

**INTERNATIONAL ECOLOGICAL  
CLASSIFICATION STANDARD:**

**TERRESTRIAL ECOLOGICAL CLASSIFICATIONS**

**Groups and Macrogroups  
of Washington**

June 26, 2015

by

NatureServe (**modified by Washington Natural Heritage Program on January 16, 2016**)

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This subset of the International Ecological Classification Standard covers vegetation groups and macrogroups attributed to Washington. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Mary J. Russo, Central Ecology Data Manager, NC <mary\_russo@natureserve.org> and Marion Reid, Senior Regional Ecologist, Boulder, CO <marion\_reid@natureserve.org>.



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# 1. FOREST & WOODLAND

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

## 1.B. Temperate & Boreal Forest & Woodland

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

### 1.B.2. Cool Temperate Forest & Woodland

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

#### 1.B.2.Nb. Rocky Mountain Cool Temperate Forest

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1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

#### M501. Central Rocky Mountain Dry Lower Montane-Foothill Forest

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

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##### OVERVIEW

**Scientific Name:** *Pinus ponderosa* var. *ponderosa* - *Pseudotsuga menziesii* - *Pinus flexilis* Central Rocky Mountain Dry Forest Macrogroup

**Common Name (Translated Scientific Name):** Ponderosa Pine - Douglas-fir - Limber Pine Central Rocky Mountain Dry Forest Macrogroup

**Type Concept:** 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 regions. It is generally dominated by *Pinus ponderosa* var. *ponderosa* or *Pinus ponderosa* var. *scopulorum*, *Pseudotsuga menziesii*, *Pinus flexilis*, or *Juniperus osteosperma* or *Juniperus scopulorum*. Other occasional trees may include *Pinus contorta*, *Picea engelmannii*, *Picea glauca* (or their hybrid), and in the Great Plains, deciduous trees such as *Acer negundo*, *Betula papyrifera*, *Fraxinus pennsylvanica*, *Populus tremuloides*, *Quercus macrocarpa*, and *Ulmus americana*. Shrub and herbaceous components are widely variable, ranging from taxa found in the Great Plains mixedgrass region (such as *Andropogon gerardii*, *Juniperus horizontalis*, *Prunus* spp., *Schizachyrium scoparium*, or *Yucca glauca*) to those found across the Northern Rockies region into the eastern Cascades (e.g., *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Artemisia* spp., *Cercocarpus* spp., *Juniperus communis*, *Physocarpus malvaceus*, *Spiraea betulifolia*, *Symphoricarpos* spp., and graminoids such as *Achnatherum* spp., *Bouteloua gracilis*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex inops*, *Festuca idahoensis*, *Hesperostipa comata*, *Koeleria macrantha*, *Piptatherum micranthum*, *Poa secunda*, or *Pseudoroegneria spicata*). This is a very wide-ranging macrogroup; it has common substrate and soil characteristics across its range, but from west to east shifts from a climate regime moderately influenced by maritime air masses, to one that is entirely continental. Generally these communities occur in lower montane to foothill settings, or on rock outcrops in the mixedgrass region of the Great Plains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops and plateaus are most common. Substrates tend to be composed of limestone, sandstone, dolomite, granite, colluvium, unweathered lava flows, pumice, cinders, or eolian sands. In most cases soil features include good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, and periods of drought during the growing season.



Most of the communities in this macrogroup are fire-dependent types. Presettlement fire regimes may have been characterized by frequent, low-intensity surface fires that maintained relatively open stands of a mix of fire-resistant species. *Pseudotsuga menziesii* forests were probably subject to a moderate-severity fire regime in presettlement times, with fire-return intervals of 30-100 years. Many of the important tree species in these forests and woodlands are fire-adapted (*Populus tremuloides*, *Pinus ponderosa*, *Pinus contorta*), and fire-induced reproduction of *Pinus ponderosa* can result in its continued codominance in *Pseudotsuga menziesii* forests. A subset of the macrogroup includes woodlands and scrub patches that are edaphically controlled rather than fire-dependent. In the limber pine - juniper woodlands, fire is infrequent and spotty because the rocky substrates prevent development of a continuous vegetation canopy needed to spread fire. In other locations, where ponderosa pine is the predominant tree, periodic drought or areas of sand dunes, scablands, and pumice limit tree establishment. This climate-edaphic interaction results in widely scattered trees over "shrub-steppe" of sagebrush, bitterbrush, or sparsely distributed grasses. Tree growth is likely episodic, with regeneration episodes in years with available moisture. The expansion of *Pinus ponderosa* woodlands from the Black Hills montane zone into the central Great Plains may be due to fire suppression.

**Classification Comments:** There are a number of classification issues pertaining to groups within this macrogroup, which may eventually result in conceptual changes to either this macrogroup, or to other related macrogroups. Below are some of the relevant comments. In addition, this description certainly needs review and additions for interior British Columbia or southern Alberta characteristics.

How to treat *Pinus flexilis* in the Rocky Mountains is still somewhat uncertain. For now, there are three groups which have limber pine as a component. The limber pine group included in this macrogroup is composed predominantly of limber pine or juniper that is elevationally below the zone of continuous lower montane forests found in the main Rocky Mountain cordillera. The associations placed in this group are restricted to foothill settings on rock outcrops, or to escarpments in the Great Plains, and in Montana, these are limestone outcrops (L. Vance pers. comm. 2014). Associations extending from the foothill zone into the subalpine, such as *Pinus flexilis* / *Arctostaphylos uva-ursi* Woodland (CEGL000802), are included in Rocky Mountain Subalpine-Montane Limber Pine - Bristlecone Pine Woodland Group (G221). Additionally, there are *Juniperus osteosperma*-dominated stands included in this group from the Pryor, Big Horn, and Laramie mountain ranges because these stands are significantly disjunct from the main distribution of *Juniperus osteosperma* in the Colorado Plateau and Great Basin regions and have floristic similarities to the Great Plains.

Forests and woodlands of mixed *Pinus ponderosa* and *Pseudotsuga menziesii* in this macrogroup need some review of concepts in relation to other groups and macrogroups, including Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest Group (G211) (in Central Rocky Mountain Mesic Lower Montane Forest Macrogroup (M500)) and East Cascades Mesic Grand Fir - Douglas-fir Forest Group (G212) (placed in Vancouverian Lowland & Montane Forest Macrogroup (M024)). In PNV (PAGs) concept, this is mostly *Pseudotsuga menziesii*, moist *Pinus ponderosa* series, dry *Abies grandis*, or warm, dry *Abies lasiocarpa* series in the Canadian Rockies, northern Middle Rockies, eastern Cascades and Okanagan ecoregions. Everett et al. (2000) indicate that in the eastern Cascades of Washington, this group forms fire polygons due to abrupt north and south topography with presettlement fire-return intervals of 11-12 years typically covering less than 810 ha. Currently, fires have 40- to 45-year return intervals with thousands of hectares in size. East Cascades Mesic Grand Fir - Douglas-fir Forest Group (G212) has a North Pacific floristic composition and is mostly found in the East Cascades ecoregion, peripheral in Okanagan ecoregion, and West Cascades. For now, this macrogroup does not include any *Abies grandis*-named associations. It may be that some of the drier end of *Abies grandis* forests should be included in this macrogroup, as they may well be mixed with *Pinus ponderosa* or *Pseudotsuga menziesii*.

Forests and woodlands of the middle Rocky Mountains dominated by *Pseudotsuga menziesii*, which are included in this macrogroup, need to be clarified as to placement; they are related to groups currently in other macrogroups; e.g. Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest Group (G211) in Central Rocky Mountain Mesic Lower Montane Forest Macrogroup (M500), and East Cascades Mesic Grand Fir - Douglas-fir Forest Group (G212) in Vancouverian Lowland & Montane Forest Macrogroup (M024). Also, its transition in the south to Southern Rocky Mountain White Fir - Douglas-fir Dry Forest Group (G226) in Southern Rocky Mountain Lower Montane Forest Macrogroup (M022) needs to be clarified. Certainly this macrogroup is outside the range of distribution of either *Picea pungens* or *Abies concolor* var. *concolor*, which are major components of the southern Rocky Mountain forest macrogroup. It also does not overlap with major interior Pacific Northwest forest types which are affiliated with a more maritime climate regime, where trees such as *Tsuga heterophylla*, *Thuja plicata*, *Larix occidentalis*, *Abies grandis*, or *Pinus monticola* occur. The floristic "transition" from middle to southern Rocky Mountains is not yet clear. Woodlands dominated by *Pseudotsuga menziesii* found in breaks along rivers and on escarpments in central and eastern Montana and Wyoming are included in this macrogroup.

Regarding *Pinus ponderosa*, this macrogroup includes the northern race of Interior Ponderosa Pine old-growth (USFS Region 6, USFS Region 1). The FEIS site describes different varieties of *Pinus ponderosa* and associated species. This macrogroup of the Central Rockies is primarily *Pinus ponderosa* var. *ponderosa* (Habeck 1992). Johansen and Latta (2003) have mapped the distribution of two varieties (*Pinus ponderosa* var. *scopulorum* and *Pinus ponderosa* var. *ponderosa*) using mitochondrial DNA. They hybridize along the Continental Divide in Montana backing up the FEIS information. Southern Rocky Mountain Lower Montane Forest Macrogroup (M022) includes forests and woodlands where *Pinus ponderosa* var. *scopulorum*, *Pinus ponderosa* var. *brachyptera*, and *Pinus arizonica* var. *arizonica* (= *Pinus ponderosa* var. *arizonica*) are the predominant ponderosa varieties. The transition between

these two macrogroups (M501 and M022) is now defined to occur in the montane zones of the Bighorns (USFS section M331B) and Laramie Range (USFS section M331I) and to the east and south of these mountains. The southern Rocky Mountain macrogroup (M022) will also occur in other isolated mountain ranges of central Wyoming, but not in eastern Wyoming. It does not occur farther north than Wyoming; all western Montana ponderosa pine woodlands are placed into this macrogroup (M501). Ponderosa pine woodlands and "steppes" in eastern Wyoming, eastern and central Montana, including the Missouri River Breaks, are also included in this macrogroup, and are predominantly *Pinus ponderosa* var. *scopulorum*. Ponderosa pine woodlands found in the Great Plains do show some floristic similarities to those found within the forested mountains of the Southern Rockies, but typically have herbaceous floristics related to the Great Plains "mixedgrass." The southern extent of the ponderosa pine woodlands included in this macrogroup is hard to determine, but farther south in Colorado, there is more *Juniperus*, *Pinus edulis*, and *Quercus gambelii*. Stands of ponderosa pine at Black Mesa in western Oklahoma and in southeastern Colorado are currently included with the southern Rocky Mountain ponderosa pine woodlands in M022. South of the Modoc Plateau in California, *Pinus ponderosa* forests and woodlands are included in Southern Vancouverian Montane-Foothill Forest Macrogroup (M023).

#### Similar NVC Types:

- M022 Southern Rocky Mountain Lower Montane Forest: includes forests and woodlands where *Pinus ponderosa* var. *scopulorum*, *Pinus ponderosa* var. *brachyptera*, and *Pinus arizonica* var. *arizonica* are the predominant ponderosa varieties.
- M020 Rocky Mountain Subalpine-High Montane Conifer Forest
- M500 Central Rocky Mountain Mesic Lower Montane Forest

**Diagnostic Characteristics:** 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 regions. Generally dominated by *Pinus ponderosa* var. *ponderosa* or *Pinus ponderosa* var. *scopulorum*, *Pseudotsuga menziesii* var. *glauca*, *Pinus flexilis*, or *Juniperus osteosperma* or *Juniperus scopulorum*. Other occasional trees may include *Pinus contorta*, *Picea engelmannii*, *Picea glauca* (or their hybrid), and in the Great Plains, deciduous trees such as *Acer negundo*, *Betula papyrifera*, *Fraxinus pennsylvanica*, *Populus tremuloides*, *Quercus macrocarpa*, and *Ulmus americana*.

## VEGETATION

**Physiognomy and Structure:** These are physiognomically variable conifer forests, woodlands or savannas, ranging 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. They can have grassy or shrubby understories. In places these are patchy woodlands dominated by relatively short conifers (scrub woodlands). Occasionally broad-leaved deciduous trees are intermixed with the conifers in mesic settings, or as seral components. Shrubs can be broad-leaved deciduous, or needle-leaved or microphyllous evergreen (sagebrush), while the graminoids are primarily bunch grasses, along with rhizomatous grasses. Understories are generally low to moderate in cover, especially in the most droughty and rocky sites. In some cases due to a climate-edaphic interaction, the structure is that of widely scattered trees over "shrub-steppe" of *Artemisia* spp., *Purshia tridentata*, or sparsely distributed grasses.

**Floristics:** In the northwestern Great Plains, the tree canopy is primarily dominated by *Pinus ponderosa* var. *scopulorum* but may include a sparse to relatively dense understory of *Juniperus scopulorum* or *Cercocarpus* with just a few scattered trees. Deciduous trees are an important component in some areas (western Dakotas, Black Hills) and are sometimes codominant with the pines, including *Acer negundo*, *Betula papyrifera*, *Fraxinus pennsylvanica*, *Populus tremuloides*, *Quercus macrocarpa*, and *Ulmus americana*. Important or common shrub species with ponderosa pine can include *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Juniperus communis*, *Juniperus horizontalis*, *Mahonia repens*, *Physocarpus monogynus*, *Prunus virginiana*, *Rhus trilobata*, *Symphoricarpos* spp., and *Yucca glauca*. The herbaceous understory is variable and can range from a sparse to dense layer with species typifying the surrounding prairie group, with mixedgrass species common, such as *Andropogon gerardii*, *Bouteloua curtipendula*, *Carex inops* ssp. *heliophila*, *Carex filifolia*, *Koeleria macrantha*, *Nassella viridula*, *Oryzopsis asperifolia*, *Pascopyrum smithii*, *Piptatherum micranthum*, and *Schizachyrium scoparium*. Higher-elevation stands often have herbaceous species more typical of the Rocky Mountains such as *Achillea millefolium*, *Antennaria rosea*, *Balsamorhiza sagittata*, *Cerastium arvense*, *Danthonia intermedia*, *Fragaria* spp., *Galium boreale*, *Pulsatilla patens*, and *Lathyrus ochroleucus*.

Further west, *Pinus ponderosa*-dominated woodlands include two physiognomic phases: true woodlands of *Pinus ponderosa* with shrubby or grassy understories, and "wooded steppes" with widely spaced, scattered *Pinus ponderosa* trees over generally shrubby but sparse understories. The former are generally fire-maintained, while the latter are often too dry and with widely spaced vegetation to carry fire. *Pinus ponderosa* var. *ponderosa* is the predominant conifer (west of the Continental Divide); *Pseudotsuga menziesii* or *Pinus flexilis* may be present in the tree canopy but are usually absent. The understory can be shrubby, with *Amelanchier alnifolia*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Ceanothus velutinus*, *Cercocarpus ledifolius*, *Physocarpus malvaceus*, *Purshia tridentata*, *Rosa* spp., *Symphoricarpos oreophilus* or *Symphoricarpos albus*, and *Vaccinium caespitosum* common species. In transition areas with big sagebrush steppe, *Artemisia arbuscula*, *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tripartita*, and *Purshia tridentata* may be common in fire-protected sites such as rocky areas. Deciduous shrubs, such as *Physocarpus malvaceus*, *Symphoricarpos albus*, or *Spiraea betulifolia*, can be abundant in more northerly

sites or more moist climates. Understory vegetation in the true savanna occurrences is predominantly fire-resistant grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. These more open stands support grasses such as *Achnatherum* spp., dry *Carex* species (*Carex inops*), *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa* spp., or *Pseudoroegneria spicata*. More mesic sites may include *Calamagrostis rubescens* or *Carex geyeri*, species more typical of the higher elevation Douglas-fir - pine forests.

In the Central Rockies forests are typically dominated by a mix of *Pseudotsuga menziesii* and *Pinus ponderosa* in the tree canopy, although either can be absent. Other seral trees may occur, including *Pinus contorta*, *Pinus monticola*, and *Larix occidentalis* (neither in central Montana). *Picea engelmannii* (or *Picea glauca* or their hybrid) becomes increasingly common to the east. In the eastern Cascades, *Pinus contorta* may be the codominant pine, rather than *Pinus ponderosa*. *Abies grandis* (a fire-sensitive, shade-tolerant species not occurring in central Montana) has increased on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by low-severity wildfire. *Abies concolor* and *Abies grandis* x *concolor* hybrids in central Idaho (the Salmon Mountains) may occur in some stands, but have very restricted ranges in this area. *Abies concolor* and *Abies grandis* in the Blue Mountains of Oregon are probably hybrids of the two and mostly *Abies grandis*. Understories are typically dominated by graminoids, such as *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, and *Pseudoroegneria spicata*, and a variety of shrubs, such as *Acer glabrum*, *Juniperus communis*, *Physocarpus malvaceus*, *Symphoricarpos albus*, *Spiraea betulifolia*, or *Vaccinium membranaceum* on mesic sites.

The foothill-rock outcrop limber pine - juniper woodlands are dominated by *Pinus flexilis*, *Juniperus osteosperma*, or *Juniperus scopulorum*. *Pinus edulis* is not present. A sparse to moderately dense short-shrub layer, if present, may include a variety of shrubs, such as *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Cercocarpus montanus*, *Ericameria nauseosa*, *Juniperus horizontalis*, *Purshia tridentata*, *Rhus trilobata*, or *Rosa woodsii*. Herbaceous layers are generally sparse, but range to moderately dense, and are typically dominated by perennial graminoids such as *Bouteloua gracilis*, *Hesperostipa comata*, *Koeleria macrantha*, *Leymus innovatus* (in Alberta), *Piptatherum micranthum*, *Poa secunda*, *Pseudoroegneria spicata*, or *Schizachyrium scoparium*.

In the Middle Rocky Mountains are found extensive *Pseudotsuga menziesii* forests, occasionally with *Pinus flexilis* on calcareous substrates, and *Pinus contorta* at higher elevations. True firs, such as *Abies concolor*, *Abies grandis*, and *Abies lasiocarpa*, are generally absent in these occurrences, but *Picea engelmannii* can occur in some stands. *Pinus ponderosa* is also not common in this region. Understory components include shrubs such as *Amelanchier alnifolia*, *Juniperus communis*, *Linnaea borealis*, *Mahonia repens*, *Physocarpus malvaceus*, *Purshia tridentata*, *Spiraea betulifolia*, *Symphoricarpos oreophilus*, and *Symphoricarpos albus*. Common graminoids include *Calamagrostis rubescens*, *Carex rossii*, and *Leucopoa kingii*. Forbs are variable, but typical taxa include *Arnica cordifolia*, *Osmorhiza berteroi*, *Thalictrum occidentale*, *Viola adunca*, and species of many other genera, including *Arenaria*, *Erigeron*, *Fragaria*, *Galium*, *Lathyrus*, *Lupinus*, *Penstemon*, *Vicia*, and others. These Douglas-fir forests often occur at the lower treeline immediately above valley grasslands, or sagebrush steppe and shrublands. Sometimes there may be a "bath-tub ring" of *Pinus ponderosa* at lower elevations or *Pinus flexilis* between the valley non-forested and the solid *Pseudotsuga menziesii* forest. In the Wyoming Basins, there are isolated stands of *Pseudotsuga menziesii*, with *Artemisia tridentata*, *Pseudoroegneria spicata*, *Leucopoa kingii*, and *Carex rossii*.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This is a very wide-ranging macrogroup; it has common substrate and soil characteristics across its range, but from west to east shifts from a climate regime moderately influenced by maritime air masses, to one that is entirely continental. The below summary of environmental characteristics has been split into 2 components, one for the "interior Pacific Northwest," the second for the component generally found east of the Continental Divide.

This macrogroup within the interior Pacific Northwest and Central Rockies regions often occurs at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests. Typically these plant communities are found in warm, dry, exposed sites at elevations ranging from 350 m in British Columbia to over 2400 m (1500-7875 feet) in the Wyoming Rockies. These interior Pacific Northwest woodlands receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Southern Rockies. In the middle Rocky Mountains, *Pseudotsuga menziesii* forests occur under a comparatively drier and more continental climate regime, and at higher elevations than in the coastal Pacific Northwest. However, these sites are often too droughty to support a closed tree canopy. They can occur on all slopes and aspects; often they occur on moderately steep to very steep slopes or ridgetops and plateaus. Lower elevation stands often occupy protected northern exposures or mesic ravines and canyons, often on steep slopes. At higher elevations, these forests occur primarily on southerly aspects or ridgetops and plateaus. Soils are highly variable and derived from diverse parent materials.

**Climate:** These interior Pacific Northwest woodlands receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Southern Rockies. The southern / southwestern monsoon influence is less and maritime climate regime is not important. Annual precipitation ranges from 50-100 cm with moderate snowfall and a greater proportion falling during the growing season. Monsoonal summer rains can contribute a significant proportion of the annual precipitation in the southern portion of the range. Winter snowpacks typically melt off in early spring at lower elevations.

**Soil/substrate/hydrology:** These sites are often too droughty to support a closed tree canopy. They can occur on all slopes and aspects; however, they commonly occur on moderately steep to very steep slopes or ridgetops and plateaus. Substrates include glacial till, glacio-fluvial sand and gravel, dunes, basaltic rubble and scablands, colluvium, or deep loess or volcanic ash-derived soils, all with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of

mineral material, rockiness, and periods of drought during the growing season. In the Oregon "pumice zone" stands occur as matrix-forming, extensive woodlands on rolling pumice plateaus and other volcanic deposits. *Pseudotsuga menziesii* forests are reported by most studies (Pfister et al. 1977, Steele et al. 1981, Mauk and Henderson 1984, Lillybridge et al. 1995) to show no particular affinities to geologic substrates.

The ponderosa pine, limber pine and juniper communities found in the northwestern Great Plains and along the foothills of the Rocky Mountains to the east of the Continental Divide occur in foothill and lower montane zones. Generally they occur on gentle to steep slopes along escarpments, buttes, canyons, rock outcrops or ravines and can grade into one of the Great Plains canyon groups or the surrounding mixedgrass prairie. Slopes are typically moderately steep to steep. In Montana, limber pine is restricted at low elevations to limestone outcrops. The *Pinus ponderosa* woodlands of the western Great Plains are found typically in the matrix of Great Plains grassland systems. They are often surrounded by mixedgrass or tallgrass prairie, in places where available soil moisture is higher or soils are more coarse and rocky. In some cases, these woodlands or savannas may occur where fire suppression has allowed trees to become established (in areas where deciduous trees are more abundant (Girard et al. 1987)). These are typically not in the same setting as Rocky Mountain ponderosa pine, where ponderosa pine forms woodlands at lower treeline and grades into mixed montane conifer systems at higher elevations.

*Climate:* Climatologically, the region east of the Continental Divide is semi-arid and has a continental regime of hot summers and cold winters. High winds are a common feature found to the east of the Continental Divide and out in the Great Plains; limber pine is adapted to these winds with highly flexible branches which prevent breakage. Precipitation patterns are variable, but snow is common in winter, and spring rains are an important contributor.

*Soil/substrate/hydrology:* The *Pinus flexilis* and *Juniperus* spp. communities are restricted to shallow soils and fractured bedrock derived from a variety of parent material, including limestone, sandstone, dolomite, granite, and colluvium. An unusual community in Idaho occurs on relatively unweathered mafic lava flows, where it occurs in mesic pockets within the fractured lava. In all cases, soils have a high rock component (typically over 50% cover) and are coarse- to fine-textured, often gravelly and calcareous. Slopes are typically moderately steep to steep. Soils of the *Pinus ponderosa* woodlands range from well-drained loamy sands to sandy loams formed in colluvium, weathered sandstone, limestone, scoria or eolian sand.

**Dynamics:** Most of the communities in this macrogroup are fire-dependent types. Presettlement fire regimes may have been characterized by frequent, low-intensity surface fires that maintained relatively open stands of a mix of fire-resistant species. *Pseudotsuga menziesii* forests were probably subject to a moderate-severity fire regime in presettlement times, with fire-return intervals of 30-100 years. Many of the important tree species in these forests and woodlands are fire-adapted (*Populus tremuloides*, *Pinus ponderosa*, *Pinus contorta*) (Pfister et al. 1977), and fire-induced reproduction of *Pinus ponderosa* can result in its continued codominance in *Pseudotsuga menziesii* forests (Steele et al. 1981).

A subset of the macrogroup includes woodlands and scrub patches that are edaphically controlled rather than fire-dependent. In the limber pine - juniper woodlands, fire is infrequent and spotty because the rocky substrates prevent development of a continuous vegetation canopy needed to spread fire. In other locations, where ponderosa is the predominant tree, periodic drought limits tree establishment. This climate-edaphic interaction results in widely scattered trees over "shrub-steppe" of sagebrush, bitterbrush, or sparsely distributed grasses. Tree growth is likely episodic, with regeneration episodes in years with available moisture. Tree density is limited in some areas by available growing space due to rocky conditions of the site. Hence the tree canopy in these locations will never reach woodland density or close due to the interaction of climate and edaphic factors, even in the absence of fire. They burn occasionally, but the vegetation is sparse enough that fires are typically not carried through the stand. Fire frequency is speculated to be 30-50 years. Some stands also occur on areas of sand dunes, scablands, and pumice where the edaphic conditions limit tree abundance.

*Pinus ponderosa* is a drought-resistant, shade-intolerant conifer which usually occurs at lower treeline in the major ranges of the western United States. Historically, surface fires and drought were influential in maintaining open-canopy conditions in these woodlands. With settlement and subsequent fire suppression, occurrences have become denser. Presently, some occurrences contain understories of more shade-tolerant species, such as *Pseudotsuga menziesii* and/or *Abies* spp., as well as younger cohorts of *Pinus ponderosa*. These altered structures have affected fuel loads and fire regimes. Presettlement fire regimes were primarily frequent (5- to 15-year return intervals), low-intensity surface fires triggered by lightning strikes or deliberately set by Native Americans. With fire suppression and increased fuel loads, fire regimes are now less frequent and often become intense crown fires, which can kill mature *Pinus ponderosa* (Reid et al. 1999). Establishment is erratic and believed to be linked to periods of adequate soil moisture and good seed crops as well as fire frequencies, which allow seedlings to reach sapling size. Longer fire-return intervals have resulted in many occurrences having dense subcanopies of overstocked and unhealthy young *Pinus ponderosa*, along with *Pseudotsuga menziesii* on moist sites (Reid et al. 1999).

A meeting of Pacific Northwest ecologists for Landfire concluded that the "true savannas" of high-frequency / low-intensity fires and grassy understories are now rare in the central and northern Rocky Mountains. Most areas that may have been savanna in the past are now more nearly closed-canopy woodlands/forests. Louisa Evers (pers. comm. 2006) notes that she has not found any evidence that ponderosa pine savanna existed historically in north-central and central Oregon. In north-central Oregon, the savanna would have been oak or pine-oak. In central Oregon, it may well have been western juniper. Condition surveys of the Cascades

Forest Reserve and General Land Office survey notes suggest that ponderosa pine formed a woodland with grassy understories, but still was often referred to as open-parklike.

In mixed stands of *Pinus ponderosa* and *Pseudotsuga menziesii*, presettlement fire regimes may have been characterized by frequent, low-intensity surface fires that maintained relatively open stands of a mix of fire-resistant species. Under present conditions, the fire regime is mixed-severity and more variable, with stand-replacing fires more common, and the forests are more homogeneous. With vigorous fire suppression, longer fire-return intervals are now the rule, and multi-layered stands of *Pseudotsuga menziesii*, *Pinus ponderosa*, and/or *Abies grandis* provide fuel "ladders," making these forests more susceptible to high-intensity, stand-replacing fires. They are productive forests which have been priorities for timber production.

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

Marriot and Faber-Langendoen (2000) report different fire regimes for ponderosa pine communities in the Black Hills, with their "Dry Group" more typically having frequent surface fires and the "Mesic Group" having infrequent catastrophic fires (every 100-200 years). The Dry Group of associations includes lower elevation foothill savanna associations, and the mesic group somewhat higher elevation, north-slope, swale associations. Kelly Kindscher (pers. comm. 2007) believes that almost all of the stands in Nebraska were there at the time of settlement and are not a result of pine expansion due to fire suppression; in addition, at least some have disappeared, such as the one in southern Nebraska (Franklin County). It is possible, however, that some areas of Great Plains ponderosa have expanded in size due to fire suppression, but this needs substantiation.

#### DISTRIBUTION

**Geographic Range:** This widespread macrogroup occurs in Canada in southern British Columbia in the Fraser River drainage and eastward in valleys that drain into the Columbia and Kootenay rivers, and in southwestern Alberta east of the Continental Divide. Southward into the U.S. it occurs along the Cascades and central Rocky Mountains of Washington, Oregon and the Modoc Plateau of northeastern California. It also is found throughout the middle Rocky Mountains of central and southern Idaho (Lemhi, Beaverhead and Lost River ranges), south and east into the Greater Yellowstone region, and south and east into the Wind River, Gros Ventre and Bighorn ranges of Wyoming. In the northeastern part of its range, it extends across the central Rocky Mountains west of the Continental Divide into western Montana, south to the Snake River Plain in Idaho, and east of the Continental Divide into the foothills of west-central Montana. It extends east into the "sky island" ranges of central Montana, and from there east into the northwestern Great Plains along areas that border the Rocky Mountains and into the central Great Plains in a few scattered localities. Some associations placed in this macrogroup also occur in Colorado and northeastern Utah in the Uinta Mountains.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

**States/Provinces:** AB, BC, CA, CO, ID, KS?, MT, ND, NE, NV?, OR, SD, UT, WA, WY

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 331A:CC, 331C:C?, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 331K:CC, 331L:CC, 331M:CC, 331N:CC, 332A:C?, 332B:C?, 332C:CC, 332D:C?, 332E:C?, 341G:PP, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CP, M242B:CC, M242C:CC, M242D:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CP, M331E:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC

#### Omernik Ecoregions:

#### Federal Lands [optional]:

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate. While there is justification for a macrogroup representing the drier, lower montane forests and woodlands of the central and Canadian Rockies, there are certainly classification issues pertaining to the groups within this macrogroup.

#### SYNONYMY

- > Black Hills pine forest (*Pinus*) (Küchler 1964)
- > Douglas-fir forest (*Pseudotsuga*) (Küchler 1964)
- > Eastern ponderosa forest (*Pinus*) (Küchler 1964)

#### WA groups

- >< Interior Douglas-fir: 210 (Eyre 1980)
- >< Interior Ponderosa Pine: 237 (Eyre 1980)
- >< Limber Pine: 219 (Eyre 1980)
- >< Ponderosa Pine - Grassland (110) (Shiflet 1994)
- >< Ponderosa Pine - Shrubland (109) (Shiflet 1994)
- >< Rocky Mountain Juniper: 220 (Eyre 1980)
- > Western ponderosa forest (*Pinus*) (Küchler 1964)

#### LOWER LEVEL UNITS

##### Groups:

- G213 Central Rocky Mountain Ponderosa Pine Woodland & Savanna
- G210 Central Rocky Mountain Douglas-fir - Pine Forest
- G215 Middle Rocky Mountain Montane Douglas-fir Forest & Woodland
- G209 Rocky Mountain Foothill-Rock Outcrop Limber Pine - Juniper Woodland
- G216 Northwestern Great Plains-Black Hills Ponderosa Pine Forest & Woodland

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** M.S. Reid

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** DFL 7-12

#### REFERENCES

**References:** Anderson 1999b, Annas and Coupé 1979, Beil 1969, Beil 1974, Bock and Bock 1984, Braumandl and Curran 1992, Brayshaw 1965, Brayshaw 1970, Camp et al. 1997, Cogan et al. 1999, Cooper et al. 1987, Crawford and Johnson 1985, Daubenmire and Daubenmire 1968, DeVelice and Lesica 1993, Everett et al. 2000, Evers pers. comm., Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Girard et al. 1987, Girard et al. 1989, Habeck 1992a, Hansen and Hoffman 1988, Hoffman and Alexander 1987, Johansen and Latta 2003, Kindscher pers. comm., Knight 1994, Knight et al. 1987, Küchler 1964, Lillybridge et al. 1995, Lloyd et al. 1990, Marriott and Faber-Langendoen 2000, Marriott et al. 1999, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Pfister et al. 1977, Reid et al. 1999, Salas and Pucherelli 1998a, Salas and Pucherelli 1998b, Salas and Pucherelli 1998c, Shiflet 1994, Steele and Geier-Hayes 1995, Steele et al. 1981, Steele et al. 1983, Steen and Coupé 1997, Stringer and LaRoi 1970, Thilenius 1972, Thilenius et al. 1995, Tisdale and McLean 1957, Topik 1989, Topik et al. 1988, USFS 1993, Williams and Lillybridge 1983

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1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

M501. Central Rocky Mountain Dry Lower Montane-Foothill Forest

### G213. Central Rocky Mountain Ponderosa Pine Woodland & Savanna

**Type Concept Sentence:**

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#### OVERVIEW

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

**Common Name (Translated Scientific Name):** Ponderosa Pine Central Rocky Mountain Woodland & Savanna Group

**Type Concept:** This inland Pacific Northwest group occurs in the foothills of the Central Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and Eastern Cascades into southern interior British Columbia. It also occurs east across Idaho into the eastern foothills of the Montana Rockies. These woodlands and savannas occur at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests, typically on warm, dry, exposed sites. These interior Pacific Northwest woodlands receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Central Rockies. However, sites are often too droughty to support a closed tree canopy. Elevations range from less than 500 m in British Columbia to 1600 m in the central Idaho mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops and plateaus are most common. This group generally occurs on most geological substrates from weathered rock to glacial deposits to eolian deposits. Characteristic soil features include good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, and periods of drought during the growing season. Some occurrences may occur as edaphic climax communities on very skeletal, infertile and/or excessively drained soils, such as pumice, cinder or lava fields, and scree slopes. Surface textures are highly variable in this group ranging from sand to loam and silt loam. Exposed rock and bare soil consistently occur to some degree in all the associations.

This group includes two physiognomic phases: true woodlands of *Pinus ponderosa* with shrubby or grassy understories, and "wooded steppes" with widely spaced, scattered *Pinus ponderosa* trees over generally shrubby but sparse understories. The former are generally fire-maintained, while the latter are often too dry and with widely spaced vegetation to carry fire. *Pinus ponderosa* var. *ponderosa* is the predominant conifer; *Pseudotsuga menziesii* or *Pinus flexilis* may be present in the tree canopy but are usually absent. The understory can be shrubby, with *Artemisia tridentata*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Cercocarpus ledifolius*, *Physocarpus malvaceus*, *Purshia tridentata*, *Symphoricarpos oreophilus* or *Symphoricarpos albus*, *Amelanchier alnifolia*, and *Rosa* spp. common species. In transition areas with sagebrush steppe, *Purshia tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tridentata* ssp. *tridentata*, and *Artemisia tripartita* may be common in fire-protected sites such as rocky areas. Deciduous shrubs, such as *Physocarpus malvaceus*, *Symphoricarpos albus*, or *Spiraea betulifolia*, can be abundant in more northerly sites or more moist climates. Herbaceous vegetation in the true savanna occurrences is predominantly fire-resistant grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. These more open stands support grasses such as *Pseudoroegneria spicata*, *Hesperostipa* spp., *Achnatherum* spp., dry *Carex* species (*Carex inops*), *Elymus elymoides*, *Festuca idahoensis*, or *Festuca campestris*. The more mesic portions of this group may include *Calamagrostis rubescens* or *Carex geyeri*, species more typical of Central Rocky Mountain Douglas-fir - Pine Forest Group (G210). Mixed fire regimes and surface fires of variable return intervals maintain these woodlands typically with a shrub-dominated or patchy shrub layer, depending on climate, degree of soil development, and understory density. Historically, many of these woodlands and savannas lacked the shrub component as a result of 3- to 7-year fire-return intervals.

