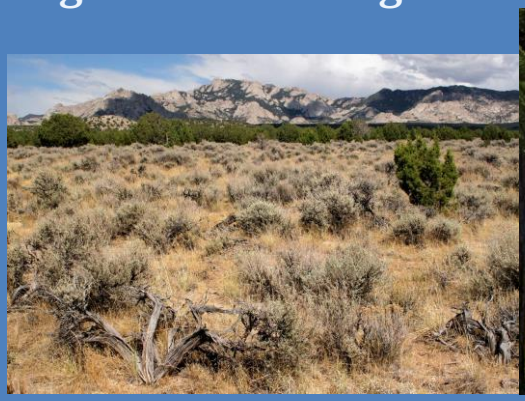
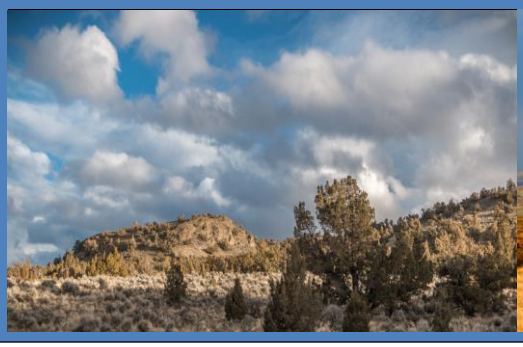
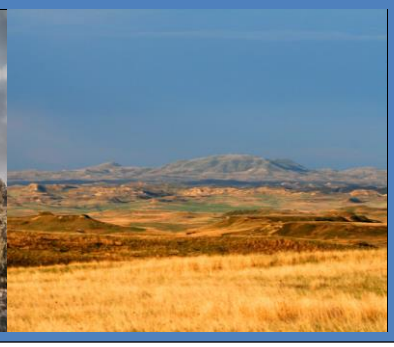
Field Keys to Groups and Alliances in the National Vegetation Classification: Northwestern Great Plains and High Plains Ecoregions



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See appendix document: Descriptions_NVC_Groups_Alliances_WestGreatPlains_Nov_2017.pdf

Contents

Figures

Tables

Introduction and Background

BLM manages extensive lands that support a variety of vegetation types that have been classified and mapped and multiple scales to facilitate resource planning, decision making, and natural resource management. On the ground land managers and biologists need to be able to independently classify these habitats to US National Vegetation Classification (NVC) vegetation types to assess the accuracy of these maps and directly label new AIM vegetation transects while in the field. These new labeled transects can be used to improve the map accuracy, assess ecological condition (ruderal vs natural or semi-natural vegetation), assess fuel loads/fire risk, and target habitats for species of concern for species management.

Field key to vegetation types are an important tool for managers to label vegetation. Dichotomous keys allow field personnel to systematically step through options and arrive at a label for a given geographic area. Field key results are linked to descriptions of each type, which can help confirm result and provide information on range of type, species composition, environmental factors, and ecological processes such as fire, and other information that will assist in resource management and vegetation restoration.

Purpose and Objectives

Across the West, BLM managers are implementing Secretarial Order 3336, to apply new strategies appropriate to conservation and management of sagebrush ecosystems and sage-grouse habitat. The sage-grouse habitat assessment framework (Stiver et al. 2015) and the BLMs Assessment, Inventory and Monitoring strategy (MacKinnon et al. 2011, Toevs et al. 2011, Herrick et al. 2015) have field data collection as components during which a land cover type “label” can be applied to the area being sampled.

Having keys to units in the National Vegetation Classification (NVC; FGDC 2008) for use in the field would provide tools for achieving consistent application of NVC type names to these field samples. Accurately labeled on-the-ground vegetation samples are extremely valuable for a number of applications, e.g. monitoring of rangeland condition by vegetation type, training sites for mapping, inventory of vegetation types found in a management area and identifying particular habitats for species of concern (Reid et al. 2016).

NatureServe ecologists have developed keys for use in the field to the NVC Macrogroups, Groups, and Alliances found in 4 clusters of EPA ecoregions (**Figure 1**): a) Central Basin and Range, b) Northern Great Basin and Range / Columbia Basin, c) Wyoming Basin, and c) Northwestern and Western Great Plains / High Plains (northern portion) (EPA 2013, Omernik 1987).

The keys include the vegetation types most relevant to the BLM, such as sagebrush, pinyon-juniper, semi-desert scrub (e.g. blackbrush, salt desert scrub), lower elevation grasslands, and riparian and wet meadow types. Generally, higher elevation forests and alpine vegetation types were not included, unless of particular interest in one ecoregion (e.g. aspen in the Central Basin and Range) or to clarify contrasting vegetation units.

Project Overview

NatureServe ecologists are well prepared to write field keys such as these. For the original LANDFIRE effort, we developed field keys to ecological systems, organized into clusters of map zones (roughly corresponding to ecoregions). NatureServe is a [artner with the National Park Service’s Vegetation Inventory Program, and has written keys over recent decades for many national park vegetation inventory efforts in the western U.S. (e.g. Cogan et al. 2012, Kearsley et al. 2015), many of them organized by NVC alliances. NatureServe ecologists developed the procedures for assigning of expert labels to plots, in coordination with the LANDFIRE, FIA, USGS and TNC partners. In partnership with LANDFIRE NatureServe staff recently developed keys to automate the labeling of some 400,000 plots in CONUS to NVC Groups (Reid et al. 2014).

The writing of field keys includes the following major tasks:

1) Determine list of NVC Groups and Alliances found in the geography selected for the field key.
2) Compile and review previously written keys for related vegetation (e.g. keys to ecological systems, NPS park units).
3) Review concepts (e.g. descriptions) and criteria used in the LANDFIRE auto-keys to NVC Groups
4) Write the keys to selected NVC Macrogroups, Groups, and Alliances
5) Have someone who did not write the keys conduct a thorough review of the keys
6) Revise keys as necessary

Figure 1. EPA Ecoregions used to organize field keys to the Groups and Alliances of the National Vegetation Classification (NVC) that are found in these ecoregions. NVC types found in the Northern Basin and Range and Columbia Plateau ecoregions were combined into one key. Types found in the northern portion of the High Plains ecoregion were included in the Northwestern Great Plains key.

List of Products

1) Project summary report (this document)
2) Field keys NVC Groups and Alliances found in 4 clusters of EPA ecoregions including:
    a. Central Basin and Range
    b. Northern Basin and Range / Columbia Plateau
    c. Wyoming Basin
    d. Northwestern Great Plains / High Plains (northern portion)
3) Descriptions of NVC Divisions, Macrogroups, Groups and Alliances reported to occur in each EPA ecoregion (Appendices to each ecoregional key; see appendix document Descriptions_NVC_Groups_Alliances_WestGreatPlains_Nov_2017.pdf).

Each ecoregion-based key is a separate document, with the same introductory material (this report & key instructions), but the key itself is different for each ecoregion. Four appendices are provided, one for each ecoregion key, containing the descriptions of the NVC Groups and Alliances included in the relevant ecoregional key.

There is a Table of Contents included for each key, so the user can easily navigate the key itself; and each description appendix also has a Table of Contents to ease finding a description of interest to the key user.

Field Key Design and Instructions for Use

Below we provide information about the NVC hierarchy (an overview), how the keys are organized, definitions for some of the terms used in the keys, and general instructions for how to use them. **We advise the user to read the below sections before attempting to use the keys**.

These field keys are dichotomous and organized using the US National Vegetation Classification (NVC) hierarchy levels for each geographic area. Dichotomous keys are tools that have commonly been used for identifying plants and animals, but can be applied to identifying other things with complex relationships such as vegetation types. "Dichotomous" means the key is organized in a series of pairwise choices of distinguishing characteristics that leads the user to the next pair of choices, or to a conclusion. These pairwise choices are also called *couplets*. Once a vegetation area is keyed, the resulting type name can be cross-checked against a vegetation description to confirm the label for the vegetation type.

NVC Hierarchy

The NVC hierarchy is organized in a strict hierarchical fashion, from broad to finer units in eight, completely nested levels from Class to Association (**Figure 2**). These keys use four of the eight hierarchical levels of the NVC: Division, Macrogroup, Group and Alliance. The mid-levels (Division, Macrogroup, and Group) are based on combinations of diagnostic and dominant plant growth forms, continental to regional differences in mesoclimate, geology, substrates, hydrology and disturbance regimes, and a broad to somewhat narrow set of diagnostic species that represent regional biogeographic differences (**Table 1**). The lower levels (Alliance) are based primarily on floristics, including a narrow range of characteristic species, diagnostic species, and some sub-regional environmental factors (Faber-langendoen et al. 2007, FGDC 2008, Faber-Langendoen et al. 2014; see www.usnvc.org to explore the full hierarchy and access descriptions of units).

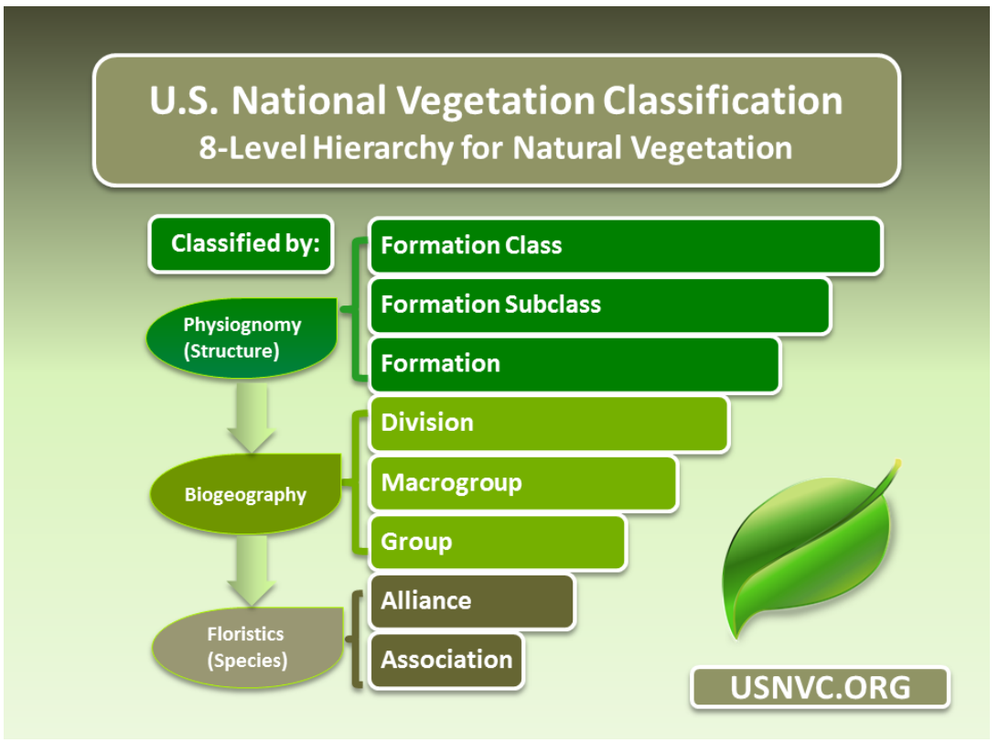

Figure 2. Summary of the primary criteria used to define the various levels of the USNVC.

Natural, Ruderal and Cultural Vegetation

One of the more distinctive features of the USNVC is that it includes both natural vegetation, which establishes spontaneously and is shaped partly or strongly by ecological processes, and cultural vegetation, which is typically planted and strongly shaped by anthropogenic processes, e.g., corn fields or golf courses). By including all vegetation types in a consistent framework, land managers and others can address issues such as wildfire regimes, pest infestations, exotic species invasions, successional changes, and conversion to farms or homes. In addition, the comprehensive approach of the USNVC classification enables an 'all lands approach,' which several government agencies use to ensure that their agency-specific land management planning takes place in the context of the larger landscape.

Natural vegetation is composed predominantly of spontaneously growing sets of plant species with composition shaped by both abiotic (site) and biotic processes; these are vegetation types whose species composition is primarily determined by non-human ecological processes (Küchler 1969, Westhoff and van der Maarel 1973, van der Maarel 2005). Although natural vegetation is variously affected by human activities (e.g., logging, livestock grazing, fire, introduced pathogens), it retains a distinctive set of spontaneous vegetation and ecological characteristics (Westhoff and van der Maarel 1973, Di Gregorio and Jansen 1996). It includes both near-natural and ruderal vegetation (see below). ***Natural vegetation types <u>are</u> included in the keys provided here.***

Ruderal vegetation includes the more distinctive invasive and weedy vegetation types; that is, those with no apparent historical natural analogs, sometimes referred to as "novel" or "emerging" ecosystems (Hobbs et al. 2006, Belnap et al. 2012). Within the NVC this vegetation is referred to as ruderal; that is "vegetation found on human-disturbed sites, with no apparent recent historical natural analogs, and whose current composition and structure (1) is not a function of continuous cultivation by humans and (2) includes a broadly distinctive characteristic species combination, whether tree, shrub or herb dominated. The vegetation is often comprised of invasive species, whether exotic or native, that have expanded in extent and abundance due to human disturbances" (Curtis 1959, Ellenberg 1988, Lincoln et al. 1998). ***Ruderal vegetation types <u>are</u> included in the keys provided here.***

Cultural Vegetation Hierarchy

The **Cultural vegetation hierarchy** is organized by type of human manipulation at the top four, broadest levels, including distinctions between agricultural lands, reclaimed farmlands, and urban lawns and parks. The two mid-levels are defined by climate, plant taxa, and specifics of human manipulations, such as temperate row crops and hayfields or tropical orchards. The lowest two levels are defined by the most common species and appearance, describing sweet corn or banana crops, for example. Definitions and examples of the cultural hierarchy are provided in FGDC (2008) and Faber-Langendoen et al. (2014). ***Cultural vegetation types <u>are not</u> included in the keys provided here***.

Table 1. Levels, definition and example of the hierarchy for natural vegetation**.** The name of the level can be added to the type name for clarity, where needed.

Natural Hierarchy		Definition	Example
Upper	L1 – Formation Class	A vegetation type defined by broad combinations of dominant general growth forms adapted to basic moisture, temperature, and/or substrate or aquatic conditions.	**Colloquial Name:** Desert & Semi-Desert **Scientific Name:** Xeromorphic Woodland, Scrub & Herb Vegetation **Code:** 3.
	L2 – Formation Subclass	A vegetation type defined by a combination of general dominant and diagnostic growth forms that reflect global mega- or macroclimatic factors driven primarily by latitude and continental position, or that reflect overriding substrate or aquatic conditions.	**Colloquial Name:** Cool Semi-Desert Scrub & Grassland **Scientific Name:** Cool Semi-Desert Scrub & Grassland **Code:** 3.B.
	L3 – Formation	A vegetation type defined by combinations of dominant and diagnostic growth forms that reflect global macroclimatic conditions as modified by altitude, seasonality of precipitation, substrates, and hydrologic conditions.	**Colloquial Name:** Cool Semi-Desert Scrub & Grassland **Scientific Name:** Cool Semi-Desert Scrub & Grassland **Code:** 3.B.1.
Mid	L4 – Division	A vegetation type defined by combinations of dominant and diagnostic growth forms and a broad set of diagnostic plant species that reflect biogeographic differences in composition and continental differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes.	**Colloquial Name:** Western North American Cool Semi-Desert Scrub & Grassland **Scientific Name:** *Artemisia tridentata - Atriplex confertifolia / Hesperostipa comata* Cool Semi-Desert Scrub & Grassland **Code:** D040

Natural Hierarchy		Definition	Example
	L5 – Macrogroup	A vegetation type defined by moderate sets of diagnostic plant species and diagnostic growth forms that reflect biogeographic difference in composition and sub-continental to regional mesoclimate, geology, substrates, hydrology, and disturbance regimes.	**Colloquial Name:** Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland **Scientific Name:** *Artemisia tridentata - Artemisia tripartita ssp. tripartita - Purshia tridentata* Steppe & Shrubland **Code:** M169
	L6 – Group	A vegetation type defined by a relatively narrow set of diagnostic plant species (including dominants and co-dominants), broadly similar composition, and diagnostic growth forms that reflect regional mesoclimate, geology, substrates, hydrology, and disturbance regimes.	**Colloquial Name:** Intermountain Dry Tall Sagebrush Steppe & Shrubland **Scientific Name:** *Artemisia tridentata ssp. wyomingensis - Artemisia tridentata ssp. tridentata* Steppe & Shrubland **Code:** G303
Lower	L7 – Alliance	A vegetation type defined by a characteristic range of species composition, habitat conditions, physiognomy, and diagnostic species, typically at least one of which is found in the uppermost or dominant stratum of the vegetation. Alliances reflect regional to subregional climate, substrates, hydrology, moisture/nutrient factors, and disturbance regimes.	**Colloquial Name:** Wyoming Big Sagebrush Dry Shrubland **Scientific Name:** *Artemisia tridentata ssp. wyomingensis* Dry Steppe & Shrubland **Code:** A3184
	L8 – Association	A vegetation type defined by a characteristic range of species composition, diagnostic species occurrence, habitat conditions and physiognomy. Associations reflect subregional to local topo-edaphic factors of substrates, hydrology, disturbance regimes and climate.	**Colloquial Name:** Wyoming Big Sagebrush / Indian Ricegrass Shrubland **Scientific Name:** *Artemisia tridentata ssp. wyomingensis / Achnatherum hymenoides* Shrubland **Code:** CEGL001046

Use in Field

The key is designed to assist users in identifying Division, Macrogroup, Group and Alliance level units in the field. The NVC vegetation unit concepts are robust, but still constructed from available field data so may not account for all types occurring within the sample area, nor explain the full range of variation of all vegetation types as they appear on the ground.

For each geographic area there is a field key to each the NVC units occurring in that Division in that area. Knowing the Division, the user can choose one of two keys to lower level units; one for upland divisions and one for riparian or wetland divisions. These secondary keys are to Macrogroup, Group and Alliance within a given Division. First vegetation is keyed to NVC Division, then depending on the division, one keys further in either the upland or the riparian and wetland key to determine Macrogroup, Group and Alliance units.

In time, field crews will be able to identify vegetation to Division without the Division Key and will be able to go directly to the appropriate secondary key. Indeed, many users will be able to go directly to the Macrogroup or Group section of the key, once familiar with the hierarchical structure of the keys and the vegetation within a region.

The Key to NVC Divisions is defined by the physiognomy of the vegetation, i.e., Forest/ Woodland, Shrubland/Shrub Steppe (shrub herbaceous), Herbaceous (graminoid or forb dominated) and Sparse vegetation. The second level (Macrogroup, Group and Alliance) focuses on the dominant and diagnostic species' canopy cover and to a lesser extent, habitat or elevation zone. Also important are geographic range of occurrence and specific environmental variables such as a sandy substrates for sand deposit vegetation types.

For use in the field there are several assumptions regarding use of keys:

1) The area being keyed is a homogeneous section of vegetation. Be aware that transects may sample ecotones or may cross from one type of vegetation into another. When a transect crosses a boundary, it may need to be keyed for each homogeneous section within the transect. Transects sampling transitional vegetation in ecotones is problematic as it may not key or key to multiple vegetation types.

2) Percent cover in the key refers to absolute canopy cover, not foliar cover and not relative cover, unless specified in key couplet.

3) Once you have made your selection of a vegetation type based on the key, always read the description; if it appears to be a poor fit, make a note of it and flag the data sheet for further expert review.

Use in the office

Plot data has the same assumptions and limitations of using a key in the field; this key assumes the unit being keyed is homogenous. It may not be possible to separate out homogenous sections if transects cross into a second type of vegetation. Also the landscape context is lost so without notes from field crews, it is difficult to determine if sampled vegetation has been disturbed or otherwise altered so that it does not represent the natural conditions, or if the vegetation is transitional (ecotonal) without a clear difference between two adjacent vegetation types.

Key Instructions

These dichotomous keys are organized by the hierarchical units of the US National Vegetation Classification (NVC) Units. Keying is done in a two-step process starting with the broader Key to Divisions, then moving to separate keys to other mid-level units (Macrogroup and Group) and the lower level unit (Alliance). The Key to Divisions will result in a division level unit such as D040 Western North American Cool Semi-Desert Scrub & Grassland. Then the user goes to the Table of Contents to find the desired key for that division. Division keys will key vegetation in a nested fashion to the Macrogroups, Groups and Alliances that occur within the geographic area of the key.

