Field Key to Ecological Systems and Target Alliances of the Map Zone 22 (Wyoming Basins), United States

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Introduction

The following keys to NatureServe ecological systems and selected US-NVC vegetation alliances cover the areas found in NLCD map zone 22 (Central Wyoming). The systems and alliances included in these keys are intended to represent the legend that LANDFIRE will be striving to map for existing vegetation (Figure 1). Some types are in the keys that characteristically occur at small spatial scales (generally <2 ha in size) and hence may not be mappable by the LANDFIRE project. However, we have chosen to be inclusive in the keys, so that the user will have information on these system types for comparison purposes. In some cases they may be important for modeling fire condition class and, given their relative distinctiveness on the landscape, they may indeed be mappable.

Plant names are almost always in Latin and follow the nomenclature of Kartesz (1999). In limited cases, we have included synonyms for some taxa.

The keys are “dichotomous”, which means the user follows the order of the ‘couplets’ and makes a choice between the 2 options represented in the couplet. The ordering of the couplets in each key does matter, and the user should choose the option in each couplet that best fits the data or field situation. A choice leads the user to the next couplet to be utilized in the keying process, via a number at the far right, or else leads to a final result (an ecological system type or an alliance).

If the choice the user makes leads to a “result”, then either an Ecological System is named or a Vegetation Alliance is named. Alliances are recognizable because “alliance” is in the name, and they all start with one or more Latin names (e.g. *Abies concolor* Forest Alliance).

Systems do not include Latin species names in them, and always start with a Biogeographic region (e.g. Inter-Mountain Basins Big Sagebrush Steppe). If an ecological system is followed by a number in parentheses, then the couplet so numbered is to alliances that are part of the system and which may be mappable.

All the keys follow the same logic. First the user determines if the vegetation (or land cover) is ‘sparse’; if not then you go to Key A and are lead into riparian or wetland woodlands or shrublands, then to upland deciduous forest/woodlands, then to upland coniferous forests/woodlands, then savannas, then shrublands and shrub-steppe. The second section of each key (Key B) is for the herbaceous systems and alliances, and keys through wetland/riparian situations first.

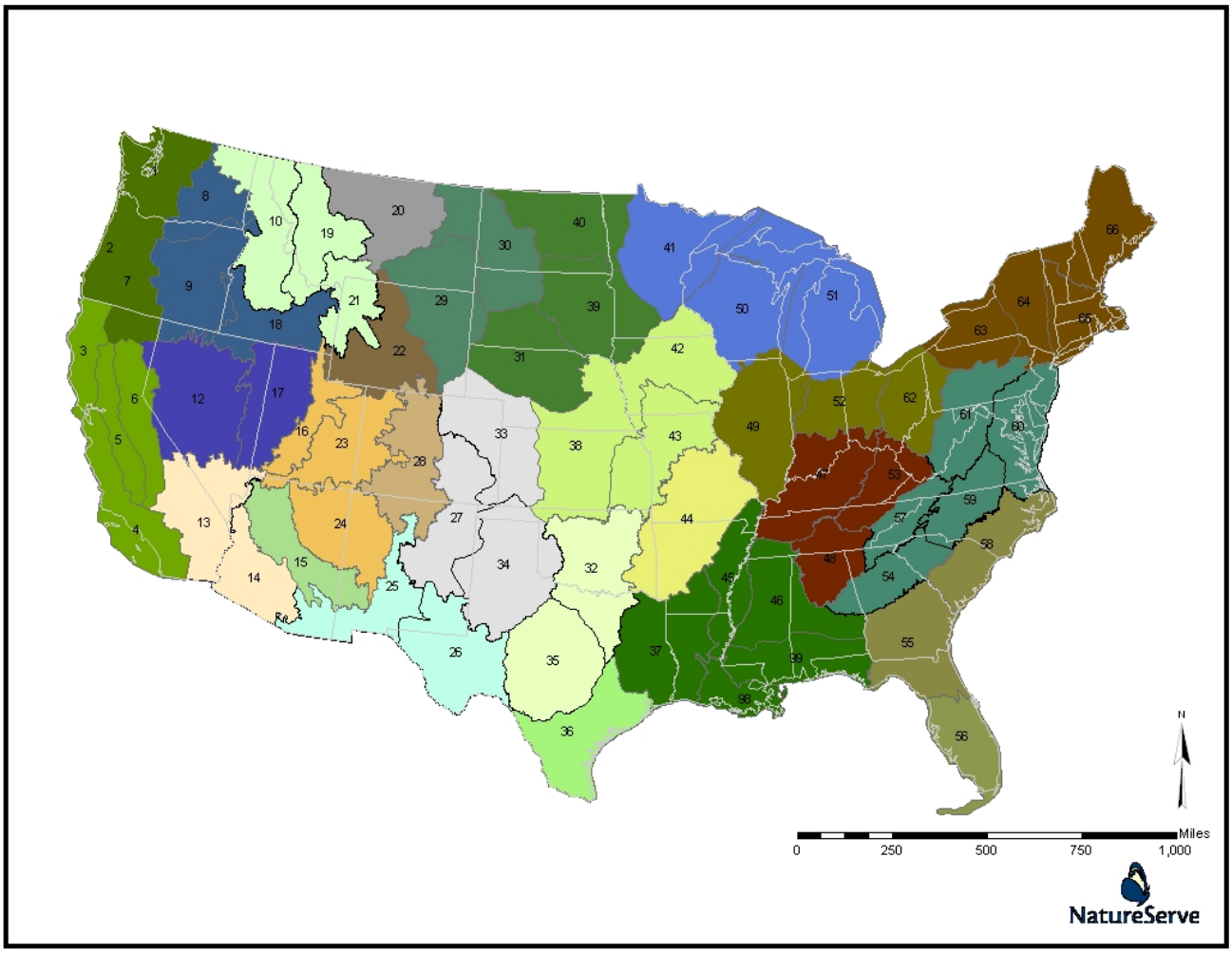

Figure 1. LANDFIRE map zone clusters with keys to ecological systems and selected alliances.

Keys are generally based on dominance within vegetation strata, with tree cover generally considered first, then that of shrubs, then the herbaceous component. Codominant species within a given strata are important as well, in some cases a system type or alliances will have 2 or more codominant species, which may or may not be present in all stands. Many ecological systems will have a variable physiognomy; where appropriate these variable systems have been placed into the keys in several places (i.e. some grassland systems have a "shrub-steppe" physiognomy and hence will be in the key both as shrub-steppe and herbaceous).

Some terminology is commonly employed throughout the keys that distinguish general spatial characteristics of the vegetation or environmental setting. For example 'matrix' types of vegetation are dominant across the majority of a given landscape, while 'large patch' types tend to occur as distinctive patches within the larger 'matrix.' Elevation-based life zones are commonly employed, with reference to 'alpine,' 'subalpine,' 'montane,' or 'foothill' zones. These zones vary in actual elevational thresholds across multiple map zones, and within individual map zones. More precise definition of these elevation breaks by map zone could be accomplished with additional research.

In the next section of the document we have provided a table showing the LANDFIRE legend units that represent non-natural vegetation and a short description for each of them. They are not formally incorporated into the keys, since they are typically recognizable without the use of a key, or else their floristic composition is so variable as to be not useful in a field key. Our primary purpose was to provide keys for the natural and near-natural vegetation of these zones.