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

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

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

**Internal Comments:** mjr 10-12: CA added based on member association distribution. DFL 7-23-12: BEC= Ponderosa Pine

**Other Comments:**

**Similar NVC Types:**

- G228 Southern Rocky Mountain Ponderosa Pine Forest & Woodland
- G229 Southern Rocky Mountain Ponderosa Pine Savanna
- G216 Northwestern Great Plains-Black Hills Ponderosa Pine Forest & Woodland
- G210 Central Rocky Mountain Douglas-fir - Pine Forest
- G344 California Montane Conifer Forest & Woodland

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

## VEGETATION

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

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

G213 Central Rocky Mountain Ponderosa Pine Woodland & Savanna Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Pinus ponderosa</i> / <i>Calamagrostis rubescens</i> Forest	G2Q/S1	CEGL000181
<i>Pinus ponderosa</i> / <i>Festuca campestris</i> Woodland	G3G4/S1	CEGL000185
<i>Pinus ponderosa</i> / <i>Festuca idahoensis</i> Woodland	G4/S2	CEGL000857
<i>Pinus ponderosa</i> / <i>Hesperostipa comata</i> Woodland	G1S1	CEGL000879
<i>Pinus ponderosa</i> / <i>Physocarpus malvaceus</i> Forest	G2/S1	CEGL000189
<i>Pinus ponderosa</i> / <i>Pseudoroegneria spicata</i> Woodland	G4/S1	CEGL000865
<i>Pinus ponderosa</i> / <i>Purshia tridentata</i> Woodland	G3G5/S3	CEGL000867
<i>Pinus ponderosa</i> / <i>Purshia tridentata</i> / <i>Achnatherum hymenoides</i> Woodland	G1/SNR	CEGL000196
<i>Pinus ponderosa</i> / <i>Purshia tridentata</i> / <i>Carex geyeri</i> Woodland	G3/SNR	CEGL002606
<i>Pinus ponderosa</i> / <i>Purshia tridentata</i> / <i>Festuca idahoensis</i> Woodland	G3/S2	CEGL000195
<i>Pinus ponderosa</i> / <i>Purshia tridentata</i> / <i>Pseudoroegneria spicata</i> Woodland	G3/S2	CEGL000197
<i>Pinus ponderosa</i> / <i>Symphoricarpos albus</i> Forest	G4?/S2	CEGL000203

## ENVIRONMENT & DYNAMICS

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

**Climate:** This group within the interior Pacific Northwest region occurs at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests typically in warm, dry, exposed sites at elevations ranging from 500-1600 m (1600-5248 feet). These interior Pacific Northwest woodlands receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the Central Rockies. **Soil/substrate/hydrology:** These sites are often too droughty to support a closed tree canopy. They can occur on all slopes and aspects; however, they commonly occur on moderately steep to very steep slopes or



ridgetops and plateaus. Substrates include glacial till, glacio-fluvial sand and gravel, dunes, basaltic rubble and scablands, colluvium, or deep loess or volcanic ash-derived soils, all with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. In the Oregon "pumice zone" this group occurs as matrix-forming, extensive woodlands on rolling pumice plateaus and other volcanic deposits.

**Dynamics:** *Pinus ponderosa* is a drought-resistant, shade-intolerant conifer which usually occurs at lower treeline in the major ranges of the western United States. Historically, surface fires and drought were influential in maintaining open-canopy conditions in these woodlands. With settlement and subsequent fire suppression, occurrences have become denser. Presently, some occurrences contain understories of more shade-tolerant species, such as *Pseudotsuga menziesii* and/or *Abies* spp., as well as younger cohorts of *Pinus ponderosa*. These altered structures have affected fuel loads and fire regimes. Presettlement fire regimes were primarily frequent (5- to 15-year return intervals), low-intensity surface fires triggered by lightning strikes or deliberately set fires by Native Americans. With fire suppression and increased fuel loads, fire regimes are now less frequent and often become intense crown fires, which can kill mature *Pinus ponderosa* (Reid et al. 1999). Establishment is erratic and believed to be linked to periods of adequate soil moisture and good seed crops as well as fire frequencies, which allow seedlings to reach sapling size. Longer fire-return intervals have resulted in many occurrences having dense subcanopies of overstocked and unhealthy young *Pinus ponderosa*, along with *Pseudotsuga menziesii* on moist sites (Reid et al. 1999).

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

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

#### DISTRIBUTION

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

**Nations:** CA, US

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

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

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

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

#### SYNONYMY

- < Interior Ponderosa Pine: 237 (Eyre 1980)
- >< Ponderosa Pine - Grassland (110) (Shiflet 1994)

- >< Ponderosa Pine - Shrubland (109) (Shiflet 1994)

#### LOWER LEVEL UNITS

##### Alliances:

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

#### AUTHORSHIP

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

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

**Acknowledgments:** M. Manning

**Version Date:** 2013/05/30

#### REFERENCES

**References:** Camp et al. 1997, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Everett et al. 2000, Evers pers. comm., Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Habeck 1992a, Johansen and Latta 2003, Mehl 1992, Meidinger and Pojar 1991, Pfister et al. 1977, Reid et al. 1999, Shiflet 1994, USFS 1993

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1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

M501. Central Rocky Mountain Dry Lower Montane-Foothill Forest

### G210. Central Rocky Mountain Douglas-fir - Pine Forest

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Pseudotsuga menziesii* - *Pinus ponderosa* Central Rocky Mountain Forest Group

**Common Name (Translated Scientific Name):** Douglas-fir - Ponderosa Pine Central Rocky Mountain Forest Group

**Type Concept:** This group is composed of highly variable montane coniferous forests found in the interior Pacific Northwest, from southernmost interior British Columbia, eastern Washington, eastern Oregon, northern Idaho, western and north-central Montana, and south along the east slope of the Cascades in Washington and Oregon. This group is associated with a submesic climate regime with annual precipitation ranging from 50 to 100 cm, with a maximum in winter or late spring. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from 460 to 1920 m. These communities rarely form either upper or lower timberline forests. Most occurrences of this group are dominated by a mix of *Pseudotsuga menziesii* and *Pinus ponderosa* (but there can be one without the other) and other typically seral species, including *Pinus contorta*, *Pinus monticola* (not in central Montana), and *Larix occidentalis* (not in central Montana). *Picea engelmannii* (or *Picea glauca* or their hybrid) becomes increasingly common towards the eastern edge of the range. In the eastern Cascades, *Pinus contorta* may be the codominant pine, rather than *Pinus ponderosa*. The nature of this forest group is a matrix of large patches dominated or codominated by one or combinations of the above species; *Abies grandis* (a fire-sensitive, shade-tolerant species not occurring in central Montana) has increased on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by low-severity wildfire. Understories are typically dominated by graminoids, such as *Pseudoroegneria spicata*, *Calamagrostis rubescens*, *Carex geyeri*, and *Carex rossii*, and a variety of shrubs, such as *Acer glabrum*, *Juniperus communis*, *Physocarpus malvaceus*, *Symphoricarpos albus*, *Spiraea betulifolia*, or *Vaccinium membranaceum* on mesic sites. *Abies concolor* and *Abies grandis* x *concolor* hybrids in central Idaho (the Salmon Mountains) may occur in some stands, but have very restricted ranges in this area. *Abies concolor* and *Abies grandis* in the Blue Mountains of Oregon are probably hybrids of the two and mostly *Abies grandis*. Presettlement fire regimes may have been characterized by frequent, low-intensity surface fires that maintained relatively open stands of a mix of fire-resistant species. Under present conditions the fire regime is mixed severity and more variable, with stand-replacing fires more common, and the forests are more homogeneous. With vigorous fire suppression, longer fire-return intervals are now prevalent, and multi-layered stands of *Pseudotsuga menziesii*, *Pinus ponderosa*, and/or *Abies grandis* provide fuel "ladders," making these forests more susceptible to high-intensity, stand-replacing fires. They are very productive forests which have been priority areas for timber production.

**Classification Comments:** Need to re-assess the concept of this group in relation to several other groups, including Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest Group (G211), East Cascades Mesic Grand Fir - Douglas-fir Forest Group (G212), Central Rocky Mountain Ponderosa Pine Woodland & Savanna Group (G213), and Middle Rocky Mountain Montane Douglas-fir Forest & Woodland Group (G215). In PNV (PAGs) concept, this is mostly *Pseudotsuga menziesii*, moist *Pinus ponderosa* series, dry *Abies grandis* or warm, dry *Abies lasiocarpa* series in the Canadian Rockies, northern Middle Rockies, East Cascades and Okanagan ecoregions. Everett et al. (2000) indicate that in the eastern Cascades of Washington, this group forms fire polygons due to abrupt north and south topography with presettlement fire-return intervals of 11-12 years typically covering less than 810 ha. Currently, fires have 40- to 45-year return intervals with thousands of hectares in size. East Cascades Mesic Grand Fir - Douglas-fir Forest Group

(G212) has a North Pacific floristic composition and is mostly found in the East Cascades ecoregion, peripheral in Okanagan ecoregion, and West Cascades.

For now, the associations attributed to this group do not include any *Abies grandis*-named types; all of those have been placed in other groups. It may be that some of the drier end of *Abies grandis* forests should be included in this group, as they may well be mixed with *Pinus ponderosa*, or *Pseudotsuga menziesii*.

**Internal Comments:** MSR 11-12: CEGLO00214 is correctly assigned to this Group, but the Group itself (and possibly the assoc) should not occur in CA. mjr 10-12: CA? added based on member association distribution. DFL 7-23-12: Compare with G215, BEC = Interior Douglas Fir. Mike Jennings: G210, Central Rocky Mountain Douglas-fir - Pine Forest, is very widespread, and I agree with Dave that it should exclude PIEN. Seedling and sapling ABGR are common on the mesic fringes of the type, but not as a significant part of the upper canopy.

**Other Comments:**

**Similar NVC Types:**

- G211 Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest
- G215 Middle Rocky Mountain Montane Douglas-fir Forest & Woodland
- G228 Southern Rocky Mountain Ponderosa Pine Forest & Woodland
- G213 Central Rocky Mountain Ponderosa Pine Woodland & Savanna
- G212 East Cascades Mesic Grand Fir - Douglas-fir Forest

**Diagnostic Characteristics:** Montane coniferous forests found in the interior Pacific Northwest; most occurrences of this group are dominated by a mix of *Pseudotsuga menziesii* and *Pinus ponderosa*, but *Pinus ponderosa* can be absent. Other typically seral species, including *Pinus contorta*, *Pinus monticola* (not in central Montana), and *Larix occidentalis* (not in central Montana). *Abies grandis* (a fire-sensitive, shade-tolerant species) have increased on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by low-severity wildfire. Generally, floristic affinities are with areas of maritime-influenced climate of the interior Pacific Northwest.

## VEGETATION

**Physiognomy and Structure:**

**Floristics:** This forest group is typically dominated by a mix of *Pseudotsuga menziesii* and *Pinus ponderosa* in the tree canopy, although either can be absent. Other typically seral species may occur in the tree canopy, including *Pinus contorta*, *Pinus monticola* (not in central Montana), and *Larix occidentalis* (not in central Montana). *Picea engelmannii* (or *Picea glauca* or their hybrid) becomes increasingly common towards the eastern edge of the range. In the eastern Cascades, *Pinus contorta* may be the codominant pine, rather than *Pinus ponderosa*. This forest group is composed of a matrix of large patches dominated or codominated by one or combinations of the above species; *Abies grandis* (a fire-sensitive, shade-tolerant species not occurring in central Montana) has increased on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by low-severity wildfire. Understories are typically dominated by graminoids, such as *Pseudoroegneria spicata*, *Calamagrostis rubescens*, *Carex geyeri*, and *Carex rossii*, and a variety of shrubs, such as *Acer glabrum*, *Juniperus communis*, *Physocarpus malvaceus*, *Symphoricarpos albus*, *Spiraea betulifolia*, or *Vaccinium membranaceum* on mesic sites. *Abies concolor* and *Abies grandis* x *concolor* hybrids in central Idaho (the Salmon Mountains) may occur in some stands, but have very restricted ranges in this area. *Abies concolor* and *Abies grandis* in the Blue Mountains of Oregon are probably hybrids of the two and mostly *Abies grandis*.

G210 Central Rocky Mountain Douglas-fir - Pine Forest Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Pinus ponderosa</i> - <i>Pseudotsuga menziesii</i> / <i>Calamagrostis rubescens</i> Woodland	G2Q/S2	CEGL000210
<i>Pinus ponderosa</i> - <i>Pseudotsuga menziesii</i> / <i>Penstemon fruticosus</i> Woodland	G2G3/S2S3	CEGL000212
<i>Pinus ponderosa</i> - <i>Pseudotsuga menziesii</i> / <i>Physocarpus malvaceus</i> Forest	GNRQ/S2	CEGL000213
<i>Pinus ponderosa</i> - <i>Pseudotsuga menziesii</i> / <i>Pseudoroegneria spicata</i> ssp. <i>inermis</i> Woodland	G3Q/S3	CEGL000207
<i>Pinus ponderosa</i> - <i>Pseudotsuga menziesii</i> / <i>Pseudoroegneria spicata</i> ssp. <i>inermis</i> Woodland	G3Q/S3	CEGL000207
<i>Pinus ponderosa</i> - <i>Pseudotsuga menziesii</i> / <i>Purshia tridentata</i> Woodland	G3/S3	CEGL000214
<i>Pinus ponderosa</i> / <i>Aspidotis densa</i> Woodland	G1/S1	CEGL000847
<i>Pseudotsuga menziesii</i> / <i>Arctostaphylos uva-ursi</i> - <i>Purshia tridentata</i> Forest	G3?/S3	CEGL000426
<i>Pseudotsuga menziesii</i> / <i>Arctostaphylos uva-ursi</i> Cascadian Forest	G3G4/S2	CEGL000425

G210 Central Rocky Mountain Douglas-fir - Pine Forest Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Pseudotsuga menziesii</i> / <i>Aspidotis densa</i> Woodland	G1/S1	CEGL000896
<i>Pseudotsuga menziesii</i> / <i>Calamagrostis rubescens</i> Woodland	G5/S5	CEGL000429
<i>Pseudotsuga menziesii</i> / <i>Carex geyeri</i> Forest	G4?/S1	CEGL000430
<i>Pseudotsuga menziesii</i> / <i>Festuca idahoensis</i> Woodland	G4/S2	CEGL000900
<i>Pseudotsuga menziesii</i> / <i>Festuca occidentalis</i> Forest	G2/S1S2	CEGL000434
<i>Pseudotsuga menziesii</i> / <i>Pseudoroegneria spicata</i> Woodland	G4/S3	CEGL000908

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* This group is associated with a submesic climate regime with annual precipitation ranging from 50 to 100 cm, with a maximum in winter or late spring. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from 460 to 1920 m. These communities rarely form either upper or lower timberline forests.

**Dynamics:** Presettlement fire regimes may have been characterized by frequent, low-intensity surface fires that maintained relatively open stands of a mix of fire-resistant species. Under present conditions, the fire regime is mixed severity and more variable, with stand-replacing fires more common, and the forests are more homogeneous. With vigorous fire suppression, longer fire-return intervals are now the rule, and multi-layered stands of *Pseudotsuga menziesii*, *Pinus ponderosa*, and/or *Abies grandis* provide fuel "ladders," making these forests more susceptible to high-intensity, stand-replacing fires. They are very productive forests which have been priorities for timber production.

#### DISTRIBUTION

**Geographic Range:** This group is found in the interior Pacific Northwest, from southern interior British Columbia south and east into Oregon, Idaho (including north and central Idaho, down to the Boise Mountains), and western Montana, and south along the east slope of the Cascades in Washington and Oregon.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 4:C, 6:C, 7:C, 8:C, 26:P, 68:C

**USFS Ecoregions (2007):** 331A:CC, 331D:C?, 341G:PP, 342C:CC, 342D:CC, 342H:CC, 342I:CC, M242C:CC, M242D:CC, M331A:PP, M332A:CC, M332B:CC, M332D:CP, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

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

#### SYNONYMY

- >< Fd - Juniper - Bluebunch wheatgrass (IDFwx/01) (Steen and Coupé 1997)
- >< FdPy - Bluebunch wheatgrass - Balsamroot (IDFwx/04) (Steen and Coupé 1997)
- >< FdPy - Bluebunch wheatgrass - Pinegrass (IDFwx/02) (Steen and Coupé 1997)
- >< FdPy - Western snowberry - Bluebunch wheatgrass (IDFwx/03) (Steen and Coupé 1997)
- >< Grand Fir: 213 (Eyre 1980) [Grand fir stands are a component of this group.]
- >< Interior Douglas-fir: 210 (Eyre 1980)
- >< Interior Ponderosa Pine: 237 (Eyre 1980)
- >< Western White Pine: 215 (Eyre 1980)
- >< White Fir: 211 (Eyre 1980) [White fir is a minor component of this group, primarily in southern Idaho and southern Oregon, where it hybridizes with grand fir.]

#### LOWER LEVEL UNITS

**Alliances:**

- A3396 *Pseudotsuga menziesii* - *Pinus contorta* var. *latifolia* Forest Alliance
- A3392 *Pseudotsuga menziesii* - *Pinus ponderosa* / Shrub Understory Forest & Woodland Alliance
- A3395 *Pseudotsuga menziesii* - *Pinus ponderosa* / Herbaceous Understory Woodland Alliance

#### AUTHORSHIP

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

**Author of Description:** M.S. Reid

**Acknowledgments:** M. Manning

Version Date: 2013/05/30

## REFERENCES

**References:** Cooper et al. 1987, Crawford and Johnson 1985, Daubenmire and Daubenmire 1968, Everett et al. 2000, Eyre 1980, Faber-Langendoen et al. 2015, Lillybridge et al. 1995, Pfister et al. 1977, Steele and Geier-Hayes 1995, Steele et al. 1981, Steen and Coupé 1997, Topik 1989, Topik et al. 1988, Williams and Lillybridge 1983

1. Forest & Woodland  
 1.B.2.Nb. Rocky Mountain Cool Temperate Forest  
 M501. Central Rocky Mountain Dry Lower Montane-Foothill Forest

**G215. Middle Rocky Mountain Montane Douglas-fir Forest & Woodland [Proposed]****Type Concept Sentence:**

## OVERVIEW

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

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

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

**Internal Comments:** DFL 12-5-12: Canada added based on member assoc. DFL 7-23-12: Compare with G210. Omernik 6.2.10.**Other Comments:****Similar NVC Types:**

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

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

## VEGETATION

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

**Floristics:** This group includes extensive *Pseudotsuga menziesii* forests, occasionally with *Pinus flexilis* on calcareous substrates, and *Pinus contorta* at higher elevations. True firs, such as *Abies concolor*, *Abies grandis*, and *Abies lasiocarpa*, are generally absent in these occurrences, but *Picea engelmannii* can occur in some stands. *Pinus ponderosa* is also not common in this group. Understory components include shrubs such as *Amelanchier alnifolia*, *Linnaea borealis*, *Physocarpus malvaceus*, *Juniperus communis*, *Purshia tridentata*, *Spiraea betulifolia*, *Symphoricarpos oreophilus*, *Symphoricarpos albus*, and *Mahonia repens*. Common graminoids include *Calamagrostis rubescens*, *Carex rossii*, and *Leucopoa kingii*. Forbs are variable, but typical taxa include *Arnica cordifolia*, *Osmorhiza berteroi*, *Thalictrum occidentale*, *Viola adunca*, and species of many other genera, including *Lathyrus*, *Penstemon*, *Erigeron*, *Lupinus*, *Fragaria*, *Vicia*, *Arenaria*, *Galium*, and others. This group often occurs at the lower treeline immediately above valley grasslands, or sagebrush steppe and shrublands. Sometimes there may be a "bath-tub ring" of *Pinus ponderosa* at lower elevations or *Pinus flexilis* between the valley non-forested and the solid *Pseudotsuga menziesii* forest. In the Wyoming Basins, this group occurs as isolated stands of *Pseudotsuga menziesii*, with *Artemisia tridentata*, *Pseudoroegneria spicata*, *Leucopoa kingii*, and *Carex rossii*.

G215 Middle Rocky Mountain Montane Douglas-fir Forest & Woodland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Pseudotsuga menziesii</i> / <i>Holodiscus discolor</i> / <i>Carex geyeri</i> Forest	G3/S2?	CEGL000437
<i>Pseudotsuga menziesii</i> / <i>Physocarpus malvaceus</i> Forest	G5/S4	CEGL000447
<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> Forest	G5/S4	CEGL000459
<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos oreophilus</i> Forest	G5/S3	CEGL000462

## ENVIRONMENT & DYNAMICS

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

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

## DISTRIBUTION

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

**Nations:** CA, US

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

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

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

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

#### LOWER LEVEL UNITS

**Alliances:**

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

#### AUTHORSHIP

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

**Author of Description:** M.S. Reid

**Acknowledgments:**

**Version Date:** 2010/03/17

#### REFERENCES

**References:** Cooper et al. 1987, Daubenmire and Daubenmire 1968, Eyre 1980, Faber-Langendoen et al. 2015, Lillybridge et al. 1995, Mauk and Henderson 1984, Pfister et al. 1977, Steele and Geier-Hayes 1995, Steele et al. 1981

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1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

## M500. Central Rocky Mountain Mesic Lower Montane Forest

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

#### OVERVIEW

**Scientific Name:** *Tsuga heterophylla* - *Abies grandis* - *Larix occidentalis* Lower Montane Forest Macrogroup

**Common Name (Translated Scientific Name):** Western Hemlock - Grand Fir - Western Larch Mesic Lower Montane Forest Macrogroup

**Type Concept:** This macrogroup encompasses mesic conifer forests and woodlands of the lower montane zone of the central Rocky Mountains and interior Pacific Northwest, including the eastern Cascades. *Abies grandis*, *Larix occidentalis*, *Pseudotsuga menziesii*, *Thuja plicata*, or *Tsuga heterophylla* are the major dominants. *Abies lasiocarpa*, *Picea engelmannii*, *Picea engelmannii* x *glauca* hybrids, *Picea glauca*, *Pinus contorta*, and *Pinus monticola* are major associates. *Pinus ponderosa* may be present but only on the warmest and driest sites. Deciduous hardwood species occur, but typically are not dominant; they include *Populus tremuloides* and *Betula papyrifera*. This macrogroup is found in the Rocky Mountains of western Montana west through northern Idaho into northeastern Washington and southern and central British Columbia, and south into the northwestern Blue Mountains of Oregon. Although in a continental climate, these forests are influenced by incursions of mild, wet, Pacific maritime air masses. Snow occurs throughout the macrogroup, but can be modified by warmer Pacific air masses even in the winter, or in the southern range, melted by rain during warm winter storms. Elevations range from 100 to 2195 m (300-7200 feet). In the Cascades, this macrogroup occurs on the upper east slopes in Washington, south of Lake Chelan and south to Mount Hood in Oregon. Occurrences are generally found on all slopes and aspects but grow best on sites with high soil moisture, such as valley bottoms, on benches, well-drained slopes, toeslopes and moist ravines. Sites supporting these forests are typically warmer and moister than the prevailing local climate. However, these are moist, non-flooded or upland sites that are not saturated year-long. At the periphery of its distribution, this macrogroup is confined to moist canyons and cooler, moister aspects. These mesic and productive forests tend to have long fire-return intervals, ranging from 150 to over 500 years for stand-replacing fires, and with moderate-severity fire intervals of 50-100 years. Gap dynamics are important in older stands. Disturbance regimes are not well-documented for the montane white spruce forests, but likely include periodic windthrow as well as fire spreading from adjacent, drier forests and woodlands. *Larix occidentalis* woodlands are maintained post-establishment by frequent, low-severity surface fires.

**Classification Comments:** Information on this macrogroup needs to be better integrated across the northwestern U.S., British Columbia and Alberta. The biogeographic line between this macrogroup and Vancouverian Lowland & Montane Forest Macrogroup (M024) needs to be more clearly determined, as there is a convergence of Rocky Mountain and east-side Cascadian floristics in the East Cascades and north into British Columbia.

~Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest Group (G211) in this macrogroup should be considered for merging with East Cascades Mesic Grand Fir - Douglas-fir Forest Group (G212) in M024; they share a number of floristic similarities, along with some differences. But perhaps those differences would be better handled as alliance-level distinctions. This needs review.

*Tsuga heterophylla* is a major tree species in the Pacific Northwest, and it is an important species in M024. This macrogroup contains western hemlock and western red-cedar associations that are confined to the interior regions of the Northwest. Certainly, there are some floristic similarities between the Northern Rockies types and those found west of the Cascades. However, there's a distinct "Rocky Mountain" set of species, i.e., *Anemone piperi*, *Aralia nudicaulis*, *Coptis occidentalis*, found in the Rocky Mountains. Further information needs to be included here for interior western hemlock and western red-cedar forests of British Columbia.

**Similar NVC Types:** Species in East Cascades forests (G212) that are absent to rare in the Northern Rockies are *Abies amabilis*, *Acer circinatum*, *Acer macrophyllum*, *Achlys triphylla*, *Anemone deltoidea*, *Anemone oregana*, *Blechnum spicant*, *Gaultheria shallon*, *Mahonia nervosa*, *Oxalis oregana*, *Picea sitchensis*, *Rhododendron macrophyllum*, *Rubus lasiococcus*, *Rubus spectabilis*, *Streptopus streptopoides*, *Vaccinium alaskaense*, and *Vaccinium parvifolium*.

- M501 Central Rocky Mountain Dry Lower Montane-Foothill Forest
- M024 Vancouverian Lowland & Montane Forest: shares some of the dominant tree species (especially the grand fir-Douglas-fir forests of the east Cascades in G212); but associated shrub and herb composition is somewhat different.

**Diagnostic Characteristics:** These productive and diverse forests dominated by *Tsuga heterophylla* and/or *Thuja plicata* in most cases are found in the interior of the Pacific Northwest, in areas under a continental climate but influenced somewhat by incursions of mild, wet, Pacific maritime air masses. Floristic affinities are with the Rocky Mountains. Some of these forests may persist for centuries, having fire-return intervals over 500 years. Other trees present can include *Abies lasiocarpa*, *Picea engelmannii* x *glauca* hybrids, *Pinus contorta*, *Pinus ponderosa*, *Populus tremuloides*, and *Pseudotsuga menziesii*. Mesic conifer forests of the central Rocky Mountains, where *Abies grandis*, *Pseudotsuga menziesii*, or *Larix occidentalis* are the major dominants.

## VEGETATION

**Physiognomy and Structure:** Generally, these are productive forests, ranging from closed-canopy to more open "savanna-like" woodlands. Composed of [usually] tall, long-lived, needle-leaved evergreen trees, sometimes composed of just one tree species, but more often are of mixed composition. Deciduous hardwoods intermingle in some occurrences; deciduous conifers are dominant in some areas. Deciduous tall and short shrubs, and perennial graminoids, forbs or ferns often form shrub and herbaceous layers, respectively. Often there is high cover of mosses. Some occurrences may lack the shrub layer. Some of these forests are the most diverse of any Rocky Mountain forest, sometimes approaching or equaling the within-stand diversity of some eastern North American forests, but the diversity resides in the shrub and herb taxa, not the trees.

**Floristics:** In the grand fir - Douglas-fir zone, *Abies grandis* is dominant and *Pseudotsuga menziesii* commonly shares the canopy. *Abies lasiocarpa*, *Larix occidentalis*, *Picea engelmannii*, *Pinus contorta*, and *Pinus monticola* are major associates. On most mesic sites, intermediate to older age stands may support some *Thuja plicata* and *Tsuga heterophylla* in the overstory. In other locations, *Tsuga heterophylla* and *Thuja plicata* are the dominants, while *Pseudotsuga menziesii* and *Abies grandis* commonly share the canopy, and *Pinus monticola*, *Pinus contorta*, *Abies lasiocarpa*, and *Larix occidentalis* are major associates. *Picea engelmannii* and *Abies lasiocarpa* may be present but only on the coldest sites, and *Pinus ponderosa* may be present but only on the warmest and driest sites or mid-seral, post-fire sites. In central British Columbia, *Tsuga heterophylla* and/or *Thuja plicata* are the dominants and are generally associated with some *Picea glauca* x *engelmannii*, *Abies lasiocarpa*, or *Pseudotsuga menziesii*. Deciduous hardwood species occur, but typically are not dominant; they include *Populus tremuloides* and *Betula papyrifera*.

Common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Cornus nuttallii*, *Mahonia nervosa*, *Menziesia ferruginea*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Symphoricarpos hesperius*, *Taxus brevifolia*, and *Vaccinium membranaceum*. *Oplopanax horridus* is common in the understory in depressional areas with high water tables. Composition of the herbaceous layer reflects local climate and degree of canopy closure; it is typically highly diverse in all but closed-canopy conditions. *Aralia nudicaulis*, *Clintonia uniflora*, *Linnaea borealis*, *Tiarella trifoliata*, *Viola orbiculata*, *Cornus canadensis*, and *Xerophyllum tenax* are common forbs in these forests. Other forbs include *Actaea rubra*, *Adenocaulon bicolor*, *Anemone piperi*, *Arnica latifolia*, *Coptis occidentalis*, *Galium triflorum*, *Goodyera oblongifolia*, *Orthilia secunda*, *Prosartes hookeri* (= *Disporum hookeri*), *Streptopus amplexifolius*, *Thalictrum occidentale*, and *Trillium ovatum*. In the eastern Cascades, *Acer circinatum*, *Achlys triphylla*, *Anemone deltoidea*, *Chrysolepis chrysophylla*, and *Vancouveria hexandra* are more common. Graminoids usually form a very minor component and typically include *Bromus vulgaris* and minor amounts of *Carex deweyana*, *Carex geyeri*, *Elymus*



*glaucus*, *Festuca subulata*, and *Oryzopsis asperifolia*. Ferns and fern allies also form an important component of the understory in many occurrences and commonly include *Athyrium filix-femina*, *Botrychium* spp., *Dryopteris filix-mas*, *Dryopteris expansa* (= *Dryopteris assimilis*), *Equisetum* spp., and *Gymnocarpium dryopteris*. Under closed-canopy conditions, a dense moss layer can form on the forest floor.

This macrogroup also includes woodlands or "savannas" of the deciduous conifer *Larix occidentalis*. Important low-growing shrubs include *Arctostaphylos uva-ursi*, *Spiraea betulifolia*, and *Vaccinium caespitosum*; taller shrubs can include *Acer glabrum*, *Ceanothus velutinus*, *Physocarpus malvaceus*, *Rubus parviflorus*, *Shepherdia canadensis*, or *Vaccinium membranaceum*. Herbaceous species include *Calamagrostis rubescens*, *Clintonia uniflora*, *Linnaea borealis*, or *Xerophyllum tenax*.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** These forests occur in areas of continental climate that are influenced somewhat by incursions of mild, wet, Pacific maritime air masses. Snow occurs throughout the macrogroup, but can be modified by warmer Pacific air masses even in the winter, or in the southern range, melted by rain during warm winter storms. Elevations range from as low as 400 m in southeastern British Columbia and 100 m along the Skeena River in northwestern British Columbia to 2195 m (2000-7200 feet). In the Cascades, it occurs on the upper east slopes in Washington, south of Lake Chelan and south to Mount Hood in Oregon. Elevations in the Cascades range from 610 to 1220 m (2000-4000 feet) in a very restricted range occupying less than 5% of the forested landscape in the East Cascades. Occurrences generally are found on all slopes and aspects but grow best on sites with high soil moisture, such as valley bottoms, on benches, well-drained slopes, toeslopes and moist ravines. However, these are moist, non-flooded or upland sites that are not saturated yearlong. At the periphery of its distribution, this macrogroup is confined to moist canyons and cooler, moister aspects. This macrogroup differs from those found west of the Cascades in having lower overall precipitation, warmer summer and colder winter temperatures, and more frequent fire (Goward and Spribille 2005).

**Climate:** This forest macrogroup is found in areas of continental temperate climate that are influenced to varying degrees by incursions of mild, wet, Pacific maritime air masses. Snow occurs throughout the macrogroup, but can be modified by warmer Pacific air masses even in the winter, or in the southern range, melted by rain during warm winter storms. In the eastern Cascades, these forests are associated with a submesic climate regime with annual precipitation ranging from 100 to 200 cm (40-80 inches) and maximum winter snowpacks that typically melt off in spring at lower elevations. This macrogroup also includes montane forests along rivers and slopes, and in mesic "coves" which were historically protected from wildfires. Further east in the Central Rockies, annual precipitation tends to be lower, averaging around 75 cm. Cooper et al. (1987) report that the interior hemlock-cedar forests require at least 20 cm of precipitation during the warm season.

**Soil/substrate/hydrology:** Parent materials are non-calcareous materials, predominately sedimentary rock and argillite. Intermittent shallow A horizons overlying a dominant B horizon indicate that volcanic ash and loess deposits have significant contribution to soil development, resulting in higher fertility and moisture-holding capacity required for supporting the dominant species. These forests occur on gravelly loams and silts with good aeration and drainage and a neutral to slightly acidic pH.

**Dynamics:** These mesic and productive forests tend to have long fire return-intervals, ranging from 150 to over 500 years for stand-replacing fires, and with moderate-severity fire intervals of 50-100 years. Gap dynamics are important in older stands. *Larix occidentalis* woodlands are maintained post-establishment by frequent, low-severity surface fires.

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

*Larix occidentalis* is a long-lived species (in excess of 700 years in the northern Rocky Mountains), and thus stands of western larch are themselves persistent. However, the life of *Larix*-dominated stands probably rarely exceeds 250 years due to various mortality sources and the in-growth of shade-tolerant species, especially on mesic sites. Occurrences of *Larix occidentalis* stands are generated by stand-replacing fire, the fire-return interval for which is speculated to be approximately 80 to 200 years (Cooper et al. 1987), but are maintained by a higher frequency, surface-fire regime. Fire suppression has led to invasion of the more shade-tolerant tree species *Abies grandis*, *Abies lasiocarpa*, *Picea engelmannii*, or *Tsuga* spp. and loss of much of the single-story canopy woodlands. *Larix occidentalis* communities occur in settings where low-intensity, high-frequency fires create open larch woodlands. These sites may be maintained in a seral status for hundreds of years since *Larix occidentalis* is a long-lived species and the understory is often dominated by *Pseudotsuga*, which will grow into the upper canopy. The potential dominants, typically *Abies lasiocarpa*, *Picea engelmannii*, and/or *Abies grandis* or rarely *Tsuga heterophylla* or *Thuja plicata*, establish and grow on these sites, presenting the distinct probability, given the fire-return intervals for this type, that the "climax" (long-term stable) condition is never attained. It has been noted in northern Idaho that, following disturbance (particularly logging) in some mesic-site occurrences, *Larix*

*occidentalis* does not necessarily replace itself, the first tree-dominated successional stages being dominated by *Pseudotsuga menziesii*, *Pinus contorta*, or less frequently by more shade-tolerant species (Cooper et al. 1987); this response is a consequence of the episodic nature of favorable cone crop years in *Larix occidentalis*.

The western red-cedar - western hemlock forests are very productive forests which have been priority stands for timber production. Typically, stand-replacement fire-return intervals are 150-500 years in the Cascades, or 150-500 years in the Northern Rockies, with moderate-severity fire-return intervals of 50-100 years. *Thuja* and *Tsuga* are capable of remaining dominant within these forests due to their longevity and *Thuja*'s ability to regenerate vegetatively. In the absence of disturbance, both species continue to regenerate under shaded conditions. Under closed-canopy conditions, both species favor vegetative reproduction over sexual reproduction, thus intermediate and young trees are found under these conditions.