These Division Keys are organized in the Table of Contents hierarchically in two groups:

A) Keys to USNVC Upland Macrogroups, Groups and Alliances in the Central Basin and Range Ecoregion in the Western US and

B) Key to USNVC Wetland and Riparian Macrogroups, Groups and Alliances in the Central Basin and Range Ecoregion in the Western US.

Numbering in these keys is organized by the NVC hierarchy. Couplets are paired 1a and 1b, to be read as 1a criteria versus 1b criteria. The key is completely nested and starts with the macrogroup couplets, which are numbered as "M"; e.g. M1a, M1b, M2a, M2b, etc.), then group couplets (numbered "G"; e.g. G1a, G1b, G2a, G2b, etc.) and finally alliance couplets (numbered "A"; e.g. A1a, A1b, A2a, A2b, etc.). The Key to Divisions is numbered similarly with "D" for each couplet: e.g. D1a, D1b, D2a, D2b, etc.).

In some cases, there are couplets for additional Macrogroups, Groups and Alliances that are not known from the specific ecoregion but have been included for reference purposes to contrast with the corresponding types. These NVC units are noted with an "*" at the end of the name of the unit.

When using this strictly nested key, if you come to a dead end or to alliances that do not represent the vegetation you are keying, it is important to verify that you correctly keyed to Division, Macrogroup and Group levels. The upper levels of the hierarchy are biogeographically influenced so vegetation dominated by similar, widespread species can occur in multiple alliances. For example, *Artemisia tridentata* (big sagebrush) occurs in multiple alliances as do widespread grasses such as *Pseudoroegneria spicata* (bluebunch wheatgrass). Also, some of the widespread Alliances were placed in Groups as a "best fit" regionally and it is possible to have "outliers" from adjacent regions e.g., Mojave Mid-Elevation Mixed Desert Scrub Group in the southern Great Basin. Therefore, it is essential to verify your initial results from the key by trying alternative similar couplets in the upper levels of the hierarchy.

In addition to the key, you will be provided full descriptions of vegetation units at the Division, Macrogroup, Group and Alliance levels. Please read the description of units to verify your key result is correct. Some NVC units are somewhat heterogeneous and may include vegetation that differs from a generalized concept, but these are often clearly addressed in the descriptions. Not all species that distinguish each Group or Alliance could be listed in the couplets; the descriptions are much more complete.

Definitions for use in keys (see Faber-Langendoen et al. 2016 for an extensive list of growth-form terms):

Definitions of Terms used in Key to NVC Divisions

Cryomorphic — Pertaining to plants having structural or functional adaptations to survive cold temperatures and resist frost damage (e.g., alpine creeping dwarfshrubs, krummholz).

Cryptogam — A plant that produces by spores or gametes rather than seed, i.e. an alga, bryophyte or pteridophyte (fern). For vegetation purposes, often extended to include lichen, which are comprised of a fungus and an alga. Often a component of biological soil crust.

Hydromorphic — Pertaining to plants having structural or functional adaptations for living in water-dominated or aquatic habitats (adapted from FGDC 1997 and Lincoln and others 1998).

Lithomorphic — Pertaining to plants, especially cryptogams, having structural or functional adaptations for living on rock surfaces or in rocky substrates (i.e. particle sizes larger than 2 mm diameter) or very hard surfaces, such as dense clay badlands (adapted from Lincoln and others 1998).

Mesomorphic — Pertaining to plants requiring environmental conditions of moderate moisture and temperature or which are only partially protected against desiccation (adapted from Lincoln and others 1998).

Scleromorphic— Pertaining to plants that have hard leaves, short internodes and leaf orientation parallel or oblique to direct sunlight.

Xeromorphic — Pertaining to plants having structural or functional adaptations to prevent water loss by evaporation (Lincoln and others 1998). Xeromorphic growth forms include succulent (e.g., cacti, euphorbias) and small-leaved shrubs and trees.

Examples:

- Mesomorphic Tree Vegetation (Forest & Woodland)
- Mesomorphic Shrub & Herb Vegetation (Shrub & Herb Vegetation)
- Xeromorphic Woodland, Scrub & Herb Vegetation (Desert & Semi-Desert)
- Hydromorphic Vegetation (Aquatic Vegetation)

Definitions of Terms used in Keys to NVC Macrogroups, Groups, and Alliances

Tree - A woody plant that generally has a single main stem and a more or less definite crown. In instances where growth form cannot be readily determined, woody plants equal to or greater than 5 m in height at maturity are to be considered trees (adapted from FGDC 1997). Excludes krummholz (wind-stunted trees), but includes small trees or "treelets" (Box 1981). Tall multi-stemmed woody plants with strong canopy structure and that will exceed 5 m would be included here (e.g. mature, multi-stemmed *Juniperus osteosperma, Cercocarpus ledifolia* in the United States). Also includes Cactaceae, *Carnegia gigantea* (saguaro), Agavaceae, *Yucca brevifolia* (Joshua trees), and other species over 5 meters in height at maturity.

Shrub - A woody plant that generally has several erect, spreading, or prostrate stems that give it a bushy appearance. In instances where growth form cannot be readily determined, woody plants less than 5 m in height at maturity are to be considered shrubs (adapted from FGDC 1997). Includes krummholz (wind-stunted trees), but excludes small trees (Box 1981). Includes dwarf-shrubs (less than 30 cm), low or short woody vines, and arborescents (woody plants that branch at or near ground-level but grow to low tree heights) (Box 1981). Includes cacti less than 5 meters in height at maturity. Includes both the "Typical Stem succulents" and "Bush succulents" (Box 1981), *Agave* and *Yucca*. Some multi-stemmed, bushy woody species ("scrub") that reach up to 10 m may be included here, such as *Quercus gambelii* (Gambel oak) or riparian scrub *Alnus incana* (gray alder) and *Alnus viridis* (green alder).

Herb - A vascular, non-woody plant without perennial aboveground woody stems, with perennating buds borne at or below the ground surface. (Whittaker 1975, FGDC 1997). Includes forbs (both flowering forbs and spore-bearing vascular plants), graminoids, and herbaceous vines.

Nonvascular - A plant or plant-like organism without specialized water or fluid conductive tissue (xylem and phloem). Includes mosses, liverworts, hornworts, lichens, and algae (adapted from FGDC 1997). Also called thallophytes or "nonvascular cryptogams," (that is, excluding the vascular cryptogams; see Herb) (Box 1981).

Epiphyte - A vascular or nonvascular plant that grows by germinating and rooting on other plants or other perched structures, and does not root in the ground (adapted from FGDC 1997).

Liana - A woody, climbing plant that begins life as terrestrial seedlings but relies on external structural support for height growth during some part of its life (Gerwing 2004), typically exceeding 5 m in height or length at maturity. Non-woody climbers are treated as "Herb."

Other tips for using field keys.

1. If area of interest is in a transition zone between wetland and upland, try keying as both upland and wetland/riparian sections of the key. In general Upland Vegetation is influenced only by precipitation, whereas vegetation of wetlands, riparian areas, playas, and/or mudflats is influenced by accumulated runoff, groundwater, impounded water, seasonal flooding, or any source of moisture in addition to precipitation.
2. You are observing vegetation that you think is an herbaceous or shrubland community, but it has some tree cover. In this case, try keying the vegetation through the woodland key as well as the herbaceous or shrubland key. In general with any layer, if it does not cover at least 8% (tree layer) or 5% (shrub or herbaceous layers), it is ignored. The exception is in very sparse communities (see #5 below).
3. The diagnostic layer consists of woody plants that may appear in either a shrub or a tree form, depending on site conditions and age. These species include *Pinus monophylla, Juniperus osteosperma,* and *Cercocarpus ledifolius*. In this key, these species are considered to be evergreen trees, regardless of their height or growth form. For example *Cercocarpus ledifolius* Scrub Alliance is keyed in a woodland division: D010 Western North American Pinyon - Juniper Woodland & Scrub
4. Big sagebrush (*Artemisia tridentata*) needs to be identified to subspecies because different subspecies are characteristic of different Groups. For example *Artemisia tridentata* ssp. *vaseyana* is diagnostic of Intermountain Mountain Big Sagebrush Steppe & Shrubland (G304) that occurs at montane and subalpine elevations. In general, subspecies of other *Artemisia* taxa are also necessary to correctly key to Alliance (e.g. subspecies of *A. arbuscula* and *A. cana*).
5. Sparsely vegetated communities are defined as having total vascular plant cover of 2-10% (sometimes a little more given the range of natural variation) and are often a mix of woody and herbaceous plants with nothing dominant or diagnostic. In some stands cover of non-vascular organisms such as lichen and moss may actually dominate these communities. Sparsely vegetated areas are typically heterogeneous and can be difficult to key. Borderline "sparsely" vegetated stands should always be run through multiple keys because even though they may not fall clearly into a woodland, shrubland or herbaceous category, they may actually be non-sparse communities (e.g.

the natural variation of some of the non-sparse vegetation types approaches 10% total vascular plant cover and may range below). This is especially true for shrubland and dwarf-shrubland associations that occur in harsh habitats such as deserts or alpine areas. Go by dominance rather than absolute cover measurements.

6. Mixed evergreen – deciduous (aspen) forests and woodlands generally have 25-75% relative tree canopy cover of both conifers and aspen. Aspen stands generally have <25% relative tree canopy cover of conifer trees and conifer stands have <25% relative tree canopy cover of aspen. Be sure to consider the full Minimum Mapping Unit (MMU) observation area in case the point lands near a small patch inclusion.
7. Focus on the perennial species in the community unless the community or layer consists almost entirely of annuals or ephemerals or is highly disturbed or degraded.
8. The NVC does not weight all species as contributing equally to a classification. Species vary in their degree of habitat specialization. To a point, the more specialized and constant a species (high fidelity), the more it is likely to be a "diagnostic" species that controls the assignment of a community to an association. Generalist species such as *Ephedra viridis, Ericameria nauseosa, Gutierrezia sarothrae, Poa secunda, Opuntia* spp. are only considered diagnostic if they are overwhelmingly dominant. For example, if you are in a pinyon - juniper woodland with about equal cover of *Cercocarpus ledifolius* and *Artemisia tridentata,* it will be classified as *Pinus monophylla - Juniperus osteosperma / Cercocarpus ledifolius* Woodland, not *Pinus monophylla - Juniperus osteosperma / Artemisia tridentata* Woodland. Weak indicator species generally are not used to classify unless strongly dominant.

Some examples of such diagnostic considerations from the interior western US include:

Subalpine trees: *Pinus longaeva > Picea engelmannii > Pinus flexilis > Populus tremuloides*

Montane trees: *Pinus ponderosa > Abies concolor > Pseudotsuga menziesii > Populus tremuloides*, although this will differ among seral stands versus persistent stands.

Rock outcrop shrubs: *Cercocarpus ledifolius > Cercocarpus intricatus > Peraphyllum ramosissimum, Glossopetalon spinescens > Artemisia tridentata > Ephedra viridis*

Upland shrubs: *Artemisia arbuscula, Artemisia nova > Artemisia tridentata* ssp*. vaseyana > A. t.* ssp*. tridentata > Amelanchier utahensis > Purshia tridentata > Symphoricarpos oreophilus*

Shrub in alluvial fans, alluvial flats and terraces: *Sarcobatus vermiculatus > Artemisia tridentata* ssp. *tridentata > A. t.* ssp*. wyomingensis > Ericameria nauseosa*

Grasses, Strong indicators: *Leymus cinereus, Elymus trachycaulus, Pseudoroegneria spicata, Achnatherum lettermanii, Hesperostipa comata,* **Medium***: Pleuraphis jamesii, Achnatherum hymenoides, Poa fendleriana.* **Weak***: Poa secunda, Elymus elymoides, Aristida* spp.*, Sporobolus cryptandrus, Bromus inermis, Poa pratensis, Bromus tectorum*.

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Keys to USNVC Divisions, Macrogroups, Groups and Alliances in the Northwestern Great Plains and High Plains Ecoregions

November 2017, NatureServe, Boulder, CO

TABLE OF CONTENTS

* Indicates that NVC unit is peripheral to the NW Great Plains key area and may not be present.

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Introduction

This is a field key of seven upland and six wetland/riparian divisions from the Northwestern Great Plains ecoregion.

NatureServe ecologists have developed keys for use in the field to the NVC Macrogroups, Groups, and Alliances found in 4 clusters of US EPA ecoregions: the Central Basin and Range, the Northern Basin and Range and the Columbia Plateau, the Wyoming Basin, and the Northwestern Great Plains and the High Plains (northern portion).

These field keys are dichotomous and organized using the National Vegetation Classification (NVC) hierarchy levels for each geographic area. Dichotomous keys are tools that have commonly been used to identify plants and animals, but can be applied to identifying other things with complex relationships such as vegetation types. Dichotomous means the key is organized in series of steps, each with two choices of distinguishing characteristics that leads to a conclusion.

The NVC hierarchy is organized in hierarchical fashion, from broad to finer units in eight, completely nested, levels from Class to Association. These keys use four of the eight hierarchical levels of the NVC: Division, Macrogroup, Group and Alliance. The mid levels (Division, Macrogroup, and Group) are based on combinations of diagnostic and dominant growth forms, continental to regional differences in mesoclimate, geology, substrates, hydrology and disturbance regimes, and a broad to somewhat narrow set of diagnostic species that represent regional biogeographic differences. The lower levels (Alliance) are based primarily on floristics, including a narrow range of characteristic species, diagnostic species, and some subregional environmental factors (Faber-langendoen et al. 2007, FGDC 2008).

The keys include the vegetation types most relevant to the BLM, such as sagebrush, pinyon-juniper, semi-desert scrub (e.g. blackbrush, salt desert scrub), lower elevation grasslands, and riparian and wet meadow types. Generally, higher elevation forests and alpine vegetation types are not included, unless of particular interest in one ecoregion (e.g. aspen in the Central Great Basin) or to clarify contrasting vegetation units.

The keys are designed to assist users in identifying Division, Macrogroup, Group and Alliance level units in the field. The NVC vegetation unit concepts are robust, but still constructed from available field data and what is currently known about distribution, so may not account for all types occurring within the sample area, nor explain the full range of variation of all vegetation types as they appear on the ground.

The key has two levels; the first level Division Key is defined by the physiognomy of the vegetation, i.e., Forest/ Woodland, Shrubland/Shrub Steppe (shrub herbaceous), Herbaceous (graminoid or forb dominated) and Sparse vegetation. The Division Key determines appropriate Division. The second level (Upland and Wetland/Riparian key) focuses on the dominant and diagnostic species' canopy cover and to a lesser extent, habitat or elevation zone, and provides the keys to Macrogroups, Groups and Alliances within the Division. Also important are geographic range of occurrence and specific environmental variables such as a sandy substrates for sand deposit vegetation types. Once the user has keyed to a Division, then the Table of Contents is used to link to that Division within a portion of the Upland or Wetland/riparian key.

For more information about the structure and content of the keys, how to use them, and definitions of some terms used in the keys, see the report accompanying this key (above, in section **Field Key Design and Instructions for Use**).

Key to USNVC Divisions in the Western US

The division key includes all divisions found in the western U.S.; one or more of the divisions may not occur in the region represented in the main body of the keys; these are indicated by an * after the name of the division.

D1a. Vegetation of rocky or rock-like habitats, including outcrops, cliffs, talus, or scree. Cryptogam vegetation tends to dominate, with vascular plant species of low cover (less than 10%). **D2**
D1b. Vascular vegetation present with 10% or greater cover and not like above in all respects. **D3**

D2a. 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 generally west of the 100th Meridian. Cryptogam vegetation tends to dominate, with vascular plants species of low cover. .....
..... D052 Western North American Temperate & Boreal Cliff, Scree & Rock Vegetation *
D2b. Vegetation of eastern and boreal North America generally east of the 100th Meridian found on somewhat to strongly vertical cliffs, talus slopes, and erosional bluffs and characterized by sparse and patchy vascular vegetation and often high nonvascular and fern cover). .....
..... D051 Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation

D3a. Tree-dominated vegetation of tropical, temperate and boreal regions, characterized by broadly mesomorphic (including scleromorphic) tree growth forms, including broad-leaved, needle-leaved, sclerophyllous, palm, bamboo trees, and tree ferns, with at least 10 percent cover. Includes humid to seasonally dry tropical to boreal and subalpine climates; wet to dry substrate conditions. Includes native, managed and some plantation forests where human management is infrequent. **D5**
D3b. Vegetation not like above in all respects **D4**

D4a. 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), typically with <10% mesomorphic tree cover (but see discussion of tropical grasslands and savannas above), tropical to boreal and subalpine climates, wet to dry substrate conditions. **D12**
D4b. 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, can be open to very sparse, including very open sandy and rocky vegetation with xeromorphic growth forms. **D20**

D5a. Treed vegetation of uplands **D6**
D5b. Treed vegetation of wetlands (site periodically) or riparian areas that have a high water tables nearby that plants can access (riparian). **D9**

D6a. Vegetation dominated by Pinyon and Juniper species. .....
.....D010 Western North American Pinyon - Juniper Woodland & Scrub
D6b. Forests not as above **D7**

D7a. Forests or woodlands of aspen, oak and mixed hardwoods found throughout the Great Plains, from central Kansas to the Canadian aspen parkland region. .....
.....D326 North American Great Plains Forest & Woodland
D7b. Forests not as above **D8**

D8a. Forests and woodlands in the cool maritime temperate climates of western North America characterized by conifers such as *Abies amabilis, Abies grandis, Abies concolor var. lowiana, Abies magnifica, Abies procera, Calocedrus decurrens, Chamaecyparis nootkatensis, Chamaecyparis 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; or broadleaf trees Acer macrophyllum, Alnus rubra, Arbutus menziesii, Lithocarpus densiflorus, Quercus chrysolepis*, and *Quercus kelloggii*.....
.....D192 Vancouverian Forest & Woodland *
D8b. Forests, woodlands and savannas of the mountains of 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*. Associated deciduous hardwoods are infrequent and include *Acer grandidentatum, Betula papyrifera*, and *Populus tremuloides*. **..... ..... D194 Rocky Mountain Forest & Woodland**

D9a. Swamp and floodplain forests and woodlands found in poorly-drained basins or along lakeshores and deciduous wet forests along small- to large-sized rivers (on a wide range of soil types), across much of cool-temperate eastern North America. ..... **.....D011 Eastern North American-Great Plains Flooded & Swamp Forest**
D9b. Wetland or riparian forests not like above **D10a**

D10a. Forested riparian and depressional wetlands dominated by broad-leaved deciduous trees or conifers (or both); at mid to high elevations of the Rocky Mountains, ranges of the Intermountain West, the Colorado Plateau, the Sierra Nevada and eastern Cascades. ..... **.....D195 Rocky Mountain-Great Basin Montane Flooded & Swamp Forest ***
D10b. Wetland or riparian forests not like above **D11**

D11a. Forested wetlands of temperate maritime climates from southern Alaska to northern California, including riparian forests, rich swamps, and poor peat swamps. Lowland riparian forests characterized by broad-leaf *Acer macrophyllum, Alnus rubra, Populus balsamifera ssp. trichocarpa, Salix lucida ssp. lasiandra* or *Fraxinus latifolia* (in southern part of range), or conifers including *Abies grandis, Picea sitchensis* or *Thuja plicata*. Montane riparian areas generally conifer-dominated, species include *Abies amabilis, Abies concolor, Abies magnifica, Pinus contorta var. murrayana, Populus tremuloides*, and/or *Tsuga mertensiana*. **..... ..... D193 Vancouverian Flooded & Swamp Forest ***
D11b. Lowland riparian forests and woodlands dominated by broad-leaved deciduous trees (cottonwoods (*Populus*), sycamores (*Platanus*, and hackberries (*Celtis*)) and palms (*Washingtonia*) 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. ..... **.....D013 Western North American Interior Flooded Forest**

D12a. Shrub- and herb-dominated vegetation of uplands.....**D13**
D12b. Shrub- and herb-dominated vegetation of wetlands and riparian areas **D16**

D13a. Vegetation of the central plains of North America, predominately grasslands commonly referred to as shortgrass, mixedgrass and tallgrass prairie, interspersed with evergreen and deciduous shrublands. Found on glaciated or non-glaciated substrates, rolling to rugged topography, and fine-textured to coarse-textured soils. **..... D023 Central North American Grassland & Shrubland**
D13b. Vegetation not like above in all respects **D14**

D14a. Chaparral shrublands occurring between low-elevation desert landscapes and higher subalpine woodlands of the western U.S. and northern Mexico. Characteristic genera include *Arctostaphylos, Ceanothus, Cercocarpus*, and *Quercus*. **..... D061 Western North American Interior Chaparral ***
D14b. Vegetation not like above in all respects **D15**

D15a. Lowland to subalpine shrubland, grassland, and meadow communities in temperate mountainous regions of western North America, dominated by cold-deciduous shrubs, cool-season bunchgrasses or mesic forbs. Strong diagnostic species that are often dominant or codominant include *Acer glabrum, Amelanchier utahensis, Ribes cereum*, and *Symphoricarpos oreophilus*. Moderate diagnostics include *Holodiscus discolor, Holodiscus dumosus, Menziesia ferruginea, Physocarpus malvaceus, Physocarpus monogynus, Rosa nutkana, Rosa woodsii*, and *Vaccinium ovalifolium*, among many others. See description for all diagnostic species. **..... ..... D022 Western North American Grassland & Shrubland**
D15b. 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. Characteristic genera include *Adenostoma, Arctostaphylos, Artemisia, Baccharis, Ceanothus, Eriogonum, Frangula, Malosma, Nassella, Quercus, Rhus*, and *Salvia*. For dominant species see full description. ..... **..... D327 Californian Scrub & Grassland ***

D16a. 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. ..... **..... D029 North American Bog & Fen ***
D16b. Wetlands or riparian areas not like above in all respects **D17**

* Indicates that NVC unit is peripheral to the NW Great Plains key area and may not be present.