Land Use, Unvegetated, Semi-natural and Altered Vegetation

LAND USE OR UNVEGETATED SURFACES	
Open Water	Open water
Developed	Generally developed lands.
Developed, Open Space	Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Impervious surfaces account for less than 20% of total cover. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.
Developed, Low Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-50% of total cover. These areas most commonly include single-family housing units.
Developed, Medium Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-80% of the total cover. These areas most commonly include single-family housing units
Developed, High Intensity	Includes highly developed areas where people reside in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to100% of the total cover.
Agriculture	Generally developed for agricultural uses.
Pasture/Hay	These agriculture lands typically have perennial herbaceous cover (e.g. regularly-shaped plantings) used for livestock grazing or the production of hay. There are obvious signs of management such as irrigation and haying that distinguish it from natural grasslands. Identified CRP lands are included in this land cover type.
Cultivated Crops and Irrigated Agriculture	These areas used for the production of crops, such as corn, soybeans, small grains, sunflowers, vegetables, and cotton, typically on an annual cycle. Agricultural plant cover is variable depending on season and type of farming. Other areas include more stable land cover of orchards and vineyards.
Perennial Ice/Snow	

SEMI-NATURAL / ALTERED VEGETATION	
Ruderal Vegetation	Vegetation resulting from succession following significant anthropogenic disturbance of an area. It is generally characterized by unnatural combinations of species (primarily native species, though they often contain slight or substantial numbers and amounts of species alien to the region as well)
Ruderal Upland - Old Field	
Ruderal Upland - Abandoned Tree Plantation	
Ruderal Wetland	
Introduced Vegetation	Vegetation dominated by introduced species. These are spontaneous, self-perpetuating, and not (immediately) the result of planting, cultivation, or human maintenance. Land occupied by introduced vegetation is generally permanently altered (converted) unless restoration efforts are undertaken.
Introduced Upland Vegetation - Treed	Land cover is significantly altered/disturbed by introduced tree species.
Introduced Upland Vegetation - Shrub	Land cover is significantly altered/disturbed by introduced woody and/or herbaceous vegetation.
Introduced Upland Vegetation - Annual and Biennial Forbland	Land cover is significantly altered/disturbed by introduced annual and biennial forbs. Natural vegetation types are no longer recognizable. Typical species that dominate these areas are *Acroptilon repens, Leucanthemum vulgare, Cirsium arvense, C. vulgare, Euphorbia esula, Lepidium latifolium, Carduus nutans, Centaurea* spp. (*diffusa, solstitialis*). *Salsola kali, Bassia scoparia, Halogeton glomeratus, Melilotus officinalis*, and *Cardaria* spp.
Introduced Upland Vegetation – Annual Grassland	Land cover is significantly altered/disturbed by introduced annual grasses. Natural vegetation types are no longer recognizable. Typical species include *Bromus japonicus, B. rigidus, B. rubens, B. tectorum, Taeniatherum caput-medusae*, and/or *Schismus barbatus*.
California Annual Grassland	Land cover dominated by introduced, non-native annual grasses within the central valley and coastal portions of California. Natural vegetation types are no longer recognizable. Grass and forb species include *Bromus* spp. (e.g., *madritensis, diandrus, hordeaceus*), *Eschscholzia californica, Aira caryophyllea, Lasthenia* spp., *Castilleja* spp., *Avena* spp., *Mesembryanthemum, Malephora*, and/or *Carpobrotus*, commonly referred to as 'iceplant.' The native shrubs *Ambrosia chamissonis, Eriogonum latifolium*, and/or *Abronia latifolia* may be present as emergents. *Poa douglasii* may also be present.
Introduced Upland Vegetation - Perennial Grassland and Forbland	Land cover is significantly altered/disturbed by introduced, non-native perennial grasses and forbs. Natural vegetation types are no longer recognizable. Grass species include *Agropyron cristatum, Poa bulbosa, Bromus inermis, Phleum pratense*, and *Poa pratensis*. Forbs may include: *Centaurea* spp., *Cirsium arvense, Euphorbia esula, Lepidium* spp., *Melilotus* spp.
Introduced Riparian Vegetation	Land cover is altered/disturbed and dominated by introduced woody vegetation (woodlands and shrublands). Typical riparian trees and shrubs include *Elaeagnus angustifolia, Tamarix* spp., *Triadica sebifera*, etc.
Introduced Wetland Vegetation	Land cover is altered/disturbed and dominated by introduced wetland vegetation. Species may include *Lythrum salicaria, Phalaris arundinacea, Phragmites australis*, etc.
Modified/Managed Vegetation	Vegetation resulting from management or modification of natural/near natural; vegetation, but producing a structural and floristic combination not clearly known to have a natural analogue. Modified vegetation may be easily restorable by either management, restoration of ecological processes, and/or succession.
Modified/Managed Upland Vegetation	Land cover is apparently managed/modified and dominated by trees and/or shrubs. Vegetation is a mixture of herbaceous, shrub, and tree species.
Recently Burned Forest and Woodland	Land cover is apparently modified by recent fires which have burned forest and woodland vegetation. Vegetation is a mixture of herbaceous, shrub, and tree species.
Recently Burned Shrubland	Land cover is apparently modified by recent fires which have shrubland vegetation. Vegetation is a mixture of herbaceous and shrub species.
Recently Burned Grassland	Land cover is apparently modified by recent fires which have burned grassland vegetation. Vegetation is a mixture of herbaceous and shrub species.
Managed Tree Plantation	Land cover is apparently modified and appears as a managed tree plantation.
Recently Logged Timberland	Land cover is apparently modified and appears as logged timberland.

Modified/Managed Wetland Vegetation	These areas include created and obviously managed wetlands of varying size resulting from water diversion. Artificial Wetlands will be mapped where obvious built structures may be distinguished from imagery.

Wyoming Basins Ecological Systems and Target Alliances

This key is intended for identifying Ecological Systems and selected alliances that are found in the Wyoming Basins, from southwestern Wyoming east and north into north-central Wyoming. Much of the eastern Plains of Wyoming are not included although some systems from that area extend into the central Wyoming basin area. Additional alliance couplets are to proposed mappable or target alliances and are not intended to be comprehensive.

Please note the following symbols:
***** indicates NS ecological system that has been grouped into broader LANDFIRE Map Unit. Included to help clarify key, but crews need to record broader LANDFIRE Map Unit(**)
****** indicates broader LANDFIRE Map Unit.
******* small patch ecological system, NOT being mapped by LANDFIRE, but is included for completeness of the key.
******** This alliance is not considered mappable, but is included as a counter-point to one that is mappable.

1a. Total woody canopy cover generally 10% or more..... **GO TO KEY A: Woodland, Savanna, Shrub-Steppe, or Shrubland Systems and Alliances**
1b. Total woody canopy cover generally less than 10% **2**

2a. Total canopy cover generally 10% or more..... **GO TO KEY B: Herbaceous Systems and Alliances**
2b. Total canopy cover generally less than 10% or annual herbaceous cover dominates vegetation..... **Sparse Vegetation (3)**

SPARSELY VEGETATED SYSTEMS (<10% vascular cover)

3a. Barren and typically sparsely vegetated alpine substrates. Land cover is mostly exposed rock (usually >90% cover of either bedrock, boulders or scree). Nonvascular cover (lichens) may be significant. ..... (**Rocky Mountain Alpine Bedrock and Scree*)**
..... **Rocky Mountain Alpine/Montane Sparsely Vegetated Systems****
3b. Barren and sparsely vegetated substrates NOT alpine, subalpine or below **4**

4a. Land cover is bottomland or drainages **5**
4b. Land cover is upland dune, mudstone or shale badlands, volcanic rock outcrop or cinder sites, or escarpments or canyons..... **6**