#### DISTRIBUTION

**Geographic Range:** This forest and woodland macrogroup occurs in the interior lower montane regions of the Pacific Northwest, east of the Cascade Range south along the eastern Cascades from Lake Chelan south to Mount Hood in Oregon; from interior British Columbia south to eastern Washington, eastern Oregon, northern Idaho and western Montana east to the Continental Divide (DellaSala et al. 2011). In British Columbia, it occurs in the lee of the Coast Mountains in the northwest, and extensively in the mountain valleys of the southeast.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

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

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 242A:CC, 331A:CC, 342H:CP, 342I:CC, M242B:CC, M242C:CC, M242D:CC, M261G:CC, M331A:PP, M332A:CC, M332B:CP, M332E:C?, M332F:C?, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- > *Picea glauca* series (Hoffman and Alexander 1987)
- > Cedar-hemlock-pine forest (*Thuja-Tsuga-Pinus*) (Küchler 1964)
- >< Grand Fir: 213 (Eyre 1980) [Grand fir stands are an important component of this group.]
- > Grand fir-Douglas fir forest (*Abies-Pseudotsuga*) (Küchler 1964)
- >< Western Hemlock: 224 (Eyre 1980) [Moist western slopes of the northern Rocky Mountains, in northern ID, northwest MT, and northeast WA.]
- > Western Larch: 212 (Eyre 1980)
- >< Western Redcedar - Western Hemlock: 227 (Eyre 1980) [NW MT, N ID]
- >< Western Redcedar: 228 (Eyre 1980)
- >< Western White Pine: 215 (Eyre 1980)

#### LOWER LEVEL UNITS

##### Groups:

- G211 Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest
- G217 Central Rocky Mountain Interior Western Red-cedar - Western Hemlock Forest
- G212 East Cascades Mesic Grand Fir - Douglas-fir Forest

#### AUTHORSHIP

**Primary Concept Source:** A.W. Küchler (1964)

**Author of Description:** M.S. Reid, mod. K.A. Schulz, D. Meidinger, D. Faber-Langendoen

**Acknowledgments:**

**Version Date:** 06/09/2015

**Classif Resp Region:** West

**Internal Author:** DFL 7-12; MSR 10-14, mod. KAS 5-15, mod. DM/DFL 6-15

#### REFERENCES

**References:** Achuff and Corns 1982, Achuff and Dudynsky 1984a, Achuff et al. 2002, Agee 1993, Chappell et al. 1997, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DellaSala et al. 2011, Eyre 1980, Faber-Langendoen et al. 2015, Goward and Spribille 2005, Hessburg et al. 1999, Hessburg et al. 2000, Hoffman and Alexander 1987, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Küchler 1964, Leavell 2000, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Topik 1989, Topik et al. 1988, Williams et al. 1995

## 1. Forest &amp; Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

M500. Central Rocky Mountain Mesic Lower Montane Forest

**G211. Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest****Type Concept Sentence:****OVERVIEW****Scientific Name:** *Abies grandis* - *Pseudotsuga menziesii* - *Larix occidentalis* Central Rocky Mountain Forest Group**Common Name (Translated Scientific Name):** Grand Fir - Douglas-fir - Western Larch Central Rocky Mountain Forest Group

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

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

**Internal Comments:** mjr 5-13: not sure if edits made by R. Crawford & M. Manning were reviewed by NS ecologist. DFL 12-5-12: Canada confirmed based on member assoc. DFL 7-23-12: Could be that this extends to the drier part of the East Cascades, where it overlaps with G212.

**Other Comments:**

**Similar NVC Types:**

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

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

**VEGETATION**

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

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

G211 Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies grandis</i> / <i>Acer glabrum</i> Forest	G3/S2	CEGL000267
<i>Abies grandis</i> / <i>Calamagrostis rubescens</i> Woodland	G4?/S4	CEGL000916
<i>Abies grandis</i> / <i>Carex geyeri</i> Woodland	G3/S3	CEGL000917
<i>Abies grandis</i> / <i>Clintonia uniflora</i> Forest	G5/S3	CEGL000272
<i>Abies grandis</i> / <i>Linnaea borealis</i> Forest	G3/S3	CEGL000275
<i>Abies grandis</i> / <i>Physocarpus malvaceus</i> Forest	G3/S2	CEGL000277
<i>Abies grandis</i> / <i>Spiraea betulifolia</i> Forest	G2/S2?	CEGL000281
<i>Abies grandis</i> / <i>Symphoricarpos albus</i> Forest	G3?/SNA	CEGL000282
<i>Abies grandis</i> / <i>Taxus brevifolia</i> Forest	G3/S1	CEGL000283
<i>Abies grandis</i> / <i>Trautvetteria caroliniensis</i> Forest	G3/S1S2	CEGL000285
<i>Abies grandis</i> / <i>Vaccinium caespitosum</i> Forest	G2/SNR	CEGL000288
<i>Larix occidentalis</i> / <i>Clintonia uniflora</i> Forest	GNR/SNR	CEGL005880
<i>Larix occidentalis</i> / <i>Clintonia uniflora</i> - <i>Xerophyllum tenax</i> Forest	GNR/SNR	CEGL005881
<i>Larix occidentalis</i> / <i>Vaccinium caespitosum</i> Forest	GNR/SNR	CEGL005882
<i>Larix occidentalis</i> / <i>Vaccinium caespitosum</i> / <i>Clintonia uniflora</i> Forest	GNR/SNR	CEGL005883
<i>Pinus contorta</i> / <i>Vaccinium membranaceum</i> Forest	G4?/S4/	CEGL000170
<i>Pinus contorta</i> / <i>Vaccinium membranaceum</i> Rocky Mountain Forest	G3G4/SNR	CEGL000169
<i>Pinus monticola</i> / <i>Clintonia uniflora</i> Forest	G1Q/S1	CEGL000176
<i>Pseudotsuga menziesii</i> / <i>Physocarpus malvaceus</i> - <i>Linnaea borealis</i> Forest	G4/S4	CEGL000448
<i>Pseudotsuga menziesii</i> / <i>Vaccinium caespitosum</i> Forest	G5/S3	CEGL000465
<i>Pseudotsuga menziesii</i> / <i>Vaccinium membranaceum</i> Forest	G5?/S3	CEGL000466
<i>Pseudotsuga menziesii</i> / <i>Vaccinium spp.</i> Forest	G4Q/S3S4	CEGL000464

#### ENVIRONMENT & DYNAMICS

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

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

*Larix occidentalis* is a long-lived species (in excess of 700 years in the Northern Rocky Mountains), and thus stands of western larch are themselves persistent. However, the life of *Larix*-dominated stands probably rarely exceeds 250 years due to various mortality sources and the in-growth of shade-tolerant species, especially on mesic sites. Occurrences of *Larix occidentalis* stands are

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

#### DISTRIBUTION

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

**Nations:** CA, US

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

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

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

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

#### SYNONYMY

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

#### LOWER LEVEL UNITS

##### Alliances:

- A3362 *Abies grandis* - *Pseudotsuga menziesii* Forest & Woodland Alliance
- A0275 *Larix occidentalis* Forest Alliance
- A0133 *Pinus monticola* Forest Alliance

#### AUTHORSHIP

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

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

**Acknowledgments:** R. Crawford, M. Manning

**Version Date:** 2013/05/30

#### REFERENCES

**References:** Agee 1993, Chappell et al. 1997, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Eyre 1980, Faber-Langendoen et al. 2015, Hessburg et al. 2000, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Leavell 2000, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Williams et al. 1995

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1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

M500. Central Rocky Mountain Mesic Lower Montane Forest

### G217. Central Rocky Mountain Interior Western Red-cedar - Western Hemlock Forest [Proposed]

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Thuja plicata* - *Tsuga heterophylla* Central Rocky Mountain Forest Group

**Common Name (Translated Scientific Name):** Western Red-cedar - Western Hemlock Central Rocky Mountain Forest Group

**Type Concept:** This forest group occurs in the Northern Rockies west of the Continental Divide within the maritime-influenced climatic zone of the Northern Rocky Mountains of western Montana, west into northeastern Washington and southern British

Columbia. These are forests dominated by *Tsuga heterophylla* and *Thuja plicata* in most cases, found in areas influenced by incursions of mild, wet, Pacific maritime air masses. Much of the annual precipitation occurs as rain, 25-50% falls as snow. Snowpacks are often melted by rain during warm winter storms. Occurrences generally are found on all slopes and aspects but grow best on sites with high soil moisture, such as toeslopes and bottomlands. At the periphery of its distribution, this group is confined to moist canyons and cooler, moister aspects. Generally these are moist, non-flooded or upland sites that are not saturated yearlong. Along with *Tsuga heterophylla* and *Thuja plicata*, *Pseudotsuga menziesii* commonly shares the canopy, and *Pinus monticola*, *Pinus contorta*, *Abies grandis*, *Taxus brevifolia*, and *Larix occidentalis* are major associates. *Cornus nuttallii* may be present in some situations. *Picea engelmannii*, *Abies lasiocarpa*, and *Pinus ponderosa* may be present but only on the coldest or warmest and driest sites. *Linnaea borealis*, *Mahonia nervosa*, *Paxistima myrsinites*, *Acer glabrum*, *Spiraea betulifolia*, *Symphoricarpos hesperius* (= *Symphoricarpos mollis* ssp. *hesperius*), *Cornus canadensis*, *Rubus parviflorus*, *Menziesia ferruginea*, and *Vaccinium membranaceum* are common shrub species. The composition of the herbaceous layer reflects local climate and degree of canopy closure; it is typically highly diverse in all but closed-canopy conditions. Important forbs and ferns include *Actaea rubra*, *Achlys triphylla*, *Anemone piperi*, *Aralia nudicaulis*, *Asarum caudatum*, *Clintonia uniflora*, *Coptis occidentalis*, *Thalictrum occidentale*, *Tiarella trifoliata*, *Trientalis borealis*, *Trillium ovatum*, *Viola glabella*, *Gymnocarpium dryopteris*, *Polystichum munitum*, and *Adiantum pedatum*. Typically, stand-replacement, fire-return intervals are 150-500 years, with moderate-severity fire intervals of 50-100 years. Species in East Cascade forests (G212) that are absent to rare in the Northern Rockies are *Picea sitchensis*, *Abies amabilis*, *Acer macrophyllum*, *Acer circinatum*, *Gaultheria shallon*, *Rhododendron macrophyllum*, *Mahonia nervosa*, *Rubus spectabilis*, *Vaccinium alaskaense*, *Vaccinium parvifolium*, *Blechnum spicant*, *Achlys triphylla*, *Oxalis oregana*, *Anemone deltoidea*, *Anemone oregana*, *Rubus lasiococcus*, and *Streptopus streptopoides*.

**Classification Comments:** *Tsuga heterophylla* is a major tree species in the Pacific Northwest, and there are many other groups where it is a dominant species. This group contains western hemlock and western red-cedar associations that are confined to the interior regions of the Northwest. Certainly, there are some floristic similarities between the Northern Rockies types and those found west of the Cascades. However, there's a distinct "Rocky Mountain" set of species i.e., *Anemone piperi*, *Aralia nudicaulis*, *Coptis occidentalis*, found in this group. Further information needs to be included here for interior western hemlock and western red-cedar forests of British Columbia. Concept needs to be narrowed to remove the East Cascadian portion of this group.

**Internal Comments:** DFL 7-23-12: BEC = Interior Cedar-Hemlock.

**Other Comments:**

**Similar NVC Types:**

- G212 East Cascades Mesic Grand Fir - Douglas-fir Forest
- G211 Central Rocky Mountain Mesic Grand Fir - Douglas-fir Forest

**Diagnostic Characteristics:** Productive and diverse forests dominated by *Tsuga heterophylla* and/or *Thuja plicata* in most cases, found in the interior of the Pacific Northwest, in areas influenced by incursions of mild, wet, Pacific maritime air masses. Floristic affinities are with the Rocky Mountains. These forests persist for centuries, having fire-return intervals often >500 years.

## VEGETATION

**Physiognomy and Structure:** These are productive forests composed of tall, long-lived, needle-leaved evergreen trees, sometimes composed of just one tree species, but more often are of mixed composition. Deciduous tall and short shrubs, and perennial forbs and ferns often form shrub and herbaceous layers, respectively. These forests are the most diverse of any Rocky Mountain forest, sometimes approaching or equaling the within-stand diversity of some eastern North American forests, but the diversity resides in the shrub and herb taxa, not the trees.

**Floristics:** In addition to the dominant *Tsuga heterophylla* and *Thuja plicata*, *Pseudotsuga menziesii* and *Abies grandis* commonly share the canopy, and *Pinus monticola*, *Pinus contorta*, *Abies grandis*, *Abies lasiocarpa*, and *Larix occidentalis* are major associates. *Picea engelmannii* and *Abies lasiocarpa* may be present but only on the coldest sites, and *Pinus ponderosa* may be present but only on the warmest and driest sites. Common shrubs include *Paxistima myrsinites*, *Acer glabrum*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Cornus canadensis*, *Rubus parviflorus*, *Menziesia ferruginea*, *Taxus brevifolia*, and *Vaccinium membranaceum*. *Oplopanax horridus* is common in the understory in depressional areas with high water tables. Composition of the herbaceous layer reflects local climate and degree of canopy closure; it is typically highly diverse in all but closed-canopy conditions. *Clintonia uniflora*, *Tiarella trifoliata*, *Xerophyllum tenax*, and *Viola orbiculata* are the most common forbs in these forests. Other forbs include *Actaea rubra*, *Adenocaulon bicolor*, *Aralia nudicaulis*, *Arnica* spp., *Galium triflorum*, *Goodyera oblongifolia*, *Linnaea borealis*, *Orthilia secunda*, *Streptopus amplexifolius*, *Thalictrum occidentale*, and *Trillium ovatum*. *Asarum caudatum* occurs in the Kootenai and Yak river areas of extreme northwestern Montana. Ferns and fern allies also form an important component of the understory and commonly include *Athyrium filix-femina*, *Botrychium* spp., *Dryopteris filix-mas*, *Equisetum* spp., *Gymnocarpium dryopteris*, and *Polystichum munitum*. Under closed-canopy conditions, a dense moss layer can form on the forest floor. Graminoids usually form a very minor

component and typically include *Bromus vulgaris*, *Carex deweyana*, *Carex geyeri*, *Elymus glaucus*, *Festuca subulata*, and *Oryzopsis asperifolia*.

G217 Central Rocky Mountain Interior Western Red-cedar - Western Hemlock Forest Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Thuja plicata</i> / <i>Aralia nudicaulis</i> Forest	G2/S2	CEGL000471
<i>Thuja plicata</i> / <i>Asarum caudatum</i> Forest	G5/SNR	CEGL000472
<i>Thuja plicata</i> / <i>Clintonia uniflora</i> - <i>Xerophyllum tenax</i> Forest	G4?/SNR	CEGL005930
<i>Thuja plicata</i> / <i>Clintonia uniflora</i> Forest	G4/S3	CEGL000474
<i>Thuja plicata</i> / <i>Vaccinium membranaceum</i> Forest	G3G4/SNR	CEGL000487
<i>Tsuga heterophylla</i> / <i>Aralia nudicaulis</i> Forest	G3/SNR	CEGL000488
<i>Tsuga heterophylla</i> / <i>Asarum caudatum</i> Forest	G4/SNR	CEGL000490
<i>Tsuga heterophylla</i> / <i>Athyrium filix-femina</i> Forest	G2Q/SNR	CEGL000491
<i>Tsuga heterophylla</i> / <i>Clintonia uniflora</i> Forest	G4/S4	CEGL000493
<i>Tsuga heterophylla</i> / <i>Menziesia ferruginea</i> Forest	G2/S2	CEGL000496
<i>Tsuga heterophylla</i> / <i>Rubus pedatus</i> Forest	G2/S2	CEGL000113
<i>Tsuga heterophylla</i> / <i>Xerophyllum tenax</i> Forest	G2/S2	CEGL000499

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This forest group is found in areas influenced by incursions of mild, wet, Pacific maritime air masses. Much of the annual precipitation occurs as rain, but where snow does occur, it can generally be melted by rain during warm winter storms. In the Cascades, it occurs on the upper east slopes in Washington, south of Lake Chelan and south to Mount Hood in Oregon. Elevations in the Cascades range from 610 to 1220 m (2000-4000 feet) in a very restricted range occupying less than 5% of the forested landscape in the East Cascades. In this region, these forests are associated with a submesic climate regime with annual precipitation ranging from 100 to 200 cm (40-80 inches) and maximum winter snowpacks that typically melt off in spring at lower elevations. Further east in the Northern Rockies, annual precipitation tends to be lower, averaging around 75 cm, while the elevation ranges from 550 m to over 1600 m (1700-5248 feet). Cooper et al. (1987) report that these interior hemlock-cedar forests require at least 20 cm of precipitation during the warm season. Occurrences generally are found on all slopes and aspects but grow best on sites with high soil moisture, such as toeslopes and bottomlands. At the periphery of its distribution, this group is confined to moist canyons and cooler, moister aspects. Generally these are moist, non-flooded or upland sites that are not saturated yearlong. This group differs from west of the Cascade groups in lower overall precipitation, warmer summer and colder winter temperatures, and more frequent fire (Goward and Spribille 2005).

**Climate:** This forest group is found in areas influenced by incursions of mild, wet, Pacific maritime air masses. Much of the annual precipitation occurs as rain, but where snow does occur, it can generally be melted by rain during warm winter storms. In the East Cascades, these forests are associated with a submesic climate regime with annual precipitation ranging from 100 to 200 cm (40-80 inches) and maximum winter snowpacks that typically melt off in spring at lower elevations. Further east in the Northern Rockies, annual precipitation tends to be lower, averaging around 75 cm. Cooper et al. (1987) report that these interior hemlock-cedar forests require at least 20 cm of precipitation during the warm season. **Soil/substrate/hydrology:** Parent materials are predominately sedimentary rock and argillite. Volcanic ash and loess deposits may have an influence on soil development, resulting in higher fertility and moisture-holding capacity required for supporting the dominant species. These forests occur on gravelly loams and silts with good aeration and drainage and a neutral to slightly acidic pH.

**Dynamics:** These are very productive forests which have been priority stands for timber production. Typically, stand-replacement fire-return intervals are 150-500 years in the Cascades, or 150-500 years in the Northern Rockies, with moderate-severity fire-return intervals of 50-100 years. *Thuja* and *Tsuga* are capable of remaining dominant within these forests due to their longevity and *Thuja*'s ability to regenerate vegetatively. In the absence of disturbance, both species continue to regenerate under shaded conditions. Under closed-canopy conditions, both species favor vegetative reproduction over sexual reproduction, thus intermediate and young trees are found under these conditions.

### DISTRIBUTION

**Geographic Range:** This forest group occurs in the interior regions of the Pacific Northwest, east of the Cascades; from interior British Columbia south to eastern Washington, Oregon, northern Idaho and western Montana east to the Continental Divide (DellaSala et al. 2011).

**Nations:** CA, US

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

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

**USFS Ecoregions (2007):** 242A:CC, 331A:CC, 342H:CP, 342I:CC, M242B:CC, M242C:CC, M242D:CC, M261G:CC, M331A:PP, M332A:CC, M332B:CP, M332E:C?, M332F:C?, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

- >< Western Hemlock: 224 (Eyre 1980) [Moist western slopes of the northern Rocky Mountains, in northern ID, northwest MT, and northeast WA.]
- >< Western Redcedar - Western Hemlock: 227 (Eyre 1980) [NW MT, N ID]
- >< Western Redcedar: 228 (Eyre 1980)

#### LOWER LEVEL UNITS

##### Alliances:

- A3612 *Tsuga heterophylla* - *Thuja plicata* Cool-Mesic Forest & Woodland Alliance
- A3613 *Tsuga heterophylla* - *Thuja plicata* Warm-Mesic Forest & Woodland Alliance

#### AUTHORSHIP

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

**Author of Description:** M.S. Reid

**Acknowledgments:** R. Crawford

**Version Date:** 2013/06/05

#### REFERENCES

**References:** Cooper et al. 1987, Daubenmire and Daubenmire 1968, DellaSala et al. 2011, Eyre 1980, Faber-Langendoen et al. 2015, Goward and Spribille 2005, Hessburg et al. 1999, Hessburg et al. 2000, Lillybridge et al. 1995, Meidinger and Pojar 1991, Pfister et al. 1977, Topik 1989, Topik et al. 1988, Williams et al. 1995

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1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

M500. Central Rocky Mountain Mesic Lower Montane Forest

## G212. East Cascades Mesic Grand Fir - Douglas-fir Forest [Proposed]

**Type Concept Sentence:**

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#### OVERVIEW

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

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

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



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

**Internal Comments:** KAS 5-15: CA changed to ?. MSR 11-14: some associations in this group are coastal (not RM) and may need to go into M024. DFL 11-20-12: CA added. mjr 10-12: CA added based on member association distribution. DFL 7-23-12: Moved to M024, and eastern parts of Cascades that lacks coastal flora goes with G211. More likely to be Interior Doug fir? Could be a mix. Coastal flora that is absent in G211 include Gaultheria shallon, Vaccinium Mahonia nervosa, Bigleaf maple, (vine maple?), Rhytidadelphus. Pinegrass present in G211.

**Other Comments:**

**Similar NVC Types:**

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

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

**VEGETATION**

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

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

G212 East Cascades Mesic Grand Fir - Douglas-fir Forest Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies grandis</i> - <i>Pseudotsuga menziesii</i> / <i>Trientalis borealis</i> ssp. <i>latifolia</i> Forest	G3/S2	CEGL000040
<i>Abies grandis</i> - <i>Thuja plicata</i> / <i>Achlys triphylla</i> Forest	G2/S2	CEGL002669
<i>Abies grandis</i> / <i>Acer circinatum</i> Forest	G4/S3	CEGL000266
<i>Abies grandis</i> / <i>Achlys triphylla</i> Forest	G3/S3	CEGL000268
<i>Abies grandis</i> / <i>Arctostaphylos nevadensis</i> Woodland	G2G3/S3	CEGL000915
<i>Abies grandis</i> / <i>Cornus nuttallii</i> - <i>Acer glabrum</i> Forest	G1/S1	CEGL001104
<i>Abies grandis</i> / <i>Holodiscus discolor</i> Forest	G2G3/S2	CEGL000274
<i>Abies grandis</i> / <i>Mahonia nervosa</i> Forest	G1/S1	CEGL000271
<i>Abies grandis</i> / <i>Orthilia secunda</i> Forest	G3/SNA	CEGL000279
<i>Abies grandis</i> / <i>Vaccinium membranaceum</i> - <i>Achlys triphylla</i> Forest	G2G3/S2S3	CEGL000291
<i>Abies grandis</i> / <i>Vaccinium membranaceum</i> Forest	G3G4/S3	CEGL000290
<i>Tsuga heterophylla</i> / <i>Arctostaphylos nevadensis</i> Woodland	G3/S3	CEGL000913
<i>Tsuga heterophylla</i> / <i>Linnaea borealis</i> Forest	G3/S3	CEGL000104
<i>Tsuga heterophylla</i> / <i>Tiarella trifoliata</i> - <i>Gymnocarpium dryopteris</i> Forest	G3/S3	CEGL000116

## ENVIRONMENT & DYNAMICS

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

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

## DISTRIBUTION

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

**Nations:** CA, US

**States/Provinces:** CA?, OR, WA

**TNC Ecoregions [optional]:** 4:C

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

## SYNONYMY

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

## LOWER LEVEL UNITS

### Alliances:

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

## AUTHORSHIP

**Primary Concept Source:** C. Topik (1989)

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

**Acknowledgments:** R. Crawford

**Version Date:** 2013/05/30

## REFERENCES

**References:** Carstens et al. 2005, Eyre 1980, Faber-Langendoen et al. 2015, Goward and Spribille 2005, Hessburg et al. 1999, Hessburg et al. 2000, Lillybridge et al. 1995, Topik 1989, Topik et al. 1988

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1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

## M020. Rocky Mountain Subalpine-High Montane Conifer Forest

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

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## OVERVIEW

**Scientific Name:** *Abies lasiocarpa* - *Picea engelmannii* - *Pinus albicaulis* Rocky Mountain Forest Macrogroup

**Common Name (Translated Scientific Name):** Subalpine Fir - Engelmann Spruce - Whitebark Pine Rocky Mountain Forest Macrogroup

**Type Concept:** This diverse forest and woodland macrogroup of the mountainous western U.S. and southern Canada is characteristic of the higher elevations (upper montane to subalpine zones) of this large region. Generally these forests and woodlands form the

elevationally uppermost forests of the Rocky Mountains, including the upper treeline ecotone with the alpine. They are mostly composed of evergreen conifers, but some broad-leaved cold-deciduous trees are often found, and (very locally) cold-deciduous conifers. This macrogroup ranges from nearly closed-canopy forests to very open or patchy short-statured woodlands, clumps of tree islands or ribbons with intervening grasslands or shrublands. At the highest settings or those most exposed to wind, the trees can be flagged or damaged from blowing snow and ice-crystals and severe cold. Shrub and herb layers vary widely, with tall or short cold-deciduous or evergreen shrubs dominating the undergrowth, or in some cases with few or no shrubs and perennial forbs, grasses or sedges the predominant growth forms. Characteristic trees include *Abies lasiocarpa*, *Larix lyallii*, *Picea engelmannii*, *Pinus albicaulis*, *Pinus aristata*, *Pinus contorta*, *Pinus flexilis*, *Pinus longaeva*, *Populus tremuloides*, and *Tsuga mertensiana* (which is also important in Pacific maritime macrogroups). Shrub and herb taxa are highly diverse. These are the matrix forests of the upper montane and subalpine zone of this region, with elevations ranging from 900 m (2950 feet) in the north to 3670 m (12,000 feet) in the south and for the subalpine-alpine transitions. They often form the upper-treeline transition to alpine tundra or dwarf-shrublands. Topography is variable; these forests or woodlands are found on gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, shoulder slopes, cirque headwalls, plateau-like surfaces, basins, toeslopes, alluvial terraces, well-drained benches, and inactive stream terraces. Patterning of which forest types occur in some locations is driven by the interaction between snow deposition, desiccating winds, soil and substrate characteristics, and the interacting effects of precipitation, temperature and both latitude and elevation/aspect. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations, occurrences are restricted by lack of moisture and are found on cooler north aspects and mesic microsites. Occurrences in this macrogroup often originate from, and are likely maintained by, stand-replacing disturbances such as avalanche, crown fire, insect outbreaks, disease, occasional windthrow, or clearcutting by man or flooding by beaver. Fire regimes are generally mixed-severity or stand-replacing, and of long return intervals, occurring from 150 to 500 years. Insect outbreaks are more frequent, every 30-50 years in some types, and can alter both the structure and composition of stands.

**Classification Comments:** In British Columbia, *Populus tremuloides* is not a species of these elevations - the boundary to Central Rocky Mountain Dry Lower Montane-Foothill Forest Macrogroup (M501) may be an issue here (D. Meidinger pers. comm. 2014). Further information on Central Rocky Mountain Montane White Spruce Forest Group (G345) in Rocky Mountain Subalpine-High Montane Conifer Forest Macrogroup (M020) in British Columbia is found in Meidinger and Pojar (1991) and in Alberta in Achuff and Corns (1982), Achuff and Dudynsky (1984a), Achuff et al. (2002), and Natural Regions Committee (2006). No sources are currently known for Montana. The full geographic extent and distinguishing / diagnostic features of G345 require further work. As of 2013, the association lists for the Alberta and British Columbia parts have not been integrated.

**Similar NVC Types:** Some of the dominant trees in this macrogroup can occur in other macrogroups; for example *Picea engelmannii* can be found in swampy bottomlands or in riparian settings with other shrubs and trees characteristic of floodplain forests (Rocky Mountain & Great Basin Montane Riparian Forest Macrogroup (M034)). Also stands where *Populus tremuloides* is mixed with conifers of the lower montane zone (such as *Pinus ponderosa* or *Pseudotsuga menziesii*) will not be classified in this macrogroup, but will be in either M022 or M501.

- M501 Central Rocky Mountain Dry Lower Montane-Foothill Forest: shares some floristics at ecotones, or due to long-lived seral species persisting in M020.
- M022 Southern Rocky Mountain Lower Montane Forest: shares some floristics at ecotones, or due to long-lived seral species persisting in M020.

**Diagnostic Characteristics:** Forests and woodlands of the mountainous western U.S. and southern Canada with a suite of tree species characteristic of the higher elevations (upper montane to subalpine zones) of this large region, including *Abies lasiocarpa*, *Larix lyallii*, *Picea engelmannii*, *Pinus albicaulis* (less characteristic in British Columbia), *Pinus aristata*, *Pinus contorta*, *Pinus flexilis*, *Pinus longaeva*, *Populus tremuloides*, and *Tsuga mertensiana*. The characteristic pines in this macrogroup are members of the *Pinus* subgenus *Haploxylon*, the white pines. Associated shrub and herb taxa are also indicative of higher elevation settings (e.g., cooler/moister), and in some cases are species generally found at upper treeline and transitions into the alpine.

## VEGETATION

**Physiognomy and Structure:** These forests and woodlands are mostly composed of evergreen conifers, but some broad-leaved cold-deciduous trees are often found, and (very uncommonly) cold-deciduous conifers. They can range from nearly closed-canopy forests to very open or patchy short-statured woodlands, or clumps of tree islands or ribbons with intervening grasslands or shrublands, with stands becoming more open and patchy with increased elevation. At the highest settings or those most exposed to wind, the trees can be flagged or damaged from blowing snow and ice-crystals and severe cold. Shrub and herb layers vary widely, with tall or short cold-deciduous or evergreen shrubs dominating the undergrowth, or in some cases with few or no shrubs and perennial forbs, grasses or sedges the predominant growth forms. Cover of shrubs and herbs varies from none to very high depending on environmental setting, time since disturbance, and microclimate factors. Nonvascular species (mosses, lichens, fungi, or soil cryptogams) also vary, but both dry and mesic forests in this macrogroup can have high cover of nonvascular taxa on the forest floor and on decaying woody debris.

**Floristics:** These forests and woodlands have a suite of tree species characteristic of the higher elevations (upper montane to subalpine zones), including *Abies lasiocarpa*, *Larix lyallii*, *Picea engelmannii*, *Pinus albicaulis*, *Pinus aristata*, *Pinus contorta*, *Pinus flexilis*, *Pinus longaeva*, *Populus tremuloides*, and *Tsuga mertensiana*. Other trees may occur but are either long-lived seral taxa (*Pseudotsuga menziesii*) or are found in transitions to lower montane forests, such as *Abies concolor*, *Juniperus scopulorum*, *Picea pungens*, *Pinus ponderosa*, *Pinus edulis*, *Pinus monophylla*, *Tsuga heterophylla*, or from adjacent riparian forests, such as *Populus angustifolia*. Canopies can be mixed or dominated by a single species. Some species are more restricted in range: for example, *Tsuga mertensiana* and *Larix lyallii* occur in southern British Columbia, Montana and Idaho west and north, but are not found further south or north; *Pinus longaeva* is found in the Great Basin and Sierra Nevada, while *Pinus aristata* is restricted to the central and southern mountains of Colorado and northern New Mexico.

Shrub species are highly variable, and typically are cold-deciduous or sometimes evergreen. Common shrubs in the U.S. part of the range include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia tridentata*, *Ceanothus velutinus*, *Jamesia americana*, *Juniperus communis*, *Lonicera utahensis*, *Physocarpus malvaceus*, *Prunus virginiana*, *Purshia tridentata*, *Ribes montigenum*, *Rosa woodsii*, *Rhamnus alnifolia*, *Ribes inerme*, *Rubus parviflorus*, *Shepherdia canadensis*, *Symphoricarpos albus*, *Symphoricarpos oreophilus*, and the dwarf-shrubs *Arctostaphylos uva-ursi*, *Linnaea borealis*, *Mahonia repens* and several *Vaccinium* spp. More mesic sites, across the entire range, can include the shrubs *Cornus canadensis*, *Empetrum nigrum*, *Ledum glandulosum*, *Menziesia ferruginea*, *Phyllodoce empetriformis*, *Rhododendron albiflorum*, *Salix brachycarpa*, *Salix glauca*, *Spiraea betulifolia*, and *Vaccinium membranaceum*. Examples in the Great Basin and Sierra Nevada might include *Arctostaphylos patula*, *Artemisia arbuscula*, *Artemisia tridentata* ssp. *vaseyana*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, *Chrysolepis sempervirens*, *Ericameria discoidea*, *Juniperus communis*, *Ribes cereum*, and *Ribes montigenum*.

Associated herbaceous species are especially diverse given the wide elevational and latitudinal range, with alpine species occurring near the upper treeline and montane and subalpine species below. Mesic stands include herbaceous species such as *Actaea rubra*, *Calamagrostis canadensis*, *Carex siccata*, *Clintonia uniflora*, *Erigeron eximius*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Gymnocarpium dryopteris*, *Heracleum maximum*, *Luzula glabrata* var. *hitchcockii*, *Maianthemum stellatum*, *Oryzopsis asperifolia*, *Osmorhiza berteroi*, *Osmorhiza occidentalis*, *Packera cardamine*, *Packera sanguisorboides*, *Pedicularis racemosa*, *Rubus pedatus*, *Rudbeckia occidentalis*, *Saxifraga bronchialis*, *Senecio triangularis*, *Thalictrum fendleri*, *Tiarella* spp., *Valeriana occidentalis*, *Valeriana sitchensis*, and *Xerophyllum tenax*. Drier sites close to the alpine might include xeric graminoids, such as *Calamagrostis purpurascens*, *Festuca arizonica*, *Festuca idahoensis*, *Festuca thurberi*, *Leucopoa kingii*, *Muhlenbergia filiculmis*, *Muhlenbergia montana*, *Poa fendleriana*, and *Trisetum spicatum*. Highest elevation stands have a floristic component of typically subalpine and alpine plants, such as *Carex elynoides*, *Carex rupestris*, *Erigeron peregrinus*, *Phlox pulvinata*, *Sedum lanceolatum*, or *Trifolium dasyphyllum*. Other scattered forbs may include species of *Achillea*, *Antennaria*, *Arenaria*, *Arnica*, *Astragalus*, *Artemisia*, *Campanula*, *Erigeron*, *Hymenoxys*, *Penstemon*, *Polemonium*, *Senecio*, and *Thalictrum*.

In the Great Basin and Sierra Nevada common herb species may include *Antennaria rosea*, *Aquilegia scopulorum*, *Arabis drummondii*, *Arenaria congesta*, *Arenaria kingii*, *Astragalus kentrophyta*, *Astragalus platytropis*, *Calamagrostis rubescens*, *Carex rossii*, *Cirsium eatonii*, *Cymopterus cinerarius*, *Cymopterus nivalis*, *Elymus elymoides*, *Eriogonum gracilipes*, *Eriogonum holmgrenii*, *Eriogonum ovalifolium*, *Erigeron pygmaeus*, *Erigeron tener*, *Festuca brachyphylla*, *Koeleria macrantha*, *Leptodactylon pungens*, *Packera wernerifolia*, *Penstemon leiophyllus*, *Poa fendleriana*, *Phlox pulvinata*, *Trifolium gymnocarpon*, and *Trisetum spicatum*. *Selaginella watsonii* is common in some high-elevation stands.