D17a. Freshwater wetlands **D18**
D17b. Alkaline, saline or brackish wetlands **D19**

D18a. 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 southern boreal latitudes of western North America. .....
D031 Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

D18b. Vegetation in eastern cool-temperate and boreal North America, including the Great Plains. Dominated by shrubs or non-hydromorphic herbaceous plants that are facultatively to obligately adapted to freshwater wetland conditions; in mineral or mucky organic soils with regular (intermittent to permanent) saturated and flooded conditions.....
..D323 Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

D19a. Brackish marsh and saline wet meadows found along shallow lakes and basins and surrounding areas across the Great Plains of North America. **.....D033 North American Great Plains Saline Marsh**

D19b. 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**.... D036 North American Western Interior Brackish Marsh, Playa & Shrubland**

D20a. Aridland shrublands and grasslands dominated by xerophytic woody shrubs, succulents and grasses that occur among the lowland intermountain basins and foothills of desert mountain ranges across the southwestern U.S. and northern Mexico. Characteristic genera include *Ambrosia* (ambrosia), *Acacia* (acacia), *Agave* (agave), *Bouteloua* (grama), *Carnegiea* (saguaro), *Dasylirion* (sotal), *Flourensia* (tarbush), *Fouquieria* (ocatillo), *Larrea* (creosotebush), *Muhlenbergia* (muhlysotal), *Olneya* (ironwood), *Parkinsonia* (paloverde), *Pleuraphis*, and *Prosopis* (mesquite). Ruderal vegetation dominated by non-native taxa (e.g., *Brassica nigra* (black mustard*), Brassica tournefortii* (Asian mustard)*, Bromus madritensis* (compact brome), *Bromus rubens* (red brome), *Eragrostis lehmanniana* (Lehmann's lovegrass), and *Schismus barbatus* (common Mediterranean grass) are also included. ..... **D039 North American Warm Desert Scrub & Grassland ***

D20b. Shrublands, shrub-steppe and grasslands within cool semi-desert climates of western North America. Includes shrublands dominated by *Artemisia tridentata, Atriplex* spp., *Yucca* spp., *Nolina* spp., *Buddleja, Coleogyne, Ephedra, Ericameria, Mortonia, Poliomintha,* etc.) Grasslands taxa are predominantly cool-season species, including *Achnatherum, Hesperostipa, Poa, Festuca, Elymus, Leymus, Pascopyrum*, and *Pseudoroegneria*. Warm-season grass genera (e.g., *Pleuraphis, Bouteloua,* and *Muhlenbergia*) are important in the southern areas. Ruderal grasslands or forblands dominated by non-native Eurasian taxa (e.g., *Bromus tectorum, Acroptilon repens, Isatis tinctoria, Sisymbrium* spp., *Taeniatherum caput-medusae*) and *Agropyron cristatum*) are also included **.....**
.....D040 Western North American Cool Semi-Desert Scrub & Grassland

* Indicates that NVC unit is peripheral to the NW Great Plains key area and may not be present.

Key to USNVC Upland Macrogroups, Groups and Alliances in the Northwestern Great Plains and High Plains Ecoregions (Selected Divisions)

1.B.2 Cool Temperate Forest & Woodland

D194 Rocky Mountain Forest & Woodland

M1a. This macrogroup comprises conifer forests, woodlands and savannas found on dry settings of the lower montane to foothill zones of the interior Pacific Northwest, and extending east into the northwestern Great Plains on escarpments and rock outcrops. *Pinus ponderosa var. ponderosa* (ponderosa pine) or *Pinus ponderosa var. scopulorum* (ponderosa pine), *Pseudotsuga menziesii* (Douglas-fir), *Pinus flexilis* (limber pine), or *Juniperus osteosperma* (Utah juniper) or *Juniperus scopulorum* (Rocky Mountain juniper). Other occasional trees may include *Pinus contorta* (lodgepole pine), *Picea engelmannii* (Engelmann spruce), *Picea glauca* (white spruce) (or their hybrid), and in the Great Plains, deciduous trees such as *Acer negundo* (box-elder), *Betula papyrifera* (paper birch), *Fraxinus pennsylvanica* (green ash), *Populus tremuloides* (quaking aspen), *Quercus macrocarpa* (bur oak), and *Ulmus americana* (American elm). **G3**
..... M501 Central Rocky Mountain Dry Lower Montane-Foothill Forest

M1b. Vegetation is not as above. **M2**

M2a. Macrogroup of high montane and subalpine forests/woodlands in mountainous regions of the western U.S. and southwestern Canada. Characteristic trees include *Abies lasiocarpa* (subalpine fir), *Larix lyallii* (subalpine larch), *Picea engelmannii* (Engelmann spruce), *Pinus albicaulis* (whitebark pine), *Pinus aristata* (bristlecone pine), *Pinus contorta* (lodgepole pine), *Pinus flexilis* (limber pine), *Pinus longaeva* (Great Basin bristlecone pine), *Populus tremuloides* (quaking aspen), and *Tsuga mertensiana* (mountain hemlock) (which is also important in Pacific maritime macrogroups). This macrogroup is mostly absent in this Great Plains key regions excepting occasional aspen dominated stands found in mesic sites in cayons and hills in the plains. **G5**
..... M020 Rocky Mountain Subalpine-High Montane Conifer Forest

M2b. Conifer and mixed deciduous-conifer macrogroup of lower montane forests, woodlands and savannas of the southern Rocky Mountains, Colorado Plateau, and Great Basin. Rare in this key region. May occur in mesic sites in the western transition zone with the Southern Rocky Mountains. Characteristic trees include *Abies concolor* (white fir), *Juniperus scopulorum* (Rocky Mountain juniper), *Pinus ponderosa* (ponderosa pine) (primarily *var. scopulorum* and *var. brachyptera*), *Pseudotsuga menziesii* (Douglas-fir), and the less extensive *Picea pungens* (blue spruce). *Populus tremuloides* (quaking aspen) may be present to codominant in the tree canopy. Other associated conifers in transitional stands include *Abies lasiocarpa var. arizonica* (corkbark fir), *Abies lasiocarpa var. lasiocarpa* (subalpine fir), *Picea engelmannii* (Engelmann spruce), *Pinus contorta* (lodgepole pine), and *Pinus flexilis* (limber pine). **G6**
..... M022 Southern Rocky Mountain Lower Montane Forest

M501 Central Rocky Mountain Dry Lower Montane-Foothill Forest

G3a. This foothill woodland group has an open-tree canopy or patchy canopy dominated by either *Pinus flexilis* (limber pine), *Juniperus osteosperma* (Utah juniper), or *Juniperus scopulorum* (Rocky Mountain juniper); found on rocky sites in the Rocky Mountains from southern Alberta to central Colorado, including escarpments and low hills across Wyoming and the western Great Plains. **A8**
..... G209 Pinus flexilis - Juniperus scopulorum Rocky Mountain Foothill Woodland

G3b. Vegetation is not as above. **G4**

G4a. This *Pinus ponderosa* (ponderosa pine) forest and woodland group occurs throughout the Great Plains Division along areas that border the Rocky Mountain Division and into the central Great Plains and range from very sparse patches of trees on drier sites, to nearly closed-canopy forest stands on north slopes or in draws where available soil moisture is higher. Deciduous trees are an important component in the western Dakotas. **A16**
..... G216 Pinus ponderosa Northwestern Great Plains Forest & Woodland Group

G4b. This *Pseudotsuga menziesii* (Douglas-fir)-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 near the

McDonald Pass and also along the Rocky Mountain Front region and central "sky island" ranges of Montana. It may extend into transition zone into the Northwestern Great Plains on mesic sites on higher hills. Additional trees present include *Populus tremuloides* (quaking aspen) in relatively mesic sites, *Pinus flexilis* (limber pine) on calcareous substrates. **A11**
..... G215 Middle Rocky Mountain Montane Douglas-fir Forest & Woodland

M020 Rocky Mountain Subalpine-High Montane Conifer Forest

G5a. A group of upland forests dominated by *Populus tremuloides* (quaking aspen) without significant conifer cover and an understory structure of complex multiple shrub and herbaceous layers, or simply just an herbaceous layer. 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. **A12**
..... G222 Rocky Mountain Subalpine-Montane Aspen Forest & Woodland

G5b. Vegetation dominated by conifers. *Populus tremuloides* may be present to codominant, but not dominant. The other groups in this macrogroup do not occur in this key region.

M022 Southern Rocky Mountain Lower Montane Forest

G6a. Dry mixed-conifer forests of mainly *Pseudotsuga menziesii* (Douglas-fir) and *Abies concolor* (white fir), although as many as seven conifers can be found in mixed stands; many cold-deciduous shrub, forb and graminoid species common. Throughout the southern Rocky Mountains and Great Basin, east into Texas; mixed-severity fire regime. It may extend out on taller hills in western Great Plains. **A13**
..... G226 Southern Rocky Mountain White Fir - Douglas-fir Dry Forest

G6b. Vegetation is not as above. **G7**

G7a. This group includes savanna-like woodlands with widely spaced (<25% tree canopy cover) *Pinus ponderosa* (ponderosa pine) (primarily *var. scopulorum* and *var. brachyptera*) (>150 years old). Understory is predominantly fire-resistant grasses and forbs that resprout following surface fires. Lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests, typically in warm, dry, exposed sites. Colorado Plateau region, west into scattered locations in the Great Basin, and north along the eastern front of the southern Rocky Mountains into southeastern Wyoming. **A14**
..... G229 Southern Rocky Mountain Ponderosa Pine Open Woodland

G7b. Widespread woodland group found throughout the cordillera of the southern Rocky Mountains at lower treeline and may extend out into hills in the breaks in the western Great Plains. It typically occurs in warm, dry, exposed sites where the dominant tree is *Pinus ponderosa* (ponderosa pine) (primarily *var. scopulorum* and *var. brachyptera*) usually with a shrubby layer of species of *Artemisia* (sagebrush), *Arctostaphylos* (manzanita), *Cercocarpus* (mountain mahogany), *Purshia* (bitterbrush), *Symphoricarpos* (snowberry), and *Quercus gambelii* (Gambel oak), with grasses *Pseudoroegneria spicata* (bluebunch wheatgrass), *Pascopyrum smithii* (western wheatgrass), and species of *Achnatherum* (needlegrass), *Bouteloua* (grama), *Festuca* (fescue), *Hesperostipa* (needle-and-thread), and *Muhlenbergia* (muhly). **A15**
..... G228 Southern Rocky Mountain Ponderosa Pine Forest & Woodland

G209 Pinus flexilis - Juniperus scopulorum Rocky Mountain Foothill Woodland

A8a. Open or patchy woodlands dominated or codominated by either *Pinus flexilis* (limber pine) often with *Juniperus osteosperma* (Utah juniper), or *Juniperus scopulorum* (Rocky Mountain juniper) present to codominant. **A9**

A8b. Open or patchy woodlands dominated by *Juniperus osteosperma* (Utah juniper), or *Juniperus scopulorum* (Rocky Mountain juniper). *Pinus flexilis* (limber pine) is typically absent. **A10**

A9a. This foothill and outcrop woodland alliance has an understory characterized by an open to moderately dense shrub layer. Herbaceous cover is typically low with less than cover than the shrubs. .....
.....A3424 Pinus flexilis / Shrub Understory Central Rocky Mountain Woodland Alliance

A9b. This foothill and outcrop woodland alliance has an understory characterized by a moderately dense to low herbaceous cover, typically perennial grass. .....
..... A3425 Pinus flexilis / Grass Understory Central Rocky Mountain Woodland Alliance

A10a. This foothill and outcrop alliance has an understory characterized by an open to moderately dense shrub cover. Shrub cover is typically >10%, but if less, then shrub cover exceeds herbaceous layer. ..... **.... A3426 Juniperus osteosperma - Juniperus scopulorum / Shrub Understory Central Rocky Mountain Woodland Alliance**

A10b. This foothill and outcrop alliance has an understory characterized by a moderately dense to low perennial grass layer. If shrubs are present, then cover is low (<10%) and perennial grass cover exceeds shrub cover. ..... **..... A3427 Juniperus osteosperma - Juniperus scopulorum / Grass Understory Central Rocky Mountain Woodland Alliance**

G215 Middle Rocky Mountain Montane Douglas-fir Forest & Woodland

A11a. This forest and woodland alliance is dominated by *Pseudotsuga menziesii* (Douglas-fir) and occurs on relatively dry to mesic sites..... **..... A3462 Pseudotsuga menziesii Middle Rocky Mountain Dry-Mesic Forest & Woodland Alliance**

A11b. This forest and woodland alliance is dominated by *Pseudotsuga menziesii* (Douglas-fir) without the maritime floristic composition. It occurs on relatively moist, cool to warm sites. .. **..... A3463 Pseudotsuga menziesii Middle Rocky Mountain Mesic-Wet Forest Alliance**

G222 Rocky Mountain Subalpine-Montane Aspen Forest & Woodland

A12a. Aspen forest alliance widespread in the southern, central and northern Rocky Mountains, west to the Sierra Nevada and east to the Black Hills; defined by a canopy dominated by *Populus tremuloides* (quaking aspen)..... **..... A2036 Populus tremuloides Rocky Mountain Forest & Woodland Alliance**

A12b. This forest and woodland alliance is found in Alberta, Montana, Washington, and Wyoming and dominated by the successional species *Betula papyrifera* (paper birch). ..... **..... A3367 Betula papyrifera Rocky Mountain Forest & Woodland Alliance**

G226 Southern Rocky Mountain White Fir - Douglas-fir Dry Forest

A13a. Forests and woodlands primarily of the southern and central Rocky Mountains dominated by diagnostic late seral tree species *Pseudotsuga menziesii* (Douglas-fir) with *Abies concolor* (white fir) typically absent or with low cover. *Populus tremuloides* (quaking aspen) is often present to codominant. ..... **..... A3454 Pseudotsuga menziesii Southern Rocky Mountain Forest & Woodland Alliance**

A13b. The other alliances in this group do not occur in this key region. .....

G229 Southern Rocky Mountain Ponderosa Pine Open Woodland

A14a. These savannas or open woodlands are characterized by widely spaced canopies dominated by *Pinus ponderosa* (ponderosa pine) primarily occurring in the southern Rocky Mountains and extending into adjacent ecoregions. ..... **.....A3419 Pinus ponderosa / Grass Understory Southern Rocky Mountain Open Woodland Alliance**

A14b. Only one alliance in this group .....

G228 Southern Rocky Mountain Ponderosa Pine Forest & Woodland

A15a. Variable alliance of forest and woodlands dominated by *Pinus ponderosa* (ponderosa pine) in association with other conifer species; southern Rocky Mountains with scattered occurrences in adjacent ecoregions. ..... **.....A3398 Pinus ponderosa Southern Rocky Mountain Forest & Woodland Alliance**

A15b. Only one alliance in this group .....

G216 Pinus ponderosa Northwestern Great Plains Forest & Woodland

A16a. This very open to moderately dense (10-30% cover) *Pinus ponderosa* (ponderosa pine) alliance sometimes has *Quercus macrocarpa* (bur oak) present to codominant in the tree canopy and is characterized by a sparse to dense herbaceous understory layer dominated by mixedgrass prairie species such as *Andropogon gerardii* (big bluestem), *Pascopyrum smithii* (western wheatgrass), and *Schizachyrium scoparium* (little bluestem). Occur in foothills of the Black Hills and along escarpments, buttes, canyons, rock outcrops or ravines as an open woodland and grades into the mixedgrass prairie as a pine savanna in surrounding Great Plains. **.....A3466 Pinus ponderosa Northwest Great Plains Open Woodland Alliance**

A16b. Not as above. Herbaceous layer not dominated by mixedgrass prairie species **A17**

A17a. This forest and woodland alliance occurs on dry to mesic sites at montane and foothill elevations in the Black Hills and is primarily dominated by *Pinus ponderosa* (ponderosa pine) but may include a sparse to relatively dense subcanopy of *Juniperus scopulorum* (Rocky Mountain juniper). The understory is variable. Shrubs may form a sparse to moderately layer or be absent. Characteristic species can include *Arctostaphylos uva-ursi* (kinnikinnick), *Artemisia tridentata ssp. wyomingensis* (Wyoming big sagebrush), *Juniperus communis* (common juniper), *Juniperus horizontalis* (creeping juniper), *Mahonia repens* (creeping barberry), *Rhus trilobata* (skunkbush sumac), *Spiraea betulifolia* (white spirea), and *Symphoricarpos albus* (common snowberry). The herbaceous understory can range from a sparse to moderately dense layer. Common species include *Carex siccata* (dryspike sedge), *Danthonia spicata* (poverty oatgrass), *Galium boreale* (northern bedstraw), *Nassella viridula* (green needlegrass), *Oryzopsis asperifolia* (roughleaf ricegrass), and *Schizachne purpurascens* (false melic)..... **A3464 Pinus ponderosa Dry-Mesic Black Hills Forest & Woodland Alliance**

A17b. This forest and woodland alliance occurs on mesic-wet sites at montane and foothill elevations in the Black Hills and isolated mountains such as Bear's Paw Mountains in the northwestern Great Plains. Stands are primarily dominated by *Pinus ponderosa* (ponderosa pine) but may include a sparse to relatively dense subcanopy of *Juniperus scopulorum* (Rocky Mountain juniper). Deciduous trees such as *Acer negundo* (box-elder), *Betula papyrifera* (paper birch), *Crataegus succulenta* (fleshy hawthorn), *Fraxinus pennsylvanica* (green ash), *Quercus macrocarpa* (bur oak), *Populus tremuloides* (quaking aspen), and *Ulmus americana* (American elm) are an important component in some areas, especially mesic draws and swales, and are sometimes codominant with the pines. The shrub layer is moderately dense to dense with characteristic species that include *Amelanchier alnifolia* (Saskatoon serviceberry), *Physocarpus monogynus* (mountain ninebark), *Prunus virginiana* (chokecherry), *Symphoricarpos occidentalis* (western snowberry), and *Toxicodendron rydbergii* (western poison-ivy). The herbaceous layer ranges from moderately dense to dense with moderate species diversity. Species such as *Antennaria rosea* (rosy pussytoes), *Apocynum androsaemifolium* (spreading dogbane), *Carex inops ssp. heliophila* (sun sedge), *Cerastium arvense* (field chickweed), *Elymus caninus* (bearded wheatgrass), *Galium boreale* (northern bedstraw), *Maianthemum stellatum* (starry false lily of the valley), *Pulsatilla patens* (eastern pasqueflower), and *Schizachne purpurascens* (false melic) are typical components of the herbaceous layer. Mosses and lichens are usually present. .... **A3465 Pinus ponderosa Mesic Black Hills Forest Alliance**

D010 Western North American Pinyon - Juniper Woodland & Scrub

M1a. This southern Rocky Mountain and Colorado Plateau pinyon and juniper savanna and woodland macrogroup is characterized by an open to closed evergreen, conifer tree canopy composed of diagnostic species *Juniperus monosperma* (one-seed juniper) and/or *Pinus edulis* (two-needle pinyon) with an understory dominated by shrubs or grasses that lacks Madrean understory species. It occurs in dry mountains and foothills in southern Colorado south into northern and central New Mexico, and extends west across the Colorado Plateau and east to the plains on breaks in the southwestern Great Plains. **G2**

..... M027 Southern Rocky Mountain-Colorado Plateau Two-needle Pinyon - Juniper Woodland

M1b. Only one macrogroup in this division occurs in key area.....