5a. Land cover is a restricted to drainages with a variety of sparse or patchy vegetation including *Sarcobatus vermiculatus, Ericameria nauseosa, Fallugia paradoxa, Artemisia cana* or *Grayia spinosa*. Herbaceous vegetation such as perennial grasses, *Distichlis spicata* or *Sporobolus airoides*, may also dominate wash. ..... (**Inter-Mountain Basins Wash***)**
5b. Land cover is restricted to barren and sparsely vegetated playas that are intermittently flooded and may remain dry several years at a time. Soil is typically saline with surface crust of evaporate. Species are typically halophytes such as *Allenrolfea occidentalis, Sarcobatus vermiculatus, Distichlis spicata,* and *Atriplex* spp..... (**Inter-Mountain Basins Playa)***
..... **Inter-Mountain Basins Sparsely Vegetated Systems ****

6a. Land cover is non-volcanic, consolidated rock (cliffs, outcrops)..... **7**
6b. Land cover is unconsolidated material..... **10**

7a. Land cover is largely of exposed bedrock cliffs and outcrops common on escarpments and canyons in the plains **8**
7b. Land cover is largely exposed bedrock and scree that does not occur on plains..... **9**

8a. Land cover is largely exposed bedrock cliffs and outcrops common on escarpments in the plains, excluding canyon sites. Substrates range from consolidated sandstone and limestone to gravelly breaks. Vegetation is typically restricted to shelves, cracks and crevices in the rock. Scattered *Pinus flexilis, P. ponderosa, Juniperus* spp. trees or shrubs such as *Artemisia longifolia, Artemisia tridentata, Cercocarpus* spp. and *Rhus trilobata* are often present. Some stands of Western Great Plains Badlands are similar, but they occur in much larger patches and more erodible soils than this small patch system ..... (**Western Great Plains Cliff and Outcrop*)**
..... **Western Great Plains Sparsely Vegetated Systems****

8b. Land cover occurs along springbranch or dry canyons in the plains. Limestone and sandstone rock outcrops and cliffs are common. These canyons typically sparse, but may contain elements of other systems that form a complex, small-patch or linear mosaic. Vegetation varies locally depending on aspect, slope position and substrate and can range from riparian vegetation to xeric or mesic woodlands. Dominant tree species include *Populus deltoides, Fraxinus pennsylvanica, Ulmus rubra, Pinus ponderosa*, and *Juniperus* spp.; shrub species may be present. If this occurs in this map zone, it will most likely be associated with the North Platte River and its tributaries... ..... (**Northwestern Great Plains Canyon*)**
..... **Western Great Plains Sparsely Vegetated Systems****

9a. Land cover is largely of exposed bedrock and restricted to montane-subalpine zone in isolated mountains in the Wyoming basins region ..... (**Rocky Mountain Cliff, Canyon and Massive Bedrock*)**
..... **Rocky Mountain Alpine/Montane Sparsely Vegetated Systems****

9b. Land cover is largely exposed bedrock and scree that is widespread across the intermountain western US from foothill to subalpine elevations (outside the Colorado Plateau Region). It occurs at below montane zone in the Wind River and Bighorn Mountains and extends into the foothills and escarpments in southwestern Wyoming. ..... (**Inter-Mountain Basins Cliff and Canyon*)**
..... **Inter-Mountain Basins Sparsely Vegetated Systems****

10a. Land cover is active or partially vegetated dunes or sand sheets that occur in central Wyoming. Common herbaceous species include *Achnatherum hymenoides, Hesperostipa comata, Leymus simplex, Lygodesmia juncea, Muhlenbergia arenicola, Muhlenbergia pungens, Psoralidium lanceolatum*, and *Sporobolus cryptandrus*. Shrubs such as *Artemisia cana, A. tridentata, Ericameria nauseosa, Grayia spinosa*, and *Purshia tridentata* may also be present ..... (**Inter-Mountain Basins Active and Stabilized Dune*)**
..... **Inter-Mountain Basins Sparsely Vegetated Systems****

10b. Land cover is NOT dunes or sand sheets **11**

11a. Small patch ecological system is eroded hills and flats typically derived from marine shales, but also includes substrates derived from siltstones and mudstones (clay). Harsh (saline/alkaline) soil properties and/or high rates of erosion and deposition limit plant growth to scattered dwarf-shrubs e.g., *Atriplex corrugata, Atriplex gardneri, Artemisia pedatifida*, and herbaceous vegetation. ..... **(Inter-Mountain Basins Shale Badland*)**
..... **Inter-Mountain Basins Sparsely Vegetated Systems ****

11b. Large patch ecological system is found within the Great Plains. This system is typified by extremely dry and easily eroded, consolidated clay soils with bands of sandstone or isolated consolidates and little to no cover of vegetation (usually less than 10%). In those areas with vegetation, species can include scattered individuals of *Grindelia squarrosa, Gutierrezia sarothrae*, or *Eriogonum* spp. Patches of *Artemisia* spp. can also occur. This system occurs where the land lies well above its local base level and is created by several factors including elevation, rainfall and carving action of streams)..... (**Western Great Plains Badlands*)**
..... **Western Great Plains Sparsely Vegetated Systems****

KEY A: Map Zone 22 (Wyoming Basins): Woodland, Savanna, Shrub-Steppe or Shrubland Ecological Systems and Mappable Alliances
(Woody cover >10% cover present)

1a. Land cover is restricted to riparian or floodplain zones of drainages, semi-riparian flats, springs or seeps and areas with high water tables.....**2**
1b. Land cover is upland vegetation without seeps or areas with high water tables **11**

RIPARIAN WOODLAND AND SHRUBLAND SYSTEMS

2a. Higher elevation woodlands and shrublands generally >2600 m (subalpine-montane) **3**
2b. Middle and lower elevation (generally <2600 m) woodlands and shrublands (lower montane to valley floor) **4**

3a. Woodlands restricted to drainages, stream terraces, semi-riparian flats and spring or seep fed slopes. Common tree species vary across the latitudinal range, although it usually includes *Abies lasiocarpa* and/or *Picea engelmannii*; other important species include *Pseudotsuga menziesii, Picea pungens, Picea engelmannii X glauca, Populus tremuloides*, and *Juniperus scopulorum* ..... (**Rocky Mountain Subalpine - Montane Riparian Woodland*)**
..... **Rocky Mountain Subalpine/Upper Montane Riparian Systems****
3b. Shrublands restricted to drainages, stream terraces, semi-riparian flats and spring or seep fed slopes. Dominant shrubs reflect the large elevational gradient and include *Alnus incana, Betula nana, Betula occidentalis, Cornus sericea, Salix bebbiana, Salix boothii, Salix brachycarpa, Salix drummondiana, Salix eriocephala, Salix geyeriana, Salix monticola, Salix planifolia*, and *Salix wolfii*. Generally the upland vegetation surrounding these riparian systems are of either conifer or aspen forests..... (**Rocky Mountain Subalpine - Montane Riparian Shrubland*)**
..... **Rocky Mountain Subalpine/Upper Montane Riparian Systems****

4a. Lower montane, foothill and plains woodlands and shrublands restricted to drainages, floodplains and semi-riparian draws and ravines.....**5**
4b. Valley bottom shrublands restricted to temporarily flooded drainages and flats **10**

5a. Woodlands and shrublands restricted to drainages and semi-riparian flats that are dominated by the introduced species *Elaeagnus angustifolia* or *Tamarix* spp. **6**
5a. Woodlands and shrublands restricted to drainages and semi-riparian flats that are NOT dominated by the introduced species *Elaeagnus angustifolia* or *Tamarix* spp.. .....**7**