In aspen forests, at least in the U.S. portion of the range, the herbaceous layers may be lush and diverse. Common graminoids may include *Bromus carinatus*, *Calamagrostis rubescens*, *Carex siccata* (= *Carex foenea*), *Carex geyeri*, *Carex rossii*, *Elymus glaucus*, *Elymus trachycaulus*, *Festuca thurberi*, and *Hesperostipa comata*. Associated forbs may include *Achillea millefolium*, *Aconitum columbianum*, *Delphinium* spp., *Eucephalus engelmannii* (= *Aster engelmannii*), *Geranium viscosissimum*, *Heracleum sphondylium*, *Ligusticum filicinum*, *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pteridium aquilinum*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, *Valeriana occidentalis*, *Wyethia amplexicaulis*, and many others. In California, *Symphotrichum spathulatum* (= *Aster occidentalis*) is a common forb. Exotic grasses such as the perennials *Poa pratensis* and *Bromus inermis* and the annual *Bromus tectorum* are often common in occurrences due to grazing disturbance.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** These are the matrix forests of the upper montane and subalpine zone of this region, with elevations ranging from 900 m (2950 feet) in its northern distribution to 3670 m (12,000 feet) in the south and for the subalpine-alpine transitions. They often form the upper-treeline transition to alpine tundra or dwarf-shrublands. Topography is variable; these forests or woodlands are found on gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, shoulder slopes, cirque headwalls, plateau-like surfaces, basins, toeslopes, alluvial terraces, well-drained benches, and inactive stream terraces. Patterning of which forest types occur in some locations is driven by the interaction between snow deposition, desiccating winds, soil and substrate characteristics, and the interacting effects of precipitation, temperature and both latitude and elevation/aspect. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations, occurrences are restricted by lack of moisture and are found on cooler north aspects and mesic microsites.

**Climate:** Climate is temperate with a growing season ranging from long for some of the lower elevation occurrences to short at the highest and most exposed sites. Winters are typically cold and in many forests deep snowpacks are common; summers are

cool for some of these forests. Frost is possible almost all summer and may be common in restricted topographic basins and benches, and places with cold-air ponding. Mean annual precipitation is generally greater than 38 cm (15 inches) and in some areas is over 150 cm (59 inches), and rarely up to 240 cm in British Columbia (Lloyd et al. 1990). Much of the annual precipitation occurs as snow; summer convective showers can contribute to annual totals, as do spring rains in the more northern areas where incursions from the Pacific bring moisture inland. In some forest types, late-melting snowpacks provide the majority of growing season moisture. Some sites have little snow accumulation because of high winds and sublimation.

*Soil/substrate/hydrology:* Substrates are highly variable, including igneous, metamorphic and sedimentary origins. Most areas have been glaciated, and glacial tills or colluvium occur. Volcanic activity is also common, with both intrusive rocks and pumice or ash deposits occurring. Valley occurrences can be found on alluvium. Acidic versus calcareous chemistry is an important factor for some forest types within this macrogroup. Soils are similarly variable, and range from deep and well-developed to shallow and rocky, or in some cases the forests or woodlands occur on rock outcrops or in areas where bedrock is within a few centimeters of the surface. Textures range from sandy loams to clay loams. Most communities in this macrogroup will be found on well-drained to excessively well-drained sites.

**Dynamics:** Occurrences in this macrogroup often originate from, and are likely maintained by, stand-replacing disturbances such as avalanche, crown fire, insect outbreaks, disease, occasional windthrow, or clearcutting by man or flooding by beaver. Fire regimes are generally mixed-severity or stand-replacing, and of long return intervals, occurring from 150 to 500 years. Insect outbreaks are more frequent, every 30-50 years in some types, and can alter both the structure and composition of stands.

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

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

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

Both *Pinus longaeva* and *Pinus flexilis* are slow-growing, long-lived trees that are intolerant of shade. *Pinus longaeva* may attain nearly 4900 years in age and 12 m in height, whereas *Pinus flexilis* may live 1000 years and attain 18 m in height. Bristlecone pine branches retain needles for as long as 30 years, whereas limber pine needles are lost after several years. Bristlecone pine trees produce dense, resinous wood that is resistant to rot and disease. Mature trees have massive, contorted trunks with mostly dead and gnarled wood (Sawyer et al. 2009). Natural regeneration of *Pinus flexilis* appears to be closely associated with caching of the large wingless seeds, primarily by Clark's nutcracker (*Nucifraga columbiana*) (Lanner and Vander Wall 1980). Germination of cached seeds often results in the multi-stemmed clumps characteristic of these sites, although the species may produce multiple stems from boles damaged near the ground. Germination and rooting will sometimes be restricted to crevices in rock. *Pinus longaeva* has smaller winged seeds and should be wind-disseminated. However, caching by nutcrackers does take place, especially when other *Pinus* species are also available (Dr. R. Lanner pers. comm.). Fires seldom destroy these woodlands due to the sparse nature of the canopy cover of trees and abundant bare ground. Peet (1978a, 1981) notes that *Pinus aristata* is dominant at higher elevations in

much of the southern Rocky Mountains, where *Pinus flexilis* is restricted to lower elevations. This is attributed to apparent competitive exclusion, because *Pinus flexilis* is dominant at high elevations in northern Colorado, Wyoming and Montana.

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

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

Pests include the mountain pine beetle (*Dendroctonus ponderosae*), which has killed many mature trees in the past, during epidemics where populations of the beetle build up in lower elevation *Pinus contorta* stands, then move up into the *Pinus albicaulis* regions (Steel et al. 1983, Burns and Honkala 1990a, Schmidt and McDonald 1990). The exotic pathogen white pine blister rust (*Cronartium ribicola*) is attacking and killing *Pinus albicaulis* trees in many parts of the interior northwestern U.S. It is especially destructive in more mesic habitats that favor infection of its alternate host *Ribes* spp. *Pinus albicaulis* is very susceptible to this disease, and the only real hope is propagating individuals that have high genetic resistance to blister rust (Steel et al. 1983, Burns and Honkala 1990a, Schmidt and McDonald 1990, Tomback et al. 2001).

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

*Populus tremuloides* stands are the result of a stand-replacing disturbance in the mainly conifer forests of this macrogroup, primarily in southern regions. The stems of these thin-barked, clonal trees are easily killed by surface fires, but they can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1994). The stems are relatively short-lived (100-150 years), and the occurrences often succeed to longer-lived conifer forest if undisturbed. Occurrences are favored by fire in the conifer zone (Mueggler 1988). With adequate disturbance, a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because the long moist conditions required to establish them are rare in the habitats where they occur. Superficial soil drying will kill seedlings (Knight 1994).

## DISTRIBUTION

**Geographic Range:** This macrogroup is found throughout the Rocky Mountains, from western Texas and southern New Mexico north into southern Alberta and central British Columbia, the isolated highlands of South Dakota, west into the scattered mountain ranges of the Colorado Plateau, Great Basin and Mojave Desert, and into the eastern slopes of the Sierra Nevada, Cascades, and small areas of Olympic Peninsula.

### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX, US

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

### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 242A:CC, 313A:CC, 313B:CC, 313D:CC, 315A:PP, 315H:PP, 321A:CC, 322A:CC, 331A:CC, 331F:CC, 331G:CC, 331I:C?, 331J:CC, 331K:CP, 331N:CP, 332F:??, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261D:CC, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

### Omernik Ecoregions:

### Federal Lands [optional]:

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

## SYNONYMY

- > *Picea engelmannii* - *Abies lasiocarpa* - *Pinus albicaulis* - *Pinus contorta* forest (Achuff 1989)
- > *Pinus albicaulis*-*Abies lasiocarpa* Woodlands and Parklands (Chappell et al. 1997)
- > *Pinus albicaulis* Series (Johnston 1987)

#### WA groups

- > *Pinus albicaulis* Series (Steele et al. 1983)
- > *Pinus albicaulis* Zone (Barrows et al. 1977)
- > Aspen Woodland (411) (Shiflet 1994)
- > Aspen: 217 (Eyre 1980)
- > Bristlecone Pine Forest (#86400) (Holland 1986b)
- > Bristlecone Pine Series (Sawyer and Keeler-Wolf 1995)
- > Bristlecone Pine: 209 (Eyre 1980)
- < EF Engelmann Spruce - Sub-alpine Fir Dry Forested (Ecosystems Working Group 1998) [Dry Grouseberry/Crowberry sites, Azalea/Rhododendron sites in ESSFdv dv1 dv2 xc 3 xc4 xv1 xv2.]
- < Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980)
- > Engelmann Spruce-Alpine Fir Series, *Populus tremuloides* subclimax Association - 121.316 (Brown et al. 1979)
- > FP Engelmann Spruce - Subalpine Fir Parkland (Ecosystems Working Group 1998)
- > Limber Pine Forest (#86700) (Holland 1986b)
- > Limber Pine Series (Sawyer and Keeler-Wolf 1995)
- >< Limber Pine: 219 (Eyre 1980)
- > Montane Seral Forests (Peet 2000)
- >< Mountain Hemlock: 205 (Eyre 1980) [Mountain hemlock in the northern Rockies of MT, ID and northeast WA is included in this macrogroup.]
- > Pine Series, *Populus tremuloides* subclimax Association - 122.326 (Brown et al. 1979)
- = The spruce-fir zone (Daubenmire 1943)
- > WB Whitebark Pine Subalpine (Ecosystems Working Group 1998)
- >< Whitebark Pine: 208 (Eyre 1980)

#### LOWER LEVEL UNITS

##### Groups:

- G220 Rocky Mountain Lodgepole Pine Forest & Woodland
- G219 Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland
- G218 Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland
- G222 Rocky Mountain Subalpine-Montane Aspen Forest & Woodland
- G221 Rocky Mountain Subalpine-Montane Limber Pine - Bristlecone Pine Woodland
- G345 Central Rocky Mountain Montane White Spruce Forest
- G223 Northern Rocky Mountain Whitebark Pine - Subalpine Larch Woodland
- G224 Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland

#### AUTHORSHIP

**Primary Concept Source:** R.F. Daubenmire (1943)

**Author of Description:** M.S. Reid, K.A. Schulz, M.E. Hall

**Acknowledgments:**

**Version Date:** 05/14/2015

**Classif Resp Region:** West

**Internal Author:** MSR/KAS/MEH 10-14, mod. MSR 5-15

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**References:** Achuff 1989, Achuff and Corns 1982, Achuff and Dudynsky 1984a, Achuff et al. 2002, Alexander 1986, Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1987, Arno and Habeck 1972, Arno et al. 1985, BCMF 2006, Baker 1992, Banner et al. 1993, Barrows et al. 1977, Bartos 1979, Bartos and Campbell 1998, Beasley and Klemmedson 1980, Braumandl and Curran 1992, Brown 1982a, Brown et al. 1979, Brunstein and Yamaguchi 1992, Burns and Honkala 1990a, Chappell et al. 1997, Clagg 1975, Cooper et al. 1987, Cooper et al. 1999, Daubenmire 1943, Daubenmire and Daubenmire 1968, DeByle and Winokur 1985, DeLong 1996, DeLong et al. 1993, DeVelice et al. 1986, Despain 1973a, Despain 1973b, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2015, Fitzhugh et al. 1987, Franklin and Dyrness 1973, Graybosch and Buchanan 1983, Green and Klinka 1994, Henderson et al. 1977, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Holland 1986b, Holland and Keil 1995, Hopkins 1979a, Hopkins 1979b, Jenny et al. 1969, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987, Johnston 1997, Johnston and Hendzel 1985, Keeley and Zedler 1998a, Knight 1994, Komarkova et al. 1988b, Krebs 1972, Kumler 1969, LaMarche and Mooney 1972, Lanner and Vander Wall 1980, Lanner pers. comm., Lillybridge et al. 1995, Lloyd et al. 1990, MacKinnon et al. 1990, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Meidinger pers. comm., Moir 1969a, Mueggler 1988, Muldavin et al. 1996, Nachlinger and Reese 1996, Natural Regions Committee 2006, Peet 1978a, Peet 1981, Peet 2000, Pfister 1972, Pfister et al. 1977, Powell 1988a, Ranne 1995, Ranne et al. 1997, Richards 1981, Romme 1982, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Schmidt and McDonald 1990, Shepperd et al. 2006, Shiflet 1994, Steele et al. 1981, Steele et al. 1983, Steen and Coupé 1997, Swanson et al. 2010, Tomback et al.

2001, Veblen 1986, Volland 1976, Whipple 1975, Whipple and Dix 1979, Williams and Lillybridge 1983, Williams and Smith 1990, Williams et al. 1995, Youngblood and Mauk 1985

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## 1. Forest & Woodland

### 1.B.2.Nb. Rocky Mountain Cool Temperate Forest

#### M020. Rocky Mountain Subalpine-High Montane Conifer Forest

## G220. Rocky Mountain Lodgepole Pine Forest & Woodland

### Type Concept Sentence:

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#### OVERVIEW

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

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

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

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

**Internal Comments:** mjr 10-12: CA? added based on member association distribution. DFL 7-23-12: Need to deal with the southern end of this. Colorado Plateau, Utah Plateau.

#### Other Comments:

#### Similar NVC Types:

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

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

#### VEGETATION

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

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



*Carex inops* ssp. *inops*, *Arnica cordifolia*, *Festuca idahoensis*, *Elymus elymoides*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex pennsylvanica*, and *Carex rossii*.

G220 Rocky Mountain Lodgepole Pine Forest & Woodland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Pinus contorta</i> / <i>Arctostaphylos uva-ursi</i> Forest	G5/S3	CEGL000134
<i>Pinus contorta</i> / <i>Calamagrostis rubescens</i> Forest	G5/S3	CEGL000139
<i>Pinus contorta</i> / <i>Clintonia uniflora</i> - <i>Xerophyllum tenax</i> Woodland	G4G5/SNR	CEGL005921
<i>Pinus contorta</i> / <i>Clintonia uniflora</i> Forest	G5/SNR	CEGL005916
<i>Pinus contorta</i> / <i>Menziesia ferruginea</i> / <i>Clintonia uniflora</i> Forest	G4G5/SNR	CEGL005922
<i>Pinus contorta</i> / <i>Shepherdia canadensis</i> Forest	G3G4/S3?	CEGL000163
<i>Pinus contorta</i> / <i>Vaccinium caespitosum</i> / <i>Clintonia uniflora</i> Forest	G4?/SNR	CEGL005923
<i>Pinus contorta</i> / <i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Forest	G4G5/SNR	CEGL005913
<i>Pinus contorta</i> / <i>Vaccinium membranaceum</i> Forest	G4?/S4?	CEGL000170
<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> / <i>Calamagrostis rubescens</i> Forest	G3Q/SNR	CEGL000174
<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> / <i>Xerophyllum tenax</i> Forest	G3G4/SNR	CEGL005924
<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Forest	G5/S4	CEGL000172

#### ENVIRONMENT & DYNAMICS

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

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

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

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

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

#### DISTRIBUTION

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

**Nations:** CA, US

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

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

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

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

#### SYNONYMY

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

#### LOWER LEVEL UNITS

**Alliances:**

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

#### AUTHORSHIP

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

**Author of Description:** M.E. Hall

**Acknowledgments:** D. Tart

**Version Date:** 2013/05/30

#### REFERENCES

**References:** Alexander 1986, Arno et al. 1985, Banner et al. 1993, Burns and Honkala 1990a, Cooper et al. 1987, DeLong 1996, DeLong et al. 1993, Despain 1973a, Despain 1973b, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2015, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Jenny et al. 1969, Johnson and Clausnitzer 1992, Johnston 1997, Kumler 1969, Lloyd et al. 1990, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Moir 1969a, Peet 2000, Pfister et al. 1977, Steele et al. 1981, Steen and Coupé 1997, Volland 1976, Whipple 1975, Williams and Smith 1990

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1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

M020. Rocky Mountain Subalpine-High Montane Conifer Forest

### G219. Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland [Proposed]

**Type Concept Sentence:**

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#### OVERVIEW

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

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

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

**Classification Comments:** What have been called "ribbon forests" or "tree islands" by some authors [citations?] are included in this group; they can be found at upper treeline in many areas of the Rockies, including the central and northern ranges in Colorado and the Medicine Bow and Bighorn ranges of Wyoming. These are more typically islands or ribbons of trees within open-meadow areas. These patterns are controlled by deposition of windblown snow where deep drifts prevent trees from establishing. The relationship of G218 and G219 may be complicated, given that they are wide-ranging groups, and it could be very hard to cleanly place associations into each group, floristically and geographically.

**Internal Comments:** KAS 3-10: Eyre 1980 concepts are a bit broad, but the alternative is narrow habitat types or use USFS Spruce-Fir Series level.

**Other Comments:**

**Similar NVC Types:**

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

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

## VEGETATION

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

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

G219 Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Calamagrostis rubescens</i> Forest	G4G5/S4	CEGL000301
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Carex geyeri</i> Forest	G5/SNA	CEGL000304
<i>Abies lasiocarpa</i> / <i>Paxistima myrsinites</i> Woodland	G4/S4	CEGL000324
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> Forest	G5/S4	CEGL000344
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Juniperus communis</i> Woodland	G4G5/S3	CEGL000919

### ENVIRONMENT & DYNAMICS

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

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

### DISTRIBUTION

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

**Nations:** CA, US

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

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

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

### SYNONYMY

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

## LOWER LEVEL UNITS

### Alliances:

- A3645 *Abies lasiocarpa* - *Populus tremuloides* Dry-Mesic Forest Alliance
- A3641 *Abies lasiocarpa* - *Picea engelmannii* Southern Rocky Mountain Dry-Mesic Forest & Woodland Alliance
- A3640 *Abies lasiocarpa* - *Picea engelmannii* - *Pinus flexilis* Dry-Mesic Krummholz Alliance
- A3643 *Abies lasiocarpa* - *Picea engelmannii* Dry-Mesic Forest & Woodland Alliance
- A3644 *Abies lasiocarpa* - *Picea engelmannii* Dry-Mesic Scree & Talus Forest & Woodland Alliance
- A3642 *Abies lasiocarpa* - *Picea engelmannii* Treeline Dry-Mesic Forest & Woodland Alliance

### AUTHORSHIP

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

**Author of Description:** K.A. Schulz

**Acknowledgments:** D. Tart

**Version Date:** 2013/10/08

### REFERENCES

**References:** Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1987, Clagg 1975, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2015, Fitzhugh et al. 1987, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Hopkins 1979a, Hopkins 1979b, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Komarkova et al. 1988b, Lillybridge et al. 1995, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Muldavin et al. 1996, Peet 1978a, Peet 1981, Pfister 1972, Pfister et al. 1977, Romme 1982, Steele and Geier-Hayes 1995, Steele et al. 1981, Veblen 1986, Whipple and Dix 1979, Williams and Lillybridge 1983, Williams et al. 1995, Youngblood and Mauk 1985

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1. Forest & Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

M020. Rocky Mountain Subalpine-High Montane Conifer Forest

## G218. Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland [Proposed]

**Type Concept Sentence:**

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### OVERVIEW

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

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

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

**Classification Comments:** This group is similar to Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest & Woodland Group (G219) but is distinguished by its occurrence on mesic to wet microsites within the matrix of the drier (and warmer) subalpine spruce-fir or lodgepole pine forests. The microsites include north-facing slopes, swales or ravines, toeslopes, cold pockets, and other locations

where available soil moisture is higher or lasts longer into the growing season. This group is NOT confined to the Northern Rocky Mountains or Pacific Northwest (it is not geographically defined, rather by topographic settings in the subalpine). In the Canadian Rockies, this group transitions to a yet-to-be described Boreal mesic mixed-conifer group, where *Abies lasiocarpa* and *Picea engelmannii* occur with boreal taxa, such as *Picea mariana* or *Picea glauca*.

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

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

**Internal Comments:** mjr 10-12: CA? added based on member association distribution. KAS 3-10: Eyre 1980 concepts are a bit broad, but the alternative is narrow habitat types or use USFS Spruce-Fir Series level.

**Other Comments:**

#### Similar NVC Types:

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

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

### VEGETATION

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

**Floristics:** This is a high-elevation group of the Rocky Mountains and dry eastern Cascades typically dominated by *Picea engelmannii* and *Abies lasiocarpa*. In the Northern Rocky Mountains of northern Idaho and Montana, *Tsuga mertensiana* occurs as small to large patches within the matrix of this mesic spruce-fir group and only in the most maritime of environments (the coldest and wettest of the more Continental subalpine fir forests). *Populus tremuloides* is a common codominant tree in many disturbed stands. Moisture-loving wet understory species are diagnostic of this group and may include shrubs *Cornus canadensis*, *Ledum glandulosum*, *Menziesia ferruginea*, *Phyllodoce empetriformis*, *Rhododendron albiflorum*, *Rubus parviflorus*, *Salix brachycarpa*, *Salix glauca*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Vaccinium membranaceum*. The understory may also be dominated by herbaceous species such as *Actaea rubra*, *Calamagrostis canadensis*, *Carex siccata*, *Clintonia uniflora*, *Erigeron eximius*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Gymnocarpium dryopteris*, *Heracleum maximum*, *Luzula glabrata* var. *hitchcockii*, *Maianthemum stellatum*, *Osmorhiza berteroi*, *Osmorhiza occidentalis*, *Packera cardamine*, *Packera sanguisorboides*, *Pedicularis racemosa*, *Rubus pedatus*, *Rudbeckia occidentalis*, *Saxifraga bronchialis*, *Thalictrum fendleri*, *Tiarella* spp., *Valeriana occidentalis*, *Valeriana sitchensis*, and *Xerophyllum tenax*.

G218 Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Clintonia uniflora</i> - <i>Xerophyllum tenax</i> Forest	G4G5/SNR	CEGL005892
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Clintonia uniflora</i> Forest	G5/S3	CEGL005912
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Linnaea borealis</i> Forest	G5/S4	CEGL000315
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland	G5/S2	CEGL000317

<b>G218 Rocky Mountain Subalpine Moist Spruce - Fir Forest &amp; Woodland Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> - <i>Vaccinium scoparium</i> Forest	G2G4/SNR	CEGL005894
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> / <i>Clintonia uniflora</i> Forest	G4G5/SNR	CEGL005893
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland	G4?/SNR	CEGL005896
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> / <i>Streptopus amplexifolius</i> Woodland	G3G4/SNR	CEGL005897
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> / <i>Xerophyllum tenax</i> Forest	G4G5/SNR	CEGL005895
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> Forest	G5/SNA	CEGL000319
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium caespitosum</i> Forest	G5/S3?	CEGL000340
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium membranaceum</i> Rocky Mountain Forest	G5/SNA	CEGL000341
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Xerophyllum tenax</i> - <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland	G4G5/SNR	CEGL005898
<i>Abies lasiocarpa</i> / <i>Cornus canadensis</i> Forest	G3G4/S3S4	CEGL000309
<i>Abies lasiocarpa</i> / <i>Rhododendron albiflorum</i> Woodland	G4/S4	CEGL000330
<i>Abies lasiocarpa</i> / <i>Vaccinium membranaceum</i> Forest	G4/S4	CEGL000342
<i>Abies lasiocarpa</i> / <i>Xerophyllum tenax</i> Forest	G5/S3	CEGL000346
<i>Picea engelmannii</i> / <i>Maianthemum stellatum</i> Forest	G4?/SNR	CEGL000415
<i>Tsuga mertensiana</i> / <i>Rhododendron albiflorum</i> Forest	GNR/SNA	CEGL000508

### ENVIRONMENT & DYNAMICS

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

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

### DISTRIBUTION

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

**Nations:** CA, US

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

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

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

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

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

**LOWER LEVEL UNITS****Alliances:**

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

**AUTHORSHIP****Primary Concept Source:** F.H. Eyre (1980)**Author of Description:** K.A. Schulz**Acknowledgments:** D. Tart**Version Date:** 2013/10/08**REFERENCES**

**References:** Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1987, BCMF 2006, Banner et al. 1993, Clagg 1975, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2015, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Komarkova et al. 1988b, Lillybridge et al. 1995, MacKinnon et al. 1990, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Muldavin et al. 1996, Peet 1978a, Peet 1981, Pfister 1972, Pfister et al. 1977, Steele et al. 1981, Steen and Coupé 1997, Williams and Lillybridge 1983, Williams et al. 1995, Youngblood and Mauk 1985

1. Forest &amp; Woodland

1.B.2.Nb. Rocky Mountain Cool Temperate Forest

M020. Rocky Mountain Subalpine-High Montane Conifer Forest

**G222. Rocky Mountain Subalpine-Montane Aspen Forest & Woodland****Type Concept Sentence:****OVERVIEW****Scientific Name:** *Populus tremuloides* Rocky Mountain Forest & Woodland Group**Common Name (Translated Scientific Name):** Quaking Aspen Rocky Mountain Forest & Woodland Group

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

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



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

**Internal Comments:** MEH 6-13: MX added.

**Other Comments:**

**Similar NVC Types:**

- G328 Northern Great Plains Fescue Aspen Parkland

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

### VEGETATION

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

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

G222 Rocky Mountain Subalpine & Montane Aspen Forest & Woodland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Betula papyrifera</i> Forest	G4Q/S2?	CEGL000520
<i>Populus tremuloides</i> / <i>Calamagrostis rubescens</i> Forest	G5?/S2	CEGL000575
<i>Populus tremuloides</i> / <i>Symphoricarpos oreophilus</i> Forest	G5/SNR	CEGL000610

### ENVIRONMENT & DYNAMICS

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

**Climate:** Climate is temperate with a relatively long growing season, typically cold winters and deep snow. Mean annual precipitation is greater than 38 cm (15 inches) and typically greater than 51 cm (20 inches), except in semi-arid environments where occurrences are restricted to mesic microsites such as seeps or where large snow drifts develop. Distribution of this group is

primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondly, its range is limited by the length of the growing season or low temperatures (Mueggler 1988).

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

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

#### DISTRIBUTION

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

**Nations:** CA, MX, US

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

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

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

**Omerik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

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

#### SYNONYMY

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

#### LOWER LEVEL UNITS

**Alliances:**

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

#### AUTHORSHIP

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

**Author of Description:** M.E. Hall

**Acknowledgments:**

**Version Date:** 2013/06/05

#### REFERENCES

**References:** Bartos 1979, Bartos and Campbell 1998, Bartos and Mueggler 1979, Brown 1982a, Brown et al. 1979, DeByle and Winokur 1985, DeVelice et al. 1986, Eyre 1980, Faber-Langendoen et al. 2015, Henderson et al. 1977, Hess and Wasser 1982,

Johnston and Hendzel 1985, Knight 1994, Mueggler 1988, Powell 1988a, Shepperd et al. 2006, Shiflet 1994, Swanson et al. 2010, Youngblood and Mauk 1985

## 1. Forest & Woodland

### 1.B.2.Nb. Rocky Mountain Cool Temperate Forest

#### M020. Rocky Mountain Subalpine-High Montane Conifer Forest

## G223. Northern Rocky Mountain Whitebark Pine - Subalpine Larch Woodland

### Type Concept Sentence:

#### OVERVIEW

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

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

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

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

**Internal Comments:** mjr 10-12: CA added based on member association distribution.

**Other Comments:**

#### Similar NVC Types:

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

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

#### VEGETATION

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

**Floristics:** These woodlands are mostly dominated by *Pinus albicaulis* or *Larix lyallii* and occasionally codominated by *Abies lasiocarpa*. Understories range from sparse to dense and are occupied by heath species, including *Arctostaphylos uva-ursi*,

*Vaccinium membranaceum*, *Vaccinium myrtillus*, *Menziesia ferruginea*, and *Vaccinium scoparium*. The herbaceous layer is sparse under dense shrub canopies or may be dense where the shrub canopy is open or absent. Common species include *Ligusticum grayi*, *Xerophyllum tenax*, *Festuca idahoensis*, *Carex rossii*, *Calamagrostis rubescens*, and *Luzula glabrata* var. *hitchcockii*.

G223 Northern Rocky Mountain Whitebark Pine - Subalpine Larch Woodland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies lasiocarpa</i> - <i>Pinus albicaulis</i> / <i>Arctostaphylos uva-ursi</i> Woodland	G2/S2	CEGL000751
<i>Abies lasiocarpa</i> - <i>Pinus albicaulis</i> / <i>Vaccinium scoparium</i> Woodland	G5?/SNA	CEGL000752
<i>Larix lyallii</i> / <i>Vaccinium deliciosum</i> Woodland	G3/S3	CEGL000952
<i>Larix lyallii</i> / <i>Vaccinium membranaceum</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland	G2G3/SNR	CEGL005884
<i>Larix lyallii</i> / <i>Vaccinium scoparium</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland	G2G3/S2S3	CEGL000951
<i>Larix lyallii</i> Woodland	G3Q/S3	CEGL000623
<i>Pinus albicaulis</i> / <i>Calamagrostis rubescens</i> Woodland	G2/S2	CEGL000753
<i>Pinus albicaulis</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland	G3/S2	CEGL000758

### ENVIRONMENT & DYNAMICS

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

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

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

Pests include the mountain pine beetle (*Dendroctonus ponderosae*), which has killed many mature trees in the past, during epidemics where populations of the beetle build up in lower elevation *Pinus contorta* stands, then move up into the *Pinus albicaulis* (Steel et al. 1983, Burns and Honkala 1990a, Schmidt and McDonald 1990). The exotic pathogen white pine blister rust (*Cronartium ribicola*) is attacking and killing *Pinus albicaulis* trees in many parts of the interior northwestern U.S. It is especially destructive in more mesic habitats that favor infection of its alternate host *Ribes* spp. *Pinus albicaulis* is very susceptible to this disease, and the only real hope is propagating individuals that have high genetic resistance to blister rust (Steel et al. 1983, Burns and Honkala 1990a, Schmidt and McDonald 1990, Tomback et al. 2001).

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

**DISTRIBUTION**

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

**Nations:** CA, US

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

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

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

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

**SYNONYMY**

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

**LOWER LEVEL UNITS**

**Alliances:**

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

**AUTHORSHIP**

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

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

**Acknowledgments:**

**Version Date:** 2013/06/10

**REFERENCES**

**References:** Achuff 1989, Arno and Habeck 1972, Barrows et al. 1977, Burns and Honkala 1990a, Chappell et al. 1997, Cooper et al. 1999, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Johnston 1987, Lillybridge et al. 1995, Meidinger and Pojar 1991, Pfister et al. 1977, Richards 1981, Schmidt and McDonald 1990, Steele et al. 1983, Tomback et al. 2001, Williams and Lillybridge 1983, Williams and Smith 1990

**1.B.2.Nc. Western North American Cool Temperate Woodland & Scrub**

1. Forest & Woodland

1.B.2.Nc. Western North American Cool Temperate Woodland & Scrub

**M026. Intermountain Singleleaf Pinyon - Utah Juniper - Western Juniper Woodland**

**Type Concept Sentence:** This broadly defined pinyon and juniper woodland, savanna and scrub macrogroup occurs in dry foothills in the interior western U.S. and is characterized by an open to closed tree canopy composed of *Juniperus occidentalis*, *Juniperus osteosperma*, *Pinus edulis*, *Pinus monophylla*, and/or *Cercocarpus ledifolius*.

**OVERVIEW**

**Scientific Name:** *Pinus monophylla* - *Juniperus osteosperma* - *Juniperus occidentalis* Intermountain Woodland Macrogroup

**Common Name (Translated Scientific Name):** Singleleaf Pinyon - Utah Juniper - Western Juniper Intermountain Woodland Macrogroup

**Type Concept:** This broadly defined macrogroup is composed of woodland, savanna and scrub characterized by an open to closed tree canopy of *Juniperus occidentalis*, *Juniperus osteosperma*, *Pinus monophylla*, and/or *Cercocarpus ledifolius*. Shrub layers are

frequently dominated by *Artemisia tridentata*, which in places can form a moderately dense shrub canopy. Other common associated shrub species include *Arctostaphylos patula*, *Artemisia arbuscula*, *Artemisia nova*, *Cercocarpus intricatus*, *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ericameria nauseosa*, *Glossopetalon spinescens*, *Purshia stansburiana*, *Purshia tridentata*, *Quercus chrysolepis*, *Quercus gambelii*, *Quercus john-tuckeri*, *Quercus turbinella*, *Ribes cereum*, *Tetradymia* spp., and *Yucca brevifolia*. The herbaceous layer may be sparse to dense depending on overstory density, substrate, landscape position, and disturbance history, with the densest graminoid layer in open tree savanna. Common graminoid associates include *Bouteloua gracilis*, *Carex filifolia*, *Hesperostipa comata*, *Festuca idahoensis*, *Leymus cinereus* (= *Elymus cinereus*), *Leymus salinus*, *Pleuraphis jamesii*, *Pseudoroegneria spicata*, *Poa fendleriana*, and *Poa secunda*. Forb species may be diverse but typically have low canopy cover values. Pinyon and juniper stands in the Colorado Plateau and Great Basin occur between 1500-2600 m elevation on warm, dry sites of lower mountain slopes, hills, mesas, plateaus, ridges, and more recently on basins and flats where trees are expanding into semi-desert grasslands and steppe. Substrates are variable, but are generally shallow, cobbly, gravelly, or sandy loams to clay loam or clay. Juniper stands in the Columbia Plateau range from under 200 m elevation along the Columbia River in central Washington to over 1500 m. In central Oregon, the center of distribution, they occur on all aspects and slope positions. *Cercocarpus ledifolius* woodland and scrub stands occur in hills and mountain ranges in the Great Basin and eastern foothills of the Sierra Nevada northeast to the foothills of the Bighorn Mountains. It typically occurs from 600 m to over 2650 m in elevation on rocky outcrops or escarpments and forms small- to large-patch stands. Most stands occur as shrublands on ridges and steep rimrock slopes, but they may be composed of small trees in steppe areas.

**Classification Comments:** This macrogroup occurs over a broad biogeographic range and has a broad concept with multiple diagnostic species. The pinyon and juniper diagnostic species are related and occur on relatively dry sites at mid to lower elevations. However, *Cercocarpus ledifolius* also occurs as seral vegetation in relatively mesic montane sites, often with *Abies concolor* trees that are colonizing and eventually dominating the site.

This macrogroup (M026) is closely related to Southern Rocky Mountain & Colorado Plateau Two-needle Pinyon - One-seed Juniper Woodland Macrogroup (M027), and could be merged (T. Keeler-Wolff pers. comm. 2014), but see comments in M027.

In Wyoming, except for stands in the southwest portion of the state, most juniper woodland stands are likely to be classified in Rocky Mountain Foothill-Rock Outcrop Limber Pine - Juniper Woodland Group (G209) in Central Rocky Mountain Dry Lower Montane-Foothill Forest Macrogroup (M501), rather than Colorado Plateau - Great Basin Juniper Woodland & Savanna Group (G246) in this macrogroup (M026). More survey and analysis are needed to better describe the geographic boundary between these types.

In addition, the *Cercocarpus ledifolius* woodland and shrubland alliances are poorly distinguished in the literature, as most authors describe the species as having either a tall-shrub or small-tree growth form within a single association. Some associations may have shrub-dominated stands in one area yet a woodland physiognomy in another. The woodland physiognomy appears to be more typical. Near the northern edge of its range in Montana and Idaho, *Cercocarpus ledifolius* is described as occurring primarily in the shrub form (Mueggler and Stewart 1980, Tisdale 1986). These northern variants are the only described stands which appear to be clearly distinct from the woodland alliance. The woodland alliance may have a different dominant subspecies (or variety) than the shrubland. Woodland stands tend to occur in the more western portion of the species' range and are largely attributed to *Cercocarpus ledifolius* var. *intercedens* or *Cercocarpus ledifolius* var. *intermontanus*, whereas *Cercocarpus ledifolius* var. *ledifolius* is found in the eastern and northern portions of the range and typically occurs as a shrubland.

One reviewer recommends moving Intermountain Basins Curl-leaf Mountain-mahogany Scrub & Woodland Group (G249) out of this macrogroup (M026) into Southern Rocky Mountain Montane Shrubland Macrogroup (M049), or at least *Cercocarpus ledifolius* shrubland stands in California (found in the Sierra Nevada to various desert mountains) that are shrubland, not woodland and are similar to stands of *Cercocarpus intricatus* in Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland Group (G276) in M049 (J. Evens pers. comm. 2014). If we follow this recommendation, then we should also consider moving *Cercocarpus ledifolius* shrubland from the northern extent into a shrubland macrogroup. Splitting the various *Cercocarpus ledifolius* associations by physiognomy into different groups and macrogroups may create issues with diagnostic species. In addition, some reviewers suggest merging the macrogroup with Southern Rocky Mountain & Colorado Plateau Two-needle Pinyon - One-seed Juniper Woodland Macrogroup (M027) because of shared diagnostic species *Pinus edulis*. Rather than combining M026 and M027, Colorado Plateau Pinyon - Juniper Woodland Group (G250) was move to M027.