M027 Southern Rocky Mountain-Colorado Plateau Two-needle Pinyon - Juniper Woodland

G2a. This southern Rocky Mountain pinyon and juniper woodland group occurs in dry mountains and foothills in southern Colorado south into northern and central New Mexico, and extends west to the Colorado Plateau and east to the plains on breaks in the southwestern Great Plains. Vegetation is characterized by an open to closed evergreen, conifer tree canopy composed of dominant and diagnostic species *Pinus edulis* (two-needle pinyon) usually with *Juniperus monosperma* (one-seed juniper) or at higher elevations *Juniperus scopulorum* (Rocky Mountain juniper) present to codominant in the tree canopy and a variable understory. **A3**

..... G253 Southern Rocky Mountain Pinyon - Juniper Woodland

G2b. This southern Rocky Mountain juniper woodland and savanna group occurs in dry mountains and foothills in southern Colorado south into northern and central New Mexico, and extends west to the Colorado Plateau and east to the plains on breaks in the southwestern Great Plains. Vegetation is characterized by an open to closed evergreen, conifer tree canopy composed of dominant and diagnostic species *Juniperus monosperma* (one-seed juniper) sometimes with or *Juniperus scopulorum* (Rocky Mountain juniper) present at higher elevations or mesic micosites to codominant in the tree canopy and a variable understory. **A4**

..... G252 Southern Rocky Mountain Juniper Open Woodland

*G253 Southern Rocky Mountain Pinyon - Juniper Woodland**

A3a. This pinyon-juniper woodland and savanna alliance is characterized diagnostic tree species *Pinus edulis* (>5% cover) that forms a very open to moderately dense tree layer often with *Juniperus monosperma* present to codominant (or *Juniperus scopulorum* at higher elevations) with an understory dominated by an open to dense shrub or dwarf-shrub layer. .....

.....A3576 Pinus edulis - Juniperus monosperma / Shrub Understory Woodland Alliance

A3b. This pinyon-juniper woodland and savanna alliance is characterized diagnostic tree species *Pinus edulis* (>5% cover) that forms a very open to moderately dense tree layer often with *Juniperus monosperma* present to codominant (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 (<10%). .....

..... A3577 Pinus edulis - Juniperus monosperma / Herbaceous Understory Open Woodland Alliance

G252 Southern Rocky Mountain Juniper Open Woodland

A4a. This juniper woodland alliance is characterized by an open to moderately dense, short (<15 m) tree canopy and is strongly dominated by *Juniperus monosperma* or *Juniperus scopulorum* at higher elevations with an understory dominated by open to dense layer of shrubs. .....

..... A3574 Juniperus monosperma / Shrub Understory Woodland Alliance

A4b. This juniper woodland and savanna alliance is characterized by an open to moderately dense, short (<15 m) tree canopy and is strongly dominated by *Juniperus monosperma* 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. .....

..... A3575 Juniperus monosperma / Herbaceous Understory Open Woodland Alliance

D326 North American Great Plains Forest & Woodland

M1a. Macrogroup of the northern Great Plains, characterized by an open to closed (10-100%) canopy dominated or codominated by *Quercus macrocarpa* (bur oak), *Populus tremuloides* (quaking aspen), and *Betula papyrifera* (paper birch) with *Fraxinus pennsylvanica* (green ash) and *Ulmus americana* (American elm) are abundant in ravines and draws in the central and southern parts of the range. Dryer sites are dominated by *Juniperus scopulorum* (Rocky Mountain juniper) and *Juniperus virginiana* (eastern red-cedar) woodland. Understory is often dominated by prairie shrubs, grasses and forbs that are more tolerant of shade.....**G2**

..... M151 Great Plains Forest & Woodland

M1b. There is only one macrogroup in this division.

M151 Great Plains Forest & Woodland

G2a. A group dominated by *Quercus macrocarpa* (bur oak); upland areas in the northern part of the Great Plains. *Quercus muehlenbergii* (chinquapin oak) can be abundant in the southeastern portion of the group's range. Other species, such as *Tilia americana* (American basswood) (not in the Dakotas), *Populus tremuloides* (quaking aspen), *Juniperus virginiana* (eastern red-cedar), and *Fraxinus* (ash) spp., may be present. **A4**
.....G329 Great Plains Bur Oak Forest & Woodland

G2b. Vegetation is not as above.

G3a. A group of the northern Great Plains; open to closed tree canopy dominated by *Betula papyrifera* (paper birch), *Fraxinus pennsylvanica* (green ash), *Populus tremuloides* (quaking aspen), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), and *Juniperus scopulorum* (Rocky Mountain juniper) and sometimes the tall shrubs *Crataegus douglasii* (black hawthorn) and *Crataegus succulenta* (fleshy hawthorn). Found in valleys, ravines, and mesic slopes. **A6**
..... G145 Great Plains Mesic Forest & Woodland

G3b. This group occurs in the transition zone from the grasslands of the Great Plains to the boreal forests where *Populus tremuloides* (quaking aspen) dominates small woodland patches, which vary from open and grassy to shaded with shrub and forb understories. **A8**
..... G328 Northwestern Great Plains Aspen Woodland

G329 Great Plains Bur Oak Forest & Woodland

A4a. Forest alliance restricted to the northern Great Plains and the Black Hills, dominated by *Quercus macrocarpa* (bur oak), although *Populus tremuloides* (quaking aspen) can be a codominant. Associated trees include *Betula papyrifera* (paper birch), *Fraxinus pennsylvanica* (green ash), and *Ulmus americana* (American elm) throughout its range, and *Pinus ponderosa* (ponderosa pine) in the Black Hills. *Ostrya virginiana* (hophornbeam) and *Juniperus virginiana* (eastern red-cedar) often in the subcanopy. Understory is variable depending on shading and includes shrubs and shade tolerant herbs. Associated shrubs are *Cornus sericea* (red-osier dogwood), *Mahonia repens* (creeping barberry), and *Symphoricarpos occidentalis* (western snowberry). The herbaceous layer typically contains *Aralia nudicaulis* (wild sarsaparilla), *Carex* (sedge) spp., *Caulophyllum thalictroides* (blue cohosh), *Elymus virginicus* (Virginia wildrye), *Maianthemum stellatum* (starry false lily of the valley), and *Viola* (violet) spp. ..... **A0245 Quercus macrocarpa Forest Alliance**

A4b. Vegetation is not as above. **A5**

A5a. Widespread woodland alliance in the northern and central Great Plains on mesic or dry-mesic sites with a tree canopy dominated by *Quercus macrocarpa* (bur oak). Common associates in the canopy are *Quercus muehlenbergii* (chinquapin oak) in the southeast portion, *Fraxinus pennsylvanica* (green ash), *Tilia americana* (American basswood), and *Populus tremuloides* (quaking aspen) in the northern half, and *Carya* (hickory) spp. and *Ulmus* (elm) spp. in the east. *Pinus ponderosa* (ponderosa pine) can occur in some stands at the extreme western limit of this alliance's range. The understory is composed of prairie shrub and/or graminoid species. A 1-2 m tall shrub layer is often present, especially in the northern half of the range of this alliance, composed of *Amelanchier alnifolia* (Saskatoon serviceberry), *Corylus americana* (American hazelnut), *Corylus cornuta* (beaked hazelnut), *Prunus virginiana* (chokecherry), or *Symphoricarpos occidentalis* (western snowberry). The herbaceous layer is dominated by graminoids ranging from tall grasses, such as *Andropogon gerardii* (big bluestem), *Panicum virgatum* (switchgrass), and *Sorghastrum nutans* (Indiangrass), to mid grasses, such as *Schizachyrium scoparium* (little bluestem) and *Hesperostipa spartea* (porcupinegrass), to short graminoids, such as *Carex inops ssp. heliophila* (sun sedge). .....
.....A0620 Quercus macrocarpa / Corylus spp. / Mixedgrass Woodland Alliance

A5b. A woodland or savanna alliance of the northern Great Plains in the mixedgrass region characterized by scattered and clumped *Quercus macrocarpa* (bur oak) trees always present with 10 to 60% cover and an understory dominated by mid- and tall grasses such as *Andropogon gerardii* (big bluestem), *Carex pensylvanica* (Pennsylvania sedge), *Schizachyrium scoparium* (little bluestem), and *Sorghastrum nutans* (Indiangrass). Scattered and patchy *Corylus* (hazelnut) spp. and *Symphoricarpos occidentalis* (western snowberry) shrubs are often present, but do not dominate understory. Occurs on sandy lacustrine and glacial outwash deposits reworked by wind, on shale, and on glacial till. **A6**
..... A1505 Quercus macrocarpa / Mixedgrass Woodland Alliance

G145 Great Plains Mesic Forest & Woodland

A6a. Alliance of the western Great Plains of the United States where *Juniperus scopulorum* (Rocky Mountain juniper) and *Juniperus virginiana* (eastern red-cedar) dominate the short, open tree canopy on steep north-facing slopes or ravines. Other woody species may be present with low cover. ..... **..... A3210 Juniperus scopulorum - Juniperus virginiana Woodland Alliance**

A6b. Vegetation is not as above. **A7**

A7a. This forest alliance has is moderately closed to closed canopy that is usually dominated by some combination of *Betula papyrifera* (paper birch) and *Populus tremuloides* (quaking aspen) with other trees including *Quercus macrocarpa* (bur oak), *Fraxinus pennsylvanica* (green ash), and *Ulmus americana* (American elm). The shrub and herbaceous strata can range from sparse to dense. Herbaceous composition is typically distinct from the nearby prairies. Sites are sheltered from fire and receive moisture from runoff and snow accumulation, but are not flooded. Stands occur in the northern half of the central and eastern Great Plains and consists of forests along ravines, draws, intermittent streams, and on mesic, protected slopes. ..... **..... A3209 Betula papyrifera - Populus tremuloides - Quercus macrocarpa Forest Alliance**

A7b. This forest alliance is variable, but often has a short (5-10 m tall), open to closed tree canopy dominant by *Fraxinus pennsylvanica* (green ash) and *Ulmus americana* (American elm). *Acer negundo* (box-elder) can also be common in some stands and *Populus deltoides* (eastern cottonwood) may be present with low cover. The shrub layer can be sparse to dense with *Prunus virginiana* (chokecherry) and *Symphoricarpos occidentalis* (western snowberry) common. Sites occur in the northern and central Great Plains in mesic ravines and draws that concentrate the available precipitation by receiving runoff from higher uplands and trapping drifting snow. Some stands may be inundated for brief periods in the spring or after heavy rains but flooding does not persist. Rarely, stands of this alliance can be found upper terraces of rivers or streams or on north- or east-facing hillsides. Fires from adjacent upland prairies do not usually move through these sites due to the more mesic conditions and the lower landscape position. ..... **..... A3211 Fraxinus pennsylvanica - Ulmus americana Great Plains Forest Alliance**

G328 Northwestern Great Plains Aspen Woodland

A8a. This woodland alliance is dominated by *Betula papyrifera* (paper birch). Other associates include *Populus tremuloides* (quaking aspen), *Quercus macrocarpa* (bur oak), and, less frequently, *Fraxinus pennsylvanica* (green ash). A shrub stratum is usually present and dominated by *Corylus* (hazelnut) spp., *Prunus virginiana* (chokecherry), *Amelanchier alnifolia* (Saskatoon serviceberry), and *Symphoricarpos* (snowberry) spp. The herbaceous stratum is dominated by woodland and forest species with few prairie species. Stands occur in the northwestern Great Plains and can be found on a variety of landscape positions from flat areas to steep slopes, though is limited to steep north-facing slopes in the southern part of its range. ..... **A3248 Betula papyrifera / Corylus cornuta Woodland Alliance**

A8b. There is only one alliance in this group .....

2.B.2 Temperate Grassland & Shrubland

D022 - Western North American Grassland & Shrubland

M1a. Upland macrogroup of ruderal grasslands, meadows and shrublands found on human-disturbed sites; dominated by non-native and generalist native species that occur in temperate areas throughout the western U.S. (Rockies westward) and southwestern Canada. **G2**
..... M493 Western North American Ruderal Grassland & Shrubland

M1b. Shrubland macrogroup of foothills, canyon slopes and montane zone of mountains of the southern Rocky Mountains and Colorado Plateau, and outcrops and canyon slopes in the western and southern Great Plains. Characterized by an open to dense shrub layer typically dominated by *Cercocarpus montanus* (alderleaf mountain-mahogany), *Purshia tridentata* (antelope bitterbrush), and/or *Quercus gambelii* (Gambel oak), and several other characteristic shrubs.....**G3**
..... M049 Southern Rocky Mountain Montane Shrubland

M493 Western North American Ruderal Grassland & Shrubland

G2a. A group of ruderal shrublands, grasslands and forblands dominated by the non-native species. Graminoids include *Agropyron cristatum* (crested wheatgrass) and *Bromus inermis* (smooth brome) (which has been purposefully seeded to prevent soil erosion), as well as many

introduced forage species, especially in more mesic montane uplands and plains sites such as *Alopecurus pratensis* (meadow foxtail), *Dactylis glomerata* (orchardgrass), *Phleum pratense* (timothy), *Poa pratensis* (Kentucky bluegrass), and *Psathyrostachys juncea* (Russian wildrye). Also, highly invasive and wind- and animal-distributed non-native forb species include *Rumex crispus* (curly dock), *Sisymbrium altissimum* (tall tumblemustard), and *Descurainia sophia* (herb sophia). Ruderal shrublands dominated by non-native shrubs are uncommon in this key region, howver stands with a native shrub layer and converted non-native herbaceous layer are more widespread.....**A4**

..... G624 Western North American Interior Ruderal Grassland & Shrubland Group

G2b. Only one group in this macrogroup occurs in key region.

M049 Southern Rocky Mountain Montane Shrubland

G3a. Group of relatively dry foothills shrublands in the Rocky Mountains and Colorado Plateau in the lower montane zone and in canyons and breaks in the western Great Plains. Characterized by an open to closed shrub layer of nearly pure *Cercocarpus montanus* (alderleaf mountain-mahogany) or a mixed shrub layer with *Amelanchier utahensis* (Utah serviceberry), *Quercus x pauciloba*, *Purshia tridentata* (antelope bitterbrush), *Rhus trilobata* (skunkbush sumac), *Ribes cereum* (wax currant), or *Symphoricarpos oreophilus* (mountain snowberry).....**A6**

G276 Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland

G3b. Only one group in this macrogroup occurs in key region. .....

G624 Western North American Interior Ruderal Grassland & Shrubland

A4a. Ruderal alliance occurs in disturbed dry to mesic meadows found in lowland, montane and subalpine elevations (sea level to 3600 m) throughout the western U.S. and Canada. Vegetation is characterized by dominance of non-native forbs such as *Rumex crispus* (curly dock), *Sisymbrium altissimum* (tall tumblemustard), *Descurainia sophia* (herb sophia), and many others. .....

.....A4191 Rumex crispus - (other FAC & Dryland Forb Species) Ruderal Meadow Alliance

A4b. Dominated by non-native grasses rather than non-native forbs. **A5**

A5a. Ruderal alliance dominated by non-native grass *Elymus repens* (quackgrass) and is known from disturbed valley bottoms, alluvial flats, fans and lower valley wall sites in western Colorado and northwestern Montana.....

..... A2658 Elymus repens Ruderal Grassland Alliance

A5b. Ruderal alliance of disturbed, dry to mesic grasslands and meadows found at lowland, montane and subalpine elevations (sea level to 3600 m) throughout the western U.S. (Rocky Mountains and west) and western Canada. 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* (crested wheatgrass) and *Bromus inermis* (smooth brome) (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* (meadow foxtail), *Dactylis glomerata* (orchardgrass), *Phleum pratense* (timothy), *Poa pratensis* (Kentucky bluegrass), and *Psathyrostachys juncea* (Russian wildrye). Highly invasive non-native forb species include *Sisymbrium altissimum* (tall tumblemustard), and *Descurainia sophia* (herb sophia). .....

..... A3254 Agropyron cristatum - Bromus inermis - Poa pratensis Ruderal Grassland Alliance

G276 Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland

A6a. This alliance is characterized by shrublands of the eastern Front Range of Colorado within canyons dominated by *Purshia tridentata* (antelope bitterbrush) or *Ribes cereum* (wax currant). The shrub *Purshia tridentata* (antelope bitterbrush) is reported from Nebraska so this alliance was included in key.....

..... A3731 Purshia tridentata - Ribes cereum Shrubland Alliance*

A6b. Vegetation is not as above. Shrublands dominated by *Amelanchier utahensis* (Utah serviceberry), *Cercocarpus montanus* (alderleaf mountain-mahogany), *Cercocarpus intricatus* (littleleaf mountain mahogany), and/or *Quercus x pauciloba* (Wavyleaf Oak).....**A7**

A7a. This alliance is characterized by shrublands dominated or codominated by *Cercocarpus montanus* (alderleaf mountain-mahogany) and/or *Quercus x pauciloba* (Wavyleaf Oak) 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. .....