6a. Woodlands restricted to drainages and semi-riparian flats that are dominated by introduced *Elaeagnus angustifolia*.....(*Elaeagnus angustifolia* **Semi-Natural Woodland Alliance*)**
..... **Invasive Riparian Woodland and Shrubland****
6b. Woodlands and shrublands restricted to drainages and semi-riparian flats that are dominated by introduced *Tamarix* spp..... (*Tamarix* **spp. Semi-Natural Temporarily Flooded Shrubland Alliance*)**
..... **Invasive Riparian Woodland and Shrubland****

7a. Lower montane and foothill woodlands and shrublands associated with mountain ranges of north-central and southern Wyoming and extending into the basins along the Green River and its tributaries. Stands occur within a broad elevation range from about 1220 m (4000 feet) to over 2135 m (7000 feet). Woodlands are often dominated by *Populus angustifolia*, but include *Populus deltoides ssp. wislizeni* along the Green River. .....(**Rocky Mountain Lower Montane Riparian Woodland and Shrubland*)**
..... **Rocky Mountain Montane Riparian Systems****
7b. Mesic woodlands and shrublands that occur in riparian woodlands and shrublands of the western Great Plains that extend into central Wyoming along rivers such as the Northern Platte. **8**

8a. Stands are typically smaller riparian woodlands and shrublands that occur in draws and ravines in Great Plains and may extend into central Wyoming. Often associated with permanent or ephemeral streams and small rivers and may occur on steep northern slopes or within canyon bottoms that do not experience periodic flooding, although soil moisture and topography allow greater than normal moisture conditions

compared to the surrounding areas. *Juniperus* spp. (especially *J. scopulorum*), *Fraxinus* spp. *Ulmus rubra* or *Ulmus americana* are typically dominant. ..... (**Western Great Plains Wooded Draw and Ravine*)** ..... **Western Great Plains Riparian Systems****

8b. Riparian woodlands and shrublands stands that are NOT restricted to mesic draws and ravines, but occur on small to large rivers in the western Great Plains. **9**

9a. Woodlands and shrublands found in the riparian areas of medium and small rivers and streams throughout the Western Great Plains extending into central Wyoming. Stands occur in highly variable landscape settings, from deep cut ravines to wide, braided streambeds. Hydrologically, these sites tend to be more flashy with less developed floodplain than on larger rivers, and may dry down for some portion of the year. Communities within this system range from riparian forests and shrublands to gravel/sand flats. Dominant species include *Populus deltoides ssp. monilifera, Salix* spp., *Artemisia cana ssp. cana, Pascopyrum smithii, Sporobolus cryptandrus*, and *Schizachyrium scoparium*. These areas are often subjected to heavy grazing and/or agriculture and can be degraded by introduced species such as *Elaeagnus angustifolia* and *Tamarix* spp., but not dominated by them. ..... **(Western Great Plains Riparian Woodland and Shrubland*)** ..... **Western Great Plains Riparian Systems****

9b. Woodlands and shrublands found in the riparian areas of medium and large rivers of the Western Great Plains. Alluvial soils and periodic, intermediate flooding (every 5-25 years) typify this system. Dominant communities within this system range from floodplain forests to wet meadows to gravel/sand flats; however, they are linked by underlying soils and the flooding regime. Dominant species include *Populus deltoides ssp. monilifera* and *Salix* spp. Grass cover underneath the trees is important and is a mix of tallgrass species, including *Panicum virgatum* and *Andropogon gerardii*. The floodplain can be degraded by introduced species such as *Elaeagnus angustifolia* and *Tamarix* spp., and less desirable grasses and forbs, but is not dominated by them ..... **(Western Great Plains Floodplain*)** ..... **Western Great Plains Riparian Systems****

10a. Open to moderately dense shrublands dominated or codominated by *Sarcobatus vermiculatus*. Stands are widespread in the Intermountain Basins region. *Atriplex canescens, Atriplex confertifolia*, or *Krascheninnikovia lanata* may be present to codominant with patches of *Distichlis spicata* grasslands. Commonly occurs on saline/alkaline plains and basins, sometimes encircling playas or on stream terraces..... ..... **Inter-Mountain Basins Greasewood Flat**

10b. Open to moderately dense shrublands dominated by one or more species of *Atriplex* and/or *Krascheninnikovia lanata*. *Sarcobatus vermiculatus* is absent or has low cover. Other shrubs present to codominant include *Artemisia tridentata ssp. wyomingensis*. This systems is typical of saline basins, alluvial slopes and plains across the Intermountain western U.S. and extends into the Great Plains..... ..... **Inter-Mountain Basins Mixed Salt Desert Scrub**

FORESTS AND WOODLANDS

11a. Upland forests and woodlands (trees generally with >25% cover) **12**

11b. Upland savannas (10-25% cover of trees, generally >3 m tall with a single main stem and often >20% cover perennial graminoids), shrublands and shrub-steppe (10-25% cover of shrubs and >20% cover of perennial graminoids)..... **27**

Broadleaf Deciduous Forest and Woodland

12a. Broadleaf forests and woodlands or mixed conifer-aspen forests and woodlands (deciduous trees make up 25-100% of the tree canopy). **13**

12b. Conifer forests and woodlands (deciduous trees may make up less than 25% cover of the tree canopy)..... **14**

13a. Broadleaf forest or woodland typically dominated by *Populus tremuloides* (and possible inclusions of other broadleaf tree species) with less than 25% total tree canopy cover of conifers..... ..... **Rocky Mountain Aspen Forest and Woodland**

13b. Mixed conifer-broadleaf forests and woodlands codominated by *Populus tremuloides* and conifer trees with 25-75% relative tree canopy of each canopy type. These mixed stands will commonly occur in relatively small areas ..... **Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland**

Conifer Forest and Woodland

14a. Subalpine conifer forests and woodlands (spruce-fir zone).....**15**
14b. Montane and foothills conifer forests and woodlands (Douglas-fir – ponderosa pine – foothill zones).....**18**

Subalpine Conifer Forest and Woodland

15a. Conifer forests and woodlands strongly dominated by *Pinus contorta* sometimes with *Populus tremuloides* codominating. *Abies lasiocarpa* and/or *Picea engelmannii* may be present, especially in the subcanopy.....**16**
15b. Conifer forests and woodlands typically dominated or codominated by *Abies lasiocarpa* and/or *Picea engelmannii* sometimes with *Pinus contorta* or *Populus tremuloides* codominating.....**17**

16a. Conifer forests and woodlands strongly dominated by *Pinus contorta* (>2/3 total tree canopy) or with *Populus tremuloides* codominating. These are subalpine forests, occasionally found in the montane zone, where the dominance of *Pinus contorta* is related to topo-edaphic conditions and nutrient-poor soils. These include excessively well-drained pumice deposits, glacial till and alluvium on valley floors where there is cold-air accumulation, warm and droughty shallow soils over fractured quartzite bedrock, and shallow moisture-deficient soils with a significant component of volcanic ash. ....**Rocky Mountain Poor Site Lodgepole Pine Forest**
16b. Conifer forests and woodlands strongly dominated by *Pinus contorta* (>2/3 total tree canopy) or with *Populus tremuloides* codominating. These are subalpine forests where the dominance of Pinus contorta is related to fire history and topo-edaphic conditions. Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system occur as early- to mid-successional forests which developed following fires. This system includes *Pinus contorta*-dominated stands that, while typically persistent for >100-year time frames, may succeed to spruce-fir forests and woodlands in the central Rocky Mountains. .....**Rocky Mountain Lodgepole Pine Forest**

