)
- < TA Talus (Ecosystems Working Group 1998)

LOWER LEVEL UNITS

Alliances:

- A3742 Black Hills Cliff, Scree & Rock Alliance
- A0556 *Picea engelmannii* Rock Alliance
- A3740 *Aletes anisatus* - *Holodiscus dumosus* - *Rubus idaeus* Cliff, Scree & Rock Alliance
- A4146 *Sullivantia hapemanii* - *Mimulus* spp. Wet Rock Alliance
- A3741 *Aquilegia flavescens* - *Phacelia hastata* Cliff, Scree & Rock Alliance

AUTHORSHIP

Primary Concept Source: G. Kittel, in Faber-Langendoen et al. (2011)

Author of Description: G. Kittel and M.S. Reid

Acknowledgments:

Version Date: 12/21/2010

Classif Resp Region: West

Internal Author: GK 10-10, 12-15, mod. MSR 3-17

REFERENCES

References: Andrews and Righter 1992, Comer et al. 2003, Ecosystems Working Group 1998, Faber-Langendoen et al. 2017a, Hess and Wasser 1982, Larson et al. 2000a, NCC 2002, Neely et al. 2001, Peet 1981

6. Open Rock Vegetation

6.B.1.Nb. Western North American Temperate & Boreal Cliff, Scree & Rock Vegetation

G565. Rocky Mountain Cliff, Scree & Rock Vegetation

A3740. *Aletes anisatus* - *Holodiscus dumosus* - *Rubus idaeus* Cliff, Scree & Rock Alliance

Type Concept Sentence: Sparsely vegetated areas dominated by various forbs and graminoids occupying cliffs, outcrops and scree areas of the Colorado and Wyoming Rocky Mountains in subalpine to alpine settings.

OVERVIEW

Scientific Name: *Aletes anisatus* - *Holodiscus dumosus* - *Rubus idaeus* Cliff, Scree & Rock Alliance

Common Name (Translated Scientific Name): Rocky Mountain Indian-parsley - Rockspirea - American Red Raspberry Cliff, Scree & Rock Alliance

Colloquial Name: Rocky Mountain Indian-parsley - Rockspirea - Raspberry Cliff, Scree & Rock

Type Concept: Associations within this alliance include sparsely vegetated areas of the Colorado and Wyoming Rocky Mountains in subalpine to alpine settings. Stands are typically herbaceous-dominated, although some are shrub-dominated. Due to the rocky substrate, total vegetation cover is typically sparse. Characteristic shrubs may include *Artemisia frigida*, *Chrysothamnus viscidiflorus*, *Holodiscus dumosus*, *Purshia tridentata*, *Rhus trilobata*, and *Ribes cereum*. The most consistent dominant herbaceous species include *Aletes anisatus*, *Aquilegia coerulea*, *Cirsium scopulorum*, *Claytonia megarhiza*, *Heuchera bracteata*, *Heuchera parvifolia*, and *Scutellaria brittonii*. Elevations range from 1800 to >3900 m. Stands occur in patches on rock ledges, scree and other steep slopes (20-100%). Substrates are shallow, rocky, rapidly drained, coarse-textured soils derived from various parent materials. Sites include windblown summits and ridges, scree and talus slopes, outcrops, and cliffs.

Classification Comments: The associations attributed here are done so based on geographic proximity and may not have much floristic overlap. More information is needed to fully describe and classify stands in this and other scree, gravel slide, and talus vegetation.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Characteristic of this alliance is perennial forb, shrub and graminoid vegetation of rock, scree and cliff areas of the Colorado and Wyoming Rocky Mountains. Sites have little to no soil development which promotes sparse vegetation cover. Most of the unvegetated surface is barren rock.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a moderate cover of low-growing shrubs, perennial forbs and graminoids that grow in the crevices of rocks. Scattered trees are occasionally present as saplings from 1.5-3 m tall. The moss layer is sparse.