..... A3733 Cercocarpus montanus - Quercus x pauciloba Shrubland Alliance

A7b. This alliance is characterized by shrublands dominated by *Amelanchier utahensis* (Utah serviceberry), *Cercocarpus montanus* (alderleaf mountain-mahogany) or *Cercocarpus intricatus* (littleleaf mountain mahogany) in the southern Rocky Mountains, Wyoming Basins, Colorado Plateau and extending west into the Great Basin. ..... **...A3732 Amelanchier utahensis - Cercocarpus montanus - Cercocarpus intricatus Shrubland Alliance**

D023 Central North American Grassland & Shrubland

M1a. This macrogroup is found in the central and western Great Plains from north of the U.S.-Canadian border to extreme northern Mexico. It is dominated by exotic, invasive grasses, forbs, or, in the south, deciduous shrubs. Vegetation cover and composition is variable. Common dominant species in the north include *Agropyron cristatum* (crested wheatgrass), *Bromus inermis* (smooth brome), *Bromus japonicus* (Japanese brome), *Bromus tectorum* (cheatgrass), *Elymus repens* (quackgrass) (on more moist sites), *Phleum pratense* (timothy), *Poa pratensis* (Kentucky bluegrass), and *Thinopyrum intermedium* (intermediate wheatgrass), and the shrubs *Baccharis neglecta* (Rooseveltweed), *Crataegus mollis* (downy hawthorn), *Crataegus viridis* (green hawthorn), and *Rhus lanceolata* (prairie sumac) can be common. *Gutierrezia texana* (Texas snakeweed) and *Amphiachyris dracunculoides* (prairie broomweed) are often extremely abundant on overgrazed sites in Texas. Across the range the forbs *Ambrosia* (ragweed) spp., *Artemisia absinthium* (absinthium), *Carduus nutans* (nodding plumeless thistle), *Centaurea* (knapweed) spp., *Cirsium arvense* (Canada thistle), *Convolvulus arvensis* (field bindweed), *Dipsacus fullonum* (Fuller's teasel), and *Euphorbia esula* (leafy spurge) can be common. .....**G4** ..... **M498 Great Plains Ruderal Grassland & Shrubland**

M1b. Vegetation is not as above. Ruderal species may be present but vegetation is characterized by native shrubs, grasses, or forbs. **M2**

M2a. This macrogroup is found from Texas to southern Canada on somewhat excessively to excessively well-drained, deep sandy to loamy sand soils and contains grasses and scattered to moderately dense shrubs that are well-adapted to these soil conditions. *Andropogon hallii* (sand bluestem) and *Calamovilfa longifolia* (prairie sandreed) are the most common species, but other associate species include *Achnatherum hymenoides* (Indian ricegrass), *Bouteloua* (grama) spp., *Calamovilfa gigantea* (giant sandreed), *Carex inops ssp. heliophila* (sun sedge), *Hesperostipa comata* (needle-and-thread), *Panicum virgatum* (switchgrass), *Schizachyrium scoparium* (little bluestem), *Sporobolus cryptandrus* (sand dropseed), and shrubs *Artemisia filifolia* (sand sagebrush), *Artemisia cana ssp. cana* (silver sagebrush), *Prunus angustifolia* (Chickasaw plum), *Rhus trilobata* (skunkbush sumac), *Rosa arkansana* (prairie rose), *Symphoricarpos occidentalis* (western snowberry), and *Yucca glauca* (soapweed yucca) are common. Wind erosion, grazing and fire can significantly impact this macrogroup. .....**G5** ..... **M052 Great Plains Sand Grassland & Shrubland**

M2b. Vegetation is not as above. Stands do not occur on excessively drained, deep sandy to loamy sand soils. Diagnostic species *Andropogon hallii* (sand bluestem) and *Calamovilfa longifolia* (prairie sandreed) are typically absent, but many of the associated species occur widely. **M3**

M3a. The macrogroup is dominated by mixed grasses and scattered to moderately dense shrubs. It is found from northern Texas to southern Alberta across to southwest in the region between the tallgrass prairies to the east and the shortgrass prairies to the west. The most common graminoid species occurring across the range of the macrogroup include *Hesperostipa comata* (needle-and-thread) and *Pascopyrum smithii* (western wheatgrass). Northern examples are typically dominated by *Festuca* (fescue) spp., especially *Festuca hallii* (plains rough fescue), in combination with *Bouteloua gracilis* (blue grama), *Hesperostipa curtiseta* (shortbristle needle and thread), *Koeleria macrantha* (prairie Junegrass), *Pascopyrum smithii* (western wheatgrass), *Poa pratensis* (Kentucky bluegrass), and *Symphoricarpos occidentalis* (western snowberry). Southern examples are more likely to be dominated by species such as *Aristida purpurea* (purple threeawn), *Bothriochloa laguroides ssp. torreyana* (silver beardgrass), *Bouteloua curtipendula* (sideoats grama), *Schizachyrium scoparium* (little bluestem), and *Sporobolus cryptandrus* (sand dropseed). The most mesic sites can have abundant tallgrasses, especially *Andropogon gerardii* (big bluestem), *Panicum virgatum* (switchgrass), and *Sorghastrum nutans* (Indiangrass). Other common associated species include *Bouteloua gracilis* (blue grama), *Buchloe dactyloides* (buffalograss), *Carex filifolia* (threadleaf sedge), *Carex inops ssp. heliophila* (sun sedge), *Calamovilfa longifolia* (prairie sandreed), *Elymus lanceolatus* (thickspike wheatgrass), *Festuca idahoensis* (Idaho fescue), *Hesperostipa curtiseta* (shortbristle needle and thread), *Hesperostipa neomexicana* (New Mexico feathergrass), *Koeleria macrantha* (prairie Junegrass), *Muhlenbergia montana* (mountain muhly), *Nassella leucotricha* (Texas wintergrass), *Nassella viridula* (green needlegrass), *Pseudoroegneria spicata* (bluebunch

wheatgrass), *Sorghastrum nutans* (Indiangrass), and *Sporobolus compositus* (composite dropseed). **G6**
..... M051 Great Plains Mixedgrass & Fescue Prairie

M3b. This macrogroup forms the matrix grassland in the western half of the Western Great Plains Division east of the Rocky Mountains and ranges from southeastern Wyoming and the western Nebraska panhandle south into the panhandles of Oklahoma and Texas and eastern New Mexico. The vegetation is primarily dominated by *Bouteloua gracilis* (blue grama) and *Buchloe dactyloides* (buffalograss) throughout its range, with various associated graminoid species changing depending on latitude, precipitation, soils, and management. Associated graminoids may include *Achnatherum hymenoides* (Indian ricegrass), *Aristida purpurea* (purple threeawn), *Bouteloua curtipendula* (sideoats grama), *Bouteloua hirsuta* (hairy grama), *Carex filifolia* (threadleaf sedge), *Carex inops ssp. heliophila* (sun sedge), *Eragrostis intermedia* (plains lovegrass), *Hesperostipa comata* (needle-and-thread), *Hesperostipa neomexicana* (New Mexico feathergrass), *Koeleria macrantha* (prairie Junegrass), *Muhlenbergia torreyi* (ring muhly), *Pascopyrum smithii* (western wheatgrass), *Pleuraphis jamesii* (James' galleta), *Sporobolus airoides* (alkali sacaton), and *Sporobolus cryptandrus* (sand dropseed). Although mid-height grass species may be present, especially on more mesic land positions and soils, they are secondary in importance to the sod-forming short grasses. Sandy soils have higher cover of *Hesperostipa comata* (needle-and-thread), *Sporobolus cryptandrus* (sand dropseed), and *Yucca glauca* (soapweed yucca). Scattered shrub and dwarf-shrub species may also be present. *Gutierrezia sarothrae* (broom snakeweed) is often present to codominant especially in disturbed areas. Cacti species such as cholla (*Opuntia imbricata* (tree cholla)) and prickly-pears (*Opuntia polyacantha* (plains pricklypear) and *Opuntia phaeacantha* (tulip pricklypear)) can be abundant on some sites **G7**
..... M053 Western Great Plains Shortgrass Prairie

M498 Great Plains Ruderal Grassland & Shrubland

G4a. This group is found in the Great Plains from Nebraska and Colorado north where exotic grasses and forbs constitute >75% of the herbaceous cover and trees and shrubs each have less than 25% cover. Common abundant or dominant species include the grasses *Agropyron cristatum* (crested wheatgrass), *Agrostis gigantea* (redtop), *Agrostis stolonifera* (creeping bentgrass), *Bromus inermis* (smooth brome), *Lolium perenne* (perennial ryegrass), *Phleum pratense* (timothy), *Poa annua* (annual bluegrass), *Poa pratensis* (Kentucky bluegrass), and *Thinopyrum intermedium* (intermediate wheatgrass) and the forbs *Ambrosia* (ragweed) spp., *Cirsium arvense* (Canada thistle), *Cirsium vulgare* (bull thistle), *Euphorbia esula* (leafy spurge), and *Melilotus officinalis* (yellow sweetclover). No alliances have been developed for this Group. .....
..... G679 Northern & Central Great Plains Ruderal Grassland & Shrubland

G4b. There is only one goup in this macrogroup found in the key area.

M052 Great Plains Sand Grassland & Shrubland

G5a. This group is found on sandy soils across most of the Great Plains where a sparse to dense shrub cover, mostly *Artemisia filifolia* (sand sagebrush) but also *Amorpha canescens* (leadplant), *Prosopis glandulosa* (honey mesquite), *Prunus pumila var. besseyi* (western sandcherry), *Rhus trilobata* (skunkbush sumac), and *Yucca glauca* (soapweed yucca), occurs over medium-tall grasses.....**A8**
..... G069 Great Plains Sand Shrubland

G5b. This sand prairie is most common in the north-central Great Plains but occurs in other parts of the western plains, as well. Medium and tall grasses dominate the sandy soils of this group, typically *Andropogon hallii* (sand bluestem), *Calamovilfa longifolia* (prairie sandreed), *Hesperostipa comata* (needle-and-thread), and *Panicum virgatum* (switchgrass). **A11**
..... G068 Great Plains Sand Grassland

M051 Great Plains Mixedgrass & Fescue Prairie

G6a. This group occurs in the central Great Plains where grasslands are dominated by *Bouteloua curtipendula* (sideoats grama), *Pascopyrum smithii* (western wheatgrass), and *Schizachyrium scoparium* (little bluestem), often with tallgrass or shortgrass species present to codominant. **A12**
..... G133 Central Great Plains Mixedgrass Prairie

G6b. This group is widespread in the northern Great Plains and has scattered occurrences in the western Great Plains; sites are dominated by a mixture of short, medium, and tall grasses, including *Andropogon gerardii* (big bluestem), *Carex inops ssp. heliophila* (sun sedge), *Carex filifolia* (threadleaf sedge), *Nassella viridula* (green needlegrass), *Panicum virgatum* (switchgrass), *Pascopyrum smithii* (western wheatgrass), *Schizachyrium scoparium* (little

bluestem), and *Sorghastrum nutans* (Indiangrass).....**A15**
..... G141 Northern Great Plains Mesic Mixedgrass Prairie

M053 Western Great Plains Shortgrass Prairie

G7a. This semi-arid shortgrass grassland group occurs in the western half of the Western Great Plains and is usually composed of *Bouteloua gracilis* (blue grama) as the dominant or codominant species with associated graminoids *Aristida purpurea* (purple threeawn), *Bouteloua curtipendula* (sideoats grama), *Bouteloua hirsuta* (hairy grama), *Buchloe dactyloides* (buffalograss), *Hesperostipa comata* (needle-and-thread), *Hesperostipa neomexicana* (New Mexico feathergrass), *Pascopyrum smithii* (western wheatgrass), *Pleuraphis jamesii* (James' galleta), *Sporobolus cryptandrus* (sand dropseed), and scattered shrubs, dwarf-shrubs and cacti.....**A21**
..... G144 Great Plains Shortgrass Prairie

G7b. There is only one group in this macrogroup.

G069 Great Plains Sand Shrubland

A8a. This alliance includes *Artemisia filifolia* (sand sagebrush)-dominated shrublands occurring mostly in the western Great Plains from as far north as the Black Hills, south to the Trans-Pecos of western Texas and northern Chihuahuan Desert, extending northwest into the Colorado Plateau. These shrublands typically occur on flat, hummocky, or rolling terrain, as well as on partially stabilized dunes and sandsheets. Vegetation cover is sparse to moderately dense, with a shrub stratum approximately 1 m tall, dominated by *Artemisia filifolia* (sand sagebrush), interspersed with areas of bare substrate and scattered tall or midgrasses. ..... **A0816 Artemisia filifolia Great Plains Sand Prairie Scrub Alliance**

A8b. Vegetation is not as above. *Artemisia filifolia* (sand sagebrush)-is typically absent or has low cover. **A9**

A9a. This alliance includes stands of herbaceous vegetation with a sparse shrub layer growing on sandstone outcrops and sandy soils in the northwestern Great Plains. Elevations range from 1100-1850 m. Stands of this alliance contain an open to moderately dense (at least 10% cover), low-shrub layer above a species-rich herbaceous layer. Dominance of the shrub layer by *Yucca glauca* (soapweed yucca) is characteristic (cover ranging from 5-15%). *Artemisia tridentata ssp. wyomingensis* (Wyoming big sagebrush) and *Artemisia cana ssp. cana* (silver sagebrush) may be present but are sparse and contribute little cover. .....
..... A1540 Yucca glauca Prairie Scrub Alliance

A9b. Vegetation is not as above. *Yucca glauca* (soapweed yucca) may be present but does not dominate vegetation. **A10**

A10a. This alliance includes patchy woodlands in western Oklahoma often consisting of scattered clonal mottes of *Sapindus saponaria* (wingleaf soapberry). .....
..... A0627 Sapindus saponaria Prairie Scrub Alliance

A10b. This alliance includes patchy shrub in the Texas Panhandle and Oklahoma often consisting of scattered clonal mottes of *Quercus havardii* (Havard oak).....
..... A4112 Quercus havardii Prairie Scrub Alliance

G068 Great Plains Sand Grassland

A11a. This alliance includes herbaceous vegetation with *Andropogon hallii* (sand bluestem), occurring in the Great Plains from the United States-Canada border south to Texas. It is dominated by tall and midgrass species, with shortgrass species becoming important in the western portion of its range. *Andropogon hallii* (sand bluestem) is usually dominant or codominant..... **A1193 Andropogon hallii Sand Prairie Alliance**

A11b. This alliance, found in the northwestern Great Plains, occurs on sandy dry-mesic sites. Stands are almost exclusively found on sand deposits; a few are on coarse loams. There are two prominent vegetation layers in stands of this alliance and a moderate amount of bare ground. The tallest layer, about 0.6-1.5 m tall, is dominated by midgrasses, particularly *Calamovilfa longifolia* (prairie sandreed). .. **A1201 Calamovilfa longifolia Sand Prairie Alliance**

G133 Central Great Plains Mixedgrass Prairie

A12a. This alliance has been identified in the northern panhandle of Texas but is likely more widespread in the southwestern Great Plains. It occurs on steep talus slopes with a moderate short-shrub canopy dominated by *Rhus trilobata* (skunkbush sumac) with lesser amounts of

Dalea formosa (featherplume), *Mimosa borealis* (fragrant mimosa), and *Yucca glauca* (soapweed yucca) and a herbaceous layer dominated by *Bouteloua curtipendula* (sideoats grama) and *Schizachyrium scoparium* (little bluestem). ..... **..... A4038 Rhus trilobata Great Plains Shrubland Alliance**

A12b. Vegetation is not as above. *Rhus trilobata* (skunkbush sumac) may be present but does not dominate vegetation. *Rhus trilobata* (skunkbush sumac) is not dominant in shrub layer. **A13**

A13a. This alliance consists of grasslands of limestone slopes and associated seeps of the Edwards Plateau and central Oklahoma where *Muhlenbergia reverchonii* (seep muhly) is dominant or codominant.....**A4040 Muhlenbergia reverchonii Grassland Alliance***

A13b. Vegetation is not as above. *Muhlenbergia reverchonii* (seep muhly) is typically absent..**A14**

A14a. This alliance is found in the southwestern Great Plains to western New Mexico where *Pascopyrum smithii* (western wheatgrass) and *Bouteloua gracilis* (blue grama) dominate in swales and valleys..... **..... A4039 Pascopyrum smithii - Bouteloua gracilis Great Plains Grassland Alliance**

A14b. This alliance is common in the central and southern Great Plains on slopes and rolling uplands where *Schizachyrium scoparium* (little bluestem) and *Bouteloua curtipendula* (sideoats grama) are dominant or codominant, possibly with a variety of other short, mid, and tallgrass species. ..... **....A4042 Schizachyrium scoparium - Bouteloua curtipendula Central Great Plains Grassland Alliance**

G141 Northern Great Plains Mesic Mixedgrass Prairie

A15a. Vegetation is characterized by an open to moderately dense shrub layer with grassy understory. **A16**

A15b. Vegetation is characterized by an open to moderately dense herbaceous layer. Scattered shrubs may be present but do not form a layer. **A19**

A16a. Stands of this temporarily flooded alliance occur in mesic draws and along streams in the northern Great Plains and adjacent foothills with a typically dense, tall (to 2.5 m) shrub layer that is dominated by *Crataegus douglasii* (black hawthorn) or *Crataegus succulenta* (fleshy hawthorn), either alone or together. A substantial amount of *Prunus virginiana* (chokecherry) and may include substantial amounts of *Amelanchier alnifolia* (Saskatoon serviceberry) and *Prunus americana* (American plum) may be present in the tall shrub layer..... **..... A0954 Crataegus douglasii - Crataegus succulenta Shrubland Alliance**

A16b. Vegetation is not as above. *Crataegus douglasii* (black hawthorn) and *Crataegus succulenta* (fleshy hawthorn) are typically absent. **A17**

A17a. This alliance is found in the northwestern Great Plains on moderate to steep slopes where short shrubs, especially *Rhus trilobata* (skunkbush sumac), are scattered in a mixedgrass prairie generally dominated by *Schizachyrium scoparium* (little bluestem) and *Carex filifolia* (threadleaf sedge). Lesser amounts of *Artemisia frigida* (prairie sagewort), *Gutierrezia sarothrae* (broom snakeweed), *Rosa arkansana* (prairie rose), and *Symphoricarpos occidentalis* (western snowberry) may be present in the shrub layer. ..... **... A1537 Rhus trilobata / Schizachyrium scoparium - Carex filifolia Shrub Grassland Alliance**

A17b. Vegetation is not as above. *Rhus trilobata* (skunkbush sumac) is typically absent or has low cover. **A18**

A18a. This alliance is found on hillslopes in the northwestern Great Plains where *Juniperus horizontalis* (creeping juniper) and *Dasiphora fruticosa ssp. floribunda* (shrubby-cinquefoil) dominate a sparse to moderate short-shrub layer mixed with moderate to dense cover of midgrasses. ..... **.....A4035 Juniperus horizontalis - Dasiphora fruticosa ssp. floribunda / Schizachyrium scoparium Shrubland Alliance**

A18b. This alliance is composed of shrublands in the northern Great Plains and adjacent areas dominated by the deciduous shrubs *Amelanchier alnifolia* (Saskatoon serviceberry), *Prunus* (plum) spp., and *Symphoricarpos occidentalis* (western snowberry) with >25% cover..... **.A4036 Prunus virginiana - Symphoricarpos occidentalis - Amelanchier alnifolia Great Plains Shrubland Alliance**

A19a. This alliance is found in the northern and western Great Plains on sites where moisture availability is greater than the surrounding landscape. The vegetation is characterized by a mix of tall and mid grasses within a mixedgrass landscape, commonly with *Andropogon gerardii* (big bluestem), *Bouteloua curtipendula* (sideoats grama), *Sorghastrum nutans* (Indiangrass), and *Schizachyrium scoparium* (little bluestem). ..... **..... A4028 Andropogon gerardii - Sorghastrum nutans Mixedgrass Western Plains Grassland Alliance**

A19b. Vegetation is not as above. Tall grasses such as *Andropogon gerardii* (big bluestem) or *Sorghastrum nutans* (Indiangrass) are typically absent. **A20**

A20a. This alliance is found in the northern Great Plains on fine-textured soils in mesic settings where the mid grasses *Pascopyrum smithii* (western wheatgrass) and *Nassella viridula* (green needlegrass) are dominant or codominant. ..... **A4031 Pascopyrum smithii - Nassella viridula Northwestern Great Plains Grassland Alliance**

A20b. This alliance is found in the northwestern Great Plains on coarse- or medium-textured soils where *Schizachyrium scoparium* (little bluestem) is the dominant grass but other mid and short grasses and sedges can be abundant, particularly *Bouteloua curtipendula* (sideoats grama), *Bouteloua gracilis* (blue grama), *Carex inops ssp. heliophila* (sun sedge), and *Carex filifolia* (threadleaf sedge)..... **..... A4034 Schizachyrium scoparium Northwestern Great Plains Grassland Alliance**

G144 Great Plains Shortgrass Prairie

A21a. This dwarf-shrubland alliance is composed of a variety of shrubs, such as *Artemisia frigida* (prairie sagewort), *Dalea formosa* (featherplume), *Gutierrezia sarothrae* (broom snakeweed), *Mimosa borealis* (fragrant mimosa), and/or *Yucca glauca* (soapweed yucca), and occurs in the shortgrass steppe of the western Great Plains in a variety of environments but is common in shallow soils near escarpments..... **... A3999 Artemisia frigida - Dalea formosa - Gutierrezia sarothrae Dwarf-shrubland Alliance**

A21b. Vegetation is not as above. Shrubs and dwarf-shrubs are typically absent or have low cover. **A22**

A22a. This mixedgrass alliance is characterized by a moderately dense grass layer of midgrass *Hesperostipa neomexicana* (New Mexico feathergrass) with a shortgrass layer composed of codominant *Bouteloua gracilis* (blue grama) and/or *Bouteloua hirsuta* (hairy grama). It is found from the northern Chihuahuan Desert north into the southwestern Great Plains on gentle to moderately steep slopes in foothills and escarpments. ..... **..... A4002 Bouteloua gracilis - Bouteloua hirsuta - Hesperostipa neomexicana Shortgrass Prairie Alliance.....**

A22b. Vegetation is not as above. The midgrass *Hesperostipa neomexicana* (New Mexico feathergrass) is typically absent or has low cover.....**A23**

A23a. This shortgrass alliance is characterized by a moderate to dense sod of short grasses *Bouteloua gracilis* (blue grama) and *Buchloe dactyloides* (buffalograss) on semi-arid prairies and is common across the western portions of the Great Plains..... **..... A4000 Bouteloua gracilis - Buchloe dactyloides Shortgrass Prairie Alliance**

A23b. This shortgrass prairie alliance is characterized by a moderate to dense layer of short grasses dominated by *Bouteloua gracilis* (blue grama), *Bouteloua hirsuta* (hairy grama), and midgrass *Bouteloua curtipendula* (sideoats grama) with *Buchloe dactyloides* (buffalograss) absent or has low cover. It is common across the western portions of the central and southern Great Plains. ..... **.... A4001 Bouteloua gracilis - Bouteloua hirsuta - Bouteloua curtipendula Shortgrass Prairie Alliance**