17a. Widespread matrix subalpine conifer forests and woodlands of drier environments that are dominated or codominated by *Abies lasiocarpa* and/or *Picea engelmannii*. Stands may extend into montane zone locally in cold air drainage areas .....**Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland**
17b. Large and small patch subalpine conifer forests and woodlands of mesic environments (north aspect or toeslopes) that are dominated or codominated by *Abies lasiocarpa* and/or *Picea engelmannii* with mesic understory shrubs such as *Amelanchier alnifolia, Rubus parviflorus, Vaccinium membranaceum, Rhododendron albiflorum, Ledum glandulosum, Phyllodoce empetriformis,* and *Salix* spp. Herbaceous species include *Actaea rubra, Clintonia uniflora, Maianthemum stellatum, Cornus canadensis, Erigeron eximius, Gymnocarpium dryopteris, Rubus pedatus, Saxifraga bronchialis, Tiarella* spp., *Lupinus arcticus ssp. subalpinus, Valeriana sitchensis,* and graminoids *Luzula glabrata var. hitchcockii* or *Calamagrostis canadensis*. Stands may extend into montane zone locally in cold air drainage areas. ....**Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland**

Montane and Foothill Conifer Forest and Woodland

18a. Montane conifer forests and woodlands.....**19**
18b. Foothill conifer forests and woodlands.....**25**

Montane Conifer Forest and Woodland

19a. Conifer forests and woodlands strongly dominated by *Pinus contorta* and sometimes codominated by *Populus tremuloides*.....**20**
19b. Conifer forests and woodlands NOT strongly dominated *Pinus contorta*, but it may be present with low cover.....**21**

20a. Conifer forests and woodlands strongly dominated by *Pinus contorta* (>2/3 total tree canopy) or with *Populus tremuloides* codominating. These subalpine forests are occasionally found in the montane zone, where the dominance of *Pinus contorta* is related to topo-edaphic conditions and nutrient-poor soils. These

include excessively well-drained pumice deposits, glacial till and alluvium on valley floors where there is cold-air accumulation, warm and droughty shallow soils over fractured quartzite bedrock, and shallow moisture-deficient soils with a significant component of volcanic ash. ..... **Rocky Mountain Poor Site Lodgepole Pine Forest**

20b. Conifer forests and woodlands strongly dominated by *Pinus contorta* (>2/3 total tree canopy) or with *Populus tremuloides* codominating. These are upper montane to subalpine forests where the dominance of Pinus contorta is related to fire history and topo-edaphic conditions. Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system occur as early- to mid-successional forests which developed following fires. This system includes *Pinus contorta*-dominated stands that, while typically persistent for >100-year time frames, may succeed to Douglas-fir forests and woodlands in the central Rocky Mountains. ..... **Rocky Mountain Lodgepole Pine Forest**

21a. Matrix *Pinus ponderosa*-dominated woodlands sometimes with inclusions of *Pseudotsuga menziesii* woodlands on cool aspects. *Pinus flexilis, Juniperus* spp., or *Populus tremuloides* may be also be present. Stands are restricted to foothills, mountains, hills and breaks in the plains in the southeastern portion of MZ22 in central Wyoming ..... **Southern Rocky Mountain Ponderosa Pine Woodland**

21b. Conifer forests and woodlands dominated by *Pseudotsuga menziesii*, and sometime codominated by *Pinus ponderosa, Pinus flexilis, P. contorta, Juniperus scopulorum* or and/or *Populus tremuloides* **22**

22a. Montane conifer forests and woodlands of the southern Rocky Mountains and common in Laramie Range and Medicine Bow Mountains. Stands are dominated or codominated by *Pseudotsuga menziesii*, and sometimes codominated by *Pinus ponderosa, Pinus flexilis*, or *P. contorta* and/or *Populus tremuloides* **23**

22b. Montane conifer forests and woodlands often occurs at the lower treeline immediately above valley grasslands, or sagebrush steppe and shrublands in the central Rocky Mountains such as the Wind River Range and Big Horn Mountains where the southern monsoon influence is less and maritime climate regime is not important. *Pseudotsuga menziesii* typically dominates, occasionally with *Pinus flexilis* on calcareous substrates, and *Pinus contorta* present at higher elevations. True firs, such as, *Abies lasiocarpa*, are absent. Understory components include shrubs such as *Physocarpus malvaceus, Juniperus communis, Symphoricarpos oreophilus*, and *Mahonia repens*, and graminoids such as *Calamagrostis rubescens, Carex rossii*, and *Leucopoa kingii*..... **Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (24)**

23a. Matrix montane conifer forests and woodlands of drier environments that are dominated or codominated by *Pseudotsuga menziesii*, and sometimes codominated by *Pinus ponderosa* or *P. contorta* and/or *Populus tremuloides* ..... **Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (24)**

23b. Large and small patch montane conifer forests and woodlands of relative mesic environments (north aspect toeslopes). Dominated or codominated by *Pseudotsuga menziesii* or *Picea pungens* with *Abies lasiocarpa* occasionally present in upper montane stands. ..... **Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (24)**

24a. Conifer forests and woodlands dominated or codominated by *Pseudotsuga menziesii*. Other trees species such as *Pinus ponderosa* and/or *Populus tremuloides* may be present..... *Pseudotsuga menziesii* **Forest Alliance**

24b. Conifer forests and woodlands NOT dominated or codominated by *Pseudotsuga menziesii* ..... **Unidentified Forest Alliance******

<u>Foothill Conifer Forest and Woodland</u>

25a. Foothill or prairie-breaks conifer woodlands dominated by *Pinus flexilis* and/or *Juniperus scopulorum* or *Juniperus osteosperma*. Common foothills woodland from north-central to eastern Wyoming, and across southern Wyoming, extending into extreme northern portions of Colorado and northeastern Utah (*Pinus flexilis* is often present, not always. *Pinus ponderosa* is absent or only occasional (<5% cover). *Pinus edulis* is never present.)..... **Rocky Mountain Foothill Limber Pine-Juniper Woodland**

25b. Foothill conifer woodlands NOT dominated or codominated by *Pinus flexilis* **26**

26a. Foothill conifer woodlands dominated or codominated by *Pinus edulis, P. flexilis* and/or *Juniperus* spp. with *Pinus ponderosa* codominant (>5% cover) ..... **Southern Rocky Mountain Ponderosa Pine Woodland**

26b. Foothill conifer woodlands dominated or codominated by *Pinus edulis* and/or *Juniperus* spp. If present, *Pinus ponderosa* is restricted to mesic microsites. Either *Juniperus osteosperma* or *J. scopulorum* (often at higher elevations) may dominate or codominate. *Pinus ponderosa* is absent or only occasional (<5% cover). Stands generally have low perennial grass cover. These woodlands are widespread in the Colorado Plateau extending north into southwestern Wyoming. ..... **Colorado Plateau Pinyon-Juniper Woodland***

Savannas (open tree canopy)

27a. Savannas with 10-25% cover of trees (generally >3 m tall with a single main stem) over perennial grassland (25% or more herbaceous cover) **28**
27b. Shrub-steppe, shrublands and dwarf-shrublands (trees with less than 10% cover) **29**

28a. Open tree layer dominated by *Pinus ponderosa*, but may have *Pinus flexilis* or *Juniperus* spp. present to codominant and extends from foothills out into the plains, often near breaks. Typically stands have a strong perennial grass layer (>20% cover). ..... **Southern Rocky Mountain Ponderosa Pine Savanna**
28b. Open tree layer NOT dominated or codominated by *Pinus ponderosa*. Open tree layer is typically dominated by *Juniperus osteosperma* or *Juniperus scopulorum* with a strong perennial grass layer (>20% cover). ..... **Inter-Mountain Basins Juniper Savanna**