Floristics: Stands are typically herbaceous-dominated, although some are shrub-dominated. Due to the rocky substrate, total vegetation cover is typically sparse. Characteristic shrubs may include *Artemisia frigida*, *Chrysothamnus viscidiflorus*, *Holodiscus dumosus*, *Purshia tridentata*, *Rhus trilobata*, and *Ribes cereum*. The most consistent dominant herbaceous species include *Aletes anisatus*, *Aquilegia coerulea*, *Cirsium scopulorum*, *Claytonia megarhiza*, *Heuchera bracteata*, *Heuchera parvifolia*, and *Scutellaria brittonii*. Other herbaceous associates present may include *Aquilegia saximontana*, *Bouteloua gracilis*, *Bromus inermis* var. *pumpellianus* (= *Bromus pumpellianus*), *Carex geophila*, *Carex heteroneura*, *Cryptogramma acrostichoides*, *Cystopteris fragilis*, *Deschampsia cespitosa*, *Elymus elymoides*, *Elymus trachycaulus*, *Festuca arizonica*, *Festuca brachyphylla*, *Mertensia lanceolata*, *Muhlenbergia montana*, *Oreoxis alpina*, *Trisetum spicatum*, and *Viola biflora*. Scattered trees, such as *Juniperus scopulorum*, *Pinus contorta*, *Pinus edulis*, *Pinus flexilis*, *Pinus ponderosa*, and *Pseudotsuga menziesii*, are occasionally present as saplings from 1.5-3 m tall.

ENVIRONMENT & DYNAMICS

Environmental Description: Vegetation of this alliance occurs at elevations ranging from 1800 to >3900 m in the subalpine and alpine zones of the mountains of Colorado and Wyoming. The climate regime is continental, with long, cold winters and short summers with frequent afternoon thunderstorms. Strong westerly winds are common in the winter. Stands occur in patches on rock ledges, scree and other steep slopes (20-100%). Substrates are shallow, rocky, rapidly drained, coarse-textured soils derived from various parent materials. Sites include windblown summits and ridges, scree and talus slopes, outcrops, and cliffs. Soils are young and poorly developed due to low soil temperature, low soil moisture during the summer, and a short growing season.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is known from the Colorado and Wyoming Rocky Mountains.

Nations: US

States/Provinces: CO, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Claytonia megarhiza-Silene acaulis ssp. subacaulescens* habitat type (Komarkova 1986)
- ? *Heucheretum bracteato-parvifoliae* Association (Komarkova 1976)
- >< *Pseudocymopterus-Mentzelia-Chalicodium* Formation (Clements 1904)
- ? *Sagino saginoidis-Claytonietum megarhizae* Association (Komarkova 1976)

LOWER LEVEL UNITS**Associations:**

- C EGL001971 *Heuchera bracteata - Heuchera parvifolia var. nivalis* Rock Vegetation
- C EGL001938 *Aquilegia coerulea - Cirsium scopulorum* Scree Sparse Vegetation
- C EGL001878 *Claytonia megarhiza* Rock Vegetation
- C EGL009605 *Petrophyton caespitosum* Sparse Vegetation
- C EGL001134 *Rubus idaeus* Scree Shrubland
- C EGL002801 *Holodiscus dumosus* Rock Outcrop Sparse Vegetation
- C EGL001948 *Aletes anisatus - Scutellaria brittonii* Scree Vegetation

AUTHORSHIP

Primary Concept Source: M. Damm and K.A. Schulz, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Clements 1904, Faber-Langendoen et al. 2017b, Komarkova 1976, Komarkova 1986

6. Open Rock Vegetation

6.B.1.Nb. Western North American Temperate & Boreal Cliff, Scree & Rock Vegetation

G565. Rocky Mountain Cliff, Scree & Rock Vegetation

A3741. Aquilegia flavescens - Phacelia hastata Cliff, Scree & Rock Alliance

Type Concept Sentence: Sparse cliff, scree and rock outcrop vegetation of the northern Rocky Mountains. The most common dominants include *Aquilegia flavescens*, *Penstemon ellipticus*, *Phacelia hastata* and *Senecio megacephalus*.