**Similar NVC Types:** A similar macrogroup, Southern Rocky Mountain & Colorado Plateau Two-needle Pinyon - One-seed Juniper Woodland Macrogroup (M027), is defined by the presence of *Pinus edulis* and may include *Juniperus osteosperma* codominated stands. A transition zone between this southern Rocky Mountain macrogroup and M026 occurs in the northwestern corner of New Mexico, adjacent southwestern Colorado west of the Continental Divide and in northeastern Arizona where the ranges of *Juniperus monosperma* and *Juniperus osteosperma* are sympatric. Stands in this transition zone are included in M026 that contains the Colorado Plateau groups. There is also a transition zone in northern Arizona with Madrean Lowland Evergreen Woodland Macrogroup (M010) that is expressed by the presence of *Juniperus monosperma* and the lack of Madrean differential species.

- M010 Madrean Lowland Evergreen Woodland: shares some of the widespread dominant/diagnostic species such as conifer *Pinus edulis*, although M026 lacks Madrean species that are differential species in M010.

- M027 Southern Rocky Mountain & Colorado Plateau Two-needle Pinyon - One-seed Juniper Woodland: may also be dominated or codominated by *Pinus edulis*.
- M049 Southern Rocky Mountain Montane Shrubland

**Diagnostic Characteristics:** This broadly defined macrogroup is composed of woodland, savanna and scrub characterized by an open to closed tree canopy composed of differential and often dominant species of *Juniperus occidentalis*, *Juniperus osteosperma*, *Pinus monophylla*, and/or *Cercocarpus ledifolius*. The fidelity of *Juniperus osteosperma* is lower than the other diagnostic species because *Juniperus osteosperma* also occurs across the western extent of Southern Rocky Mountain Two-needle Pinyon - One-seed Juniper Woodland Macrogroup (M027) in the Colorado Plateau and western slope of the Colorado Rocky Mountains with *Pinus edulis* in this macrogroup. In addition, *Juniperus californica* is a component in the western Mojave and locally in eastern Mojave mountains. It is considered part of M009 (California woodlands) but its modal expression in the western Mojave and the inner southern Coast Ranges of California is much like other members of M026 (T. Keeler-Wolf pers. comm. 2014). *Cercocarpus ledifolius* woodland stands are most common at the western extent of the macrogroup often occurring with *Juniperus occidentalis* or *Pinus monophylla* stands. *Juniperus monosperma* is absent except in some transitional stands in northeastern Arizona. In *Pinus monophylla*-dominated stands across some regions of southern California, *Juniperus osteosperma* is replaced by *Juniperus californica*. *Pinus jeffreyi* may be present on the eastern slope of the Sierra Nevada in California.

## VEGETATION

**Physiognomy and Structure:** This broadly defined evergreen macrogroup is composed of a woodland, savanna and scrub structure. Stands are typically short (2-10 m tall), with an open to closed, evergreen needle-leaved or scale-leaved or broad-leaved, sclerophyllous tree canopy. The understory is variable with lush grass cover and occasionally scattered shrubs in the savanna stands to a sparse to dense short-shrub layer and/or herbaceous layer in woodland stands. On extremely xeric sites, diagnostic juniper and pinyon trees species may only attain 2 m in height and have a more shrub form. However, *Juniperus occidentalis*-dominated stands have two different tree canopy structures: (1) an old-growth woodland with large, fairly well-spaced trees with rounded crowns, and (2) relatively young, often dense junipers trees with pointed crowns. The structure of the understory ranges from perennial grass-dominated tree savannas and open woodlands to shrublands with a very open tree canopy (wooded shrublands) and open to moderately dense woodlands with a shrub-dominated understory. Cover of understory species sharply declines when tree canopy cover exceeds 40% (Young et al. 1982). Many of the tree savannas have a sparse shrub layer present. Vegetation structure is variable as *Cercocarpus ledifolius* stands may form an open to dense short-tree canopy (3-5 m tall), a tall-shrub layer (3-4 m tall), or a short-shrub layer (1-2 m tall). Herbaceous layers are variable depending on the density of woody canopy, substrate, landscape position, and disturbance history. Perennial graminoids typically dominate most herbaceous layer with an often high diversity of species with low cover.

**Floristics:** This broadly defined macrogroup is composed of woodland, savanna and scrub characterized by an open to closed tree canopy of *Juniperus occidentalis*, *Juniperus osteosperma*, *Pinus monophylla*, and/or *Cercocarpus ledifolius*. There is limited overlap between stands dominated by *Juniperus occidentalis* and *Pinus monophylla*. *Juniperus osteosperma* occurs across the ranges of both *Pinus edulis* and *Pinus monophylla* in this macrogroup. *Cercocarpus ledifolius* woodland stands are most common at the western extent of the macrogroup, often occurring with *Juniperus occidentalis* or *Pinus monophylla* stands. *Juniperus monosperma* is absent except in some transitional stands in northeastern Arizona. In *Pinus monophylla*-dominated stands of some regions of southern California, *Juniperus osteosperma* is replaced by *Juniperus californica*. On the east slope of the Sierra Nevada in California, *Pinus jeffreyi* may be a minor component of these woodlands. The understory is variable and can be characterized by shrubs or graminoids. Shrub layers are frequently dominated by the widespread species *Artemisia tridentata* forming a moderately dense shrub layer. Other common associated shrub species include *Arctostaphylos patula*, *Artemisia arbuscula*, *Artemisia nova*, *Cercocarpus intricatus*, *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ephedra viridis*, *Ericameria nauseosa*, *Garrya flavescens*, *Glossopetalon spinescens*, *Purshia stansburiana*, *Purshia tridentata*, *Quercus chrysolepis*, *Quercus gambelii*, *Quercus turbinella*, *Ribes cereum*, *Ribes velutinum*, *Symphoricarpos* spp., *Tetradymia* spp., *Yucca baccata*, and *Yucca brevifolia*. The herbaceous layer may be sparse to dense depending on overstory density and substrate with the densest graminoid layer in open tree savanna. Common graminoid associates include *Achnatherum speciosum*, *Bouteloua gracilis*, *Bouteloua eriopoda*, *Carex filifolia*, *Elymus elymoides*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus* (= *Elymus cinereus*), *Leymus salinus*, *Pleuraphis jamesii*, *Pseudoroegneria spicata*, *Poa fendleriana*, and *Poa secunda*. Non-natives, including *Bromus rubens* and *Bromus tectorum*, have invaded some stands. Forb species may be diverse but typically have low canopy cover values.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This broadly defined woodland, savanna and scrub macrogroup is found in the interior western U.S. Single-leaf pinyon and juniper stands in the Colorado Plateau and Great Basin occur between 1500-2600 m elevation on warm, dry sites on lower mountain slopes, hills, mesas, plateaus, ridges, and more recently on basins and flats where trees are expanding into semi-desert grasslands and steppe. Substrates are variable, but are generally calcareous and alkaline, and often shallow and rocky, but may be acidic in places. Soils texture ranges from stony, cobbly, gravelly, or sandy loams to clay loam or clay. Juniper stands in

the Columbia Plateau range from under 200 m elevation along the Columbia River in central Washington to over 1500 m. In central Oregon, the center of distribution across the Columbia Plateau, the type occurs on all aspects and slope positions. Old-growth stands are largely restricted to rocky outcrops, upper slopes and ridges, and rims of mesas and canyons that are fire-safe. Younger seral stands have invaded adjacent shrublands and grasslands in recent times and now occur on lower slopes, valleys and plains. *Cercocarpus ledifolius* woodland and scrub stands occur in hills and mountain ranges of the Great Basin and eastern foothills of the Sierra Nevada northeast to the foothills of the Bighorn Mountains. They typically occur from 600 m to over 2650 m in elevation on rocky outcrops or escarpments and form small- to large-patch stands in forested areas. Most stands occur as shrublands on ridges and steep rimrock slopes, but they may be composed of small trees in steppe areas. In the Great Basin and Colorado Plateau where juniper and pinyon tree are both present, pinyon tend to occur at higher elevations.

**Dynamics:** Periodic fire (at a 10- to 30-year interval) is important in maintaining the juniper savanna structure (Wright et al. 1979, West and Young 2000). Juniper trees less than 1.2 m (4 feet) tall are readily killed by fires (Wright et al. 1979). Heavy grazing by livestock reduces the fine fuel layer (grasses), which decreases the fire frequency, resulting in increased juniper density (Wright et al. 1979, West and Young 2000). Over the last century, a reduction in fire frequency has caused a conversion of some juniper savanna to juniper woodland, as well as invasion of juniper trees from areas of naturally low fire frequency, e.g., rocky ridges into adjacent communities, especially sagebrush steppe (Wright et al. 1979, West and Young 2000, Romme et al. 2009). In contrast, woodland stands of *Juniperus osteosperma* and *Pinus monophylla* are not maintained by frequent fire (historic return intervals are >100 years), since fires kill small to larger trees in stands and trees slowly regenerate from seed. Instead, periodic fire poses a risk to their stands because non-native grasses can invade in burned areas and promote increased fire frequency by providing fuels that spread fire (J. Evens pers. comm. 2014).

### DISTRIBUTION

**Geographic Range:** This broadly defined woodland, scrub and tree savanna macrogroup occupies the interior western U.S. from the Western Slope of Colorado and northwestern corner of New Mexico east into the Colorado Plateau, and Great Basin to the eastern foothills of the Sierra Nevada extending southwest in California to the northern Transverse Ranges (Ventura County) and San Jacinto Mountains (Riverside County), and north into the Modoc Plateau of northeastern California and along the eastern foothills of the Cascades, south-central Washington, and southern Idaho and east to the foothills of the Bighorn Mountains.

#### Spatial Scale & Pattern [optional]:

**Nations:** US

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

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315H:CC, 321A:CC, 322A:CC, 322B:CC, 331A:CC, 331G:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CP, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M261A:C?, M261D:CC, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:C?, M331B:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CP, M332A:CC, M332B:C?, M332D:C?, M332E:CC, M332F:CC, M332G:CC, M333D:PP, M341A:CC, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

### SYNONYMY

- > *Juniperus occidentalis* Zone (Franklin and Dyrness 1973)
- > Curlleaf Mountain-Mahogany (415) (Shiflet 1994)
- > Curlleaf Mountain-Mahogany - Bluebunch Wheatgrass (322) (Shiflet 1994)
- >< Juniper - Pinyon Pine Woodland (504) (Shiflet 1994)
- >< Juniper - Pinyon Woodland (412) (Shiflet 1994)
- >< Juniper steppe woodland (*Juniperus* - *Artemisia* - *Agropyron*) (Küchler 1964)
- >< Juniper-Pinon Savannas and Woodlands of Western North America (412) (West 1999a)
- >< Juniper-Pinyon woodland (Küchler 1964)
- > Northern Juniper Woodlands (Holland and Keil 1995)
- > PIMO Series (West et al. 1998)
- > Pinon-Juniper Woodlands (West and Young 2000)
- >< Pinyon - Juniper: 239 (Eyre 1980)
- > Pinyon Juniper Series, *Juniperus osteosperma* Association - 122.418 (Brown et al. 1979)
- > Pinyon Juniper Series, *Pinus monophylla*-*Juniperus californica* - chaparral Association - 122.414a (Brown et al. 1979)
- > Pinyon Juniper Series, *Pinus monophylla*-*Juniperus californica* Association - 122.411a (Brown et al. 1979)
- > Pinyon Juniper Series, *Pinus monophylla*-*Juniperus osteosperma* Association - 122.416 (Brown et al. 1979)



- > Pinyon Juniper Series, *Pinus monophylla* Association - 122.417 (Brown et al. 1979)
- >< Rocky Mountain Juniper: 220 (Eyre 1980)
- > Utah Juniper Series (Dick-Peddie 1993)
- > Western Juniper: 238 (Eyre 1980)

#### LOWER LEVEL UNITS

##### Groups:

- G246 Colorado Plateau - Great Basin Juniper Woodland & Savanna
- G248 Columbia Plateau Western Juniper Woodland & Savanna
- G247 Great Basin Pinyon - Juniper Woodland
- G249 Intermountain Basins Curl-leaf Mountain-mahogany Scrub & Woodland

#### AUTHORSHIP

**Primary Concept Source:** N.E. West, R.J. Tausch, and P.T. Tueller (1998)

**Author of Description:** K.A. Schulz and M. Jennings

**Acknowledgments:**

**Version Date:** 05/14/2015

**Classif Resp Region:** West

**Internal Author:** mod. KAS 5-13, 5-15

#### REFERENCES

**References:** Baker and Kennedy 1985, Barbour and Major 1977, Barbour and Major 1988, Blackburn and Tueller 1970, Brown 1982a, Brown et al. 1979, Dealy 1975, Dealy 1978, Dick-Peddie 1993, Evens pers. comm., Eyre 1980, Faber-Langendoen et al. 2015, Francis 1986, Franklin and Dyrness 1973, Holland and Keil 1995, Johnson and Clausnitzer 1992, Keeler-Wolf pers. comm., Knight 1994, Knight et al. 1987, Kuchler 1964, Larson and Moir 1986, Larson and Moir 1987, Lewis 1975b, Mueggler and Stewart 1980, Romme et al. 2009, Sawyer et al. 2009, Shiflet 1994, Stuever and Hayden 1997a, Thorne et al. 2007, Tisdale 1986, Tuhy et al. 2002, Volland 1976, West 1999a, West 1999b, West and Young 2000, West et al. 1998, Wright et al. 1979, Young et al. 1982

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#### 1. Forest & Woodland

1.B.2.Nc. Western North American Cool Temperate Woodland & Scrub

M026. Intermountain Singleleaf Pinyon - Utah Juniper - Western Juniper Woodland

### G248. Columbia Plateau Western Juniper Woodland & Savanna

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Juniperus occidentalis* Woodland & Savanna Group

**Common Name (Translated Scientific Name):** Western Juniper Woodland & Savanna Group

**Type Concept:** This woodland group is found on the Columbia Plateau and extends to the northern and western margins of the Great Basin, from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern California. Elevations range from under 200 m along the Columbia River in central Washington to over 1500 m. Generally soils are medium-textured, with abundant coarse fragments, and derived from volcanic parent materials. In central Oregon, the center of distribution, all aspects and slope positions occur. Where this group grades into relatively mesic forest or grassland habitats, these woodlands become restricted to rock outcrops or escarpments with excessively drained soils. *Pinus monophylla* is not present in this region, so *Juniperus occidentalis* is typically the only tree species, although *Pinus ponderosa* or *Pinus jeffreyi* may be present in some stands. The tree form of *Cercocarpus ledifolius* may occasionally codominate. In the understory, *Artemisia tridentata* is the most common shrub; others are *Purshia tridentata*, *Ericameria nauseosa*, *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Ribes cereum*, and *Tetradymia* spp. Graminoids commonly include *Carex filifolia*, *Festuca idahoensis*, *Poa secunda*, and *Pseudoroegneria spicata*. These woodlands are generally restricted to rocky areas where fire frequency is low. However, throughout much of its range, fire exclusion and removal of fine fuels by grazing livestock have reduced fire frequency and allowed *Juniperus occidentalis* seedlings to colonize adjacent alluvial soils and expand into the shrub-steppe and grasslands. *Juniperus occidentalis* savanna may occur on the drier edges of the woodland where trees are intermingling with or invading the surrounding grasslands and where local edaphic or climatic conditions favor grasslands over shrublands.

**Classification Comments:** This woodland group includes two very different ecological types. There are old-growth *Juniperus occidentalis* woodlands with trees and stands often over 1000 years old, with large, fairly well-spaced trees with rounded crowns. There are also large areas where juniper has expanded into sagebrush steppe and bunchgrass-dominated areas, with young, pointed-crowned trees growing closely together. Currently, these two very different types are about equally distributed across the landscape, with *Juniperus occidentalis* continuing to expand, either from the combination of fire exclusion, past grazing or climate

change. *Juniperus occidentalis* has also expanded into *Pinus ponderosa* and *Pinus ponderosa* - *Pinus contorta* stands in central Oregon.

Woodland stands dominated by *Juniperus occidentalis* var. *australis* occur in the subalpine Sierra Nevada and forested uplands of the northern Coast Ranges of California, southward to San Bernardino, San Gabriel and various desert mountain ranges and westward into Nevada are included in Sierra-Cascade Cold-Dry Subalpine Woodland Group (G243).

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G243 Sierra-Cascade Cold-Dry Subalpine Woodland

**Diagnostic Characteristics:** *Juniperus occidentalis* is the diagnostic and typically dominant species of this woodland and savanna group. This juniper species is largely restricted to the Columbia Plateau ecoregion. *Cercocarpus ledifolius* may codominate some stands. *Pinus monophylla* is not present in this region. The understory of stands included in this group is variable and ranges from perennial grass-dominated tree savannas and open woodlands to open and moderately dense woodlands with a shrub-dominated understory to wooded shrublands with a sparse *Juniperus occidentalis* tree layer (5-10% cover).

### VEGETATION

**Physiognomy and Structure:** This woodland and savanna group has an open to dense canopy that includes two very different tree canopy structures: (1) an old-growth *Juniperus occidentalis* woodland with large, fairly well-spaced trees with rounded crowns, and (2) relatively young, often dense junipers trees with pointed crowns. The structure of the understory ranges from perennial grass-dominated tree savannas and open woodlands to shrublands with a very open tree canopy (wooded shrublands) and open to moderately dense woodlands with a shrub-dominated understory. Cover of understory species sharply declines when tree canopy cover exceeds 40% (Young et al. 1982). Many of the tree savannas have a sparse shrub layer present.

**Floristics:** Stands are dominated by *Juniperus occidentalis* trees, although *Pinus ponderosa* or *Pinus jeffreyi* may be present in some stands. *Pinus monophylla* is not present in this region. The tree form of *Cercocarpus ledifolius* may occasionally codominate. In the understory, *Artemisia tridentata* is the most common shrub; others are *Purshia tridentata*, *Ericameria nauseosa*, *Cercocarpus ledifolius* (shrub form), *Chrysothamnus viscidiflorus*, *Ribes cereum*, and *Tetradymia* spp. Graminoids commonly include *Carex filifolia*, *Festuca idahoensis*, *Poa secunda*, and *Pseudoroegneria spicata*.

G248 Columbia Plateau Western Juniper Woodland & Savanna Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Juniperus occidentalis</i> / <i>Artemisia tridentata</i> / <i>Festuca idahoensis</i> Wooded Herbaceous Vegetation	G3/S1	CEGL001720
<i>Juniperus occidentalis</i> / <i>Artemisia tridentata</i> / <i>Pseudoroegneria spicata</i> Wooded Herbaceous Vegetation	G3G4/SNR	CEGL001721
<i>Juniperus occidentalis</i> / <i>Festuca idahoensis</i> Wooded Herbaceous Vegetation	G2/SNR	CEGL001724
<i>Juniperus occidentalis</i> / <i>Pseudoroegneria spicata</i> Wooded Herbaceous Vegetation	G3/SNR	CEGL001728

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This woodland group is found on the Columbia Plateau and extends to the northern and western margins of the Great Basin. Elevations range from under 200 m along the Columbia River in central Washington to over 1500 m. In central Oregon, the center of distribution, all aspects and slope positions occur. Old-growth stands are largely restricted to rocky outcrops, upper slopes and ridges, and rims of mesa and canyon that are fire-safe. Younger seral stands have invaded adjacent shrublands and grasslands and now occur on lower slopes, valleys and plains. Soils are generally medium-textured, with abundant coarse fragments, and derived from volcanic parent materials. Where this group grades into relatively mesic forest or grassland habitats, these woodlands become restricted to dry sites such as rock outcrops or escarpments with excessively drained soils. **Soil/substrate/hydrology:** Soils are generally medium-textured, with abundant coarse fragments, and derived from volcanic parent materials. In central Oregon, the center of distribution, all aspects and slope positions occur. Where this group grades into relatively mesic forest or grassland habitats, these woodlands become restricted to dry sites such as rock outcrops or escarpments with excessively drained soils.

**Dynamics:**

**DISTRIBUTION**

**Geographic Range:** This woodland and savanna group is found along the northern and western margins of the Great Basin, from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern California. It also occurs in scattered localities of northern Nevada and south-central Washington.

**Nations:** US

**States/Provinces:** CA, ID, NV, OR, WA

**TNC Ecoregions [optional]:** 4:C, 6:C, 8:C

**USFS Ecoregions (2007):** 341G:CC, 342B:CC, 342C:CC, 342D:CP, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M261A:C?, M261D:CC, M261E:CP, M261G:CC, M332G:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

- = *Juniperus occidentalis* Zone (Franklin and Dyrness 1973)
- = Northern Juniper Woodlands (Holland and Keil 1995)
- < Western Juniper - Big Sagebrush - Bluebunch Wheatgrass (107) (Shiflet 1994)
- = Western Juniper: 238 (Eyre 1980)

**LOWER LEVEL UNITS**

**Alliances:**

- A3500 *Juniperus occidentalis* / Herbaceous Understory Woodland & Savanna Alliance
- A3499 *Juniperus occidentalis* / Shrub Understory Woodland Alliance

**AUTHORSHIP**

**Primary Concept Source:** J.F. Franklin and C.T. Dyrness (1973)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2013/05/22

**REFERENCES**

**References:** Barbour and Major 1988, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Holland and Keil 1995, Johnson and Clausnitzer 1992, Sawyer et al. 2009, Shiflet 1994, Thorne et al. 2007, Volland 1976, Young et al. 1982

**1.B.2.Nd. Vancouverian Cool Temperate Forest**

1. Forest & Woodland

1.B.2.Nd. Vancouverian Cool Temperate Forest

**M886. Southern Vancouverian Dry Foothill Forest**

**Type Concept Sentence:**

**OVERVIEW**

**Scientific Name:** Southern Vancouverian Dry Foothill Forest Macrogroup

**Common Name (Translated Scientific Name):** Southern Vancouverian Dry Foothill Forest

**Type Concept:**

**Classification Comments:**

**Similar NVC Types:**

**Diagnostic Characteristics:**

**VEGETATION**

**Physiognomy and Structure:**

**Floristics:**

**ENVIRONMENT & DYNAMICS**

**Environmental Description:**

**Dynamics:**

**DISTRIBUTION**

**Geographic Range:**

**Spatial Scale & Pattern [optional]:**

**Nations:** CA, US

**States/Provinces:** BC

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Unassigned.

**SYNONYMY**

**LOWER LEVEL UNITS**

**Groups:**

- G800 Southern Vancouverian Dry Douglas-fir - Madrone Woodland
- G206 Cascadian Oregon White Oak - Conifer Forest & Woodland

**AUTHORSHIP**

**Primary Concept Source:**

**Author of Description:**

**Acknowledgments:**

**Version Date:**

**Classif Resp Region:** West

**Internal Author:** MSR 11-14

**REFERENCES**

**References:** Faber-Langendoen et al. 2015

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- 1. Forest & Woodland
  - 1.B.2.Nd. Vancouverian Cool Temperate Forest
  - M886. Southern Vancouverian Dry Foothill Forest

**G800. Southern Vancouverian Dry Douglas-fir - Madrone Woodland**

**Type Concept Sentence:**

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**OVERVIEW**

**Scientific Name:** Southern Vancouverian Dry Douglas-fir - Madrone Woodland Group

**Common Name (Translated Scientific Name):** Southern Vancouverian Dry Douglas-fir - Madrone Woodland Group

**Type Concept:** This dry, mixed broadleaf-conifer forest group is dominated by the evergreen broadleaf *Arbutus menziesii* and the evergreen conifer *Pseudotsuga menziesii*. Some stands may have only *Pseudotsuga menziesii*. The short-lived conifer *Pinus contorta*, the broad-leaved deciduous *Acer macrophyllum*, and the shade-tolerant conifer *Abies grandis* can be locally dominant or codominant species. *Calocedrus decurrens* is absent. The broad-leaved deciduous tree *Quercus garryana* may also be present in the upper tree stratum or as a subcanopy. The forest understory is usually species-rich and well-developed. This group is found in lowland areas of the Puget Sound, including the San Juan Islands in Washington and the Gulf Islands in British Columbia, and as far south as the Klamath Mountains. It occurs along low-elevation (0-1000 m) mountain slopes and valley margins, usually on southern exposures with ample sun and seasonal drought. Sites usually have bedrock or sandy soils which drain quickly.

**Classification Comments:**

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

**Diagnostic Characteristics:** Dry stands dominated by *Arbutus menziesii* and *Pseudotsuga menziesii*.

**VEGETATION**

**Physiognomy and Structure:** Tall woodlands and forests up to 18 m in height.

**Floristics:** Stands are dominated by *Arbutus menziesii* and *Pseudotsuga menziesii*. *Pinus contorta*, *Acer macrophyllum*, and *Abies grandis* can be locally dominant or codominant species. *Calocedrus decurrens* is absent. Other conifers, such as *Taxus brevifolia* and *Juniperus scopulorum*, may be present in the tree layer, depending upon location and stand history. The broad-leaved deciduous tree *Quercus garryana* may also be present in the upper tree stratum or as a subcanopy. The forest understory is usually species-rich and well-developed. Common shrub species include *Corylus cornuta* var. *californica*, *Gaultheria shallon*, *Holodiscus discolor*, *Lonicera hispidula*, *Symphoricarpos albus*, and *Vaccinium ovatum*. The herbaceous layer is usually well-developed and dominated by xerophytic grasses and forbs. *Festuca occidentalis*, *Elymus glaucus*, and *Bromus vulgaris* are typical grass species. *Vicia americana*, *Lathyrus nevadensis*, and *Sanicula crassicaulis* are common forbs. Ferns include *Polystichum munitum* and *Pteridium aquilinum*.

<b>G800 Southern Vancouverian Dry Douglas-fir - Madrone Woodland Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Arbutus menziesii</i> - <i>Pinus contorta</i> / <i>Gaultheria shallon</i> Forest	GNRQ/SNR	CEGL000132
<i>Arbutus menziesii</i> / <i>Arctostaphylos columbiana</i> Woodland	G2/S1	CTWA003374
<i>Pseudotsuga menziesii</i> - <i>Abies grandis</i> / <i>Symphoricarpos albus</i> / <i>Melica subulata</i> Forest	G1?/S1	CEGL003350
<i>Pseudotsuga menziesii</i> - <i>Arbutus menziesii</i> / <i>Gaultheria shallon</i> Forest	G3/S2	CEGL000421
<i>Pseudotsuga menziesii</i> - <i>Arbutus menziesii</i> / <i>Vicia americana</i> Forest	G1G2Q/S1S2	CEGL000422
<i>Pseudotsuga menziesii</i> / <i>Corylus cornuta</i> / <i>Polystichum munitum</i> Forest	G1/S1	CEGL002616
<i>Pseudotsuga menziesii</i> / <i>Gaultheria shallon</i> - <i>Holodiscus discolor</i> Forest	G2G3/S2	CEGL000436
<i>Pseudotsuga menziesii</i> / <i>Rosa gymnocarpa</i> - <i>Holodiscus discolor</i> Forest	G2G3/S2	CEGL000456
<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> - <i>Holodiscus discolor</i> Forest	G1/S1	CEGL000460

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** This group occurs along low-elevation (0-1000 m) mountain slopes and valley margins, usually on southern exposures with ample sun and seasonal drought, often adjacent to saltwater shorelines. Primarily, this group occurs in areas with a pronounced rainshadow effect from the Olympics and other coastal ranges. Sites usually have bedrock or sandy soils which drain quickly.

**Dynamics:** *Arbutus menziesii* stump sprouts following fire, and these communities were probably subject to a moderate-severity fire regime in presettlement times. These sites are too dry and warm or have been too frequently and extensively burned for more than small amounts of *Tsuga heterophylla* or *Thuja plicata* to be present as regeneration. On sites where it occurs, *Arbutus menziesii* dominance is favored by high-severity fires; *Pseudotsuga menziesii* can be locally eliminated by logging and hot fire or repeated high-severity fires.

**DISTRIBUTION**

**Geographic Range:** This group is found in lowland areas of the Puget Sound, including the San Juan Islands in Washington and the Gulf Islands in British Columbia, and as far south as the Klamath Mountains of northern California. It is less common around the margins of the Willamette Valley, Oregon, and on the lower foothills of the Cascades in Washington and Oregon.

**Nations:** CA, US

**States/Provinces:** BC, CA, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL****USNVC Confidence Level with Comments:** Unassigned.**SYNONYMY****LOWER LEVEL UNITS****Alliances:**

- A3716 *Pseudotsuga menziesii* - *Abies grandis* - *Arbutus menziesii* Forest & Woodland Alliance

**AUTHORSHIP****Primary Concept Source:** C. Chappell, in Faber-Langendoen et al. (2015)**Author of Description:** G. Kittel and C. Chappell**Acknowledgments:****Version Date:** 2015/05/14**REFERENCES****References:** Faber-Langendoen et al. 2015

## 1. Forest &amp; Woodland

1.B.2.Nd. Vancouverian Cool Temperate Forest

M886. Southern Vancouverian Dry Foothill Forest

**G206. Cascadian Oregon White Oak - Conifer Forest & Woodland [Proposed]****Type Concept Sentence:****OVERVIEW****Scientific Name:** *Quercus garryana* - *Pinus ponderosa* - *Pseudotsuga menziesii* Forest & Woodland Group**Common Name (Translated Scientific Name):** Oregon White Oak - Ponderosa Pine - Douglas-fir Forest & Woodland Group

**Type Concept:** This narrowly restricted group appears at or near lower treeline in foothills of the eastern Cascades in Washington and Oregon, within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion. Elevations range from 460 to 1920 m. Disjunct occurrences in the Klamath Mountains and southernmost Cascades have more sagebrush and bitterbrush in the understory, along with other shrubs. Most occurrences of this group are dominated by a mix of *Quercus garryana* and *Pinus ponderosa* or *Pseudotsuga menziesii*. Isolated, taller *Pinus ponderosa* or *Pseudotsuga menziesii* over *Quercus garryana* trees characterize parts of this group. Clonal *Quercus garryana* can create dense patches across a grassy landscape or can dominate open woodlands or even savannas. The understory may include dense stands of shrubs or, more often, be dominated by grasses, sedges or forbs. Shrub-steppe shrubs may be prominent in some stands and create a distinct tree / shrub / sparse grassland habitat, including *Purshia tridentata*, *Artemisia tridentata*, *Artemisia nova* (in Oregon only), and *Chrysothamnus viscidiflorus*. Understories are generally dominated by herbaceous species, especially graminoids. Mesic sites have an open to closed sodgrass understory dominated by *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Carex inops*, or *Elymus glaucus*. Drier savanna and woodland understories typically contain bunchgrass steppe species such as *Festuca idahoensis* or *Pseudoroegneria spicata*. Common exotic grasses that often appear in high abundance are *Bromus tectorum* and *Poa bulbosa*. These woodlands occur at the lower treeline/ecotone between *Artemisia* spp. or *Purshia tridentata* steppe or shrubland and *Pinus ponderosa* and/or *Pseudotsuga menziesii* forests or woodlands. In the Columbia River Gorge, this group appears as small to large patches in transitional areas in the Little White Salmon and White Salmon river drainages in Washington and Hood River, Rock Creek, Moiser Creek, Mill Creek, Threemile Creek, Fifteen Mile Creek, and White River drainages in Oregon. *Quercus garryana* can create dense patches often associated with grassland or shrubland balds within a closed *Pseudotsuga menziesii* forest landscape. Commonly the understory is shrubby and composed of *Ceanothus integerrimus*, *Holodiscus discolor*, *Symphoricarpos albus*, and *Toxicodendron diversilobum*. Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii* in the gorge and other oak patches on xeric sites in the east Cascade foothills. In the past, most of the habitat experienced frequent low-severity fires that maintained woodland or savanna conditions. The mean fire-return interval is 20 years, although variable. Soil drought plays a role, maintaining an open tree canopy in part of this dry woodland habitat.

Westside: This group is limited to the southern portions of the North Pacific region. It occurs in southwestern British Columbia, in the Puget Trough and Willamette Valley south into the Klamath Mountains and into northern California, southward through the lower southern Cascades and western Modoc Plateau and the middle and inner North Coast Ranges into Mendocino County 600-1600 m (1800-4850 feet) on steep, rocky slopes where snow and cold temperatures occur. This group is associated with dry, predominantly low-elevation sites and/or sites that experienced frequent presettlement fires. In the Willamette Valley, soils are mesic yet well-drained, and the stands are mostly large patch. In the Puget Lowland and Georgia Basin, this group is primarily found on dry sites, typically either shallow bedrock soils or deep gravelly glacial outwash soils. It occurs on various soils in the interior valleys of the Klamath Mountains, and on shallow soils of "bald hill" toward the coast. Even where more environmentally limited,

the group is strongly associated with a historic low-severity fire regime. With frequent annual burning (at lower elevations and on warmer sites), this group is an open to dense woodland of large oaks with well-developed grassy understories of native perennial bunchgrass. The vegetation ranges from savanna and woodland to forest dominated by deciduous broadleaf trees, mostly *Quercus garryana*. Codominance by the evergreen conifer *Pseudotsuga menziesii* is common, and *Pinus ponderosa* is important in some stands. In the south, common associates also include *Quercus kelloggii* and *Arbutus menziesii*. The predominant oaks with the higher frequency fires include *Quercus kelloggii* and *Quercus garryana*, with *Quercus garryana* var. *garryana* codominant in the central and northern Coast Ranges, Klamath Mountains and Modoc Plateau. However, *Quercus garryana* var. *breweri* often codominates in the northwestern Coast Ranges. More isolated patches of shrubby, clonal *Quercus garryana* var. *semota* (similar to but apparently distinct from var. *breweri*) occur farther south into the Sierra Nevada southward to the Paiute and Tehachapi mountains (southern branches of the Sierra Nevada), but these are without *Pinus ponderosa* or *Pseudotsuga menziesii* and appear to behave more as montane chaparral stands. The perennial bunchgrass component includes *Festuca idahoensis*, *Festuca californica*, *Elymus glaucus*, and *Danthonia californica* (close to the coast). A variety of native forbs also occur. Other characteristic species include *Toxicodendron diversilobum*, *Juniperus occidentalis*, and *Ceanothus cuneatus*. Succession in the absence of fire tends to favor increased shrub dominance in the understory, increased tree density, and increased importance of conifers, with the end result being conversion to a conifer forest. This group merges into California Broadleaf Forest & Woodland Group (G195). This group occurs as both small patch and large patch in its dynamics.

**Classification Comments:** This group is a matrix type with stands of either pure *Pinus ponderosa*, pure *Quercus garryana*, or mixed *Pinus ponderosa* - (*Pseudotsuga menziesii*) - *Quercus garryana*. The description of *Pinus ponderosa* - *Quercus garryana* / *Arctostaphylos viscida* / *Festuca californica* Woodland (CEGL000880) indicates that it is a transitional type or a clustering of plots from the interbasins (*Festuca idahoensis* and *Pseudoroegneria spicata*) and California (*Festuca californica*, *Toxicodendron diversilobum*).

*Quercus garryana* var. *breweri* (and other shrub-form varieties) are not included in this group; in California, they are considered part of montane deciduous scrub, occurring at higher elevations than the tree-form *Quercus garryana* var. *garryana*.