29a. Dwarf- or low shrubland or dwarf shrub-steppe **30**
29b. Shrubland or shrub-steppe **31**

DWARF SHRUB-STEPPE OR SHRUBLAND

30a. Low shrubland dominated by *Atriplex confertifolia* and/or *Krascheninnikovia lanata* dominate the shrub layer. *Artemisia pedatifida, Atriplex corrugata* or *Atriplex gardneri* are absent or have low cover (<5%). Typically found in basins ..... **Inter-Mountain Basins Mixed Salt Desert Scrub**
30b. Low shrubland NOT dominated by *Atriplex confertifolia* **31**

31a. Low shrubland dominated by *Artemisia pedatifida, Atriplex corrugata* or *Atriplex gardneri*. Stands occur on dry sites such as shale hills and shaley or windswept plains. Stands may form a mosaic with big sagebrush stands where big sagebrush is restricted to deeper soils, sandy deposits, and/or washes with well-drained substrates ..... **Inter-Mountain Basins Mat Saltbush Shrubland**
31b. Low shrubland or shrub-steppe dominated or codominated by *Artemisia nova* or *Artemisia tripartita ssp. rupicola*. Common in dry habitats throughout the basins of central and southern Wyoming, and may extend into northern Colorado and northeastern Utah. Stands typically occur on windswept ridges and south and west facing slopes above 2135 m ..... **Wyoming Basins Low Sagebrush Shrubland**

SHRUB-STEPPE AND SHRUBLAND

32a. *Cercocarpus ledifolius* dominates the shrub (or tree) layer. ..... **Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland**
32b. Shrubland NOT dominated by *Cercocarpus ledifolius* **33**

33a. Shrub layer is dominated or codominated by species of *Artemisia* (and sometimes *Purshia tridentata*), but NOT *Quercus gambelii* (<5% cover). **34**
33b. Other taxa dominate or codominate the shrub layer including *Artemisia* spp. and *Quercus gambelii* **39**

Sagebrush Shrublands or Steppe

34a. Montane or subalpine (>2000 m elevations) shrubland or shrub-steppe dominated or codominated by *Artemisia tridentata ssp. vaseyana, A. tridentata ssp. spiciformis*, non-riparian *A. cana ssp. viscidula, A. arbuscula ssp. arbuscula* and/or *Purshia tridentata*. *Symphoricarpos* spp. may codominate some stands. ..... **Inter-Mountain Basins Montane Sagebrush Steppe (35)**

34b. Foothill shrublands.....**36**

35a. *Artemisia tridentata ssp. vaseyana* typically dominates shrub layer of 10% or more cover with typically less than 20% total perennial herbaceous cover. .....*Artemisia tridentata ssp. vaseyana* **Shrubland Alliance**
35b. *Artemisia arbuscula ssp. arbuscula*-dominated shrubland..... ..... *Artemisia arbuscula* ***ssp.*** *arbuscula* **Dwarf-Shrubland Alliance******

36a. Shrubland or shrub-steppe dominated or codominated by *Artemisia tridentata ssp. tridentata* and/or *Artemisia tridentata ssp. wyomingensis*. *Symphoricarpos* spp. or *Purshia tridentata* may codominate some stands.....**37**
36b. Low shrubland or shrub-steppe dominated or codominated by *Artemisia nova* or *Artemisia tripartita ssp. rupicola*. Common in dry habitats throughout the basins of central and southern Wyoming, and may extend into northern Colorado typically occur on windswept ridges and south and west aspect slopes above 2135 m.....**Wyoming Basins Low Sagebrush Shrubland**

37a. *Artemisia tridentata ssp. tridentata* and/or *Artemisia tridentata ssp. wyomingensis* dominate relative cover of shrub layer with 10% or more absolute cover and with less than 25% total perennial herbaceous cover; typically in broad basins between mountain ranges, plains and foothills between 1500 and 2300 m elevation. Soils are typically deep, well-drained and non-saline..... ..... **Inter-Mountain Basins Big Sagebrush Shrubland**
37b. *Artemisia tridentata ssp. tridentata, Artemisia tridentata ssp. xericensis, Artemisia tridentata ssp. wyomingensis, Artemisia tripartita ssp. tripartita*, and/or *Purshia tridentata* dominate open to moderately dense (10-40% cover) shrub layer and with at least 25% total perennial herbaceous cover. The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs, so the general aspect of the vegetation is a grassland..... **Inter-Mountain Basins Big Sagebrush Steppe (38)**

38a. *Purshia tridentata* dominates shrub layer of 10% or more absolute cover and with typically greater than 20% total perennial herbaceous cover. *Artemisia tridentata* may be present, but not codominant. ....*Purshia tridentata* **Shrub Herbaceous Alliance**
38b. *Purshia tridentata* dominates shrub layer of 10% or more absolute cover and with typically less than 20% total perennial herbaceous cover. *Artemisia tridentata* may be present, but not codominant. .... *Purshia tridentata* **Shrubland Alliance******

Non-Sagebrush Shrublands and Steppe

39a. Shrubland or shrub-steppe of montane elevations usually dominated or codominated by *Quercus gambelii*. *Quercus gambelii* may be locally absent but then stand is mesic and dominated by *Amelanchier* spp. Other shrubs include *Acer grandidentatum, Cercocarpus montanus,* or *Symphoricarpos* spp., which may codominate some stands. *Artemisia tridentata* may be present to codominant (with *Quercus gambelii*) ..... **Rocky Mountain Gambel Oak - Mixed Montane Shrubland (40)**
39b. Shrubland or shrub-steppe of lower montane and foothill elevations (drier) NOT codominated by *Quercus gambelii*. Stands restricted to southwestern portion of the Map Zone 22.....**41**

40a. *Quercus gambelii* dominates or codominate the shrub layer..... *Quercus gambelii* **Shrubland Alliance**
40b. *Arctostaphylos patula* dominates or codominates the shrub layer with Quercus gambelii absent or with low cover
(<5%)..... *Arctostaphylos patula* **Shrubland Alliance**

41a. Shrubland or shrub-steppe of lower montane and foothill **42**
41b. Shrubland or shrub-steppe of basins or plains.....**43**

42a. Common shrubland or shrub-steppe of lower montane and foothill elevations (drier) with *Quercus gambelii* absent or with low cover (<5%) and NOT codominant. Shrub layer is dominated or codominated by *Amelanchier utahensis*, *Cercocarpus montanus, Purshia tridentata, Rhus trilobata, Ribes cereum, Symphoricarpos oreophilus*, and/or *Yucca glauca*. *Artemisia tridentata* may be present, but not codominant. ..... **Rocky Mountain Lower Montane-Foothill Shrubland**

42b. This shrubland ecological system is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the northern Rockies, but may extend into northern extent of this map zone. These shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands and rarely up into the dry sites of the subalpine zone. The shrublands are usually found on steep slopes of canyons and in areas with some soil development. These communities develop near talus slopes as garlands, at the heads of dry drainages, and toeslopes in the moist shrub-steppe and steppe zones. *Physocarpus malvaceus, Prunus emarginata, Prunus virginiana, Rosa* spp., *Rhus glabra, Acer glabrum, Spiraea betulifolia, Amelanchier alnifolia, Symphoricarpos albus,* and *Holodiscus discolor* are the most common dominant shrubs, any one or in any combination. In moist areas *Crataegus douglasii* can be common. *Festuca idahoensis, Festuca campestris, Calamagrostis rubescens, Carex geyeri, Koeleria macrantha, Pseudoroegneria spicata,* and *Poa secunda* are the most important grasses. *Achnatherum thurberianum* and *Leymus cinereus* can be locally important. *Poa pratensis* and *Phleum pratense* are common introduced grasses. *Geum triflorum, Potentilla gracilis, Lomatium triternatum, Balsamorhiza sagittata*, and species of *Eriogonum*, *Phlox*, and *Erigeron* are important forbs. ....**Northern Rocky Mountain Montane-Foothill Deciduous Shrubland**