OVERVIEW

Scientific Name: *Aquilegia flavescens - Phacelia hastata* Cliff, Scree & Rock Alliance

Common Name (Translated Scientific Name): Yellow Columbine - Silverleaf Phacelia Cliff, Scree & Rock Alliance

Colloquial Name: Yellow Columbine - Silverleaf Phacelia Cliff, Scree & Rock

Type Concept: Sparse cliff, scree and rock outcrop vegetation of the northern Rocky Mountains. Structurally, vegetation is very open and characterized by the dominance of forbs, the most important species including *Aquilegia flavescens*, *Phacelia hastata*, *Penstemon ellipticus*, and *Senecio megacephalus*. Associated herbaceous species may include *Achillea millefolium*, *Aquilegia flavescens*, *Arenaria capillaris*, *Arnica x diversifolia*, *Castilleja miniata*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Cirsium hookerianum*, *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Galium boreale*, *Minuartia nuttallii* (= *Arenaria nuttallii*), *Phacelia sericea*, *Potentilla diversifolia*, *Sedum lanceolatum*, *Senecio megacephalus*, *Stellaria americana*, *Symphyotrichum foliaceum* (= *Aster foliaceus*), and *Valeriana sitchensis*. This subalpine to alpine community occurs from 1800 to 2400 m on steep to very steep (45-80%) talus slopes and scree fields spanning a range of exposures from east to primarily southwest (facing prevailing winds).

Classification Comments: The associations attributed here are done so based on geographic proximity and may not have much floristic overlap.

Internal Comments: MSR 11-14: alpine? Need to move out of here.

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Sparse perennial forb-dominated vegetation of the subalpine and alpine zones of the northern Rocky Mountains occupying cliff, scree and rock outcrop areas. Sites have little to no soil development which promotes sparse vegetation cover. Most of the unvegetated surface is barren rock.

VEGETATION

Physiognomy and Structure: This alliance is characterized by a rock-dominated substrate and a sparse cover of moderately tall (<1 m) perennial herbs that grow in patches between the rocks. Moss cover is sparse.

Floristics: Structurally, vegetation is very open and characterized by the dominance of forbs, the most important species including *Aquilegia flavescens*, *Phacelia hastata*, *Penstemon ellipticus*, and *Senecio megacephalus*. Associated herbaceous species may include *Achillea millefolium*, *Aquilegia flavescens*, *Arenaria capillaris*, *Arnica x diversifolia*, *Castilleja miniata*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Cirsium hookerianum*, *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Galium boreale*, *Minuartia nuttallii* (= *Arenaria nuttallii*), *Phacelia sericea*, *Potentilla diversifolia*, *Sedum lanceolatum*, *Senecio megacephalus*, *Stellaria americana*, *Symphotrichum foliaceum* (= *Aster foliaceus*), and *Valeriana sitchensis*. *Elymus alaskanus ssp. latiglumis* (= *Agropyron latiglume*) is the only characteristic graminoid. Mosses and lichens usually comprise less than 1% canopy cover.

ENVIRONMENT & DYNAMICS

Environmental Description: The climate regime of this alliance is continental, with long, cold winters and short summers with frequent afternoon thunderstorms. Strong westerly winds are common in the winter. Stands occur between 1800 and 2400 m elevation on all aspects of gentle to very steep (45-80%) talus slopes and scree fields. The ground is covered with small- to large-sized boulders that are snow-covered in winter. The boulders provide protection from the wind and an increased moisture supply to the vegetation. Precipitation that falls on the boulders concentrates in the crevices between the rocks creating mesic microsites suitable for the vegetation in the alliance. Stands also occur among the krummholz, where the stunted trees may provide similar sheltered sites. Soils are young and poorly developed due to low soil temperature, low soil moisture during the summer, and a short growing season.

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is currently only known from Waterton - Glacier National International Peace Park in Alberta and Montana.

Nations: CA, US

States/Provinces: AB, MT

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGLO05901 *Phacelia hastata* - (*Penstemon ellipticus*) Sparse Vegetation
- CEGLO05899 *Aquilegia flavescens* - *Senecio megacephalus* Sparse Vegetation

AUTHORSHIP

Primary Concept Source: M. Damm, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Faber-Langendoen et al. 2017b

6. Open Rock Vegetation

6.B.1.Nb. Western North American Temperate & Boreal Cliff, Scree & Rock Vegetation

G565. Rocky Mountain Cliff, Scree & Rock Vegetation

A3742. Black Hills Cliff, Scree & Rock Alliance

Type Concept Sentence: This alliance is characterized by sparsely vegetated rock, cliff and scree areas of the Black Hills. Vegetation is dominated by widely spaced woody species of trees and shrubs.