D040 Western North American Cool Semi-Desert Scrub & Grassland

M1a. Upland macrogroup of ruderal semi-desert scrub and grasslands dominated by non-native (usually >90% relative cover) and generalist native species in cool semi-desert areas of U.S. Characteristic non-native species are *Acroptilon repens* (hardheads), *Agropyron cristatum* (crested wheatgrass), *Alhagi maurorum* (camelthorn), *Brassica nigra* (black mustard), *Bromus tectorum* (cheatgrass), *Bromus hordeaceus* (soft brome), *Bromus madritensis* (compact brome), *Cardaria draba* (whitetop), several *Centaurea* (knapweed/star-thistle) species, *Crupina vulgaris* (common crupina), *Cynoglossum officinale* (gypsyflower), *Cytisus striatus* (striated broom), *Euphorbia esula* (leafy spurge), *Halogeton glomeratus* (saltlover), *Hyoscyamus niger* (black henbane), *Hypericum perforatum* (common St. Johnswort), *Isatis tinctoria* (Dyer's woad), *Lepidium latifolium*

(broadleaved pepperweed), *Linaria dalmatica* (Dalmatian toadflax), *Linaria vulgaris* (butter and eggs), *Peganum harmala* (harmal peganum) *Salsola tragus* (prickly Russian thistle), *Taeniatherum caput-medusae* (medusahead), and *Zygophyllum fabago* (Syrian beancaper). If shrub layer is mostly native (such as *Artemisia tridentata* (big sagebrush), *Atriplex confertifolia* (shadscale saltbush), *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Ericameria nauseosa* (rubber rabbitbrush), *Grayia spinosa* (spiny hopsage), and *Gutierrezia sarothrae* (broom snakeweed)), then a significant herbaceous layer (>10% cover) is present and strongly dominated by non-native species so that the natural understory cannot be determined (usually >90% relative cover non-native). If herbaceous cover < 10% then treat as a sparse understory natural type. **G5**

..... M499 Western North American Cool Semi-Desert Ruderal Scrub & Grassland

M1b. Upland vegetation of cool semi-desert scrub, dry grasslands, shrub steppe, shrublands, and sparse vegetation dominated by native species. If herbaceous understory is present, then not strongly dominated (>90% relative cover) by non-native species. **M2**

M2a. Widespread cool semi-desert macrogroup centers west of the Rockies; typically composed of *Artemisia pedatifida* (birdfoot sagebrush), *Artemisia pygmaea* (pygmy sagebrush), *Atriplex corrugata* (mat saltbush), or *Atriplex gardneri* (Gardner's saltbush) dominated dwarf-shrublands and various saltbush shrublands dominated by *Atriplex canescens* (fourwing saltbush), *Atriplex confertifolia* (shadscale saltbush), *Atriplex cuneata* (valley saltbush), *Atriplex lentiformis* (big saltbush), *Atriplex obovata* (mound saltbush), *Atriplex polycarpa* (cattle saltbush), and *Atriplex spinifera* (spinescale saltbush). Shrubs dominate either singly or mixed; substrates are typically saline, alkaline, fine-textured soils developed from shale or alluvium. **G6**

..... M093 Great Basin Saltbush Scrub

M2b. Semi-desert scrub, dry grasslands, shrub steppe, and shrublands characterized by a variety of species including sparsely vegetated dune scrub and grassland sand sheets. If present, species of *Atriplex* (Saltbush), *Artemisia pedatifida* (birdfoot sagebrush) or *Artemisia pygmaea* (pygmy sagebrush) have low cover. **M3**

M3a. Shrub steppe, shrublands, and dwarf-shrublands characterized by a variety of woody *Artemisia* (sagebrush) species, such as *Artemisia arbuscula* (little sagebrush), *Artemisia bigelovii* (Bigelow sage), *Artemisia cana* (silver sagebrush), *Artemisia frigida* (prairie sagewort), *Artemisia nova* (black sagebrush), *Artemisia papposa* (Owyhee sage), *Artemisia rigida* (scabland sagebrush), *Artemisia tridentata* (big sagebrush), *Artemisia tripartita* (threetip sagebrush). Other shrubs include *Chamaebatiaria millefolium* (fernbush), *Eriogonum* (buckwheat) dwarf-shrub species, *Purshia tridentata* (antelope bitterbrush), *Salvia dorrii* (purple sage), or *Symphoricarpos* (snow berry) species. **M4**

M3b. Diverse macrogroup of the semi-arid interior western U.S. Includes open shrublands, dwarf-shrublands, shrub herbaceous, or grasslands. Characteristic species include shrubs *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Coleogyne ramosissima* (blackbrush), *Ephedra* (joint-fir) spp., *Ericameria nauseosa* (rubber rabbitbrush), *Gutierrezia sarothrae* (broom snakeweed), *Krascheninnikovia lanata* (winterfat), and dry grasses such as *Achnatherum hymenoides* (Indian ricegrass), *Achnatherum lettermanii* (Letterman's needlegrass), *Aristida purpurea* (purple threeawn), *Bouteloua gracilis* (blue grama), *Hesperostipa comata* (needle-and-thread), *Leymus salinus ssp. salinus* (saline wildrye), *Muhlenbergia pungens* (sandhill muhly), *Pleuraphis jamesii* (James' galleta), *Poa fendleriana* (muttongrass), *Poa secunda* (Sandberg bluegrass), *Pseudoroegneria spicata* (bluebunch wheatgrass), *Sporobolus cryptandrus* (sand dropseed), and *Sporobolus airoides* (alkali sacaton). Mid-elevation sites in eastern and central Mojave Desert, Great Basin, Colorado Plateau, Columbia Plateau; lower elevation sites in the central Rocky Mountains east across Wyoming Basins into the western Great Plains. **G7**

..... M171 Great Basin-Intermountain Dry Shrubland & Grassland

M4a. Shrubland macrogroup of the big sagebrush shrubland and shrub-steppe that is common throughout much of the interior western U.S. and extend into the western Great Plains; dominated by *Artemisia tridentata* (big sagebrush), *Purshia tridentata* (antelope bitterbrush), and several local dominants such as *Artemisia cana* (silver sagebrush) and *Artemisia tripartita ssp. tripartita* (threetip sagebrush). **G8**

..... M169 Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland

M4b. A macrogroup of the interior western U.S. that may extend out into the western Great Plains and is characterized by short sagebrush taxa that form an open to moderately dense dwarf-shrub layer on shallow, rocky, calcareous or alkaline soils. Dominated by one of several diagnostic *Artemisia* (sagebrush) taxa depending on location and habitat including *Artemisia arbuscula* (little sagebrush), *Artemisia bigelovii* (Bigelow sage), *Artemisia frigida* (prairie sagewort), *Artemisia nova* (black sagebrush), *Artemisia papposa* (Owyhee sage), *Artemisia rigida* (scabland sagebrush), or *Artemisia tripartita ssp. rupicola* (Wyoming threetip sagebrush). **G10**

..... M170 Great Basin-Intermountain Dwarf Sagebrush Steppe & Shrubland

M499 Western North American Cool Semi-Desert Ruderal Scrub & Grassland

G5a. Ruderal shrubland and grassland group includes vegetation strongly dominated by invasive, exotic species. Also includes shrubland and shrub-steppe with mostly native shrubs but where a significant herbaceous layer (>10% cover) is strongly dominated by non-native species (usually >90% relative cover non-native). **A11**

..... G600 Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

G5b. Only one group in this macrogroup .....

M093 Great Basin Saltbush Scrub

G6a. 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. Characterized by an open canopy of dwarf-shrubs composed of *Artemisia pedatifida* (birdfoot sagebrush), *Atriplex corrugata* (mat saltbush), or *Atriplex gardneri* (Gardner's saltbush) sometimes with *Artemisia longifolia* (longleaf wormwood), *Artemisia pygmaea* (pygmy sagebrush), or *Picrothamnus desertorum* (bud sagebrush) dominant or codominant. **A15**

..... G300 Intermountain Shadscale - Saltbush Scrub

G6b. Other groups in macrogroup do not occurs in key area.

M171 Great Basin-Intermountain Dry Shrubland & Grassland

G7a. This widespread, open to moderately dense dwarf-shrubland, shrubland and shrub-steppe group occurs throughout the semi-arid western U.S. and is characterized by *Chamaebatiaria millefolium* (desert sweet), *Chrysothamnus albidus* (whiteflower rabbitbrush), *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Ericameria nauseosa* (rubber rabbitbrush), *Ephedra viridis* (mormon-tea), *Ephedra torreyana* (Torrey's joint-fir), *Glossopetalon spinescens* (spiny greasebush), *Gutierrezia sarothrae* (broom snakeweed), *Gutierrezia microcephala* (threadleaf snakeweed), *Ericameria nana* (dwarf goldenbush), *Ericameria parryi* (Parry's rabbitbrush), *Ericameria teretifolia* (green rabbitbrush), *Krascheninnikovia lanata* (winterfat), *Mahonia fremontii* (Fremont's mahonia), *Opuntia polyacantha* (plains pricklypear), and *Tetradymia canescens* (spineless horsebrush) with or without an herbaceous layer. **A16**

..... G310 Intermountain Semi-Desert Steppe & Shrubland

G7b. Other groups in macrogroup do not occurs in key area.

M169 Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland

G8a. This sagebrush shrubland and shrub-steppe group is found at montane and subalpine elevations across the western U.S. and is composed primarily of *Artemisia tridentata ssp. vaseyana* (mountain big sagebrush), *Artemisia cana ssp. bolanderi* (silver sagebrush), *Artemisia cana ssp. viscidula* (silver sagebrush), and related taxa such as *Artemisia tridentata ssp. spiciformis* (big sagebrush) and *Artemisia rothrockii* (timberline sagebrush) with *Symphoricarpos* (snowberry) spp. often codominant and there is usually an abundant perennial herbaceous layer (over 25% cover). **A18**

..... G304 Intermountain Mountain Big Sagebrush Steppe & Shrubland

G8b. Vegetation dominated not dominated by *Artemisia tridentata ssp. vaseyana* (mountain big sagebrush), *Artemisia cana ssp. bolanderi* (silver sagebrush), *Artemisia cana ssp. viscidula* (silver sagebrush), and *Artemisia tridentata ssp. spiciformis* (spiked big sagebrush) and *Artemisia rothrockii* (timberline sagebrush) are typically absent. **G9**

G9a. This widely distributed, matrix-forming shrubland group is concentrated in the drier, more southerly portions of the interior western U.S., but extends into xeric portions of the Columbia Plateau, Rocky Mountains, across Wyoming into the northwestern Great Plains. Vegetation is typically dominated by *Artemisia tridentata ssp. wyomingensis* (Wyoming big sagebrush) and *Artemisia tridentata ssp. tridentata* (basin big sagebrush), sometimes codominated by xeric shrubs such as *Atriplex* (saltbush) spp., with a typically sparse to open herbaceous layer dominated by dry-site graminoids. **A19**

..... G303 Intermountain Dry Tall Sagebrush Steppe & Shrubland

G9b. This matrix-forming sagebrush steppe and shrubland group occurs throughout the interior western U.S., across Wyoming into the northwestern Great Plains and is characterized by an open to sparse shrub layer of *Artemisia tridentata* (big sagebrush) (ssp. *tridentata*, ssp. *xericensis*) or *Artemisia tripartita ssp. tripartita* (threetip sagebrush) with an often dense

herbaceous layer dominated by perennial bunchgrasses such as *Achnatherum occidentale* (western needlegrass), *Festuca campestris* (rough fescue), *Festuca idahoensis* (Idaho fescue), *Leymus cinereus* (basin wildrye), *Poa secunda* (Sandberg bluegrass), and *Pseudoroegneria spicata* (bluebunch wheatgrass). **A21**
..... G302 Intermountain Mesic Tall Sagebrush Steppe & Shrubland

M170 Great Basin-Intermountain Dwarf Sagebrush Steppe & Shrubland

G10a. This open to moderately dense, semi-arid dwarf-shrubland and steppe occurs throughout the intermountain western U.S. and is dominated by one of the following: *Artemisia arbuscula ssp. arbuscula* (little sagebrush), *Artemisia arbuscula ssp. longicaulis* (little sagebrush), *Artemisia arbuscula ssp. longiloba* (little sagebrush), *Artemisia arbuscula ssp. thermopola* (little sagebrush), *Artemisia bigelovii* (Bigelow sage), *Artemisia frigida* (prairie sagewort), *Artemisia nova* (black sagebrush), or *Artemisia tripartita ssp. rupicola* (Wyoming threetip sagebrush) depending on environment and species distribution. **A24**
..... G308 Intermountain Low & Black Sagebrush Steppe & Shrubland

G10b. Other groups in macrogroup do not occurs in key area.

G600 Great Basin-Intermountain Ruderal Dry Shrubland & Grassland

A11a. This cool, semi-arid interior western U.S. ruderal shrubland alliance is dominated by species of *Artemisia* (sagebrush) often with other native shrubs present to codominant. The open to moderate herbaceous understory (generally > 10% cover) strongly dominated (>90% relative cover) by non-native herbaceous species; a widespread example is *Artemisia tridentata* (big sagebrush) / *Bromus tectorum* (cheatgrass) shrubland. .....
.....A4213 Artemisia spp. - Mixed Shrub Ruderal Understory Shrubland Alliance

A11b. Vegetation is dominated by herbaceous vegetation.....**A12**

A12a. Vegetation is dominated by herbaceous annual species. **A13**

A12b. Vegetation is dominated by herbaceous perennial species. **A14**

A13a. This ruderal annual grassland alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic annual grass species such as *Bromus tectorum* (cheatgrass), and less commonly *Bromus arvensis* (field brome), *Bromus hordeaceus* (soft brome), *Bromus madritensis* (compact brome), or *Taeniatherum caput-medusae* (medusahead). It occurs in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m. .....
..... A1814 Bromus tectorum - Taeniatherum caput-medusae Ruderal Annual Grassland Alliance

A13b. This ruderal annual herbaceous alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic annual forb species such as *Brassica nigra* (black mustard), *Centaurea melitensis* (Maltese star-thistle), *Centaurea solstitialis* (yellow star-thistle), *Crupina vulgaris* (common crupina), *Cynoglossum officinale* (gypsyflower), *Hyoscyamus niger* (black henbane), *Isatis tinctoria* (Dyer's woad), or *Salsola tragus* (prickly Russian thistle) and occurs in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m. .....
.. A3257 Centaurea solstitialis - Isatis tinctoria - Salsola tragus Ruderal Annual Forb Alliance

A14a. This ruderal perennial grassland alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic perennial grasses, especially *Agropyron cristatum* (crested wheatgrass), which can occur as a near-monoculture or mixed grassland with other exotic perennial grasses such as *Poa pratensis* (Kentucky bluegrass) and exotic perennial forbs and annuals.....**A4148 Agropyron cristatum Western Ruderal Perennial Grassland Alliance**

A14b. This ruderal herbaceous alliance is strongly dominated (>90% relative canopy cover) by invasive, exotic perennial forbs such as *Acroptilon repens* (hardheads), *Cardaria draba* (whitetop), *Centaurea calcitrapa* (red star-thistle), *Centaurea diffusa* (diffuse knapweed), *Centaurea iberica* (Iberian knapweed), *Centaurea biebersteinii* (spotted knapweed), *Centaurea triumfettii* (squarrose knapweed), *Euphorbia esula* (leafy spurge), *Hypericum perforatum* (common St. Johnswort), *Lepidium latifolium* (broadleaved pepperweed), *Linaria dalmatica* (Dalmatian toadflax), *Linaria vulgaris* (butter and eggs), or *Peganum harmala* (harmal peganum) and occurs in disturbed dry to mesic basins, alluvial fans, and foothills at elevations up to 2200 m. .....
..... A3255 Cardaria draba - Centaurea spp. - Lepidium latifolium Ruderal Perennial Forb Alliance

G300 Intermountain Shadscale - Saltbush Scrub

A15a. This low scrub alliance is characterized by a sparse dwarf-shrub layer of *Artemisia pygmaea* (pygmy sagebrush) and occurs in relatively dry areas of the sagebrush desert of Nevada and Utah, from 1200-1800 m in elevation. ..... **..... A0869 Atriplex canescens Scrub Alliance**

A15b. This widespread scrub alliance is characterized by a sparse to moderately dense shrub layer dominated or codominated by *Atriplex confertifolia* (shadscale saltbush) and/or *Picrothamnus desertorum* (bud sagebrush). Several other semi-desert shrubs may be present to codominant. ..... **A0870 Atriplex confertifolia Scrub Alliance**

G310 Intermountain Semi-Desert Steppe & Shrubland

A16a. This alliance represents vegetation of the interior western U.S. characterized by a sparse to dense layer of *Krascheninnikovia lanata* (winterfat)..... **..... A3202 Krascheninnikovia lanata Steppe & Dwarf-shrubland Alliance**

A16b. Vegetation is not characterized by *Krascheninnikovia lanata* (winterfat) shrubs **A17**

A17a. This shrub steppe and shrubland alliance is characterized by a sparse to dense layer of *Chrysothamnus viscidiflorus* (yellow rabbitbrush) 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. ..... **A3195 Chrysothamnus viscidiflorus Steppe & Shrubland Alliance***

A17b. This shrub steppe and shrubland alliance has an open to closed shrub layer dominated by *Ericameria nauseosa* (rubber rabbitbrush) and includes both natural and semi-natural stands from localized areas across the northern Great Plains and throughout the western U.S. ..... **..... A3196 Ericameria nauseosa Steppe & Shrubland Alliance**

G304 Intermountain Mountain Big Sagebrush Steppe & Shrubland

A18a. This steppe and shrubland alliance is characterized by a moderate to dense shrub layer in which *Artemisia tridentata ssp. vaseyana* (mountain big sagebrush) is codominant with non-sagebrush shrub species *Amelanchier utahensis* (Utah serviceberry), *Holodiscus dumosus* (rockspirea), *Purshia tridentata* (antelope bitterbrush), or *Symphoricarpos oreophilus* (mountain snowberry). 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 patches within montane or subalpine coniferous forests across the western U.S..... **.....A3208 Artemisia tridentata ssp. vaseyana - Mixed Steppe & Shrubland Alliance**

A18b. Other alliances in this group do not occur in key area.