43a. This shrubland ecological system ranges from southern Canada to South Dakota and may extend into this map zone. These shrublands occur in relatively mesic areas such as along upper terraces of rivers and streams, gently inclined slopes near breaklands, and upland sandy loam areas throughout its range. Stands are dominated by shrub species such as *Amelanchier alnifolia, Rhus trilobata, Symphoricarpos* spp., *Shepherdia argentea, Crataegus douglasii, Dasiphora fruticosa ssp. floribunda,* and dwarf-shrubs such as *Juniperus horizontalis*. .....**Northwestern Great Plains Shrubland**
43b. These dry shrublands are common in saline basins of disturbed sites and may extend out into the plains.....**44**

44a. *Atriplex* spp. and/or *Krascheninnikovia lanata* dominate the shrub layer. Typically found in basins .... **Inter-Mountain Basins Mixed Salt Desert Scrub**
44b. *Ericameria nauseosa* and/or *Gutierrezia sarothrae* dominate an open shrub layer with or without perennial grass understory.....**Inter-Mountain Basins Semi-Desert Shrub-Steppe**

KEY B Map Zone 22 (Wyoming Basins): Herbaceous Ecological Systems and Alliances

(Herbaceous layer dominant >10% cover with low woody cover <10%)

1a. Land cover is restricted to drainages, semi-riparian flats, springs or seeps.....**2**
1b. Land cover is upland vegetation.....**9**

2a. High elevation herbaceous wetlands (subalpine-montane) **3**
2b. Middle and lower elevation herbaceous wetlands (lower montane to valley floor).....**4**

Wetland Herbaceous

3a. Alpine to montane wet meadows without a 40 cm deep organic layer. .....
.....**Rocky Mountain Alpine - Montane Wet Meadow*****
3b. Subalpine to montane wetlands with a 40 cm deep organic layer. This wetland is typically groundwater fed.....
..... **Rocky Mountain Subalpine - Montane Fen*****

4a. Middle and low elevation wetland system that is widespread in the arid and semi-arid regions of western North America. Stands are marshes typically dominated by species of *Schoenoplectus, Typha*, or *Juncus* and other species adapted to saturated soil conditions. These wetlands may include areas of deeper water with emergent and floating vegetation. ..... **North American Arid West Emergent Marsh*****
4b. Not as above.....**5**

5a. Land cover is a restricted to drainages with a variety of sparse or patchy vegetation including *Sarcobatus vermiculatus, Ericameria nauseosa, Fallugia paradoxa, Artemisia cana ssp. cana* or *Grayia spinosa*. Herbaceous vegetation such as perennial grasses, *Distichlis spicata* or *Sporobolus airoides*, may also dominate wash. .....(**Inter-Mountain Basins Wash***)**
5b. Land cover is confined to sparsely to densely vegetated depression or basin. **6**

6a. Site more typical of western Great Plains (depressional wetland is generally surrounded by grasslands).....**7**
6b. Site more typical of intermountain west (depressional wetland is generally surrounded by shrublands) **8**

7a. Site occurs in upland depressional rainwater basin that is characterized by the presence of an impermeable soil layer and is usually recharged by rainwater and nearby runoff. They are rarely linked to outside groundwater sources and do not have an extensive watershed. Ponds and lakes associated with this system experience periodic drawdowns during drier seasons and years, and are often replenished by spring rains. *Eleocharis* spp., *Hordeum jubatum*, along with common forbs such as *Coreopsis tinctoria, Symphyotrichum subulatum*, and *Polygonum pensylvanicum* are common vegetation in the wetter and deeper depression, while *Pascopyrum smithii* and *Buchloe dactyloides* are more common in shallow depressions in rangeland.....(**Western Great Plains Closed Depression Wetland***)**
..... **Western Great Plains Depressional Wetland Systems****
7b. Site occurs in lowland depressions and also occurs along lake borders that have more open basins and a permanent water source through years. Site has a large watershed and/or significant connection to the groundwater table. The system includes submergent and emergent marshes, and associated wet meadows and wet prairies. These types can also drift into stream margins that are more permanently wet. This system may not occur in this map zone. .....(**Western Great Plains Open Depression Wetland***)**
..... **Western Great Plains Depressional Wetland Systems****

8a. Site are seasonally to semipermanently flooded, usually retaining water into the growing season and drying completely only in drought years. Many are associated with springs, located in basins with internal drainage. Soils are alkaline to saline clays with hardpans. Seasonal drying exposes mudflats colonized by annual wetland vegetation. Salt encrustations can occur on the surface in some examples of this system, and the soils are severely affected and have poor structure. Species that typify this system are salt-tolerant and halophytic species such as *Distichlis spicata, Puccinellia lemmonii, Poa secunda, Muhlenbergia* spp., *Leymus triticoides (= Elymus triticoides), Schoenoplectus maritimus, Schoenoplectus americanus, Triglochin maritima,* and *Salicornia* spp. Types often occur along the margins of perennial lakes, in alkaline closed basins, with extremely low-gradient shorelines. ..... **Inter-Mountain Basins Alkaline Closed Depression*****

8b. This herbaceous wetland occurs within dune fields as small (usually less than 0.1 ha), interdunal swales. These depressions occur in wind deflation areas, where sands are scoured down to the water table. Small ponds may be associated. Water table may be perched over an impermeable layer of caliche or clay layer or a closed basin that traps water. These wetlands are typically dominated by common emergent herbaceous vegetation such as species of *Eleocharis, Juncus*, and *Schoenoplectus*. Dune field ecological processes distinguish these emergent wetlands from similar non-dune wetlands. ..... **Inter-Mountain Basins Interdunal Swale Wetland*****

Upland Herbaceous

9a. Herbaceous cover dominated by annual graminoids or annual and biennial forbs **10**
9b. Herbaceous cover dominated by perennial species **11**

10a. Herbaceous cover dominated by annual species of brome grass (typically *Bromus tectorum*, but including *Bromus japonicus, Bromus rubens, Bromus hordeaceus, Bromus rigidus*) ..... **Invasive Annual Grassland**
10b. Herbaceous cover dominated by introduced annual and biennial forbs (including *Ceratocephala testiculata, Halogeton glomeratus, Bassia scoparia, Lepidium perfoliatum, Salsola kali*, etc.) ..... **Invasive Annual and Biennial Forbland**

11a. Herbaceous cover dominated by introduced perennial grasses and forbs (including *Agropyron cristatum, Alopecurus geniculatus, Agrostis stolonifera, Bromus inermis, Centaurea* sp., *Cirsium arvense, Dactylis glomerata, Euphorbia esula, Lepidium latifolium, Melilotus* spp., *Poa pratensis, Phleum pratense, Thinopyrum intermedium,* and other introduced forage species ..... **Invasive Perennial Grassland and Forbland**
11b. Herbaceous cover dominated by native species **12**

12a Alpine herbaceous vegetation dominated by short graminoids and forbs forming a turf. Characteristic species are include *Artemisia arctica, Carex elynoides, Carex siccata, Carex scirpoidea, Carex nardina, Carex rupestris, Festuca brachyphylla, Festuca idahoensis, Geum rossii, Kobresia myosuroides, Phlox pulvinata,* and *Trifolium dasyphyllum.* ..... **Rocky Mountain Dry Tundra**
12b Subalpine, montane, foothill and basin vegetation **13**