OVERVIEW

Scientific Name: Black Hills Cliff, Scree & Rock Alliance

Common Name (Translated Scientific Name): Black Hills Cliff, Scree & Rock Alliance

Colloquial Name: Black Hills Cliff, Scree & Rock

Type Concept: This alliance is characterized by sparsely vegetated rock, cliff and scree areas of the Black Hills. Vegetation is dominated by widely spaced woody species of trees and shrubs. Common dominant trees include *Pinus ponderosa* and *Juniperus scopulorum*. *Arctostaphylos uva-ursi* and *Juniperus communis* are the most common dwarf-shrub species. Depending on the site, ferns, forbs or graminoids may dominate the sparse herbaceous layer. Common dominants include *Achillea millefolium*, *Carex inops ssp. heliophila*, *Campanula rotundifolia*, and *Woodsia oregana*. Few vascular plants grow in this community, although lichens are common. Stands occur on volcanic cones, buttes, large rock outcrops (greater than 20 m vertical relief) and hills or small mountains with large rock exposures on multiple sides. There is little soil development; what soil there is can be found in cracks and depressions in the rock surface.

Classification Comments: Very little floristic information has been compiled regarding associations attributed here.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Sparsely vegetated rocky areas of the Black Hills. Vegetation is highly variable and may be composed of *Pinus ponderosa* in association with other widely spaced shrubs, forbs and graminoids.

VEGETATION

Physiognomy and Structure: This alliance is characterized by widely spaced woody species of needle- and scale-leaved evergreen trees and broad-leaved deciduous shrubs.

Floristics: Vegetation is dominated by widely spaced woody species of trees and shrubs. Common dominant trees include *Pinus ponderosa* and *Juniperus scopulorum*. *Arctostaphylos uva-ursi* and *Juniperus communis* are the most common dwarf-shrub species. Depending on the site, ferns, forbs or graminoids may dominate the sparse herbaceous layer. Common dominants include *Achillea millefolium*, *Carex inops ssp. heliophila*, *Campanula rotundifolia*, and *Woodsia oregana*. Few vascular plants grow in this community, although lichens are common.

ENVIRONMENT & DYNAMICS

Environmental Description: Stands occur on volcanic cones, buttes, large rock outcrops (greater than 20 m vertical relief) and hills or small mountains with large rock exposures on multiple sides. Slopes range from none (flat) to steep. There is little soil development; what soil there is can be found in cracks and depressions in the rock surface. Substrates include igneous and metamorphic rock types (e.g., granites, slates, phonolite porphyry).

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is currently known from the Black Hills in South Dakota.

Nations: US

States/Provinces: SD

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Moderate.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEG002295 Granite - Metamorphic Black Hills Rock Outcrop Sparse Vegetation
- CEG005283 Igneous - Metamorphic Black Hills Butte Sparse Vegetation

- CEG002307 Scree - Talus Black Hills Sparse Vegetation

AUTHORSHIP

Primary Concept Source: D. Faber-Langendoen, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: Faber-Langendoen et al. 2017b

6. Open Rock Vegetation

6.B.1.Nb. Western North American Temperate & Boreal Cliff, Scree & Rock Vegetation

G565. Rocky Mountain Cliff, Scree & Rock Vegetation

A0556. *Picea engelmannii* Rock Alliance

Type Concept Sentence: These wooded scree communities are characterized by *Picea engelmannii* as the dominant mature tree species and occur on steep slopes of any exposure in the southern Rocky Mountains of southern Colorado and northern New Mexico.

OVERVIEW

Scientific Name: *Picea engelmannii* Rock Alliance

Common Name (Translated Scientific Name): Engelmann Spruce Rock Alliance

Colloquial Name: Engelmann Spruce Wooded Scree

Type Concept: These wooded scree communities are characterized by *Picea engelmannii* as the dominant mature tree species. The trees are typically widely spaced and rarely reach over 20% cover. A few other trees can occur, usually as seedlings and saplings, including *Abies lasiocarpa*, *Pinus flexilis*, or *Populus tremuloides*. The shrub layer, also very sparse, can include *Jamesia americana*, *Juniperus communis*, *Ribes montigenum*, and *Ribes wolfii*. The herbaceous component is nearly unnoticeable, as plants typically are found only in crevices in the talus where small amounts of soil may have accumulated. Species can include *Carex rossii*, *Festuca brachyphylla*, *Koeleria macrantha*, *Saxifraga bronchialis*, *Sedum lanceolatum*, and *Senecio atratus*. These wooded scree communities occur on steep slopes of any exposure in the southern Rocky Mountains of southern Colorado and northern New Mexico. Differences in rock size and rates of movement cause heterogeneity in the development of vegetation. Elevations are upper montane to subalpine, ranging from about 3000 to 3600 m. Winter snowfall comprises the major portion of annual precipitation in this region. Melting snow can be held within the rocky matrix of these scree slopes, providing greater moisture-holding capacity than at first appearance. Slopes of these scree communities are typically greater than 50%. Greater than 80% of the substrate is composed of coarse rock fragments, with mineral soils confined to pockets.