G303 Intermountain Dry Tall Sagebrush Steppe & Shrubland

A19a. This dry steppe and shrubland alliance is dominated by *Artemisia tridentata ssp. tridentata* (basin big sagebrush) or *Artemisia tridentata ssp. xericensis* (foothill big sagebrush). Other shrubs have low cover, except species that increase with disturbance such as *Gutierrezia sarothrae* (broom snakeweed), *Chrysothamnus viscidiflorus* (yellow rabbitbrush), and *Ericameria nauseosa* (rubber rabbitbrush). The understory, if present, is characterized by dry-site grass species..... **A3194 Artemisia tridentata ssp. tridentata - Artemisia tridentata ssp. xericensis Dry Steppe & Shrubland Alliance**

A19b. Vegetation is not dominated by *Artemisia tridentata ssp. tridentata* (basin big sagebrush) or *Artemisia tridentata ssp. xericensis* (big sagebrush). **A20**

A20a. This dry steppe and shrubland alliance is dominated by *Artemisia tridentata ssp. wyomingensis* (Wyoming big sagebrush). Other shrubs have low cover, except species that increase with disturbance such as *Gutierrezia sarothrae* (broom snakeweed), *Chrysothamnus viscidiflorus* (yellow rabbitbrush), and *Ericameria nauseosa* (rubber rabbitbrush). This understory is a sparse to moderately dense herbaceous layer characterized by dry-site perennial graminoids such as *Achnatherum hymenoides* (Indian ricegrass), *Bouteloua gracilis* (blue grama), *Carex filifolia* (threadleaf sedge), *Distichlis spicata* (saltgrass), *Elymus elymoides* (squirreltail), *Hesperostipa comata* (needle-and-thread), *Pleuraphis jamesii* (James' galleta), and *Poa fendleriana* (muttongrass). Stands occur in the western United States on dry steppes with core distribution in the Great Basin, Colorado Plateau and Wyoming. ..... **..... A3184 Artemisia tridentata ssp. wyomingensis Dry Steppe & Shrubland Alliance**

A20b. This dry steppe and shrubland alliance has a mixed shrub canopy codominated by *Artemisia tridentata* (big sagebrush) with dry-site shrub species such as *Atriplex canescens*

(fourwing saltbush), *Atriplex confertifolia* (shadscale saltbush), *Ephedra fasciculata* (Arizona joint-fir), *Ephedra viridis* (mormon-tea), *Ephedra nevadensis* (Nevada joint-fir), *Grayia spinosa* (spiny hopsage), *Sarcobatus vermiculatus* (greasewood), or *Tetradymia canescens* (spineless horsebrush) present to codominant. The sparse to moderately dense herbaceous layer is dominated by dry-site perennial graminoids and diverse forbs. .....
.....A3198 Artemisia tridentata - Mixed Shrub Dry Steppe & Shrubland Alliance

G302 Intermountain Mesic Tall Sagebrush Steppe & Shrubland

A21a. This mesic steppe and shrubland alliance is characterized by an open to moderately dense short-shrub layer dominated or codominated by *Purshia tridentata* (antelope bitterbrush) with *Artemisia tridentata* (big sagebrush) and sometimes *Prunus virginiana* (chokecherry) present to codominant. The understory is sparse to dense and typically dominated by perennial bunchgrasses such as *Achnatherum hymenoides* (Indian ricegrass), *Achnatherum nelsonii* (Columbia needlegrass), *Achnatherum occidentale* (western needlegrass), *Festuca campestris* (rough fescue), *Festuca idahoensis* (Idaho fescue), *Hesperostipa comata* (needle-and-thread), *Leymus cinereus* (basin wildrye), *Poa secunda* (Sandberg bluegrass), and *Pseudoroegneria spicata* (bluebunch wheatgrass).....
.....A3179 Purshia tridentata - Artemisia tridentata Mesic Steppe & Shrubland Alliance

A21b. Vegetation is not characterized by an open to moderately dense short-shrub layer dominated or codominated by *Purshia tridentata* (antelope bitterbrush).....**A22**

A22a. This mesic steppe and shrubland alliance is characterized by an open to moderately dense shrub layer dominated or codominated by *Artemisia tripartita* (threetip sagebrush) with 10-25% cover, often with herbaceous species having equal or greater coverage than shrubs. Stands are distributed from the Columbia Basin east to the northern Rocky Mountains. .....
...A1528 Artemisia tripartita ssp. tripartita - Artemisia tridentata Mesic Steppe & Shrubland Alliance

A22b. Vegetation is not characterized by an open to moderately dense shrub layer dominated or codominated by *Artemisia tripartita* (threetip sagebrush). **A23**

A23a. This widespread mesic steppe and shrubland alliance is characterized by an open to dense shrub layer dominated (or codominated with at least 40% relative cover (in mixed stands) by *Artemisia tridentata ssp. wyomingensis* (Wyoming big sagebrush). Common associates include *Atriplex confertifolia* (shadscale saltbush), *Artemisia frigida* (prairie sagewort), *Krascheninnikovia lanata* (winterfat), *Purshia tridentata* (antelope bitterbrush), and *Symphoricarpos longiflorus* (desert snowberry). The sparse to dense herbaceous layer dominated by dry-mesic perennial bunchgrasses, especially *Festuca idahoensis* (Idaho fescue), *Hesperostipa comata* (needle-and-thread), *Pascopyrum smithii* (western wheatgrass), and *Pseudoroegneria spicata* (bluebunch wheatgrass). .....
.....A3182 Artemisia tridentata ssp. wyomingensis Mesic Steppe & Shrubland Alliance

A23b. This widespread mesic steppe and shrubland alliance is characterized by an open to moderately dense shrub layer of *Artemisia tridentata ssp. tridentata* (basin big sagebrush) or *Artemisia tridentata ssp. xericensis* (big sagebrush) with a sparse to dense herbaceous layer dominated by dry-mesic perennial bunchgrasses, especially *Elymus lanceolatus* (thickspike wheatgrass), *Festuca idahoensis* (Idaho fescue), *Hesperostipa comata* (needle-and-thread), *Leymus cinereus* (basin wildrye), *Pascopyrum smithii* (western wheatgrass), and *Pseudoroegneria spicata* (bluebunch wheatgrass). It occurs on sloping fans, footslopes, rolling hills, and especially deep, well-drained alluvial bottomlands with vegetation .....
..... A3183 Artemisia tridentata ssp. tridentata - Artemisia tridentata ssp. xericensis Mesic Steppe & Shrubland Alliance

G308 Intermountain Low & Black Sagebrush Steppe & Shrubland

A24a. This steppe and shrubland alliance is dominated by *Artemisia bigelovii* (Bigelow sage) and occurs in southern and central New Mexico, the Colorado Plateau near canyon rims, and southern Great Plains along escarpments.....
..... A3223 Artemisia bigelovii Steppe & Shrubland Alliance

A24b. This alliance is dominated by the dwarf-shrub *Artemisia frigida* (prairie sagewort) and is described from the Colorado Plateau and western slope of the southern Rocky Mountains. ....
..... A2565 Artemisia frigida Dwarf-shrubland Alliance

6.B.1 Temperate & Boreal Cliff, Scree & Other Rock Vegetation

D052 Western North American Temperate & Boreal Cliff, Scree & Rock Vegetation

M1a. This sparsely vegetated rock outcrop and cliff face macrogroup is found in temperate and boreal western North America from the Alaska Peninsula, Alaskan boreal region, and Aleutian Islands Alaskan boreal region, south along 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%. **G2**

..... M887 Western North American Cliff, Scree & Rock Vegetation*

M1b. This macrogroup and division are peripheral in this Great Plains ecoregion. .....

Go to: **..... D051 Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation**

D051 Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation

M1a. This sparsely vegetated rock outcrop, bluff and cliff macrogroup is found throughout the Great Plains with vegetation comprised of sparse, rocky vegetation and sparse to abundant lichens... ..... **G2**

..... M116 Great Plains Cliff, Scree & Rock Vegetation

M1b. This badlands macrogroup is found in the northern Great Plains where erodible parent material is dissected into dry, sparsely vegetated, generally steep slopes, usually above rivers or perennial or intermittent streams. The dominant vegetation is a mix of shrubs, forbs, and grasses with each dominating some areas. **G3**

..... M115 Great Plains Badlands Vegetation

M116 Great Plains Cliff, Scree & Rock Vegetation

G2a. This group is composed of cliffs, bluffs, and rock outcrops in the Great Plains from the U.S.-Canadian border area south to Texas. It is defined by having sparse vegetation and the abundance of exposed bedrock. The bedrock exposure can be vertical, sloping, or horizontal along rivers, at the tops of buttes, in dry canyons, or, rarely, large, low bedrock outcrops. Vegetation is generally sparse except where soil accumulates in pockets or ledges. Common species are able to tolerate the dry to xeric conditions and poor soil development found in this group and include *Bouteloua eriopoda* (black grama) (in the southwest), *Bouteloua gracilis* (blue grama), *Cercocarpus montanus* (alderleaf mountain-mahogany), *Juniperus* (juniper) spp., *Opuntia* (pricklypear) spp., and *Rhus trilobata* (skunkbush sumac). **A4**

..... G567 Great Plains Cliff, Scree & Rock Vegetation

G2b. There is only one group in this macrogroup

M115 Great Plains Badlands Vegetation

G3a. This badlands group includes occurs in the Northern Great Plains of the United States and Canada, typically on slopes of easily erodible clay and poorly consolidated shale interspersed with sandstone, lignite lenses, and occasional scoria outcrops. Vegetation cover is typically sparse but can be moderate in small areas with shallower slopes and is a mix of shrubs, forbs and grasses with each dominating some areas. Common species include *Sarcobatus vermiculatus* (greasewood), *Atriplex* (saltbush) spp., *Artemisia longifolia* (longleaf wormwood), *Artemisia tridentata* (big sagebrush), *Gutierrezia sarothrae* (broom snakeweed), *Eriogonum pauciflorum* (fewflower buckwheat), and *Pseudoroegneria spicata* (bluebunch wheatgrass). **A6**

..... G566 Great Plains Badlands Vegetation

G3b. There is only one group in this macrogroup

G567 Great Plains Cliff, Scree & Rock Vegetation

A4a. This sparsely vegetated bluff and cliff alliance occurs on limestone or dolostone in the central and northern Great Plains. Species are variable but often include shrubs *Rhus trilobata* (skunkbush sumac) and *Rosa arkansana* (prairie rose), the forbs *Mentzelia decapetala* (tenpetal blazingstar), *Eriogonum pauciflorum* (fewflower buckwheat), *Gutierrezia sarothrae* (broom snakeweed), and the grasses *Schizachyrium scoparium* (little bluestem) and *Achnatherum hymenoides* (Indian ricegrass). Soils are generally absent or poorly developed or limited to cracks and ledges.....

..... A3980 Great Plains Alkaline Cliff Alliance

A4b. Vegetation is not as above. **A5**

A5a. This sparsely vegetated bluff and cliff alliance occurs on sandstone or siltstone in the central and northern Great Plains. Vascular floristic diversity is low. Forbs such as *Mentzelia decapetala* (tenpetal blazingstar) and *Penstemon glaber* (sawsepal penstemon) are relatively abundant. Scattered shrubs, *Rhus trilobata* (skunkbush sumac) and *Cercocarpus montanus*

(alderleaf mountain-mahogany), and grasses, such as *Pseudoroegneria spicata* (bluebunch wheatgrass) and *Bouteloua gracilis* (blue grama) are are common. In general, slopes are steep to vertical but small areas with gentle slopes or flat ledges can occur. Soils are absent or poorly developed and limited to cracks or ledges. ..... **..... A3981 Great Plains Acidic Cliff Alliance**

A5b. This outcrop alliance occurs on acidic bedrock in the central and northern Great Plains. Species vary widely across the range of this alliance but typically consist of Great Plains taxa that can tolerate the shallow, dry soils. Total vegetation cover is sparse across the outcrops but can be moderate or even dense in small pockets where soil accumulates. Substrate varies from granite and quartzite (in Minnesota and Wisconsin) to siltstone, sandstone, shale, and even pockets of gypsum. The outcrops are generally flat to moderately sloping but soil development is limited to cracks or depressions. **A6**
..... A3982 Great Plains Acidic Rock Outcrop Alliance

G566 Great Plains Badlands Vegetation

A6a. This greasewood alliance is found in the Badlands regions of the northwestern Great Plains on weakly consolidated sedimentary rocks, where eroded slopes contain interbedded clay and silt shales. Stands have a sparse to moderate woody layer (15-40% cover) dominated by the deciduous, facultative halophytic shrub *Sarcobatus vermiculatus* (greasewood)..... **.....A3978 Sarcobatus vermiculatus Great Plains Badlands Alliance**

A6b. Vegetation is not as above. *Sarcobatus vermiculatus* (greasewood) is typically absent. **A7**

A7a. This alliance is known from northeastern Colorado on hot, dry sites such as exposed siltstone barrens and ravines on convex slopes where erosion is active and moisture penetration is minimal. Stands have a sparse, short herbaceous layer of mostly perennial, mat-forming cushion plants, particularly *Arenaria hookeri* (Hooker's sandwort), and a few grasses. .....**A1642 Arenaria hookeri Rock Alliance**

A7b. Vegetation is not as above. *Arenaria hookeri* (Hooker's sandwort) is typically absent. **A8**

A8a. This vegetation is known from badlands in the northwestern Great Plains on moderately to steeply sloping acid-shale barrens and clay with sparse to moderate cover by forbs, especially *Artemisia longifolia* (longleaf wormwood) with *Eriogonum pauciflorum* (fewflower buckwheat) sometimes codominating. ..... **A1874 Artemisia longifolia Badlands Alliance**

A8b. This alliance contains sparsely vegetated, forb-dominated communities on badland landscapes in the northwestern Great Plains on clays, shales, and poorly consolidated sandstones or conglomerates or on the colluvial slopes at the base of such slopes. Rapid erosion prevents the development of soils and this along with the arid climate limit vegetation development to 1-10% cover. Consistent species in this alliance are *Eriogonum pauciflorum* (fewflower buckwheat) and *Gutierrezia sarothrae* (broom snakeweed). .....
..... A3979 Eriogonum pauciflorum - Gutierrezia sarothrae Badlands Alliance

Key to USNVC Wetland and Riparian Macrogroups, Groups and Alliances in the Northwestern Great Plains and High Plains Ecoregions

1.B.3 Temperate Flooded & Swamp Forest

D011 Eastern North American-Great Plains Flooded & Swamp Forest

M1a. Forested wetlands and riparian dominated by native tree species and native understory species. These deciduous forests and woodlands, dominated by *Populus deltoides* (eastern cottonwood), *Fraxinus pennsylvanica* (green ash), and other hardwoods, are found along floodplains of permanent rivers in the prairie-dominated landscapes of the western and central Great Plains from southern Canada to northern Texas. **G2**
..... M028 Great Plains Floodplain Forest

M1b. There is only one MacroGroup within the geography of this key **G2**

M028 Great Plains Floodplain Forest

G2a. Great Plains floodplains of medium to small rivers where the tree canopy is dominated by *Populus deltoides* (eastern cottonwood) or sometimes *Fraxinus pennsylvanica* (green ash), often with *Acer negundo* (box-elder), *Salix amygdaloides* (peachleaf willow), *Salix nigra* (black willow), and, in the southern portion of the group's range, *Celtis laevigata* (sugarberry) and *Platanus occidentalis* (American sycamore). **A3**
..... G147 Great Plains Floodplain Forest

G2b. There is only one Group wtihin this Macrogroup.

G147 Great Plains Floodplain Forest

A3a. Stands dominated by *Fraxinus pennsylvanica* (green ash) on infrequently flooded floodplains and terraces in the northern Great Plains. .....
..... A4131 Fraxinus pennsylvanica - Ulmus americana - Populus deltoides Floodplain Forest Alliance

A3b. Stands may have some *Fraxinus pennsylvanica* (green ash) but generally this is not the dominant tree.....**A4**

A4a. Stands along rivers and large streams dominated by open woodlands (25%-60% canopy cover) of *Populus deltoides* (eastern cottonwood) throughout its range. Secondary canopy species include *Acer negundo* (box-elder) throughout, *Salix nigra* (black willow) (in the eastern part of its range), *Fraxinus pennsylvanica* (green ash) and *Ulmus americana* (American elm) (central and eastern), and *Salix amygdaloides* (peachleaf willow) (central and western). Shrubs include *Salix* (willow) spp., *Symphoricarpos occidentalis* (western snowberry), and *Prunus virginiana* (chokecherry). The understory often has mid- and tallgrass components from the surrounding prairie, though recently scoured sites can be barren or dominated by early-successional species. Found throughout the Great Plains extending west into Wyoming and New Mexico. Very similar to the next alliance.. .....
..... A0636 Populus deltoides Floodplain Woodland Alliance

A4b. Stands of floodplain forests with a dense to closed canopy (60-100%) nearly always dominated by *Populus deltoides* (eastern cottonwood). *Fraxinus pennsylvanica* (green ash) can be codominant, particularly in the northern part of this alliance's range. *Platanus occidentalis* (American sycamore) and *Celtis laevigata* (sugarberry) can be codominant to dominant in the southern part of this alliance's range. Other common associates are *Acer negundo* (box-elder) and *Ulmus americana* (American elm).The shrub layer is also dense with up to 60% cover, and often multi-tiered, with both tall and short shrubs with species such as *Cornus drummondii* (roughleaf dogwood), *Cornus sericea* (red-osier dogwood), *Prunus virginiana* (chokecherry), *Salix exigua* (narrowleaf willow), and *Symphoricarpos occidentalis* (western snowberry). Found on alluvial soils, known from throughout the Great Plains. Very similar to the above alliance..... **A3423 Populus deltoides Floodplain Forest Alliance**

D013 Western North American Interior Flooded Forest

M1a. Macrogroup of low-elevation riparian and lacustrine areas of western U.S. and into Mexico; dominated by non-native invasive woody species such as *Tamarix* (tamarisk) spp., *Elaeagnus angustifolia* (Russian olive), *Phoenix dactylifera* (date palm), *Salix alba* (white willow) and/ or *Salix fragilis* (crack willow). Includes stands dominated by native tree species such as *Acer negundo (box elder) and Populus* spp. (cottonwood), with understories of non-native species. **G2**
.....M298 Interior West Ruderal Flooded & Swamp Forest & Woodland

M1b. There is only one macroGroup within the geography of this key.

M298 Interior West Ruderal Flooded & Swamp Forest & Woodland

G2a. Dominated by non-native invasive woody species such as *Tamarix* (tamarisk) spp., *Elaeagnus angustifolia* (Russian olive), and others. There is only one group in this macrogroup. **A3**
.....G510 Interior West Ruderal Flooded & Swamp Forest & Woodland

G2b. There is only one Group within this MacroGroup.

G510 Interior West Ruderal Flooded & Swamp Forest & Woodland

A3a. Stands dominated by *Tamarix* (tamarisk) and/or *Elaeagnus angustifolia* (Russian olive) **A4**

A3b. Stands dominated by other taxa. **A5**

A4a. Dominated by introduced species of *Tamarix* (tamarisk), including *Tamarix chinensis* (five-stamen tamarisk), *Tamarix gallica* (French tamarisk), *Tamarix parviflora* (smallflower tamarisk), and *Tamarix ramosissima* (saltcedar). Moderately dense to dense thickets on banks of larger streams, rivers and playas across the southwestern U.S. and northern Mexico .....**A0842 Tamarix spp. Ruderal Riparian Scrub Alliance**

A4b. Alliance dominated by the introduced and naturalized tree species *Elaeagnus angustifolia* (Russian olive) with a variety of native and introduced species in the shrub and herbaceous layers. Widespread throughout much of the western United States; seeds are spread by birds. Occurs in a variety of mesic areas, such as near streams and rivers, upland basins and drainages. ..... **A3566 Elaeagnus angustifolia Ruderal Riparian Scrub Alliance**

A5a. Riparian forests dominated by *Acer negundo (box elder), Populus* spp. (cottonwood species) or *Picea* spp (spruce species), with non-native understory species such as *Tamarix* (tamarisk), *Bromus tectorum* (cheatgrass), or other introduced species, generally these have high cover. Ruderal type, can occur anywhere along riparian and low wet areas throughout the western US..... **A4155 Acer negundo - Populus spp. - Picea spp. Ruderal Riparian Forest Alliance**

A5b. Naturalized stands of *Salix fragilis* (crack willow) and/or *Salix alba* (white willow) occurring along riverbanks and lakeside margins. Throughout the western U.S. and western Great Plains.....**A4192 Salix alba - Salix fragilis Ruderal Riparian Forest Alliance**

2.C.4 Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland

D031 Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

M1a. Disturbed natural wetland habitats of temperate western North America that are now strongly dominated by non-native and sometimes weedy or generalist native species.....**G2**
..... M301 Western North American Ruderal Marsh, Wet Meadow & Shrubland

M1b. No other Macrogroups occur within this geography.

M301 Western North American Ruderal Marsh, Wet Meadow & Shrubland

G2a. Wet meadows dominated by non-native species such as *Agrostis gigantea* (redtop), *Agrostis stolonifera* (creeping bentgrass), *Alopecurus pratensis* (meadow foxtail), *Conyza canadensis* (Canadian horseweed), *Cirsium arvense* (Canada thistle), *Sonchus* (sowthistle) spp., *Lactuca serriola* (prickly lettuce), *Phalaris arundinacea* (reed canarygrass), *Phragmites australis* (common reed), *Poa palustris* (fowl bluegrass), and/or *Poa pratensis* (Kentucky bluegrass) that occur in the same physical settings as native wet meadows found throughout the western U.S. and Canada. **A3**
.....G524 Western North American Ruderal Marsh, Wet Meadow & Shrubland

G2b. No other groups occur within this macrogroup within this geography.