**Internal Comments:** mjr 10-12: CA added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G344 California Montane Conifer Forest & Woodland

**Diagnostic Characteristics:** Forests and woodlands dominated by a mix of *Quercus garryana* and *Pinus ponderosa* or *Pseudotsuga menziesii*. Shrubs and herbaceous species are Intermountain Basin species, diagnostic of the Columbia Plateau and Great Basin or Rocky Mountains species. Bakker and Colasurdo (2010) concluded that *Quercus garryana* tree densities in all size classes were higher in eastern Washington than on western sites. Westside: Dry low-elevation stands dominated by *Quercus garryana* which can have some *Arbutus menziesii*, *Quercus chrysolepis*, or *Quercus kelloggii*. *Pseudotsuga menziesii* is common, and *Pinus ponderosa* occurs occasionally but is not diagnostic. Other characteristic species include *Toxicodendron diversilobum*, *Symphoricarpos albus*, *Juniperus occidentalis*, and *Ceanothus cuneatus*.

## VEGETATION

**Physiognomy and Structure:** Medium-tall woodlands and forests often with emergent taller conifer trees. Undergrowth of medium-height shrubs and an open layer of grasses and or forbs is typical. Also medium-height open-canopy deciduous broadleaf woodlands with grassy understory.

**Floristics:** Most occurrences of this group are dominated by *Quercus garryana* with and without *Pinus ponderosa* or *Pseudotsuga menziesii*. Isolated, taller *Pinus ponderosa* or *Pseudotsuga menziesii* over *Quercus garryana* trees characterize part of this group. Clonal *Quercus garryana* can create dense tree or tall-shrub patches across a grassy landscape or can dominate open woodlands or even savannas. The understory may include dense stands of shrubs or, more often, be dominated by grasses, sedges or forbs. Shrub-steppe shrubs may be prominent in some stands and create a distinct tree / shrub / sparse grassland habitat, including *Purshia tridentata*, *Artemisia tridentata*, *Artemisia nova*, and *Chrysothamnus viscidiflorus*. Understories are generally dominated by herbaceous species, especially graminoids. Mesic sites have an open to closed sodgrass understory dominated by *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Carex inops*, or *Elymus glaucus*. Drier savanna and woodland understories typically contain bunchgrass steppe species such as *Festuca idahoensis* or *Pseudoroegneria spicata*. Common exotic grasses that often appear in high abundance are *Bromus tectorum* and *Poa bulbosa*. These woodlands occur at the lower treeline/ecotone between *Artemisia* spp. or *Purshia tridentata* steppe or shrubland and *Pinus ponderosa* and/or *Pseudotsuga menziesii* forests or woodlands. In the Columbia River Gorge, this group appears as small to large patches in transitional areas in the Little White Salmon and White Salmon river drainages in Washington and Hood River, Rock Creek, Moiser Creek, Mill Creek, Threemile Creek, Fifteen Mile Creek, and White River drainages in Oregon. *Quercus garryana* can create dense patches often associated with grassland or shrubland balds within a closed *Pseudotsuga menziesii* forest landscape. Commonly the understory is shrubby and composed of *Ceanothus integerrimus*,

*Holodiscus discolor*, *Symphoricarpos albus*, and *Toxicodendron diversilobum*. Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii* in the gorge and other oak patches on xeric sites in the east Cascade foothills.

Westside floristics: With frequent annual burning (at lower elevations and on warmer sites), this group is an open to dense woodland of large oaks with well-developed grassy understories of native perennial bunchgrass. The perennial bunchgrass component includes *Festuca idahoensis*, *Festuca californica*, *Elymus glaucus*, and *Danthonia californica* (close to the coast). A variety of native forbs also occur. Other characteristic species include *Toxicodendron diversilobum*, *Juniperus occidentalis*, and *Ceanothus cuneatus*. The predominant oaks with the higher frequency fires include *Quercus kelloggii* and *Quercus garryana*, with *Quercus garryana* var. *garryana* codominant in the central and northern Coast Ranges. Succession in the absence of fire tends to favor increased shrub dominance in the understory, increased tree density, and increased importance of conifers, with the end result being conversion to a conifer forest. The vegetation ranges from savanna and woodland to forest dominated by deciduous broadleaf trees, mostly *Quercus garryana*. Codominance by the evergreen conifer *Pseudotsuga menziesii* is common, and *Pinus ponderosa* is important in some stands. In the south, common associates also include *Quercus kelloggii* and *Arbutus menziesii*.

G206 Cascadian Oregon White Oak - Conifer Forest & Woodland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Pseudotsuga menziesii</i> - <i>Quercus garryana</i> / <i>Melica subulata</i> Forest	G1G2/S1	CEGL003355
<i>Pseudotsuga menziesii</i> - <i>Quercus garryana</i> / <i>Symphoricarpos albus</i> Woodland	G2G3/S2S3	CEGL000929
<i>Pseudotsuga menziesii</i> - <i>Quercus garryana</i> / <i>Toxicodendron diversilobum</i> Woodland	G3/S2?	CEGL000928
<i>Quercus garryana</i> / <i>Carex inops</i> - <i>Camassia quamash</i> Woodland	G1/S1	CEGL000548
<i>Quercus garryana</i> / <i>Festuca (roemerii, rubra)</i> Wooded Herbaceous Vegetation	G1/S1	CEGL001714
<i>Quercus garryana</i> / <i>Symphoricarpos albus</i> / <i>Carex inops</i> Woodland	G2/S1	CEGL003358
<i>Quercus garryana</i> / <i>Toxicodendron diversilobum</i> / <i>Elymus glaucus</i> Woodland	G2/S1	CEGL000932
<i>Quercus garryana</i> / <i>Viburnum ellipticum</i> - <i>Toxicodendron diversilobum</i> Woodland	G1/S1	CEGL003354
<i>Quercus garryana</i> Forest [Placeholder]	G2Q/S1	CEGL000547
<i>Pinus ponderosa</i> / <i>Carex inops</i> - <i>Festuca roemerii</i> Woodland	G1/S1	CEGL003348
<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> / <i>Hieracium cynoglossoides</i> Forest	G2/SNR	CEGL000458

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This narrowly restricted group appears at or near lower treeline in foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion associated with low-elevation slopes and valley margins. This area receives 50-80 cm of annual precipitation, falling mostly as winter rain and snow. Elevation ranges from 460 to 1920 m. Stands often occur on warm sites with southern exposures with seasonal soil drought or desiccating winds. Substrates usually have bedrock, sand, or pumice soils which drain quickly (Reid et al.1999).

Westside environment: This group is limited to southwestern British Columbia, in the Puget Trough and Willamette Valley south into the Klamath Mountains and into northern California, where it is found throughout the Sierra Nevada and Coast Ranges foothills and lower montane elevations from 600-1600 m (1800-4850 feet) on steep, rocky slopes where snow and cold temperatures occur. This group is associated with dry, predominantly low-elevation sites and/or sites that experienced frequent presettlement fires. In the Willamette Valley, soils are mesic yet well-drained, and the stands are mostly large patch. In the Puget Lowland and Georgia Basin, this group is primarily found on dry sites, typically either shallow bedrock soils or deep gravelly glacial outwash soils. It occurs on various soils in the interior valleys of the Klamath Mountains, and on shallow soils of "bald hills" toward the coast.

**Dynamics:** Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii* in the gorge and other oak patches on xeric sites in the east Cascade foothills. Most of the habitat experienced frequent low-severity fires that maintained woodland or savanna conditions. The mean fire-return interval is 20 years, although variable. Landfire VDDT models: #R OAP1 Oregon White Oak-Ponderosa Pine model describes general successional pathways treating drier pine succession separate from more mesic Douglas-fir pathways. Frequent annual burning (at lower elevations and on warmer sites) is required to maintain the open to dense woodland of large oaks with well-developed grassy understories of native perennial bunchgrass. Landfire VDDT models: #R OWOA Oregon White Oak applies to southern occurrences.



**DISTRIBUTION**

**Geographic Range:** This narrowly restricted group appears at or near lower treeline in the foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion. Disjunct occurrences in the Klamath Mountains and southernmost Cascades may have big sagebrush and bitterbrush in the understory, along with other shrubs.

**Westside range:** This group occurs primarily in the Puget Trough and Willamette Valley and extends southward at low elevations in the Klamath Mountains on both sides of the Oregon/California stateline, and continues south throughout the Sierra Nevada and Coast Ranges foothills and lower montane of California and Oregon at elevations from 600-1600 m (1800-4850 feet).

**Nations:** CA, US

**States/Provinces:** BC, CA, OR, WA

**TNC Ecoregions [optional]:** 4:C, 6:C

**USFS Ecoregions (2007):** 342H:CC, 342I:CC, M242B:C?, M242C:CC, M242D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Proposed. M.S. Reid 2-13: G204 was merged into this group. Text was quickly added from that group to this one, but further editing to clean up the concept is required. Below comments are from reviewers prior to this merge, and are part of the reason for the merging of these 2 groups.

I think the distinction between this and Californian-Vancouverian Deciduous Oak Woodland Group (G204) is very uncertain. We need to review floristics of both, and consider merging them into one type. Rather than clumping groups that have only the overstory differential species in common I'd look at the associations and maybe alliances in G204 and move them into the east Cascades group G206 based on floristics, i.e., Idaho fescue to G206 Roemer's fescue into California G204. G206 is mostly Intermountain Basin or Rocky Mountains flora i.e., *Pseudoroegneria*, *Carex geyeri*, *Calamagrostis*, *Purshia tridentata*, *Artemisia tridentata*, *Artemisia nova*, and *Chrysothamnus viscidiflorus* except for oak. Maybe moving the central Gorge and Klamath associations with *Ceanothus integerrimus*, *Toxicodendron diversilobum*, *Festuca californica* to the California group would clarify these groups.

This type concept works for stands in the east Klamath Mountains and Cascades in CA. The problem in CA is what to do with the shrub vars. of *Quercus garryana*. Should they be in G204? They are considered by people in CA as the low limits of the montane chaparral, but maybe in this group as a southern extension along the westside if the Sierra Nevada and the interior North Coast Ranges makes sense. See *Quercus garryana* shrubland alliance in MVC2. This group, even with *Quercus garryana* also defining G204, is sufficiently different from this group in CA. Here the distinction suggested for *Festuca idahoensis/roemerii* is blurred.

G204 was merged into this group. Text was quickly added from that group to this one, but further editing to clean up the concept is required. *Quercus garryana* var. *breweri* (and other shrub-form varieties) is not included in this group; in California it is considered part of montane deciduous scrub, occurring at higher elevations than the tree-form *Quercus garryana* var. *garryana*.

**SYNONYMY**

- < Interior Ponderosa Pine: 237 (Eyre 1980)
- < Oregon White Oak: 233 (Eyre 1980)

**LOWER LEVEL UNITS****Alliances:**

- A3327 *Quercus garryana* - *Pinus ponderosa* / *Carex geyeri* Woodland Alliance
- A3328 *Quercus garryana* - *Pseudotsuga menziesii* / *Toxicodendron diversilobum* Forest & Woodland Alliance

**AUTHORSHIP**

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel, mod. C. Chappell, M.S. Reid and R. Crawford

**Acknowledgments:** R. Crawford, R.J. Cole, T. Keeler-Wolf, J. Evens

**Version Date:** 2013/04/18

**REFERENCES**

**References:** Bakker and Colasurdo 2010, Barbour et al. 2007a, Eyre 1980, Faber-Langendoen et al. 2015, John and Tart 1986, Lillybridge et al. 1995, Reid et al. 1999, Sawyer et al. 2009, Simpson 2007, Topik et al. 1988

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1. Forest & Woodland
    - 1.B.2.Nd. Vancouverian Cool Temperate Forest

## M024. Vancouverian Lowland & Montane Forest

**Type Concept Sentence:** This macrogroup consists of lowland temperate rainforests of the Pacific Northwest, dominated by *Abies amabilis*, *Acer macrophyllum*, *Alnus rubra*, *Arbutus menziesii*, *Chamaecyparis lawsoniana*, *Picea sitchensis*, *Pinus contorta* var. *contorta*, *Pseudotsuga menziesii*, *Sequoia sempervirens*, *Thuja plicata*, and/or *Tsuga heterophylla*. Forests range from coastal very wet hypermaritime to slightly less wet leeward sites.

### OVERVIEW

**Scientific Name:** *Tsuga heterophylla* - *Picea sitchensis* - *Sequoia sempervirens* Forest Macrogroup

**Common Name (Translated Scientific Name):** Western Hemlock - Sitka Spruce - Redwood Macrogroup

**Type Concept:** This macrogroup covers coastal and inland rainforests at low elevations dominated by *Abies amabilis*, *Acer macrophyllum*, *Alnus rubra*, *Arbutus menziesii*, *Chamaecyparis nootkatensis*, *Picea sitchensis*, *Pinus contorta* var. *contorta*, *Pseudotsuga menziesii*, *Sequoia sempervirens*, *Thuja plicata*, and/or *Tsuga heterophylla*. Additional trees that may be present include *Abies grandis*, *Pinus monticola*, and *Chamaecyparis lawsoniana*. This macrogroup combines predominantly evergreen rainforests of the region and the coastal redwood forests of northern California. These forests and woodlands occur in the hypermaritime (within salt spray exposure), the subarctic, as well as more protected areas of the leeward Coast and west-side Cascade ranges. They may also occur on cool temperate lower montane slopes where winter snowpack typically lasts for several months, sometimes referred to as the "rain-on-snow" zone because of the common occurrence of major winter rainfall on an established snowpack. Climate is wet, mild maritime. Forests along the immediate coast experience a uniformly wet and mild climate, where precipitation ranges from 100 to 300 cm/year with frequent fog and low clouds during warmer months, and additional moisture from fog drip can be significant. Away from the coast, climate is still mild but with less moisture (as low as 50 cm/year) and greater temperature extremes.

**Classification Comments:** This macrogroup combines predominantly evergreen rainforests of the region, namely Krajina's (1965) Coastal Western Hemlock Zone, and the *Picea sitchensis*, *Tsuga heterophylla*, and *Abies amabilis* zones of Oregon and Washington described by Franklin and Dyrness (1973).

### Similar NVC Types:

- M009 California Forest & Woodland: occurs mainly within the Mediterranean climate of California and southern Oregon and includes *Lithocarpus densiflorus*, *Umbellularia californica*, and *Quercus chrysolepis*.
- M500 Central Rocky Mountain Mesic Lower Montane Forest
- M025 Vancouverian Subalpine Forest
- M023 Southern Vancouverian Montane-Foothill Forest

**Diagnostic Characteristics:** Tall evergreen and broad-leaved deciduous rainforests dominated by one or a mix of the following species: *Abies amabilis*, *Chamaecyparis lawsoniana*, *Picea sitchensis*, *Pseudotsuga menziesii*, *Sequoia sempervirens*, *Thuja plicata*, and/or *Tsuga heterophylla*.

### VEGETATION

**Physiognomy and Structure:** Tall (>25 m) conifer, mixed broad-leaved evergreen and mixed conifer and broad-leaved evergreen forests and woodlands.

**Floristics:** This rainforest macrogroup covers forests that are a mix of several species that change with substrate and aspect. Probably the most abundant forests are stands of *Pseudotsuga menziesii* with *Tsuga heterophylla* and/or *Thuja plicata*. These occur on a wide range of "dry-site" to "very mesic" settings. Understory species may include *Acer circinatum*, *Achlys triphylla*, *Gaultheria shallon*, *Linnaea borealis*, *Mahonia nervosa*, *Oxalis oregana*, *Polystichum munitum*, *Rhododendron macrophyllum*, and *Rubus spectabilis*. Understory species here may include *Acer circinatum*, *Cornus nuttallii*, *Linnaea borealis*, *Mahonia nervosa*, *Paxistima myrsinites*, *Rubus parviflorus*, *Spiraea betulifolia*, *Symphoricarpos hesperius*, and *Vaccinium membranaceum*.

Early-seral forests are represented by stands dominated by *Alnus rubra* or *Acer macrophyllum* which are often mixed with *Abies grandis*, *Picea sitchensis*, *Pseudotsuga menziesii*, *Thuja plicata*, and/or *Tsuga heterophylla*. Other major dominant broadleaf species are *Frangula purshiana*, and *Cornus nuttallii*. The understory is characterized by deciduous shrubs such as *Acer circinatum*, *Corylus cornuta*, *Oemleria cerasiformis*, *Rubus ursinus*, *Symphoricarpos albus*, and/or *Toxicodendron diversilobum*, but evergreen shrubs, including *Gaultheria shallon* and *Mahonia nervosa*, and forbs, such as *Polystichum munitum* and *Oxalis oregana*, can be dominant.

At higher elevations, *Tsuga heterophylla* and/or *Abies amabilis* dominate the canopy of late-seral stands, and *Chamaecyparis nootkatensis* can be codominant, especially at the highest elevations and most northerly locations within this macrogroup's range. *Thuja plicata* is also common and sometimes codominates in British Columbia. In more mesic settings, *Pseudotsuga menziesii* is

relatively rare to absent, and a major understory dominant species is *Vaccinium ovalifolium*. Other mesic-setting understory species include *Blechnum spicant*, *Oxalis oregana*, *Rubus spectabilis*, and/or *Rubus pedatus*. Dry-setting understory species may include *Achlys triphylla*, *Mahonia nervosa*, *Rhododendron macrophyllum*, *Vaccinium membranaceum*, and/or *Xerophyllum tenax*. In extreme southeastern Alaska, *Abies amabilis* occurs in nearly pure stands and in mixture with *Picea sitchensis* and *Tsuga heterophylla*.

Further south, in California, stands of *Sequoia sempervirens* produce a deep shade, with diverse understories from fern-covered slopes to scattered herbs. *Pseudotsuga menziesii* is the common associate among the large trees. *Tsuga heterophylla* is found in northern old-growth stands. *Sequoia sempervirens* can be the sole canopy dominant while understory species include *Aralia californica*, *Gaultheria shallon*, *Mahonia nervosa* (= *Berberis nervosa*), *Oxalis oregana*, *Rubus parviflorus*, *Vaccinium ovatum*, and many ferns, such as *Blechnum spicant*, *Polystichum munitum*, and *Polypodium* spp., may be present.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This broad rainforest type occurs on a variety of settings from sea level to mid-montane elevations (0-1067 m) and includes dry to wet mid- and toeslopes, valley floors and side terraces both exposed to the ocean and of interior valleys, and stabilized coastal sand dunes. Climate is relatively mild and moist to wet. Mean annual precipitation is mostly 90-254 cm (35-100 inches) (but as low as 50 cm [20 inches] in the extreme rainshadow areas) falling predominantly as winter rain. Snowfall ranges from rare to regular, but not persistent, and summers are relatively dry. Some forests within this macrogroup are limited to the fog belt found along the coast from northern California to British Columbia. Soils range from dry to subirrigated, are generally deep, fine- to moderately coarse-textured, with some subsurface seepage or richer parent material.

**Dynamics:** There are large areas of wet rainforests that rarely burn, where fire plays a minor role and windthrow gaps are the predominant source of stand dynamics. However, fire becomes an increasingly important factor of stand dynamics where drier climatic conditions exist in the more southern and subarctic ranges of this macrogroup, as well as dry microclimate pockets throughout the range. In drier stands, where fire did/does occur, the dominant natural (pre-European settlement) process included stand-replacing fires on average every 150-500 years (Agee 1993). In these situations, where old-growth does exist, it is mostly "young old-growth" about 200-500 years in age. Natural-origin stands less than 200 years old are also common. Mixed-severity fires occur more frequently (about every 50-100 years) in the drier more subarctic and often southern parts of this macrogroup, so that forest structure, patch size and proportions can be different from northern, more mesic stands (Agee 1993, Brown and Hebda 1999).

California coastal redwood historically had surface fires that exposed mineral soil necessary for redwood seed germination. Less frequent disturbance can result in increases in *Tsuga heterophylla* in northern occurrences, as it is sensitive to fire and declines with fire and flood. Fire suppression has tended to result in increasing abundance of *Acer macrophyllum*, *Alnus rubra*, *Arbutus menziesii*, *Lithocarpus densiflorus*, and *Umbellularia californica*. Other disturbances such as flood, wind and landslides, and human disturbance will also favor these species. Landslides and forest fire that eliminate upper canopies allow for full sunlight and early-successional forests dominated by *Alnus rubra*, *Acer macrophyllum*, and/or *Pseudotsuga menziesii* to become established. Due to human disturbance, these early-seral forests are more abundant today than other types within the macrogroup in the Pacific Northwest. These forests, however, can persist (>200 years) and remain as mixed deciduous-conifer forests.

Fire is not a major disturbance factor in the northern range of *Pseudotsuga menziesii* - *Tsuga heterophylla* forests. Although fire is by no means common or frequent, those sites in locations most vulnerable to fire tend to have a major component of *Pseudotsuga menziesii* in their canopies (Agee 1993). Stand-maintaining surface fires, both aboriginal and lightning-caused, were more frequent (perhaps every 50-100 years) and likely maintained a moderately open overstory (Agee 1993, Brown and Hebda 1999). The coastal mesic forests dominated by *Abies amabilis* and *Tsuga heterophylla* rarely, if ever, burn and are dominated by trees that run from 700 to over 1000 years in age. In British Columbia, coastal rainforests may burn an average of once every 2000 years. Extreme, stand-replacing fires are infrequent to absent, with return intervals of several hundred or more years.

Gap dynamics in old forests result in multi-aged stand structure (Franklin and Dyrness 1973). Unless growing in wind-protected conditions, windthrow and breakage tend to keep these forests from becoming or remaining very old. *Tsuga heterophylla*, one of the leading tree species, is vulnerable to wind breakage and also to uprooting given the shallow soils. If wind exposure is limited, then stand replacement is more gradual, through the process of the mortality of individuals or small numbers of canopy trees. Where windthrow is not pervasive, the age composition of these potentially old edaphic climax forests is uneven. Within mature and old forests, small gaps result from the death of single trees or small groups of trees due to root-rots, bark beetles or windthrow.

#### DISTRIBUTION

**Geographic Range:** These forests cover nearly 30° of latitude (about 36° to 62°N latitude), extending from the Gulf of Alaska to northern California but lying within 60-120 km of the Pacific coast. Areas occupied include southeastern Alaska, much of the coastal mountain ranges of British Columbia, Washington, and Oregon, the western slope of the Cascade Range and maritime lowlands of western California.

**Spatial Scale & Pattern [optional]:**

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 3:C, 5:C, 14:C, 15:C, 69:C, 70:C, 81:C

**USFS Ecoregions (2007):** 242A:CC, 242B:CC, 263A:CC, 342I:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261B:CC, M261D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** High.

**SYNONYMY**

- ? Coastal Western Hemlock Zone (Krajina 1965) [combines four zones from Franklin and Dyrness (1973): the *Picea sitchensis*, *Tsuga heterophylla*, and *Abies amabilis* Zones of Oregon and Washington, and the coastal redwood forest of northern California.]
- < Major Temperate Forest Types: *Pseudotsuga menziesii*-*Tsuga heterophylla*, *Picea sitchensis*-*Tsuga heterophylla*, and *Sequoia sempervirens* Forests. (Barbour and Billings 2000) [pp. 127-134]

**LOWER LEVEL UNITS**

**Groups:**

- G235 California Coastal Redwood Forest
- G205 Vancouverian Dry Coastal Beach Pine Forest & Woodland
- G240 North Pacific Maritime Douglas-fir - Western Hemlock Forest
- G241 North Pacific Maritime Silver Fir - Western Hemlock Forest
- G750 North Pacific Maritime Western Hemlock - Sitka Spruce Rainforest
- G751 North Pacific Western Hemlock - Sitka Spruce - Western Red-cedar Seasonal Rainforest
- G237 North Pacific Red Alder - Bigleaf Maple - Douglas-fir Forest

**AUTHORSHIP**

**Primary Concept Source:** V.J. Krajina (1965)

**Author of Description:** G. Kittel, D. Meidinger and D. Faber-Langendoen

**Acknowledgments:**

**Version Date:** 05/14/2015

**Classif Resp Region:** West

**Internal Author:** GK 10-14, 5-15

**REFERENCES**

**References:** Agee 1993, BCMF 2006, Banner et al. 1993, Banner et al. 2004, Barbour and Billings 2000, Barbour and Major 1988, Barbour et al. 2007a, Brown and Hebda 1999, Cadrin and Wolowicz 2005, Carstens et al. 2005, Chappell and Christy 2004, Comer et al. 2003, Crawford et al. 2009, DeMeo et al. 1992, DeVelice et al. 1999, Dorner and Wong 2003, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Goward and Spribille 2005, Green and Klinka 1994, Hessburg et al. 1999, Hessburg et al. 2000, Holland and Keil 1995, Krajina 1965, Lillybridge et al. 1995, Lorimer et al. 2009, Martin et al. 1995, Noss 2000, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Sillett and Bailey 2003, Sillett and Van Pelt 2000, Topik 1989, Topik et al. 1988, Viereck et al. 1992, Waring and Franklin 1979, Zinke 1977

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1. Forest & Woodland

1.B.2.Nd. Vancouverian Cool Temperate Forest

M024. Vancouverian Lowland & Montane Forest

**G205. Vancouverian Dry Coastal Beach Pine Forest & Woodland [Proposed]**

**Type Concept Sentence:** This group consists of dry *Pinus contorta* var. *contorta* forests or woodlands on stabilized sand dunes.

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**OVERVIEW**

**Scientific Name:** *Pinus contorta* var. *contorta* Forest & Woodland Group

**Common Name (Translated Scientific Name):** Beach Pine Forest & Woodland Group

**Type Concept:** This group consists of old, stabilized sand dunes covered in forests or woodlands of *Pinus contorta* var. *contorta*. It occurs on long stabilized sand dunes in Washington, Oregon into northernmost California in the coastal areas. It may occur in British Columbia but this needs to be confirmed.

**Classification Comments:** Early-successional scrubby and stunted stands of lodgepole pine on sand dunes are part of North Pacific Maritime Coastal Scrub & Herb Beach & Dune Group (G498), which is in a different division and macrogroup, 2.B.4.Nb Pacific North American Coast Scrub & Herb Vegetation Division (D027), and Pacific Coastal Cliff & Bluff Vegetation Macrogroup (M058), respectively.

**Internal Comments:** GK 5-15: BC/Canada changed to ?. GK 12-11: CA added.

**Other Comments:**

**Similar NVC Types:**

- G208 California Moist Coastal Mixed Evergreen Forest

**Diagnostic Characteristics:** *Pinus contorta* var. *contorta*-dominated sites near the coast on old sand dunes.

**VEGETATION**

**Physiognomy and Structure:** Dry conifer forests and woodlands 10-25 m tall with little understory structure.

**Floristics:** Dry conifer forests and woodlands dominated by *Pinus contorta* var. *contorta*.

G205 Vancouverian Dry Coastal & Lowland Beach Pine Forest & Woodland	Global/ State Rank	NatureServe/ WANHP Code
<i>Pinus contorta</i> var. <i>contorta</i> - <i>Pseudotsuga menziesii</i> / <i>Cladina</i> spp. Forest	G2/S1?	CEGL003375
<i>Pinus contorta</i> var. <i>contorta</i> / <i>Arctostaphylos uva-ursi</i> Woodland	G1/S1	CEGL002605
<i>Pinus contorta</i> var. <i>contorta</i> / <i>Gaultheria shallon</i> Forest	G1G2/S1	CEGL000150

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** Along the Pacific Coast, it occupies well-stabilized sand dunes.

**Dynamics:**

**DISTRIBUTION**

**Geographic Range:** This group occurs along the coastal dunes and coastal mountains of northern California, Oregon and Washington. It may occur in British Columbia but this needs to be confirmed.

**Nations:** CA, US

**States/Provinces:** BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 5:C

**USFS Ecoregions (2007):** 242A:CC, 242B:CC, 263A:PP, M242A:CC, M242B:CC, M242D:CP, M261A:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Proposed.

**SYNONYMY**

- >< Grand Fir: 213 (Eyre 1980) [Grand fir can occasionally be a dominant in occurrences of this group.]
- >< Interior Ponderosa Pine: 237 (Eyre 1980)
- < Pacific Douglas-fir: 229 (Eyre 1980)

**LOWER LEVEL UNITS**

**Alliances:**

- A3717 *Pinus contorta* var. *contorta* Sand Dune Woodland Alliance

**AUTHORSHIP**

**Primary Concept Source:** C. Chappell, in Faber-Langendoen et al. (2011)

**Author of Description:** C. Chappell, mod. D. Meidinger and G. Kittel

**Acknowledgments:** R.J. Cole, R. Crawford

**Version Date:** 2015/05/15

**REFERENCES**

**References:** Chappell and Christy 2004, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Green and Klinka 1994

## 1. Forest &amp; Woodland

## 1.B.2.Nd. Vancouverian Cool Temperate Forest

## M024. Vancouverian Lowland &amp; Montane Forest

**G240. North Pacific Maritime Douglas-fir - Western Hemlock Forest**

**Type Concept Sentence:** This conifer forest group comprises much of the lowland mesic to dry regions of the south-central Pacific Northwest rainforests, from western Washington, northwestern Oregon, eastern Vancouver Island and mainland southern Coast Mountains in British Columbia. *Pseudotsuga menziesii* and *Tsuga heterophylla* are the major dominants and typical ground-layer indicators are *Polystichum munitum* (mesic sites), *Gaultheria shallon* (coastal and well-drained sites), and *Vaccinium parvifolium* (higher elevation, cool nutrient-poor sites).

**OVERVIEW**

**Scientific Name:** *Pseudotsuga menziesii* - *Tsuga heterophylla* / *Gaultheria shallon* Forest Group

**Common Name (Translated Scientific Name):** Douglas-fir - Western Hemlock / Salal Forest Group

**Type Concept:** This group comprises much of the major coastal lowland forests dominated by evergreen needle-leaved trees of western Washington, northwestern Oregon, eastern Vancouver Island and mainland southern Coast Mountains in British Columbia. These forests occur on uplands on moist to dry moisture microhabitat conditions within the Western Hemlock Zone of the Pacific Northwest. Elevation ranges from sea level to 1067 m (3500 feet) in Oregon, 610 m (2000 feet) in northern Washington, and to 700 m (2275 feet) in British Columbia. Topography ranges from relatively flat glacial tillplains to steep mountainous terrain. Overstory canopy is generally dominated by *Pseudotsuga menziesii* with *Tsuga heterophylla* and/or *Thuja plicata*, but *Pseudotsuga menziesii* may simply be present. *Acer macrophyllum* and *Alnus rubra* sometimes occur in the subcanopy and, if in the upper canopy, not more than 10% cover. Stands occur on dry well-drained as well as subirrigated soils. Well-drained site understory species typically include *Gaultheria shallon*, *Mahonia nervosa*, *Rhododendron macrophyllum*, *Linnaea borealis*, *Achlys triphylla*, and/or *Vaccinium ovatum*. Intermediate moisture (mesic) locations often have *Acer circinatum* and *Polystichum munitum* (especially on rich-nutrient sites) with one or more of the evergreen shrubs. Moist sites are dominated by *Polystichum munitum*, *Oxalis oregana*, *Rubus spectabilis*, and/or *Oplopanax horridus*. Indicator canopy species include *Tsuga heterophylla* and *Pseudotsuga menziesii* with a lack (or very low cover) of *Abies amabilis*. Understory indicator species include *Polystichum munitum*, *Achlys triphylla*, *Gaultheria shallon*, and *Mahonia nervosa*; in other words, stands without *Picea sitchensis* and understory species more commonly found in greater abundance close to the coast, such as *Blechnum spicant*, *Anemone deltoidea*, and *Maianthemum dilatatum*, and without wetland indicator species, such as *Lysichiton americanus*.

**Classification Comments:** Stands dominated or codominated by *Chamaecyparis lawsoniana* that are within 25 km (15 miles) of the coast are part of either California Coastal Redwood Forest Group (G235) (extreme southern Oregon and northern California) or North Pacific Western Hemlock - Sitka Spruce - Western Red-cedar Seasonal Rainforest Group (G751). Stands in these areas may or may not have redwood or Sitka spruce present. Criteria for canopy cover of conifers should be reviewed between G237 and G240. Excluded from this group is the area of Douglas-fir and grand fir that does not have western hemlock that occurs in the U.S. in the northeastern part of the Olympic Peninsula, the San Juan Islands, and perhaps part of Seattle (no longer though).

**Internal Comments:** GK 12-11: CA added.

**Other Comments:**

**Similar NVC Types:**

- G235 California Coastal Redwood Forest: occurs farther south and is dominated or codominated by *Sequoia sempervirens*.
- G751 North Pacific Western Hemlock - Sitka Spruce - Western Red-cedar Seasonal Rainforest: occurs in the hypermaritime zone and has at least 10% cover of *Picea sitchensis*.
- G750 North Pacific Maritime Western Hemlock - Sitka Spruce Rainforest: is primarily an Alaskan group that lacks *Pseudotsuga menziesii* and barely comes into northwestern British Columbia.
- G241 North Pacific Maritime Silver Fir - Western Hemlock Forest: indicated by presence of *Abies amabilis*.

**Diagnostic Characteristics:** Overstory canopy is dominated by *Pseudotsuga menziesii* with *Tsuga heterophylla* and/or *Thuja plicata*, the lack of dominance by *Picea sitchensis* or *Chamaecyparis lawsoniana*, and the near absence of *Abies amabilis*.

**VEGETATION**

**Physiognomy and Structure:** This group contains tall coastal temperate rainforests 20 to >35 m tall, dominated by evergreen conifer trees. Undergrowth canopy varies from thick to sparse depending on site productivity and overstory canopy closure.

**Floristics:** Overstory canopy is dominated by *Pseudotsuga menziesii* with *Tsuga heterophylla* and/or *Thuja plicata*. *Pseudotsuga menziesii* is usually at least present to more typically codominant or dominant. *Acer macrophyllum* and *Alnus rubra* sometimes be

present in the subcanopy. Stands occur on dry well-drained as well as subirrigated soils. Dry-site understory shrubs typically include *Gaultheria shallon*, *Mahonia nervosa*, *Rhododendron macrophyllum* (but not in British Columbia), *Linnaea borealis*, and *Achlys triphylla*. Intermediate moisture (mesic) locations often have *Acer circinatum* and *Polystichum munitum* (especially on rich-nutrient sites) with one or more of the evergreen shrubs. Moist sites are dominated by *Polystichum munitum*, *Oxalis oregana*, *Rubus spectabilis*, and/or *Oplopanax horridus*. Indicator species include *Tsuga heterophylla* and *Pseudotsuga menziesii* with a lack (or very low amounts) of *Abies amabilis*. Understory indicator species include *Polystichum munitum*, *Achlys triphylla*, *Gaultheria shallon*, and *Vaccinium parvifolium*; in other words, stands without *Picea sitchensis* in the tree canopy and lacking understory indicator species more common near the coast, such as *Blechnum spicant*, *Anemone deltoidea*, *Maianthemum dilatatum*, and *Vaccinium ovatum*, as well as without wetland indicator species, such as *Lysichiton americanus*.