Classification Comments: Scree and talus slopes with sparse vegetation have been poorly sampled and classified in the West. Undoubtedly there are coniferous tree-dominated communities in mountainous areas throughout the West occurring on talus, such as in this alliance. Also, several other wooded scree associations (e.g., dominated by *Abies lasiocarpa*, *Abies concolor*, *Pinus aristata*, *Pinus ponderosa*, and *Pseudotsuga menziesii*, and others) have been mentioned in the literature (Pfister et al. 1977, DeVelice et al. 1986, Fitzhugh et al. 1987), and are currently placed into their respective woodland alliances. Without more quantitative data for these scree communities, it is difficult to judge their proper classification and placement in the hierarchy. Wooded scree communities should be reviewed, and most probably belong in the Sparse Vegetation Class in the USNVC.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics: Needle-leaved evergreen sparsely vegetated scree slopes of the southern Rocky Mountains where *Picea engelmannii* is the dominant species but typically not exceeding 20% cover.

VEGETATION

Physiognomy and Structure: The primary feature of this alliance is its occurrence on semi-stabilized talus slopes. These are very open woodlands dominated by needle-leaved evergreen trees up to 30 m in height and of only sparse cover (5-20%). There is a very sparse layer of short shrubs, primarily of scale-leaved evergreen species, although some cold-deciduous species may be present. There are very few forbs or graminoids present in most stands, typically found in crevices in the rocks where small amounts of soil may have accumulated. Total cover is characteristically less than 10%, although some stands may be somewhat higher.

Floristics: These wooded screes are characterized by *Picea engelmannii* as the dominant mature tree species. The trees are typically widely spaced and rarely reach over 20% cover. A few other trees can occur, usually as seedlings and saplings, including *Abies lasiocarpa*, *Pinus flexilis*, or *Populus tremuloides*. The shrub layer, also very sparse, can include *Jamesia americana*, *Juniperus communis*, *Ribes montigenum*, and *Ribes wolfii*. The herbaceous component is nearly unnoticeable, as plants typically are found only in crevices in the talus where small amounts of soil may have accumulated. Species can include *Carex rossii*, *Festuca brachyphylla*, *Koeleria macrantha*, *Saxifraga bronchialis*, *Sedum lanceolatum*, and *Senecio atratus*.

ENVIRONMENT & DYNAMICS

Environmental Description: These wooded scree communities occur on steep slopes of any exposure in the southern Rocky Mountains of southern Colorado and northern New Mexico. Elevations are upper montane to subalpine, ranging from about 3000 to 3600 m. Winter snowfall comprises the major portion of annual precipitation in this region, although summer monsoon rain events contribute as well. Maximum snowfall accumulations range from 5 m in northern New Mexico to over 13 m in the San Juan Mountains. Melting snow can be held within the rocky matrix of these scree slopes, providing greater moisture-holding capacity than at first appearance. Slopes of these screes are typically greater than 50% (24°). Greater than 80% of the substrate is composed of coarse rock fragments, with mineral soils confined to pockets (DeVelice et al. 1986). Differences in rock size and rates of movement cause heterogeneity in the development of vegetation (Pfister et al. 1977).

Dynamics: Vegetation on scree slopes reaches a quasi-equilibrium with the shifting substrate. Differences in rock size and rates of movement cause heterogeneity in the development of vegetation (Pfister et al. 1977), and there is a corresponding variability in species composition from one slope to another. The instability of the substrate leads to lack of soil development and slow regeneration of trees. Why some screes are dominated by *Picea engelmannii* and others by *Abies lasiocarpa* (or other conifers) is not documented in the literature.

DISTRIBUTION

Geographic Range: This woodland alliance is presently known only from the mountains of southern Colorado and northern New Mexico. It is probable that it occurs elsewhere in the Rocky Mountain cordillera.