G524 Western North American Ruderal Marsh, Wet Meadow & Shrubland

A3a. Stands of native willows and/or native *Artemisia cana* (silver sagebrush) sagebrush with non-native grasses and forbs dominant in the understory, found in western U.S. streams and floodplains. The herbaceous layer is dominated by non-native invasive species such as *Agrostis gigantea* (redtop), *Agrostis stolonifera* (creeping bentgrass), *Alopecurus pratensis* (meadow foxtail), *Conyza canadensis* (Canadian horseweed), *Cirsium arvense* (Canada thistle), *Sonchus* (sowthistle) spp., *Lactuca serriola* (prickly lettuce), *Phalaris arundinacea* (reed canarygrass), *Phragmites australis* (common reed), *Poa palustris* (fowl bluegrass), and/or *Poa pratensis* (Kentucky bluegrass).....
..... A4217. Salix spp. - Artemisia cana Ruderal Understory Wet Shrubland Alliance

A3b. Riparian areas and wet meadows dominated by herbaceous species. If shrubs are present they constitute less than 10% cover.....**A4**

A4a. Non-native forb-dominated waste and other disturbed places of the western U.S. dominated by such species as *Conyza canadensis* (Canadian horseweed), *Cirsium arvense* (Canada thistle), or *Lactuca serriola* (prickly lettuce) (other species may be present to dominant). ..... **.....A3849. Conyza canadensis - Cirsium arvense - Lactuca serriola Ruderal Wet Meadow Alliance**

A4b. Stands dominated by graminoid species.....**A5**

A5a. Tall robust herbaceous marsh vegetation dominated by non-native grasses such as *Phalaris arundinacea* (reed canarygrass), *Phragmites australis ssp. australis* (European common reed), *Arundo donax* (giant reed), and/or *Alopecurus pratensis* (meadow foxtail) (which isn't all that tall, but is included here). **A6**

A5b. Stands dominated by other, smaller stature graminoids.....**A7**

A6a. Common reed marsh alliance dominated by introduced *Phragmites australis ssp. australis* (European common reed), *Arundo donax* (giant reed), and/or *Alopecurus pratensis* (meadow foxtail). Temperate regions of the western U.S. and Canada. ..... **A3847. Phragmites australis - Arundo donax - Alopecurus pratensis Ruderal Marsh Alliance**

A6b. Dominated by *Phalaris arundinacea* (reed canarygrass), which tends to occur in monocultures; mesic to wet disturbed areas and along rivers that no longer flood throughout the western U.S. ..... **..... A3846. Phalaris arundinacea Western Ruderal Marsh Alliance**

A7a. Grasslands dominated by introduced grasses such as *Agrostis gigantea* (redtop), *Agrostis stolonifera* (creeping bentgrass), *Alopecurus pratensis* (meadow foxtail), or *Poa pratensis* (Kentucky bluegrass), Very common and widespread in the western U.S. where it has invaded natural meadows, wetlands and riparian areas. ..... **.....A3848. Poa pratensis - Agrostis gigantea - Agrostis stolonifera Ruderal Marsh Alliance**

A7b. Vegetation not like above in all respects, not covered in this key.

D323 Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

M1a. Freshwater riparian and non-riparian mesic settings, dominated by a wide variety of native herb or native shrub that are obligate or facultative wetland species, found on the Great Plains. .....**G2** **..... M071 Great Plains Marsh, Wet Meadow, Shrubland & Playa**

M1b. Only one macrogroup occurs within this division in this geography .....

M071 Great Plains Marsh, Wet Meadow, Shrubland & Playa

G2a. Wet meadows and wetlands assocaited with basins, playas, fens and other shallow depressions.....**G3**

G2b. Wetlands associated with drainages, streams, creeks and rivers, some type of moving water, temporary or permanent.....**G4**

G3a. Intermittently or temporarily flooded playas and shallow depressions with an impermeable layer such as dense clay in the southern part of the Great Plains, and is often dominated by *Buchloe dactyloides* (buffalograss), *Panicum obtusum* (vine-mesquite), *Panicum virgatum* (switchgrass), *Pascopyrum smithii* (western wheatgrass), and sometimes annual graminoids and forbs. Rainwater and runoff recharge these playas, rarely interact with groundwater. Sites can be moderately saline. .....**A6** **..... G136 Great Plains Playa & Rainwater Basin Wetland**

G3b. Freshwater seasonally flooded wet meadows in on poorly drained nearly level sites such as depressional basins and on the margins of floodplains; sites can have abundant *Calamagrostis stricta* (slimstem reedgrass), *Carex* (sedge) spp., and *Spartina pectinata* (prairie cordgrass). Fine-textured soils, fens where minerothrophic groundwater meets the surface on lower slopes or cliff bases, or on floodplians, are included here. Some sites can be moderately saline, and are found in the northern and central Great Plains, and occur as far west as eastern Montana, eastern Wyoming, and western Kansas.....**A9** **..... G336 Great Plains Wet Prairie, Wet Meadow & Seepage Fen**

G4a. Riparian vegetation, either on banks or within the active channel of rivers.....**G5**

G4b. Wetlands not like above in all repects, emergent marshes. The alliances within this Group are not keyed here. .....**G325 Great Plains Freshwater Marsh***

* Indicates that NVC unit is peripheral to the NW Great Plains key area and may not be present.

G5a. This group encompasses sites within the scour zone of stream channels in the Great Plains from the U.S.-Canadian border region south to the U.S.-Mexican border region. It is more common in the western Great Plains than the eastern Great Plains. Examples of this group are found in watercourses that have been recently scoured by flooding. These can be beds of intermittent streams or in the floodplains of more permanent streams or rivers which have frequent flooding. Stands can have sparse cover of short shrubs or tree seedlings or herbaceous species. Frequent scouring prevents more dense vegetation from developing. *Salix* (willow) spp., and particularly *Salix interior* (sandbar willow), are the most common shrubs. Seedlings of *Populus deltoides* (eastern cottonwood) can be present. The herbaceous component is diverse and can have significant amounts of exotic species. Species such as *Sporobolus cryptandrus* (sand dropseed), *Artemisia campestris* (field sagewort), *Juncus articulatus* (jointleaf rush), *Polygonum* (knotweed) spp., and the exotics *Agrostis stolonifera* (creeping bentgrass), *Bidens frondosa* (devil's beggarticks), and *Trifolium repens* (white clover) are common in much of the Great Plains with *Andropogon glomeratus* (bushy bluestem) and *Panicum virgatum* (switchgrass) often abundant in south Texas. **A11**
..... G568 Great Plains Riverscour Vegetation

G5b. This group consists of shrub- and herbaceous-dominated stands along perennial or intermittent rivers in the Great Plains. This riparian group can be found throughout most of the Great Plains from the U.S. border in central Montana and North Dakota to Oklahoma. Sites are found on raised islands and terraces above the main channel that experience periodic flooding. Shrubs or herbaceous plants can dominate. Common species include *Cornus drummondii* (roughleaf dogwood), *Cornus sericea* (red-osier dogwood), *Symphoricarpos occidentalis* (western snowberry), *Prunus virginiana* (chokecherry), *Pascopyrum smithii* (western wheatgrass), *Schizachyrium scoparium* (little bluestem) (in the west and south), and the exotics *Poa pratensis* (Kentucky bluegrass) and *Melilotus* (sweetclover) spp. Scattered trees may be present, and examples of this group may occur on a floodplain interspersed with Great Plains Cottonwood - Green Ash Floodplain Forest Group (G147).....**A12**
..... G337 Great Plains Riparian Wet Meadow & Shrubland

G136 Great Plains Playa & Rainwater Basin Wetland

A6a. Playas or depressions dominated by *Panicum obtusum* (vine-mesquite) or *Pascopyrum smithii* (western wheatgrass). **A7**

A6b. Wet meadows, playas or depressions and mudflats dominated other taxa..... **A8**

A7a. Stands of abundant *Panicum obtusum* (vine-mesquite) on heavy, mesic soils in depressions, along streams, and in playa basins, found in the southern Great Plains and northern Chihuahuan Desert. ..... **A1238 Panicum obtusum Wet Meadow Alliance***

A7b. Stands of wet meadows where *Pascopyrum smithii* (western wheatgrass) is dominant in depressions or along streams, found in the southern Great Plains from Nebraska to Oklahoma and northern Texas. .....**A3597 Pascopyrum smithii Wet Meadow Alliance**

A8a. Mudflat environments dominated by annual herbaceous graminoids and forbs, mostly <1 m tall, species composition and extent of the community fluctuate from site to site and year to year. Species include forbs such as *Ambrosia grayi* (woollyleaf bur ragweed), *Bacopa rotundifolia* (disk water-hyssop), *Chenopodium berlandieri* (pitseed goosefoot), *Coreopsis tinctoria* (golden tickseed), *Elatine rubella* (southwestern waterwort), *Heteranthera limosa* (blue mudplantain), *Limosella aquatica* (water mudwort), *Lindernia dubia* (yellowseed false pimpernel), *Mollugo verticillata* (green carpetweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum lapathifolium* (curlytop knotweed), *Rumex stenophyllus* (narrowleaf dock), and *Sagittaria calycina* (hooded arrowhead), and *Symphyotrichum subulatum* (eastern annual saltmarsh aster); and graminoids such as *Cyperus acuminatus* (tapertip flatsedge), *Eleocharis engelmannii* (Engelmann's spikerush), *Echinochloa muricata* (rough barnyardgrass) and *Hordeum jubatum* (foxtail barley). This wetland community is found throughout the Great Plains of the United States. .....
..... A1348 Polygonum spp. - Echinochloa spp. - Distichlis spicata Wet Meadow Alliance

A8b. Playas, wet meadows, or depressions dominated by vegetation not like above, or deep water emergent marshes, not covered by this key.

G336 Great Plains Wet Prairie, Wet Meadow & Seepage Fen

A9a. Fens, where mineral-rich groundwater emerges at the ground's surface, dominated by *Carex* (sedge) spp., *Eleocharis quinqueflora* (fewflower spikerush), *Lobelia kalmii* (Ontario lobelia), *Parnassia palustris* (marsh grass of Parnassus), and *Rhynchospora capillacea* (needle beaksedge). Found in northwestern Great Plains. .....

..... A3495 Carex spp. - Triglochin maritima - Eleocharis quinqueflora Alkaline Fen Alliance

A9b. Herbaceous vegetation of wet meadows and prairies, but not fens. **A10**

A10a. Depressions and drainages with moderate to heavy grass cover dominated by *Panicum virgatum* (switchgrass), sometimes with *Pascopyrum smithii* (western wheatgrass) as a codominant.....**A3492 Panicum virgatum - Pascopyrum smithii Wet Meadow Alliance**

A10b. Wet prairies on intermittently flooded sites with dense, tall graminoids, usually with *Spartina pectinata* (prairie cordgrass) common or abundant along with species such as *Calamagrostis canadensis* (bluejoint), *Carex aquatilis* (water sedge), *Carex atherodes* (wheat sedge), *Carex pellita* (woolly sedge), and *Carex sartwellii* (Sartwell's sedge). .....
..... A3493 Spartina pectinata Great Plains Wet Meadow Alliance

G568 Great Plains Riverscour Vegetation

A11a. Riverine gravel flats alliance found in the central Great Plains. Vegetation is sparse and often consists of nearly equal cover of annual grasses, perennial grasses, and annual or biennial forbs under 1 m tall. *Sporobolus cryptandrus* (sand dropseed) and *Artemisia campestris ssp. caudata* (field sagewort) are conspicuous. In some sites, *Populus deltoides* (eastern cottonwood) may be scattered to woodland-like in structure. Shrubs are also scattered and uncommon, with *Amorpha fruticosa* (false indigobush) the most frequent. Other herbaceous species that can occur include *Ambrosia artemisiifolia* (annual ragweed), *Chamaesyce glyptosperma* (ribseed sandmat), *Chamaesyce serpyllifolia* (thymeleaf sandmat), *Froelichia gracilis* (slender snakecotton), *Helianthus petiolaris* (prairie sunflower), *Opuntia macrorhiza* (twistspine pricklypear), and *Triplasis purpurea* (purple sandgrass). Stands occur along major rivers where gravel has been deposited on the first terraces of rivers. The substrate consists of a mixture of gravel and some sand, and soils are poorly developed or absent. Sites can occasionally be flooded in spring. .....
..... A3591 Sporobolus cryptandrus - Artemisia campestris Wet Meadow Alliance

A11b. This herbaceous alliance is found along streams in southern Texas. The herbaceous stratum varies in density from very open to dense. Herbs are rooted in cracks and in soil mats, and characteristic species are *Andropogon glomeratus var. pumilus* (bushy bluestem), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Fuirena simplex* (western umbrella-sedge), *Panicum virgatum* (switchgrass), and *Rhynchospora colorata* (starrush whitetop). Other species may include *Arundo donax* (giant reed), *Bothriochloa ischaemum var. songarica* (yellow bluestem) (exotic), *Eleocharis geniculata* (Canada spikesedge), *Eleocharis montevidensis* (sand spikerush), *Eupatorium serotinum* (lateflowering thoroughwort), *Indigofera lindheimeriana* (Lindheimer's indigo), *Polanisia dodecandra* (redwhisker clammyweed), *Ratibida columnifera* (upright prairie coneflower), *Schizachyrium scoparium* (little bluestem), *Senna lindheimeriana* (velvet leaf senna), and *Solidago altissima* (Canada goldenrod). Woody shrubs and trees may occur as scattered individuals and may include *Baccharis neglecta* (Rooseveltweed), *Baccharis salicifolia* (mule-fat), *Chilopsis linearis* (desert willow), *Juglans microcarpa* (little walnut), *Platanus occidentalis* (American sycamore), and *Salix nigra* (black willow). This community occurs on periodically scoured flat-bedded limestone shores of perennial streams. .....
..... A4115 Panicum virgatum - Andropogon glomeratus Riverscour Wet Meadow Alliance

G325 Great Plains Freshwater Marsh

A12a. Herbaceous wetlands along perennial streams at lower to mid elevations in the Black Hills of the United States, and perhaps more widely in the northern Great Plains. Species composition is variable, and dominance is patchy within stands; local dominants include *Agrostis stolonifera* (creeping bentgrass), *Cicuta douglasii* (western water hemlock), *Eleocharis palustris* (common spikerush), *Glyceria grandis* (American mannagrass), *Leersia oryzoides* (rice cutgrass), *Lycopus asper* (rough bugleweed), *Poa palustris* (fowl bluegrass), *Rorippa nasturtium-aquaticum* (watercress), and *Scirpus pallidus* (cloaked bulrush). *Ranunculus longirostris* (longbeak buttercup) can be abundant in adjacent shallow water. .....
..... A3587 Schoenoplectus spp. - Poa palustris Marsh Alliance

12B. Wetland characterized by shrubs. **A12**

G337 Great Plains Riparian Wet Meadow & Shrubland

A13a. Riparian areas, draws, and low wet areas dominated with alder or dogwoods **A14**

A13b. Not like above in all respects.....**A15**

A14a. Shrublands in this alliance are dominated by *Alnus maritima ssp. oklahomensis* (Oklahoma alder), occurring on cobble bars and riparian zones in southern Oklahoma. .....

..... **A0942 Alnus maritima ssp. oklahomensis Wet Shrubland Alliance***

A14b. This dogwood shrubland is found along rivers and streams in the central Great Plains above the stream channel where periodic flooding in late winter or spring inundates the sites favoring dominance by *Amorpha fruticosa* (false indigobush) and *Cornus drummondii* (roughleaf dogwood) with scattered patches of *Cornus sericea* (red-osier dogwood), *Salix exigua* (narrowleaf willow), and *Populus deltoides* (eastern cottonwood) saplings.....
.....A3588 Cornus drummondii - Amorpha fruticosa Wet Shrubland Alliance

A15a. Riparian areas, draws, and low wet areas with stands dominated with *Shepherdia argentea* (silver buffaloberry) or *Elaeagnus commutata* (silverberry). **A16**

A15b. Not like above in all respects.....**A17**

A16a. The vegetation of this mesic shrubland alliance is dominated by a moderate to dense canopy of medium-tall shrubs. The most abundant of these, *Shepherdia argentea* (silver buffaloberry), is typically 1.5-3 m tall. Other common shrub species are *Juniperus horizontalis* (creeping juniper), *Prunus virginiana* (chokecherry), *Ribes* (currant) spp., *Rhus aromatica* (fragrant sumac), *Rosa woodsii* (Woods' rose), and *Symphoricarpos occidentalis* (western snowberry). Graminoids and forbs may have only half the coverage of the shrub layer. It is found in the northern Great Plains of the United States and Canada. Stands occur on stream terraces, rolling uplands, and badlands, and where moisture is more plentiful than on the surrounding landscape, such as in swales, ravines, near streams, and on northwest- to east-facing slopes. ..... **A3590 Shepherdia argentea Wet Shrubland Alliance**

A16b. This silverberry shrubland occurs in the northwestern Great Plains on north-facing slopes and river valley slopes where open thickets dominated by *Elaeagnus commutata* (silverberry) occur within the mixedgrass prairie landscape. .....
.....A0918 Elaeagnus commutata Wet Shrubland Alliance

A17a. This shrubland is found in the Great Plains along streams and rivers where flooding is frequent and *Salix interior* (sandbar willow) is the dominant shrub, though other shrubs or saplings are common, including *Cornus sericea*, *Populus deltoides* (eastern cottonwood), *Salix amygdaloides* (peachleaf willow), *Salix eriocephala* (Missouri River willow), *Salix lutea* (yellow willow), and *Salix nigra* (black willow) (in the east). .....
..... **A3589 Salix interior Wet Shrubland Alliance**

A17b. This alliance, found in the northern Great Plains along streams and intermittent watercourses, has a sparse to dense short-shrub layer dominated by *Artemisia cana ssp. cana* (silver sagebrush) with *Artemisia tridentata* (big sagebrush), *Ericameria* (goldenbush) spp., and *Sarcobatus vermiculatus* (greasewood) possibly present to codominant and mixedgrass species in the herbaceous layer. .....
..... **A3586 Artemisia cana ssp. cana Wet Shrubland Alliance**

D033 North American Great Plains Saline Marsh

M1a. Graminoid-dominated saline shallow depressions and mudflats dominated by *Distichlis spicata* (saltgrass), *Hordeum jubatum* (foxtail barley), *Pascopyrum smithii* (western wheatgrass), or *Salicornia rubra* (red swampfire), as well as other flood- and saline-tolerant species. It occurs throughout the Great Plains from southern Canada to the panhandle of Texas and west into the plains of Montana, Wyoming and Colorado. **G2**
.....M077 Great Plains Saline Wet Meadow & Marsh

M1b. This is the only macrogroup in this division within this geography **G2**

M077 Great Plains Saline Wet Meadow & Marsh

G2a. Alkaline grasslands with and without a shrub layer with dominant grasses that include *Distichlis spicata* (saltgrass), *Muhlenbergia porteri* (bush muhly), *Panicum obtusum* (vine-mesquite), *Puccinellia nuttalliana* (Nuttall's alkaligrass), *Scleropogon brevifolius* (burrograss), and/or *Sporobolus airoides* (alkali sacaton), and found in the Great Plains and Rocky Mountain foothills. Stands have a high water table because of land position and impermeable subsurface horizons. Soils are moderately saline and usually alkaline. **A3**
.....G534 Western Great Plains Saline Wet Meadow Group

G2b. Wet saline meadows further east, not like above in all respects.....
..... **G324 Great Plains Saline Wet Meadow & Marsh***

G534 Western Great Plains Saline Wet Meadow

A3a. Stands with high herbaceous cover and widely spaced shrubs. Dominant herbaceous species include *Distichlis spicata* (saltgrass), *Grindelia squarrosa* (curlycup gumweed), *Hordeum*

jubatum (foxtail barley), *Pascopyrum smithii* (western wheatgrass), *Plantago* (plantain) spp., Puccinellia nuttalliana, Salicornia rubra, and/or *Symphyotrichum ericoides* (white heath aster). The very open and widely spaced shrub layer is dominated by *Artemisia frigida* (prairie sagewort), *Artemisia tridentata* (big sagebrush), and/or *Sarcobatus vermiculatus* (greasewood). Total vegetation cover can be low to moderate and abundant bare soil can be common. Soils are often alkaline. This alliance occurs in the northern and western Great Plains and Rocky Mountain foothills. ..... **..... A3905 Sarcobatus vermiculatus Great Plains Wet Shrubland Alliance**

A3b. *Sporobolus airoides* (alkali sacaton)-dominated or -codominated grasslands. The vegetation is characterized by a sparse to moderately dense graminoid layer of medium-tall bunchgrasses with smaller densities of short grasses and forbs. Widely scattered (<10% cover) xeromorphic or halophytic shrubs and dwarf-shrubs may also be present. This grassland alliance occurs in the western and southern Great Plains. Stands occur in a wide variety of lowland sites, such as stream terraces, swales, interdune basins, and alluvial flats... **..... A3904 Sporobolus airoides Great Plains Marsh Alliance**