13a Subalpine and montane vegetation **14**
13b. Lower montane, foothill, mesa and lower elevation grasslands found in basins and plains, and alkaline flats **15**

14a. Subalpine herbaceous vegetation that is typically dominated or codominated by mesic, perennial forbs. Important taxa include forbs such as *Balsamorhiza sagittata, Campanula* spp., *Ligusticum* spp., *Lupinus* spp., *Mertensia* spp., *Penstemon* spp., *Rudbeckia occidentalis, Solidago* spp., *Thalictrum occidentale, Valeriana sitchensis, Wyethia* spp., and grasses *Deschampsia caespitosa, Koeleria macrantha,* perennial *Bromus* spp., and species of *Carex*. Mesic shrubs *Dasiphora fruticosa ssp. floribunda* and *Symphoricarpos* spp. are occasionally present. ..... **Rocky Mountain Subalpine Mesic Meadow**

14b. Montane to subalpine grasslands from the Southern Rocky Mountains which include the Laramie Range and Medicine Bow Mountains in southern Wyoming. Stands occur between 2200-3000 m elevation on dry flat to rolling plains or lower side slopes, but may extend up to 3350 m on warm aspects. Vegetation is

dominated by bunch grasses such as *Danthonia* spp., *Festuca* spp., *Muhlenbergia filiculmis, M. montana* or *Pseudoroegneria spicata*. ..... **Southern Rocky Mountain Montane - Subalpine Grassland**

15a Lower montane to foothill elevation grasslands in the mountains and large valleys of western Montana and northern Wyoming, such as the Bighorn Valley. These grasslands are floristically similar, particularly in dominant grasses to Inter-Mountain Basins Big Sagebrush Steppe, but lack a big sagebrush shrub layer. Stands range from small meadows to large open parks surrounded by conifers in the lower montane, to extensive foothill and valley grasslands below the lower treeline. Many of these valleys may have been primarily sage-steppe with patches of grassland in the past, but because of land-use history post-settlement (herbicide, grazing, fire suppression, pasturing, etc.), they have been converted to grassland-dominated areas. Stands are dominated by cool-season perennial bunch grasses and forbs (>25% cover), sometimes with a sparse shrub cover (<10%). Dominant grasses are *Pseudoroegneria spicata, Festuca campestris, Festuca idahoensis*, or *Hesperostipa comata* with a variety of other graminoids, such as *Achnatherum hymenoides, A. occidentale (= Stipa occidentalis), A. richardsonii, Bromus inermis ssp. pumpellianus (= B. pumpellianus), Carex filifolia, Danthonia intermedia, Elymus trachycaulus, Hesperostipa curtiseta, Koeleria macrantha, Leymus cinereus*, and *Pascopyrum smithii*. Important exotic grasses include *Phleum pratense, Bromus inermis*, and *Poa pratensis*. Scattered shrub may include *Amelanchier alnifolia, Artemisia tridentata, Eriogonum heracleoides, Juniperus communis, Rosa* spp., *Symphoricarpos* spp., and in Wyoming *Artemisia tripartita ssp. rupicola*. These are extensive grasslands, not grass-dominated patches within the sagebrush shrub-steppe ecological system. *Festuca campestris* is easily eliminated by grazing and does not occur in all areas of this system. ..... **Northern Rocky Mountain Lower Montane Foothill and Valley Grassland**

15b Not as above..... **16**

16a. Widespread mixed-grass prairie that extends into high plains of eastern Wyoming from northern Nebraska, Dakotas and eastern Montana from both glaciated and non-glaciated substrates. Soil texture tends to be finer textured loams and clay loams. Cool-season grasses typically dominate the ground cover (greater than 50% cover). Characteristic species include *Pascopyrum smithii, Nassella viridula, Bouteloua gracilis, Hesperostipa comata, Koeleria macrantha*, and *Carex filifolia*. *Festuca campestris* and *Festuca idahoensis* may be more abundant in the north and foothill/montane grassland transition areas. *Hesperostipa comata* is also an important component and becomes increasingly so as improper grazing regimes favor it at the expense of (usually) *Pascopyrum smithii*; progressively more destructive grazing can result in the loss of *P. smithii* from the system followed by drastic reduction in *Hesperostipa comata* and ultimately the dominance of *Bouteloua gracilis* (or *Poa secunda* and other short graminoids) and/or a lawn of *Selaginella densa*. Shrub species such as *Symphoricarpos* spp., *Artemisia frigida*, and *A. cana* also occur. Those areas with greater than 10% cover of native shrub species in conjunction with topographic relief (break) would be considered part of Northwestern Great Plains Shrubland. ..... **Northwestern Great Plains Mixedgrass Prairie**

16. Not as above..... **17**

17a Mixed-grass to tallgrass grasslands found on moderate to gentle slopes, usually at the base of foothill slopes of the Southern Rocky Mountain Front Range that extends into southern Wyoming along the foot of the Laramie Range and Medicine Bow Mountains where it typically occurs as a relatively narrow elevational band between foothill woodlands or shrublands and the plains. Communities may be dominated by *Andropogon gerardii, Schizachyrium scoparium, Muhlenbergia montana, Nassella viridula, Pascopyrum smithii, Sporobolus cryptandrus, Bouteloua gracilis, B. curtipendula, Hesperostipa comata*, or *Hesperostipa neomexicana*. In Wyoming, typical grasses found in this system include *Pseudoroegneria spicata, Festuca idahoensis, Hesperostipa comata*, and species of *Poa*.. ..... **Western Great Plains Foothill and Piedmont Grassland**

17b. Not as above..... **18**

18b. Shortgrass prairie that may extend into southeastern Wyoming from eastern Colorado and may occur in this map zone. Sites are primarily on flat to rolling uplands with loamy, ustic soils ranging from sandy to clayey. *Bouteloua gracilis* and/or *Buchloe dactyloides* typically dominating this grassland. Associated graminoids may include *Aristida purpurea, Bouteloua curtipendula, Bouteloua hirsuta, Buchloe dactyloides, Hesperostipa comata, Koeleria macrantha, Pascopyrum smithii, Pleuraphis jamesii, Sporobolus airoides*, and *Sporobolus cryptandrus*. 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, Sporobolus cryptandrus*, and *Yucca glauca*. Scattered shrub and dwarf-dwarf species such as *Artemisia filifolia, Artemisia frigida, Artemisia tridentata, Atriplex canescens, Eriogonum effusum, Gutierrezia sarothrae*, and *Lycium pallidum* may also be present with low cover. ..... **Western Great Plains Shortgrass Prairie (19)**

18b. Widespread dry foothill and lower elevation grasslands found on dry plains, mesas and alkaline flats in basins southwestern Wyoming and throughout much of the intermountain western US. Typically dominated or codominated by *Bouteloua gracilis, Achnatherum hymenoides, Pleuraphis jamesii, Hesperostipa comata, Sporobolus airoides* and may include scatter shrubs and dwarf-shrubs ....**Inter-Mountain Basins Semi-Desert Grassland**

19a. Shrub layer is present and dominated by *Yucca glauca*. Typically restricted to localize areas in the short grass steppe with sandy soils. ..... *Yucca glauca* **Shrubland Alliance**

19b. Shrub layer is present and dominated by *Gutierrezia sarothrae*. Typically restricted to disturbance areas in the short grass steppe..... *Gutierrezia sarothrae* **Shrubland Alliance******