G240 North Pacific Maritime Douglas-fir - Western Hemlock Forest Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies grandis</i> - <i>Tsuga heterophylla</i> / <i>Polystichum munitum</i> Forest	G2/S2	CEGL000287
<i>Pseudotsuga menziesii</i> - ( <i>Abies grandis</i> , <i>Thuja plicata</i> ) / <i>Mahonia nervosa</i> - <i>Gaultheria shallon</i> Forest	G2/S1	CEGL002845
<i>Pseudotsuga menziesii</i> - ( <i>Tsuga heterophylla</i> ) / <i>Holodiscus discolor</i> / <i>Polystichum munitum</i> Forest	G3/SNR	PNWCOAST_187
<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> Forest	G3/S2	CEGL000084
<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Mahonia nervosa</i> Forest	G2/S1	CEGL000083
<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Polystichum munitum</i> Forest	G3?/S2	CEGL000085
<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Rhododendron macrophyllum</i> - <i>Vaccinium ovatum</i> - <i>Gaultheria shallon</i> Forest	G2/S2	CEGL002615
<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Vaccinium ovatum</i> Forest	G2/S2	CEGL002614
<i>Pseudotsuga menziesii</i> / <i>Acer circinatum</i> - <i>Holodiscus discolor</i> Forest	G3Q/S2	CEGL000109
<i>Pseudotsuga menziesii</i> / <i>Acer circinatum</i> Forest	G5?/S4S5	CEGL000417
<i>Pseudotsuga menziesii</i> / <i>Gaultheria shallon</i> Forest	G3G4/SNR	CEGL000435
<i>Pseudotsuga menziesii</i> / <i>Polystichum munitum</i> Forest	G4G5Q/SNR	CEGL000450
<i>Pseudotsuga menziesii</i> -( <i>Alnus rubra</i> - <i>Tsuga heterophylla</i> )/ <i>Rubus spectabilis</i> Forest	G4/SNR	CEGL000102
<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> / <i>Polystichum munitum</i> Forest	G4/SNR	CEGL000091
<i>Tsuga heterophylla</i> / <i>Acer circinatum</i> / <i>Achlys triphylla</i> Forest	G3G4/S2	CEGL000090
<i>Tsuga heterophylla</i> / <i>Achlys triphylla</i> Forest	G4/S4	CEGL000094
<i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> / <i>Polystichum munitum</i> Forest	G4/S4	CEGL000101
<i>Tsuga heterophylla</i> / <i>Mahonia nervosa</i> - <i>Gaultheria shallon</i> Forest	G4/S4	CEGL000096
<i>Tsuga heterophylla</i> / <i>Mahonia nervosa</i> Forest	G4/S4	CEGL000492
<i>Tsuga heterophylla</i> / <i>Polystichum munitum</i> - <i>Blechnum spicant</i> Forest	G4/S4	CEGL000108
<i>Tsuga heterophylla</i> / <i>Rhododendron macrophyllum</i> Forest	G4/S4	CEGL000112

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Climate is relatively mild and moist to wet. Mean annual precipitation is mostly 90-254 cm (35-100 inches) (but as low as 50 cm [20 inches] in the extreme rainshadow) falling predominantly as winter rain. Snowfall ranges from rare to regular, but not persistent, and summers are relatively dry. Elevation ranges from sea level to 1067 m (3500 feet) in Oregon, to 610 m (2000 feet) in northern Washington, and to 700 m (2275 feet) in British Columbia.

*Soil/substrate/hydrology:* Topography ranges from relatively flat glacial tillplains to steep mountainous terrain. Soils range from dry to subirrigated. Typical soils for *Polystichum* sites would be deep, fine- to moderately coarse-textured, with some subsurface seepage or richer parent material, and for *Oplopanax* sites, soils typically have an impermeable layer at a moderate depth.

**Dynamics:** Stands originated from infrequent stand-replacing fires (perhaps every 150-200 years) that would occur only in the driest microsites, as well as from windthrow gaps. Stand-maintaining surface fires, both aboriginal and lightning-caused, were more frequent (perhaps every 50-100 years) (Agee 1993, Brown and Hebda 1999) prior to European settlement. Surface fires likely maintained a moderately open overstory. Gap dynamics in old forests result in multi-aged stand structure (BCCDC unpubl. data)

2013). Unless growing in wind-protected conditions, windthrow and breakage tend to keep these forests from becoming or remaining very old. *Tsuga heterophylla*, one of the leading tree species, is vulnerable to wind breakage and also to uprooting given the shallow soils. If wind exposure is limited, then stand replacement is more gradual, through the process of the mortality of individuals or small numbers of canopy trees. Where windthrow is not pervasive, the age composition of these potentially old edaphic climax forests is uneven. With the exception of those geographic areas in the rainshadow of the Vancouver Ranges or the Olympic Mountains, where summer-dry conditions prevail, fire is not a viable disturbance factor. Although fire is by no means common or frequent, those sites in locations most vulnerable to fire tend to have a major component of *Pseudotsuga menziesii* in their canopies. Hemlock dwarf mistletoe (*Arceuthobium tsugense*) is a moderate threat to *Tsuga heterophylla* (Dorner and Wong 2003, Cadrin and Wolowicz 2005). Within mature and old forests, small gaps result from the death of single trees or small groups of trees due to root-rots, bark beetles or windthrow.

#### DISTRIBUTION

**Geographic Range:** This group encompasses lowland forests of western Washington, northwestern Oregon, eastern Vancouver Island, and the southern Coastal Mountains in British Columbia. In southwestern Oregon and northwestern California, it becomes local and more small-patch in nature. It occurs throughout low-elevation western Washington, except on extremely dry sites and in the hypermaritime zone near the outer coast where it is rare. In Oregon, it occurs on the western slopes of the Cascades, around the margins of the Willamette Valley, and in the Coast Ranges. In British Columbia, it occurs commonly on the eastern (leeward) side of Vancouver Island, and rarely on the windward side, and in the southern Coast Mountains. It also extends to the east side of the Coast Mountains in British Columbia and the Cascades in Washington and Oregon, where a few more continental understory species may also be present. Stands in northern California with western hemlock and Douglas-fir with *Chamaecyparis lawsoniana* that lack redwood, *Arbutus*, tan oak and other Mediterranean species may be represent [see Sawyer et al. (2009)].

**Nations:** CA, US

**States/Provinces:** BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 3:C, 5:C, 69:C, 81:C

**USFS Ecoregions (2007):** 242A:CC, 242B:CC, 342I:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

- < Douglas-fir - Western Hemlock: 230 (Eyre 1980) [Includes both wet and dry stands]
- >< Grand Fir: 213 (Eyre 1980)
- < Pacific Douglas-fir: 229 (Eyre 1980) [80% Douglas-fir]
- < Port Orford-Cedar: 231 (Eyre 1980) [not serpentine, not in Sitka spruce zone, and not swamps]
- >< Red Alder: 221 (Eyre 1980) [early-successional stage of many PNW Forests]
- < Western Hemlock: 224 (Eyre 1980) [80% western hemlock cover]

#### LOWER LEVEL UNITS

**Alliances:**

- A3379 *Tsuga heterophylla* - *Pseudotsuga menziesii* / *Holodiscus discolor* Dry Forest Alliance
- A3377 *Tsuga heterophylla* - *Pseudotsuga menziesii* / *Rubus spectabilis* Wet Forest Alliance
- A3376 *Tsuga heterophylla* - *Pseudotsuga menziesii* / Serpentine Soil Forest Alliance
- A3378 *Tsuga heterophylla* - *Pseudotsuga menziesii* / *Cornus unalaschkensis* Mesic Forest Alliance

#### AUTHORSHIP

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

**Author of Description:** G. Kittel, mod. D. Meidinger and D. Faber-Langendoen

**Acknowledgments:** D. Meidinger, R. Crawford, J. Sawyer

**Version Date:** 2013/10/09

#### REFERENCES

**References:** Agee 1993, BCCDC unpubl. data, BCMF 2006, Brown and Hebda 1999, Cadrin and Wolowicz 2005, Crawford et al. 2009, Dorner and Wong 2003, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Green and Klinka 1994

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1. Forest & Woodland

1.B.2.Nd. Vancouverian Cool Temperate Forest

M024. Vancouverian Lowland & Montane Forest



## G241. North Pacific Maritime Silver Fir - Western Hemlock Forest

**Type Concept Sentence:** This forested group occurs in the lower and montane regions of the central Pacific Northwest rainforest region, primarily west of the Cascade Crest, in dry to moist maritime and some subarctic climatic zones from northwestern Oregon, coastal British Columbia, and possibly a very few stands occurring in extreme southeastern Alaska.

### OVERVIEW

**Scientific Name:** *Abies amabilis* - *Tsuga heterophylla* Forest Group

**Common Name (Translated Scientific Name):** Pacific Silver Fir - Western Hemlock Forest Group

**Type Concept:** This forested group occurs in the Pacific Northwest mountains primarily west of the Cascade Crest. It occurs at mid-montane elevations in dry to moist maritime, some hypermaritime and some subarctic climatic zones from northwestern Oregon, coastal British Columbia to extreme southeastern Alaska. It generally occurs in an elevational band above *Pseudotsuga menziesii* - *Tsuga heterophylla* and hypermaritime zone forests and below *Tsuga mertensiana* forests. It is known to occur on windward and leeward sides of Vancouver Island and on the Olympic Peninsula. In the Cascade Range of northern Washington (north of Snoqualmie River) and in the Coast Mountains of mainland British Columbia, it occurs in the wettest portions, including inland to the mountain crest. A somewhat variable winter snowpack that typically lasts for 2-4 months is characteristic. The climatic zone within which it occurs is sometimes referred to as the "rain-on-snow" zone because of the common occurrence of major winter rainfall on an established snowpack. *Tsuga heterophylla* and/or *Abies amabilis* dominate the canopy of late-seral stands, and *Chamaecyparis nootkatensis* can be codominant, especially at higher elevations or moister sites. *Thuja plicata* is also common and sometimes codominates in British Columbia. In more mesic settings, *Pseudotsuga menziesii* is relatively rare to absent, and a major understory dominant species is *Vaccinium alaskaense*. Other mesic-setting understory species include *Blechnum spicant* and/or *Rubus pedatus*.

In drier settings, *Tsuga heterophylla* and/or *Abies amabilis* dominate the canopy of late-seral stands, though *Pseudotsuga menziesii* is usually also common because of its long lifespan and because it regenerates after fires and therefore is frequent as a codominant, and indeed its prevalence is an important indicator for dry climate stands within this group. At the highest elevations, *Chamaecyparis nootkatensis* can be codominant. *Abies procera* forests (usually mixed with silver fir) are included in this group and occur in the Cascades from central Washington to central Oregon and rarely in the Coast Ranges of Oregon. *Abies lasiocarpa* sometimes occurs as a codominant on the east side of the Cascades and in higher elevations British Columbia. Dry-setting understory species may include *Achlys triphylla*, *Mahonia nervosa*, *Xerophyllum tenax*, *Vaccinium membranaceum*, and/or *Rhododendron macrophyllum*.

**Classification Comments:** *Abies amabilis* in southeastern Alaska is an extreme outlier, occurring in only a few stands in the extreme southern part of the panhandle (T. DeMeo pers. comm. 2013). Therefore, *Abies amabilis* associations in Alaska need to be further documented and determined if they belong to this group or another.

**Internal Comments:** mjr 10-12: CA? added based on member association distribution.

**Other Comments:**

### Similar NVC Types:

- G245 North Pacific Mountain Hemlock - Silver Fir Forest & Tree Island: occurs at higher elevations codominated by mountain hemlock.
- G751 North Pacific Western Hemlock - Sitka Spruce - Western Red-cedar Seasonal Rainforest: occurs at lower elevations to this group in British Columbia and very southern Alaska.
- G240 North Pacific Maritime Douglas-fir - Western Hemlock Forest: occurs at lower and warmer elevations within the southern range of G241.

**Diagnostic Characteristics:** This group contains full-statured, continuous forests dominated by *Tsuga heterophylla* and *Abies amabilis*.

### VEGETATION

**Physiognomy and Structure:** This group contains tall 15-45 m tall evergreen coniferous forests with thick low to tall shrub undergrowth.

**Floristics:** *Tsuga heterophylla* and/or *Abies amabilis* dominate the canopy of late-seral stands, and *Chamaecyparis nootkatensis* can be codominant, especially at higher elevations. *Thuja plicata* is also common and sometimes codominates in British Columbia. In Alaska, *Abies amabilis* occurs in nearly pure stands and in mixture with *Picea sitchensis* and *Tsuga heterophylla*. In more mesic settings, *Pseudotsuga menziesii* is relatively rare to absent, and a major understory dominant species is *Vaccinium ovalifolium*. Other mesic-setting understory species include *Oxalis oregana*, *Blechnum spicant*, and/or *Rubus pedatus*.

In drier settings, *Tsuga heterophylla* and/or *Abies amabilis* dominate the canopy of late-seral stands, though *Pseudotsuga menziesii* is usually also common because of its long lifespan and because it regenerates after fires and therefore is frequent as a codominant, and indeed its prevalence is an important indicator for dry climate alliances within this group. At the highest elevations, *Chamaecyparis nootkatensis* can be codominant. *Abies procera* forests (usually mixed with silver fir) are included in this group and occur in the Cascades from central Washington to central Oregon and rarely in the Coast Ranges of Oregon. *Abies lasiocarpa* sometimes occurs as a codominant on the east side of the Cascades and at higher elevations in British Columbia. Dry-setting understory species may include *Achlys triphylla*, *Mahonia nervosa*, *Xerophyllum tenax*, *Vaccinium membranaceum*, and/or *Rhododendron macrophyllum*.

G241 North Pacific Maritime Silver Fir - Western Hemlock Forest Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies amabilis</i> / <i>Gaultheria shallon</i> / <i>Blechnum spicant</i> Forest	G3/S3	CEGL000221
<i>Abies amabilis</i> / <i>Gaultheria shallon</i> Forest	G4/S4	CEGL000220
<i>Abies amabilis</i> / <i>Mahonia nervosa</i> Forest	G4/S4	CEGL000217
<i>Abies amabilis</i> / <i>Menziesia ferruginea</i> Forest	G4/S4	CEGL000224
<i>Abies amabilis</i> / <i>Polystichum munitum</i> Forest	G4/S4	CEGL000006
<i>Abies amabilis</i> / <i>Rhododendron macrophyllum</i> - <i>Mahonia nervosa</i> Forest	G4/SNA	CEGL000218
<i>Abies amabilis</i> / <i>Rhododendron macrophyllum</i> - <i>Vaccinium ovalifolium</i> Forest	G4/S3	CEGL000226
<i>Abies amabilis</i> / <i>Rhododendron macrophyllum</i> / <i>Xerophyllum tenax</i> Forest	G4/S3	CEGL000227
<i>Abies amabilis</i> / <i>Tiarella trifoliata</i> Forest	G4/S4	CEGL000007
<i>Abies amabilis</i> / <i>Vaccinium membranaceum</i> - <i>Vaccinium ovalifolium</i> Forest	G4G5/S4S5	CEGL002610
<i>Abies amabilis</i> / <i>Vaccinium membranaceum</i> / <i>Clintonia uniflora</i> Forest	G4/S4	CEGL002625
<i>Abies amabilis</i> / <i>Vaccinium membranaceum</i> / <i>Rubus lasiococcus</i> Forest	G4/S3S4	CEGL000236
<i>Abies amabilis</i> / <i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Forest	G4/S4	CEGL000239
<i>Abies amabilis</i> / <i>Vaccinium membranaceum</i> Forest	G4/S4	CEGL000235
<i>Abies amabilis</i> / <i>Vaccinium ovalifolium</i> - <i>Gaultheria shallon</i> Forest	G4/S4	CEGL002626
<i>Abies amabilis</i> / <i>Vaccinium ovalifolium</i> / <i>Clintonia uniflora</i> Forest	G5/S5	CEGL000233
<i>Abies amabilis</i> / <i>Vaccinium ovalifolium</i> / <i>Erythronium montanum</i> Forest	G3/S3	CEGL000234
<i>Abies amabilis</i> / <i>Vaccinium ovalifolium</i> / <i>Mahonia nervosa</i> Forest	G4/S4	CEGL000232
<i>Abies amabilis</i> / <i>Vaccinium ovalifolium</i> / <i>Tiarella trifoliata</i> Forest	G4/S3	CEGL000009
<i>Abies amabilis</i> / <i>Vaccinium ovalifolium</i> / <i>Xerophyllum tenax</i> Forest	G4/S3	CEGL002609
<i>Abies amabilis</i> / <i>Vaccinium ovalifolium</i> Forest	G4G5/S4S5	CEGL000231
<i>Abies procera</i> / <i>Oxalis oregana</i> Forest	G1/SX	CEGL003444
<i>Tsuga heterophylla</i> - <i>Abies amabilis</i> / <i>Oxalis oregana</i> - <i>Blechnum spicant</i> Forest	G4/S4	CEGL000005

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* This forested group occurs at mid-montane elevations in dry to moist maritime and some subarctic climatic zones from northwestern Oregon, coastal British Columbia to extreme southeastern Alaska. It generally occurs in an elevational band above *Pseudotsuga menziesii* - *Tsuga heterophylla* and hypermaritime zone forests and below *Tsuga mertensiana* forests. It is known to occur on windward and leeward sides of Vancouver Island and on the Olympic Peninsula. In the Cascade Range of northern Washington (north of Snoqualmie River) and in the Coast Mountains of mainland British Columbia, it occurs in the wettest portions but does not extend all the way inland to the mountain crest. A somewhat variable winter snowpack that typically lasts for 2-4 months is characteristic. The climatic zone within which it occurs is sometimes referred to as the "rain-on-snow" zone because of the common occurrence of major winter rainfall on an established snowpack.

**Dynamics:** Fire regime is significantly different at regional scale between dry and mesic stands of this forest. Mesic stands occur within a very wet climate that is more coastal, less continental, with cooler summers, and warmer winters on average. The major disturbance process within these coastal mesic forests are small-scale gap dynamics where windthrow is common, causing gap creation that starts the successional process. These mesic stands rarely, if ever, burn and are dominated by trees that run from 700 to over 1000 years in age. In British Columbia, coastal rainforests may burn an average of once every 2000 years. Extreme, stand-replacing fires are infrequent to absent, with return intervals of several hundred or more years.

In drier stands, the dominant natural process is stand-replacing fires which occur on average every 200-500 years. Where old-growth does exist, it is mostly "young old-growth" 200-500 years in age. Natural-origin stands less than 200 years old are also common. Mixed-severity fires occur in the drier more interior and often southern parts of this group, so that forest structure, patch size and proportions can be different from northern, more mesic stands. In Oregon, there are more mixed-severity fires.

#### DISTRIBUTION

**Geographic Range:** This forested group occurs only in the Pacific Northwest mountains, primarily west of the Cascade Crest. It dominates mid-montane dry to mesic maritime and some sub-maritime climatic zones from northwestern British Columbia to northwestern Oregon. In the Olympic Mountains, this group occurs on the leeward side of the mountains only. In British Columbia and the Washington Cascades, it occurs on both windward and leeward sides of the mountains. It occurs very sporadically in the Willapa Hills of southwestern Washington and in the northern Oregon Coast Range. This type may also occur on the east side of the Oregon Cascades north of 45°N latitude (Mount Hood National Forest - Hood River and Barlow ranger districts, and possibly the northern edge of Warm Springs Reservation in part of the McQuinn Strip). It is restricted in Washington's eastern Cascades to a few miles of the crest, primarily between the upper Naches drainage and Lake Wenatchee, finally dwindling to scattered stands in the upper Methow drainage in the northern Cascades (Lillybridge et al 1995). It may also extend north to about 56°N latitude in southeastern Alaska. *Abies amabilis* has a limited distribution in Alaska, and is confined to the extreme southern mainland and a few islands south of 56°N latitude.

**Nations:** CA, US

**States/Provinces:** AK, BC, CA?, OR, WA

**TNC Ecoregions [optional]:** 1:C, 3:C, 69:C, 70:C, 81:C

**USFS Ecoregions (2007):** 242A:CC, 342I:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- < Coastal True Fir - Hemlock: 226 (Eyre 1980) [includes wet, moist and dry silver fir]
- >< Douglas-fir - Western Hemlock: 230 (Eyre 1980)
- = I.A.1.h - Silver fir-western hemlock (Viereck et al. 1992)
- > Pacific Ponderosa Pine - Douglas-fir: 244 (Eyre 1980)
- >< Western Hemlock: 224 (Eyre 1980) [80% western hemlock]

#### LOWER LEVEL UNITS

**Alliances:**

- A3386 *Abies amabilis* - *Tsuga heterophylla* / *Achlys triphylla* Forest Alliance
- A3387 *Abies amabilis* - *Tsuga heterophylla* / *Vaccinium membranaceum* Cold Forest Alliance

#### AUTHORSHIP

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

**Author of Description:** G. Kittel, mod. D. Meidinger and D. Faber-Langendoen

**Acknowledgments:**

**Version Date:** 2013/10/09

#### REFERENCES

**References:** Banner et al. 1993, Crawford et al. 2009, DeMeo et al. 1992, DeVelice et al. 1999, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyness 1973, Henderson pers. comm., Lillybridge et al. 1995, Martin et al. 1995, Steen and Coupé 1997, Viereck et al. 1992

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1. Forest & Woodland

1.B.2.Nd. Vancouverian Cool Temperate Forest

M024. Vancouverian Lowland & Montane Forest

### G751. North Pacific Western Hemlock - Sitka Spruce - Western Red-cedar Seasonal Rainforest [Proposed]

**Type Concept Sentence:** These are tall evergreen conifer forests composed of *Tsuga heterophylla*, *Picea sitchensis*, and *Thuja plicata* (either mixed or singly) that occupy the hyper-maritime zone of the Pacific Northwest rainforest region on and near the Pacific Coast, along a heavy rain and fog belt from about Prince Rupert, British Columbia, south to Point Arena, California.

#### OVERVIEW

**Scientific Name:** *Tsuga heterophylla* - *Picea sitchensis* - *Thuja plicata* North Pacific Seasonal Rainforest Group

**Common Name (Translated Scientific Name):** Western Hemlock - Sitka Spruce - Western Red-cedar North Pacific Seasonal Rainforest Group

**Type Concept:** These rainforests are dominated by tall evergreen needle-leaved trees, and are restricted to the outer coastal hypermaritime areas of southeastern Alaska, British Columbia, Washington, Oregon and northern California. The forests are often open and scrubby but can have a closed upper canopy. Stands may be pure *Picea sitchensis*, *Thuja plicata*, or *Tsuga heterophylla* but are more often a mix and may occur with other conifers such as *Chamaecyparis nootkatensis*, *Chamaecyparis lawsoniana*, *Abies grandis*, *Pseudotsuga menziesii*, *Acer circinatum*, *Alnus rubra*, *Acer macrophyllum*, and *Frangula purshiana* (= *Rhamnus purshiana*). *Abies amabilis* is widespread (except in southern Washington) and can be common but is not dominant. In Washington, nearly pure stands of *Tsuga heterophylla* are common and seem to be associated with microsites where exposure to intense windstorms is likely. Wet coastal environments that support stands of *Chamaecyparis lawsoniana* in the absence of *Tsuga heterophylla*, *Thuja plicata*, or *Picea sitchensis* are also part of this group. The understory is rich with shade-tolerant shrubs and ferns, including *Gaultheria shallon*, *Vaccinium ovatum*, *Menziesia ferruginea*, *Polystichum munitum*, *Dryopteris* spp., and *Blechnum spicant*, as well as a high diversity of mosses. *Oxalis oregana* is important in the understory of moist sites in Washington. *Oplopanax horridus* and *Rubus spectabilis* are important understory shrubs on wet sites dominated by *Picea sitchensis* in the overstory canopy, these sites tend to be sub-irrigated and wet, but not saturated, soils remain well-oxygenated.

Stands are restricted to areas within 25 km of saltwater and are most abundant along coastal central British Columbia, coastal Vancouver Island, and on the Olympic Peninsula of Washington. They range from southern southeastern Alaska (approximately south of Wrangell), through British Columbia, along the southern Washington, Oregon and northern California coasts. The climate is hypermaritime, with cool summers, mild and very wet winters (coldest temperatures range 0-5°C [32-41°F), and abundant fog without a major snowpack. Annual precipitation ranges from 975 to 2399 mm (38-94 inches) with an average of 1572 mm (62 inches) with the majority falling as winter rain. Summer rains are less frequent (<10% of annual rainfall occurs in summer) which can be ameliorated by frequent, dense coastal fog and cloud cover.

Stands are found mostly below 300 m in elevation, where the terrain is mostly gentle, of low topographic relief, and often rocky. Some stands occur on stabilized dunes, others in lower toeslopes and wet sites that are also well-drained, such as sloped floodplains (but are not influenced by overbank flooding) and coarse valley bottoms. Sites occupied include the outermost coastal fringe where salt spray is prominent, riparian terraces and valley bottoms near the coast where there is major fog accumulation. Soils typically have a distinct humus layer overlying mineral horizons or bedrock. In central British Columbia the humus layers can be very thick (mean = 17-35 cm). Soils are often imperfectly drained. These forests very rarely burn, and natural disturbance is more often single tree gap-disturbance events and intense winter storms on local and regional scales. Fire becomes more of a player in the southern portions of the range, in Oregon and California.

**Classification Comments:** At its northern border this group transitions into North Pacific Maritime Western Hemlock - Sitka Spruce Rainforest Group (G750).

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G240 North Pacific Maritime Douglas-fir - Western Hemlock Forest
- G750 North Pacific Maritime Western Hemlock - Sitka Spruce Rainforest
- G241 North Pacific Maritime Silver Fir - Western Hemlock Forest

**Diagnostic Characteristics:**

## VEGETATION

**Physiognomy and Structure:**

**Floristics:** The forests are often open and scrubby but can have a closed upper canopy. Stands may be pure *Picea sitchensis*, *Thuja plicata*, or *Tsuga heterophylla* but are more often a mix and may occur with other conifers such as *Chamaecyparis nootkatensis*, *Chamaecyparis lawsoniana*, *Abies grandis*, *Pseudotsuga menziesii*, *Acer circinatum*, *Alnus rubra*, *Acer macrophyllum*, and *Frangula purshiana* (= *Rhamnus purshiana*). *Abies amabilis* is widespread (except in southern Washington) and can be common but is not dominant. In Washington, nearly pure stands of *Tsuga heterophylla* are common and seem to be associated with microsites where exposure to intense windstorms is likely. Wet coastal environments that support stands of *Chamaecyparis lawsoniana* in the absence of *Tsuga heterophylla*, *Thuja plicata*, or *Picea sitchensis* are also part of this group. The understory is rich with shade-tolerant shrubs and ferns, including *Gaultheria shallon*, *Vaccinium ovatum*, *Menziesia ferruginea*, *Polystichum munitum*, *Dryopteris* spp., and *Blechnum spicant*, as well as a high diversity of mosses. *Oxalis oregana* is important in the understory of moist sites in

Washington. *Oplopanax horridus* and *Rubus spectabilis* are important understory shrubs on wet sites dominated by *Picea sitchensis* in the overstory canopy, these sites tend to be sub-irrigated and wet, but not saturated, soils remain well-oxygenated.

G751 North Pacific Western Hemlock - Sitka Spruce - Western Red-cedar Seasonal Rainforest Group [Proposed]	Global/ State Rank	NatureServe/ WANHP Code
<i>Picea sitchensis</i> - <i>Pinus contorta</i> / <i>Gaultheria shallon</i> - <i>Vaccinium ovatum</i> Forest	G3/S2	CEGL000403
<i>Picea sitchensis</i> - <i>Tsuga heterophylla</i> / <i>Polystichum munitum</i> Forest	G3?/SNR	CEGL003787
<i>Picea sitchensis</i> / <i>Calamagrostis nutkaensis</i> Forest	G3G4/SNR	CEGL003266
<i>Picea sitchensis</i> / <i>Gaultheria shallon</i> - <i>Rubus spectabilis</i> Forest	G3/SNA	CEGL000402
<i>Picea sitchensis</i> / <i>Gaultheria shallon</i> Forest	G3/S3	CEGL000401
<i>Picea sitchensis</i> / <i>Menziesia ferruginea</i> - <i>Vaccinium parvifolium</i> Forest	G3/SNA	CEGL000056
<i>Picea sitchensis</i> / <i>Oplopanax horridus</i> Giant Forest	G4?/S2	CEGL000057
<i>Picea sitchensis</i> / <i>Oxalis oregana</i> Forest	G3/S3	CEGL000058
<i>Picea sitchensis</i> / <i>Vaccinium ovatum</i> Forest	G3/S2	CWWA000118
<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Polystichum munitum</i> - <i>Oxalis oregana</i> Forest	GNR/S3	CEGL005568
<i>Thuja plicata</i> - <i>Abies grandis</i> / <i>Polystichum munitum</i> Forest	G1G2/S1	CEGL000468
<i>Thuja plicata</i> - <i>Acer macrophyllum</i> - <i>Abies grandis</i> / ( <i>Oemleria cerasiformis</i> ) / <i>Polystichum munitum</i> Forest	GNR/SNR	CEGL002846
<i>Thuja plicata</i> - <i>Pseudotsuga menziesii</i> - <i>Abies grandis</i> / <i>Mahonia nervosa</i> / <i>Polystichum munitum</i> Forest	GNR/SNR	CEGL002848
<i>Thuja plicata</i> - <i>Tsuga heterophylla</i> / <i>Vaccinium ovatum</i> Forest	G3/SNR	CEGL000322
<i>Thuja plicata</i> / <i>Acer circinatum</i> Forest	GNRQ/SNR	CEGL000469
<i>Thuja plicata</i> / <i>Gaultheria shallon</i> Forest	G1G2/S1S2	CEGL000475
<i>Thuja plicata</i> / <i>Linnaea borealis</i> Forest	G2/SNR	CEGL000089
<i>Tsuga heterophylla</i> - ( <i>Pseudotsuga menziesii</i> ) / <i>Vaccinium alaskaense</i> / <i>Polystichum munitum</i> Forest	GNR/S4	CEGL005573
<i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> / <i>Polystichum munitum</i> - <i>Blechnum spicant</i> Forest	GNR/S3	CEGL000100
<i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> / <i>Blechnum spicant</i> Forest	G/S3	CTWA000013
<i>Tsuga heterophylla</i> / <i>Polystichum munitum</i> - <i>Oxalis oregana</i> Forest	GNR/S3?	CEGL005586

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** Stands are restricted to areas within 25 km of saltwater and are most abundant along coastal central British Columbia, coastal Vancouver Island, and on the Olympic Peninsula of Washington. They range from southern southeastern Alaska (approximately south of Wrangell), through British Columbia, along the southern Washington, Oregon and northern California coasts. The climate is hypermaritime, with cool summers, mild and very wet winters (coldest temperatures range 0-5°C [32-41°F), and abundant fog without a major snowpack. Annual precipitation ranges from 975 to 2399 mm (38-94 inches) with an average of 1572 mm (62 inches) with the majority falling as winter rain. Summer rains are less frequent (<10% of annual rainfall occurs in summer) which can be ameliorated by frequent, dense coastal fog and cloud cover.

Stands are found mostly below 300 m in elevation, where the terrain is mostly gentle, of low topographic relief, and often rocky. Some stands occur on stabilized dunes, others in lower toeslopes and wet sites that are also well-drained, such as sloped floodplains (but are not influenced by overbank flooding) and coarse valley bottoms. Sites occupied include the outermost coastal fringe where salt spray is prominent, riparian terraces and valley bottoms near the coast where there is major fog accumulation. Soils typically have a distinct humus layer overlying mineral horizons or bedrock. In central British Columbia the humus layers can be very thick (mean = 17-35 cm). Soils are often imperfectly drained. These forests very rarely burn, and natural disturbance is more often single tree gap-disturbance events and intense winter storms on local and regional scales. Fire becomes more of a player in the southern portions of the range, in Oregon and California.

#### Dynamics:

**DISTRIBUTION**

**Geographic Range:** This group ranges from southern southeastern Alaska (approximately south of Wrangell), through British Columbia, along the southern Washington, Oregon and northern California coasts.

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Proposed.

**SYNONYMY****LOWER LEVEL UNITS****Alliances:**

- A3609 *Abies grandis* - *Picea sitchensis* - *Thuja plicata* Forest Alliance
- A3604 *Tsuga heterophylla* - *Picea sitchensis* / *Rhytidiadelphus loreus* Forest Alliance
- A3606 *Chamaecyparis lawsoniana* - *Picea sitchensis* Forest Alliance
- A3607 *Picea sitchensis* Stabilized Dune Forest Alliance
- A3605 *Tsuga heterophylla* - *Thuja plicata* - *Chamaecyparis nootkatensis* Forest Alliance
- A3611 *Tsuga heterophylla* - *Thuja plicata* / *Vaccinium ovalifolium* Forest Alliance
- A3610 *Tsuga heterophylla* - *Thuja plicata* / *Blechnum spicant* Rich Mesic Forest Alliance
- A3608 *Picea sitchensis* / *Rubus spectabilis* Wet-Site Forest Alliance

**AUTHORSHIP**

**Primary Concept Source:**

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2015/05/15

**REFERENCES**

**References:** Faber-Langendoen et al. 2015

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1. Forest & Woodland

1.B.2.Nd. Vancouverian Cool Temperate Forest

M024. Vancouverian Lowland & Montane Forest

**G237. North Pacific Red Alder - Bigleaf Maple - Douglas-fir Forest**

**Type Concept Sentence:** This lowland hardwood or mixed hardwood-conifer forest group occurs throughout the Pacific Northwest rainforest region, on sites of recent and past disturbance, both human-induced and natural. It occurs on flat coastal areas and on steep slopes and bluffs that are subject to mass movements on a periodic basis. *Alnus rubra* or *Acer macrophyllum* are the major tree species, occurring with a variety of companion species, such as the conifers *Pseudotsuga menziesii*, *Thuja plicata*, *Abies grandis*, *Tsuga heterophylla*, and/or *Picea sitchensis*.

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**OVERVIEW**

**Scientific Name:** *Alnus rubra* - *Acer macrophyllum* Forest Group

**Common Name (Translated Scientific Name):** Red Alder - Bigleaf Maple Forest Group

**Type Concept:** This lowland hardwood or mixed hardwood-conifer forest group occurs in the Pacific Northwest from northern British Columbia to northern California, on valley terraces and slopes at low elevations in the mountains of the Pacific Northwest Coast and interior valleys west of the high Cascade Range. It is the dominant forest and woodland surrounding cities and towns of the Pacific Northwest, and component species are indicators of recent and past disturbance, both human-induced and natural. It also occurs on steep slopes and bluffs that are subject to mass movements on a periodic basis. These forests are composed of deciduous broadleaf forests, woodlands, or shrublands, sometimes with varying components of conifers. *Alnus rubra* or *Acer macrophyllum* are the major tree species. Companion species are common and specific species present depend on the geographic location. Conifers, including *Pseudotsuga menziesii*, *Thuja plicata*, *Abies grandis*, *Tsuga heterophylla*, and/or *Picea sitchensis*, can be codominant (up to one-third relative cover). Other major dominant broadleaf species are *Quercus garryana*, *Frangula purshiana*, and *Cornus nuttallii*. Conifers tend to increase in abundance with time in the absence of major disturbance, although the hardwoods, particularly *Acer*

*macrophyllum*, can persist in the overstory. The understory is characterized by deciduous shrubs such as *Acer circinatum*, *Corylus cornuta*, *Oemleria cerasiformis*, *Rubus ursinus*, *Symphoricarpos albus*, and/or *Toxicodendron diversilobum*, but evergreen shrubs, including *Gaultheria shallon* and *Mahonia nervosa* and forbs, such as *Polystichum munitum* and *Oxalis oregana*, can be dominant.

**Classification Comments:** This group is conceptually a combination of two ecological systems, North Pacific Broadleaf Landslide Forest and Shrubland (CES204.846) and North Pacific Lowland Mixed Hardwood-Conifer Forest (CES204.073). Open shrubby and herbaceous associations that are part of the landslide system are not included in this group. British Columbia ecologists feel this group may extend over too broad a range north to south, because there are different understory species, such as the presence of *Vaccinium ovalifolium* and lack of *Mahonia nervosa*, and different overstory species, such as *Acer circinatum* and *Acer macrophyllum* throughout the range as currently defined. One option is to subdivide this type among several groups, north to south, and treat them as alliance-based successional stages. Further review is needed. Really wet areas along streams and hillslope springs that have an abundance of wet-loving shrubs in the understory, such as *Rubus spectabilis*, *Rubus parviflorus*, *Ribes bracteosum*, and *Oplopanax horridus*, are a part of North Pacific Lowland Riparian Forest & Woodland Group (G254).