Nations: US

States/Provinces: CO, NM

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low.

SYNONYMY

- ? *Picea engelmannii* Series (DeVelice et al. 1986) [Scree Forests and Habitat Types]

LOWER LEVEL UNITS

Associations:

- CEG000893 *Picea engelmannii* / *Saxifraga bronchialis* Scree Sparse Vegetation

AUTHORSHIP

Primary Concept Source: M.S. Reid, in Faber-Langendoen et al. (2013)

Author of Description: M.E. Hall

Acknowledgments:

Version Date: 2014/09/26

REFERENCES

References: DeVelice et al. 1986, Faber-Langendoen et al. 2017b, Fitzhugh et al. 1987, Pfister et al. 1977

6. Open Rock Vegetation

6.B.1.Nb. Western North American Temperate & Boreal Cliff, Scree & Rock Vegetation

G565. Rocky Mountain Cliff, Scree & Rock Vegetation

A4146. *Sullivantia hapemanii* - *Mimulus* spp. Wet Rock Alliance [Low - Poorly Documented]

Type Concept Sentence: These are seepage areas along vertical rockfaces, vertical to sloped rockwalls at the base of waterfalls, and large rocks and boulders kept wet by spray from nearby turbulent waterflow (e.g., cascading streamflow or churning of plunge pools at the base of waterfalls). They have a water regime ranging from seasonally to perennially wet but a minimum duration of wetness is needed to maintain these communities. This alliance is found in montane to alpine regions of the Rocky Mountain cordillera, from southern New Mexico north into Montana, Idaho, northeast Washington, Alberta and British Columbia, and west into the lower elevations and mountain ranges within the Intermountain West region.

OVERVIEW

Scientific Name: *Sullivantia hapemanii* - *Mimulus* spp. Wet Rock Alliance

Common Name (Translated Scientific Name): Hapeman's Coolwort - Monkeyflower species Wet Rock Alliance

Colloquial Name: Rocky Mountain-Great Basin Wet Cliff & Spray Zone

Type Concept: These are seepage areas along vertical rockfaces, vertical to sloped rockwalls at the base of waterfalls, and large rocks and boulders kept wet by spray from nearby turbulent waterflow (e.g., cascading streamflow or churning of plunge pools at the base of waterfalls). They have a water regime ranging from seasonally to perennially wet but a minimum duration of wetness is needed to maintain these communities. Generally they are freshwater but water chemistry and pH can vary according to local bedrock. These are wet surfaces that range from nearly unvegetated to supporting mats of mosses and liverworts that in turn may support vascular plants and invertebrates. These areas are sometimes called "hanging gardens," or "vertical wetlands." This alliance is found in montane to alpine regions of the Rocky Mountain cordillera, from southern New Mexico north into Montana, Idaho, northeast Washington, Alberta and British Columbia, and west into the lower elevations and mountain ranges within the Intermountain West region.

Classification Comments: These habitats have not been well-studied. The types and diversity of nonvascular and vascular plant communities are not well-known. Abiotic variation such as pH, water chemistry, shading effects, microclimatic effects, etc. are also understudied.

Internal Comments:

Other Comments:

Similar NVC Types:

Diagnostic Characteristics:

VEGETATION

Physiognomy and Structure:

Floristics:

ENVIRONMENT & DYNAMICS

Environmental Description:

Dynamics:

DISTRIBUTION

Geographic Range: This alliance is found in montane to alpine regions of the Rocky Mountain cordillera, from southern New Mexico north into Montana, Idaho, northeast Washington, Alberta and British Columbia, and west into the lower elevations and mountain ranges within the Intermountain West region.

Nations: CA, US

States/Provinces: AB, BC, CO, ID, MT, NM, NV, UT, WA, WY

TNC Ecoregions [optional]:

USFS Ecoregions (2007):

Omernik Ecoregions:

Federal Lands [optional]:

CONFIDENCE LEVEL

USNVC Confidence Level with Comments: Low - Poorly Documented.

SYNONYMY

LOWER LEVEL UNITS

Associations:

- CEGL005509 *Sullivantia hapemanii* - *Mimulus* spp. Wet Rock Vegetation

AUTHORSHIP

Primary Concept Source: J. Rocchio, in Faber-Langendoen et al. (2014)

Author of Description: J. Rocchio

Acknowledgments:

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