Should successional red alder stands that are common in coastal Del Norte and Humboldt counties be included in this group? If so, redwood should be added to the list of conifers. If redwood is present, then it is part of the California Coastal Redwood Forest Group (G235).

**Internal Comments:** GK 12-11: CA added. J. Kagan 4-07: The fire and natural disturbance regimes cause some places to be mixed forests and others conifer-dominated; these areas need to be distinguished. In our conifer forests, the map classes are things we have to carefully distinguish, particularly since clearcutting is such a major part of the landscape. They clearcut these mixed forests just like they clearcut the Douglas-fir forests, and when they replant, they systematically plant ONLY conifers, causing this type to decline in heavily managed landscapes. So, it becomes an important type for conservation, especially in the Coast Ranges. It is NOT just a seral type of dry or mesic Douglas-fir - western hemlock.

**Other Comments:**

#### Similar NVC Types:

**Diagnostic Characteristics:** These forests are composed of deciduous broadleaf forests and woodlands, sometimes with varying components of conifers. *Alnus rubra* and *Acer macrophyllum* are the major tree species. Conifers, including *Pseudotsuga menziesii*, *Thuja plicata*, *Abies grandis*, *Tsuga heterophylla*, and/or *Picea sitchensis*, can be codominant.

### VEGETATION

**Physiognomy and Structure:** These forests are composed of deciduous broadleaf forests and woodlands, sometimes with varying components of conifers. They are 14-20 m tall, and the canopy is generally closed to slightly open.

**Floristics:** *Alnus rubra* or *Acer macrophyllum* are the major tree species throughout the range of this group. Stands are often mixed with other conifers or broadleaf species. As *Alnus rubra* and *Acer macrophyllum* have a wide north-to-south coastal distribution, the companion species shift with geography. Conifer species such as *Pseudotsuga menziesii*, *Thuja plicata*, *Abies grandis*, *Tsuga heterophylla*, and/or *Picea sitchensis* can be codominant. Other major dominant broadleaf species are *Quercus garryana*, *Frangula purshiana*, and *Cornus nuttallii*. Conifers tend to increase in abundance with time in the absence of major disturbance, although the hardwoods, particularly *Acer macrophyllum*, can persist in the overstory. The understory is characterized by deciduous shrubs such as *Acer circinatum*, *Corylus cornuta*, *Oemleria cerasiformis*, *Rubus ursinus*, *Symphoricarpos albus*, and/or *Toxicodendron diversilobum*, but evergreen shrubs, including *Gaultheria shallon* and *Mahonia nervosa* and forbs, such as *Polystichum munitum* and *Oxalis oregana*, can be dominant.

G237 North Pacific Red Alder - Bigleaf Maple - Douglas-fir Forest Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies grandis</i> - <i>Acer macrophyllum</i> / <i>Symphoricarpos albus</i> Forest	G3Q/SNA	CEGL000519
<i>Acer macrophyllum</i> - <i>Alnus rubra</i> / <i>Polystichum munitum</i> - <i>Tellima grandiflora</i> Forest	G2G3/S2	CEGL003334
<i>Acer macrophyllum</i> - <i>Pseudotsuga menziesii</i> / <i>Acer circinatum</i> / <i>Polystichum munitum</i> Forest	G4/SNA	CEGL003394
<i>Acer macrophyllum</i> - <i>Pseudotsuga menziesii</i> / <i>Corylus cornuta</i> / <i>Hydrophyllum tenuipes</i> Forest	G3/SNA	CEGL000517
<i>Acer macrophyllum</i> / <i>Acer circinatum</i> Forest	G4G5/S4?	CEGL000560
<i>Alnus rubra</i> / <i>Polystichum munitum</i> Forest	G4/S4	CEGL000638
<i>Betula papyrifera</i> var. <i>commutata</i> - <i>Alnus rubra</i> / <i>Polystichum munitum</i> Forest	G1/S1	CEGL003352

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This alliance occurs on valley terraces and slopes at low elevations in the mountains of the Pacific Northwest Coast and interior valleys west of the high Cascade Range, and west of the Klamath Mountains in northwestern California. It is the dominant forest and woodland surrounding cities and towns of the Pacific Northwest, and component species are indicators of recent and past disturbance, both human-induced and natural. They also occur on steep slopes and bluffs that are subject to mass movements on a periodic basis. They are found in patches of differing age associated with different landslide events.

*Soil/substrate/hydrology:* In some places, hardwoods are truly only found in early-seral conditions. This is truer in the northern part of the range. In the southern regions, such as Washington state, there are a few places where hardwoods persist, outside of the dry Douglas-fir - madrone forests around the Willamette Valley, Puget Trough and the western Oregon interior valleys. In the Coast Ranges and Cascades, there are hardwoods (mostly *Alnus rubra* and *Acer macrophyllum*) found in most of the valley toeslopes. They also occur in areas with exposed talus and exposed rocks, often with *Quercus garryana* and *Fraxinus latifolia*. This mix of deciduous hardwoods and conifers can be a late-seral, relatively stable forest in many areas, while in others it is successional, with the conifers completely overtaking the hardwoods after 200 years or so without disturbance.

**Dynamics:** This is, for the most part, an early-successional forest group. *Alnus* and *Acer* are dependent on full sunlight, and once overtopped by larger conifer species, will, without further disturbance, typically succeed to a conifer forest type. However, some stands can persist without disturbance (200 years) and remain mixed deciduous-conifer forests.

## DISTRIBUTION

**Geographic Range:** This group occurs from northern British Columbia to northern California, in the coastal areas of the Pacific Northwest, at elevations below the Silver Fir Zone in the northern Pacific mountains and in lowlands (latter especially adjacent to coastlines), becoming less prominent in the northern half of this region.

**Nations:** CA, US

**States/Provinces:** BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 3:C, 69:C, 81:C

**USFS Ecoregions (2007):** 242A:CC, 242B:CC, 342I:??, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Low.

## SYNONYMY

- >< Red Alder: 221 (Eyre 1980)

## LOWER LEVEL UNITS

**Alliances:**

- A0427 *Alnus rubra* - *Acer macrophyllum* - *Pseudotsuga menziesii* Forest Alliance
- A3385 *Alnus rubra* - *Acer macrophyllum* Forest Alliance

## AUTHORSHIP

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

**Author of Description:** G. Kittel, mod. D. Faber-Langendoen

**Acknowledgments:**

**Version Date:** 2013/10/08

## REFERENCES

**References:** Chappell and Christy 2004, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973

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1. Forest & Woodland

1.B.2.Nd. Vancouverian Cool Temperate Forest

## M025. Vancouverian Subalpine Forest

**Type Concept Sentence:** These are short to tall, dense to open forests, tree islands and large patches dominated by *Abies amabilis*, *Abies lasiocarpa*, *Abies magnifica* (= var. *magnifica*), *Abies x shastensis* (= *Abies magnifica* var. *shastensis*), *Abies procera*, *Chamaecyparis nootkatensis*, *Pinus albicaulis*, *Pinus balfouriana*, *Pinus contorta* var. *murrayana*, *Pinus monticola*, and/or *Tsuga mertensiana*. These Pacific coastal subalpine forests approach treeline in mountain regions of the Pacific states, extending from low elevations in southeastern Alaska south into high montane regions of Baja California, Mexico, and the Sierra Nevada of California.

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## OVERVIEW

**Scientific Name:** *Abies magnifica* - *Tsuga mertensiana* - *Pinus contorta* var. *murrayana* Forest Macrogroup

**Common Name (Translated Scientific Name):** California Red Fir - Mountain Hemlock - Sierra Lodgepole Pine Forest Macrogroup

**Type Concept:** This macrogroup consists of upper elevation forests of the Pacific states and British Columbia, and extend from southeastern Alaska south into Baja California, Mexico. These forests and woodlands are dominated by *Abies amabilis*, *Abies lasiocarpa*, *Abies magnifica* (= var. *magnifica*), *Abies procera*, *Abies x shastensis* (= *Abies magnifica* var. *shastensis*), *Chamaecyparis nootkatensis*, *Pinus albicaulis*, *Pinus contorta* var. *murrayana*, *Pinus monticola*, and/or *Tsuga mertensiana*. Understories are open, with scattered shrubs and herbaceous species, which do not carry fire should one get started. Structurally these forests can be of short or tall stature, in dense to open, large continuous forests, or occur in small tree islands. Trees can be very large and old and can attain diameters of 1.2 m (4 feet). These high-elevation forests occur in the San Pedro Martir Mountains of Baja California, Mexico, throughout the Sierra Nevada, Transverse and Peninsular ranges of California, the Klamath Mountains and Cascade Range of Oregon and Washington, the coastal mountains and coastal islands of British Columbia, and southeastern Alaska. Elevation changes from south to north, being greater in the south (1600-3600 m [4850-12,000 feet]) and lower in the north (300-2300 m [1000-7500 feet]). Heavy snowpack is a major source of soil moisture throughout the growing season, and deep, late-lying snowpack is a primary environmental factor preventing tree establishment that contributes to the patchiness of the forest at the upper elevational limit.

### Classification Comments:

#### Similar NVC Types:

- M023 Southern Vancouverian Montane-Foothill Forest
- M024 Vancouverian Lowland & Montane Forest

**Diagnostic Characteristics:** These are short to tall, dense to open forests, tree islands and patches dominated by *Abies amabilis*, *Abies lasiocarpa*, *Abies magnifica* (= var. *magnifica*), *Abies procera*, *Abies x shastensis* (= *Abies magnifica* var. *shastensis*), *Chamaecyparis nootkatensis*, *Pinus albicaulis*, *Pinus balfouriana*, *Pinus contorta* var. *murrayana*, *Pinus monticola*, or *Tsuga mertensiana*.

## VEGETATION

**Physiognomy and Structure:** These forests are dominated by evergreen needle-leaved trees with open canopies and a generally sparse understory.

**Floristics:** Overstory trees include *Abies amabilis*, *Abies lasiocarpa*, *Abies magnifica* (= var. *magnifica*), *Abies procera*, *Abies x shastensis* (= *Abies magnifica* var. *shastensis*), *Chamaecyparis nootkatensis*, *Pinus albicaulis*, *Pinus balfouriana*, *Pinus contorta* var. *murrayana*, *Pinus monticola*, and *Tsuga mertensiana*. Important shrubs include *Arctostaphylos nevadensis*, *Artemisia tridentata*, *Ceanothus cordulatus*, *Cercocarpus ledifolius*, *Chrysolepis sempervirens*, *Elliottia pyroliflorus*, *Empetrum nigrum*, *Harrimanella stelleriana*, *Holodiscus discolor* (= *Holodiscus microphyllus*), *Luetkea pectinata*, *Menziesia ferruginea*, *Phyllodoce aleutica* (or *Phyllodoce glanduliflora*), *Phyllodoce breweri*, *Ribes montigenum*, *Rubus pedatus*, *Vaccinium membranaceum*, and *Vaccinium ovalifolium*. Grasses, forbs and ferns include *Blechnum spicant*, *Carex exserta*, *Carex filifolia*, *Carex rossii*, *Eriogonum incanum*, *Geum calthifolium*, *Gymnocarpium dryopteris*, *Nephrophyllidium crista-galli*, *Penstemon davidsonii*, *Penstemon newberryi*, *Poa wheeleri*, *Streptopus lanceolatus*, and *Tiarella trifoliata*.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* The climate is generally characterized by short, cool summers, rainy autumns and long, cool, wet winters with heavy snow cover for 5-9 months. The heavy snowpack is ubiquitous, but for some more southern exposure and southern stands, summer drought is more significant.

*Soil/substrate/hydrology:* Stands often occur on ridges and rocky slopes around upper timberline on soils that are often shallow and coarse-textured, rocky substrates and which may be exposed to desiccating winds with ice and snow blasts. Other stands occur on deep, well-drained soils. Elevation changes from south to north, being greater in the south (1600-3600 m [4850-12,000 feet]) and lower in the north (300-2300 m [1000-7500 feet]). Limiting factors can be cold-air drainages or ponding, or coarser soils and short growing season. Some stands are found on subalpine stream benches, slopes, and can be extensive on north-facing aspects and lake margins.

**Dynamics:** Avalanches, tree mortality from insect outbreak and disease, drought, and associated wildfire are drivers of community structure and composition. Stand-replacing fire is important in some stands, becoming much less important in northern and the highest elevation stands, following a "moderate-severity fire regime" (Agee 1993), i.e., high variability in severity and moderate frequency of fires. Where fire is less important, small-gap dynamics predominate.

**DISTRIBUTION**

**Geographic Range:** This macrogroup occurs in the mountains of the Pacific states including coastal southeastern Alaska, British Columbia and Baja California, Mexico. It occurs at upper treeline elevations from the San Pedro Martir Mountains in Baja California, throughout the Sierra Nevada, Transverse, Peninsular and Coast ranges of California, the Klamath Mountains, Modoc Plateau and Warner Mountains of California and Oregon, the Coast and Cascade ranges of Oregon, the Cascade Range of Washington, and the Coastal Mountains of islands and mainland British Columbia north into southeastern Alaska to Cook Inlet.

**Spatial Scale & Pattern [optional]:**

**Nations:** CA, MX, US

**States/Provinces:** AK, BC, CA, MXBC, NV, OR, WA

**TNC Ecoregions [optional]:** 1:C, 3:C, 4:C, 5:C, 7:C, 12:C, 16:C, 69:C, 70:C, 81:C, 144:C

**USFS Ecoregions (2007):** 242A:CC, 322A:??, 341D:CC, 341F:CC, 342B:??, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261B:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

- < EW Subalpine Fir - Mountain Hemlock Wet Forested (Ecosystems Working Group 1998)
- < MF Mountain Hemlock - Amabilis Fir Forested (Ecosystems Working Group 1998)
- = Upper Montane/Subalpine Forests and Parklands (Barbour and Billings 2000)

**LOWER LEVEL UNITS****Groups:**

- G749 Sierra-Cascade Red Fir - Mountain Hemlock Forest
- G243 Sierra-Cascade Cold-Dry Subalpine Woodland
- G245 North Pacific Mountain Hemlock - Silver Fir Forest & Tree Island

**AUTHORSHIP**

**Primary Concept Source:** Barbour and Billings (2000)

**Author of Description:** G. Kittel, D. Meidinger, M.S. Reid, D. Faber-Langendoen

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 10-14

**REFERENCES**

**References:** Adams et al. 2006, Agee 1993, Banner et al. 1993, Banner et al. 2004, Barbour and Billings 2000, Barbour and Major 1988, Barbour et al. 2007a, Brooke et al. 1970, Comer et al. 2003, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2015, Franklin 1988, Green and Klinka 1994, Hickman 1993, Holland 1986b, Holland and Keil 1995, Klinka and Chourmouzis 2002, Potter 1998, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shiflet 1994

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1. Forest & Woodland

1.B.2.Nd. Vancouverian Cool Temperate Forest

M025. Vancouverian Subalpine Forest

**G245. North Pacific Mountain Hemlock - Silver Fir Forest & Tree Island**

**Type Concept Sentence:**

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**OVERVIEW**

**Scientific Name:** *Tsuga mertensiana* - *Abies amabilis* - *Chamaecyparis nootkatensis* Forest Group

**Common Name (Translated Scientific Name):** Mountain Hemlock - Pacific Silver Fir - Alaska-cedar Forest Group

**Type Concept:** This forested group occurs throughout the mountains of the North Pacific, from the central Cascades of Oregon north to the upper slopes of mountain ranges along the Gulf Coast of Alaska, to the Cook Inlet. It is the predominant forest of subalpine elevations in the coastal mountains of British Columbia, Alaska, western Washington and western Oregon. It also occurs on mountain slopes on the outer coastal islands of British Columbia. It occurs at elevations ranging from 300 to 2300 m (1000-7500 feet). At the highest altitudes, the forest may begin to break up, forming "tree islands" that are surrounded by meadows or shrublands, where they form the "parkland" habitats before giving way to treeline. The lower and upper elevational limits decrease

from south to north and from east to west. *Tsuga mertensiana* is one of the dominant tree species throughout, and *Abies amabilis* becomes an important associated species in the southern and central portion of the range, and drops out completely for the Alaska portion of this group's range. *Tsuga heterophylla* often occurs at lower elevations in this group but is much less abundant than *Tsuga mertensiana*. *Chamaecyparis nootkatensis* occurs in the more coastal-influenced sections, decreasing with increasing continental climate, while *Abies lasiocarpa* is found inland and becomes increasingly common near the transition to the Subalpine Fir-Engelmann Spruce Zone in the Cascades and British Columbia. On the leeward side of the Cascades, the group is usually a dense canopy composed of *Abies lasiocarpa* and *Tsuga mertensiana*, with some *Picea engelmannii* or *Abies amabilis*. In Alaska *Abies lasiocarpa* mixes with the canopy of *Tsuga mertensiana* in some locations. *Picea sitchensis* and *Thuja plicata* are occasionally present. Deciduous trees are rare. Common understory species include *Blechnum spicant*, *Elliottia pyroliflorus*, *Empetrum nigrum*, *Geum calthifolium*, *Vaccinium ovalifolium*, *Gymnocarpium dryopteris*, *Harrimanella stelleriana*, *Luetkea pectinata*, *Menziesia ferruginea*, *Nephrophyllidium crista-galli*, *Phyllodoce aleutica* (or *Phyllodoce glanduliflora*), *Rubus pedatus*, *Streptopus lanceolatus*, *Tiarella trifoliata*, *Vaccinium membranaceum*, and *Vaccinium ovalifolium*.

**Classification Comments:** At its southern border, this group merges into Sierra-Cascade Red Fir - Mountain Hemlock Forest Group (G749) in the Cascade Range south of Crater Lake National Park in Oregon. The central Oregon Cascades, and the eastern slope of the Cascades in Washington all have important high-severity fire regime (occasional intense fires), warmer, drier summers, and little to no *Abies amabilis*, and may have other floristic differences from the forests west of coastal mountain divide from northern Oregon to southeastern Alaska which have very little to no fire, lots of *Abies amabilis*, and cool summers. This group includes what the Alaska Natural Heritage Program calls Maritime Subalpine Fir-Mountain Hemlock Forest. These differences may be best handled at the alliance level.

Placement of the following associations in this group needs review as they could be Rocky Mountain associations. Even though they are on the lee side of the Coast, they are likely more floristically related to interior types: *Abies lasiocarpa* / *Valeriana sitchensis* Forest (CEGL000345); *Abies lasiocarpa* / *Vaccinium membranaceum* / *Valeriana sitchensis* Forest (CEGL002612); *Abies lasiocarpa* / *Phyllodoce empetriformis* Woodland (CEGL000920); and *Abies lasiocarpa* - *Pseudotsuga menziesii* / *Acer circinatum* Woodland (CEGL000921). And should the following association be placed in G244: *Chamaecyparis nootkatensis* Subalpine Parkland Woodland (CEGL000350).

**Internal Comments:** GK 10-13: CA removed. mjr 10-12: CA? added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G241 North Pacific Maritime Silver Fir - Western Hemlock Forest

**Diagnostic Characteristics:** Dominance of *Tsuga mertensiana* singly or with *Abies amabilis*. Other conifers may be present. May form large continuous forests or small clumps of trees.

**VEGETATION**

**Physiognomy and Structure:** Needle-leaved trees (15-35 m tall) in dense to open forests or as clumps of 10-50 individual trees forming a closed canopy. Forests may be open patchy canopy, or clumps of trees surrounded by herbaceous vegetation aka "parkland."

**Floristics:** *Tsuga mertensiana* is one of the dominant tree species throughout, and *Abies amabilis* becomes an important associated species in the southern portion of the range, and drops out completely for most of the Alaska portion of this group's range [this statement needs review]. *Tsuga heterophylla* often occurs at lower elevations in this group but is much less abundant than *Tsuga mertensiana*. *Chamaecyparis nootkatensis* becomes less predominant with increasing distance from the coast, while *Abies lasiocarpa* is found inland and becomes increasingly common near the transition to the Subalpine Fir-Engelmann Spruce Zone in the Cascades and British Columbia. On the leeward side of the Cascades, this is usually a dense canopy composed of *Abies lasiocarpa* and *Tsuga mertensiana*, with some *Picea engelmannii* or *Abies amabilis*. In Alaska *Abies lasiocarpa* mixes with the canopy of *Tsuga mertensiana* in some locations. *Picea sitchensis* and *Thuja plicata* are occasionally present. Deciduous trees are rare. Common understory species include *Blechnum spicant*, *Elliottia pyroliflorus*, *Empetrum nigrum*, *Geum calthifolium*, *Vaccinium ovalifolium*, *Gymnocarpium dryopteris*, *Harrimanella stelleriana*, *Luetkea pectinata*, *Menziesia ferruginea*, *Nephrophyllidium crista-galli*, *Phyllodoce aleutica* (or *Phyllodoce glanduliflora*), *Rubus pedatus*, *Streptopus lanceolatus*, *Tiarella trifoliata*, *Vaccinium membranaceum*, and *Vaccinium ovalifolium*.

G245 North Pacific Mountain Hemlock - Silver Fir Forest & Tree Island Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies amabilis</i> / <i>Rhododendron albiflorum</i> Forest	G5/S5	CEGL000225
<i>Abies lasiocarpa</i> - ( <i>Pinus contorta</i> ) / <i>Lupinus arcticus</i> ssp. <i>subalpinus</i> Woodland	G2/S2	CEGL000316

<i>Abies lasiocarpa</i> / <i>Phyllodoce empetriformis</i> Woodland	G4Q/S4	CEGL000920
<i>Abies lasiocarpa</i> / <i>Vaccinium membranaceum</i> / <i>Valeriana sitchensis</i> Forest	G4/S4	CEGL002612
<i>Abies lasiocarpa</i> / <i>Valeriana sitchensis</i> Forest	G3/S3	CEGL000345
<i>Chamaecyparis nootkatensis</i> / <i>Vaccinium ovalifolium</i> Forest	G4Q/S4	CEGL000351
<i>Chamaecyparis nootkatensis</i> Subalpine Parkland Woodland	G3/SNA	CEGL000350
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Elliottia pyroliflorus</i> Woodland	G3/G4/S2	CEGL000503
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Phyllodoce empetriformis</i> - <i>Vaccinium deliciosum</i> Woodland	G4/S4	CEGL000914
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Rhododendron albiflorum</i> Forest	G5/S5	CEGL002632
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Rubus lasiococcus</i> Forest	G3/S3	CEGL000509
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Tiarella trifoliata</i> var. <i>unifoliata</i> - <i>Streptopus lanceolatus</i> Forest	G3G4/S3S4	CEGL000125
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Vaccinium membranaceum</i> - <i>Vaccinium ovalifolium</i> Forest	G4G5/S4S5	CEGL002620
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Vaccinium membranaceum</i> - <i>Valeriana sitchensis</i> Forest	G4/S4	CEGL002619
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Vaccinium membranaceum</i> - <i>Xerophyllum tenax</i> Forest	G4/S4	CEGL000515
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Vaccinium membranaceum</i> Forest	G4?/S3	CEGL002618
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Vaccinium ovalifolium</i> - <i>Clintonia uniflora</i> Forest	G4G5/S4	CEGL000512
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Vaccinium ovalifolium</i> - <i>Erythronium montanum</i> Forest	G3G4/S3	CEGL000513
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Vaccinium ovalifolium</i> - <i>Maianthemum dilatatum</i> Forest	G3G4/S3S4	CEGL002617
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Xerophyllum tenax</i> Forest	G3/S3	CEGL000500
<i>Tsuga mertensiana</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Forest	G5/S3	CEGL000505
<i>Tsuga mertensiana</i> / <i>Vaccinium scoparium</i> Forest	G4/SNA	CEGL000126

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* The climate is generally characterized by short, cool summers, rainy autumns and long, cool, wet winters with heavy snow cover for 5-9 months. The heavy snowpack is ubiquitous, but at least in southern Oregon and perhaps the eastern Cascades, summer drought is more significant.

**Dynamics:** Fire is very rare or absent across the northern and coastal influence portion of the range of the group. In the drier-summer climatic areas (eastern Cascades), occasional high-severity fires occur, with return intervals of 400-600 years (J. Kertis pers. comm. 2006, K. Kopper pers. comm. 2006). On drier sites, *Abies lasiocarpa* and *Pinus contorta* can be the first forests to develop after stand-replacing fire. These early-seral stages, with lodgepole pine dominant in the upper canopy, should be considered part of this group if *Tsuga mertensiana* and *Abies amabilis* are present, as it will succeed as a mixed pine type, then mountain hemlock becomes characteristic. Landfire VDDT models: R#ABAMup.

#### DISTRIBUTION

**Geographic Range:** This group occurs throughout the mountains of the North Pacific, from the central Cascades of Oregon north to the coast of Alaska to the Cook Inlet.

**Nations:** CA, US

**States/Provinces:** AK, BC, OR, WA

**TNC Ecoregions [optional]:** 1:C, 3:C, 69:C, 70:C, 81:C

**USFS Ecoregions (2007):** 242A:??, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:C?, M261G:C?

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

- >> BaHm - Oak fern (MHmm1/03) (Banner et al. 1993)
- >> BaHm - Oak fern (MHmm2/03) (Banner et al. 1993)
- >> BaHm - Twistedstalk (MHmm1/05) (Banner et al. 1993)
- >> BaHm - Twistedstalk (MHmm2/05) (Banner et al. 1993)
- >> BIHm - Cladonia (ESSFmk/03) (Banner et al. 1993)
- >> BIHm - Oak fern (ESSFmk/04) (Banner et al. 1993)
- >> BIHm - Twistedstalk (ESSFmk/01) (Banner et al. 1993)
- >> CwYc - Goldthread (CWHvm2/09) (Banner et al. 1993)
- < EW Subalpine Fir - Mountain Hemlock Wet Forested (Ecosystems Working Group 1998)
- >> HmBa - Mountain-heather (MHmm1/02) (Banner et al. 1993)
- >> HmBa - Mountain-heather (MHmm2/02) (Banner et al. 1993)
- >> HmBa -Blueberry (MHmm1/01) (Banner et al. 1993)
- >> HmBa -Blueberry (MHmm2/01) (Banner et al. 1993)
- >> HmBa -Bramble (MHmm1/04) (Banner et al. 1993)
- >> HmBa -Bramble (MHmm2/04) (Banner et al. 1993)
- >> HmSs -Blueberry (MHwh1/01) (Banner et al. 1993)
- < MF Mountain Hemlock - Amabilis Fir Forested (Ecosystems Working Group 1998)
- < Mountain Hemlock: 205 (Eyre 1980)
- >> SsHm - Reedgrass (MHwh1/03) (Banner et al. 1993)

**LOWER LEVEL UNITS****Alliances:**

- A3728 *Chamaecyparis nootkatensis* - *Tsuga mertensiana* - *Abies amabilis* Forest & Woodland Alliance
- A3725 *Tsuga mertensiana* Alaskan Parkland Woodland Alliance
- A3726 *Abies amabilis* - *Tsuga mertensiana* - *Abies lasiocarpa* Cascadian Forest & Woodland Alliance
- A3729 *Abies lasiocarpa* - *Picea engelmannii* / *Rubus lasiococcus* Cascadian Forest Alliance
- A3727 *Tsuga mertensiana* - *Abies amabilis* - *Chamaecyparis nootkatensis* Tree Island Alliance
- A3723 *Tsuga mertensiana* - *Abies amabilis* Forest & Woodland Alliance
- A3724 *Tsuga mertensiana* - *Tsuga heterophylla* - *Chamaecyparis nootkatensis* Forest & Woodland Alliance

**AUTHORSHIP**

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

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2013/10/09

**REFERENCES**

**References:** Banner et al. 1993, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2015, Franklin 1988, Green and Klinka 1994, Kertis pers. comm., Klinka and Chourmouzis 2002, Kopper pers. comm.

## 1.B.3. Temperate Flooded & Swamp Forest

Temperate Flooded & Swamp Forest is a tree-dominated wetland influenced by minerotrophic groundwater, either on mineral or organic (peat) soil, found in mid-latitudes of the globe.

### 1.B.3.Nc. Rocky Mountain & Great Basin Montane Flooded & Swamp Forest

Forested riparian and depressional wetlands dominated by broad-leaved deciduous trees or conifers (or both) that occur at mid to high elevations of the Rocky Mountains, ranges of the Intermountain West and the Colorado Plateau, and in the Sierra Nevada and eastern Cascades.

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1. Forest & Woodland

1.B.3.Nc. Rocky Mountain & Great Basin Montane Flooded & Swamp Forest

## M034. Rocky Mountain & Great Basin Montane Riparian Forest

**Type Concept Sentence:** This macrogroup consists of montane riparian and swamp forests and woodlands dominated by cottonwood trees, conifer trees, or a mix with such species as *Acer negundo*, *Alnus rhombifolia*, *Picea engelmannii*, *Picea pungens*, *Pinus contorta*, *Pinus ponderosa*, *Populus angustifolia*, and *Populus balsamifera*. It occurs throughout the Great Basin and Rocky Mountains.

### OVERVIEW

**Scientific Name:** Rocky Mountain & Great Basin Montane Riparian Forest Macrogroup

**Common Name (Translated Scientific Name):** Rocky Mountain & Great Basin Montane Riparian Forest Macrogroup

**Type Concept:** This macrogroup consists of riparian and permanently saturated forests and woodlands dominated by cottonwood trees conifer trees or a mix. Species typically seen are *Abies grandis*, *Abies lasiocarpa*, *Acer negundo*, *Alnus rhombifolia*, *Fraxinus latifolia*, *Juglans major*, *Juniperus scopulorum*, *Larix occidentalis*, *Picea engelmannii*, *Picea pungens*, *Pinus contorta*, *Pinus ponderosa*, *Populus angustifolia*, *Populus balsamifera*. Many other tree species may dominate. Stands usually have complex structure of tree shrub and herbaceous layers. Shrubs species include dryland to wetland obligate species and range from *Artemisia* spp. to *Salix* spp., and include *Alnus* spp., *Betula occidentalis*, and *Cornus sericea*. Herbaceous layers can be dominated by forbs, graminoids or be sparsely vegetated, depending on the amount of shading and soil moisture and disturbance history. Dominant herbaceous species include *Asarum caudatum*, *Athyrium filix-femina*, *Calamagrostis canadensis*, *Carex obnupta*, *Clintonia uniflora*, *Distichlis spicata*, *Equisetum* spp., *Gymnocarpium dryopteris*, *Leymus triticoides*, *Maianthemum stellatum*, *Senecio triangularis*, and *Thalictrum fendleri*. Introduced forage species such as *Agrostis stolonifera*, *Poa pratensis*, *Phleum pratense*, and *Bromus inermis* can be abundant. This macrogroup occupies interior mountains and valleys at elevations east of the Cascade Range and Sierra Nevada below alpine along streambanks, hillside seeps and floodplain soils that are seasonally wet via high water tables or surface flooding. This macrogroup occurs throughout the Great Basin and Rocky Mountains, from New Mexico north into Alberta and British Columbia and from Colorado west to Idaho, Washington, Nevada, Oregon and high mountains in New Mexico.

### Classification Comments:

#### Similar NVC Types:

- M036 Interior Warm & Cool Desert Riparian Forest: includes riparian forests of warm deserts of southern California, Arizona and New Mexico and Texas.
- M035 Vancouverian Flooded & Swamp Forest: includes riparian and permanently saturated forests of the coastal and maritime climates of the Pacific Northwest.

**Diagnostic Characteristics:** This macrogroup includes plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent lotic and lentic waterbodies and springs/seeps. Facultative or wetland tree species are characteristic and include the cottonwoods, conifers and aspen woodlands that line streams or seeps. These are communities tolerant of periodic flooding and high water tables.

### VEGETATION

**Physiognomy and Structure:** Open to closed-canopy tall woodlands, often linear plant communities with complex horizontal structure, mostly cold-deciduous trees, but can be conifer-dominated or a mix.

**Floristics:** Dominant trees include deciduous broad-leaved trees *Acer negundo*, *Alnus rhombifolia*, *Betula papyrifera*, *Populus angustifolia*, *Populus balsamifera* ssp. *trichocarpa*, and *Populus tremuloides*. Coniferous species include *Abies concolor*, *Abies grandis*, *Abies lasiocarpa*, *Larix occidentalis*, *Juglans major*, *Juniperus scopulorum*, *Pinus ponderosa* (occasionally), *Picea engelmannii*, *Picea pungens*, *Picea glauca*, *Pinus contorta*, *Pseudotsuga menziesii*, *Thuja plicata*, or *Tsuga heterophylla*. Exotic trees *Elaeagnus angustifolia* and *Tamarix* spp. are common in some stands. Understory shrubs include *Acer glabrum*, *Alnus incana*, *Amelanchier alnifolia*, *Artemisia tridentata*, *Artemisia cana*, *Betula occidentalis*, *Brickellia grandiflora*, *Cornus sericea*, *Crataegus douglasii*, *Crataegus rivularis*, *Ericameria nauseosa*, *Oplopanax horridus*, *Philadelphus lewisii*, *Physocarpus capitatus*, *Prunus virginiana*, *Quercus gambelii*, *Rhamnus alnifolia*, *Rhododendron occidentale*, *Rhus trilobata*, *Ribes* spp., *Rosa nutkana*, *Rosa woodsii*, *Salix drummondiana*, *Salix geyeriana*, *Salix exigua*, *Salix lucida*, *Salix lasiolepis*, *Sambucus caerulea*, *Shepherdia argentea*, *Symphoricarpos* spp., and others.

Herbaceous undergrowth layers can be dominated by graminoids or forbs and may be sparsely vegetated depending on the amount of overstory shading. Herbaceous species that can be dominate include forbs and ferns such as *Asarum caudatum*, *Athyrium filix-femina*, *Callitriche heterophylla*, *Clintonia uniflora*, *Dryopteris* spp., *Gymnocarpium dryopteris*, *Heracleum maximum*, *Lysichiton americanus*, *Maianthemum stellatum*, *Mitella breweri*, *Mitella pentandra*, *Ranunculus alismifolius*, *Senecio bigelovii* var. *bigelovii*, *Senecio triangularis*, *Streptopus amplexifolius*, *Thalictrum fendleri*, and *Veratrum californicum*; as well as graminoids and fern allies

*Alopecurus aequalis*, *Calamagrostis canadensis*, *Carex aquatilis* var. *aquatilis*, *Carex disperma*, *Carex obnupta*, *Carex pellita*, *Carex vesicaria*, *Distichlis spicata*, *Eleocharis palustris*, *Equisetum arvense*, *Equisetum spp.*, *Leymus triticoides*, and *Phalaris arundinacea*. Introduced forage species such as *Agrostis stolonifera*, *Bromus inermis*, *Phleum pratense*, *Poa pratensis*, *Trifolium pratense*, and *Trifolium repens* can be abundant.

This floristic information is compiled from several sources that describe specific plant associations from eastern Washington and Oregon (Kovalchik 1987, 1993, Crowe and Clausnitzer 1997), Nevada (Manning and Padgett 1995), Colorado (Kittel et al. 1999b, Carsey et al. 2003b), Montana (Butler 1979, 1985, Malanson and Butler 1984, Hansen et al. 1989, Mincemoyer 2005), British Columbia (NCC 2002, MacKenzie and Moran 2004), Alberta (NCC 2002), Utah (Padgett et al. 1989, Tuhy et al. 2002), New Mexico and Arizona (Szaro 1989, Muldavin et al. 2000a), and Wyoming (Walford 1996, Walford et al. 2001).

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup contains riparian, seep and swampy areas mostly associated with streambanks and floodplains of permanent, intermittent and ephemeral streams. It is found between mountain ranges, on mountain hill slopes and well into the mountains to subalpine elevations, but below alpine. They occur in V-shaped, narrow valleys and canyons (where there is cold-air drainage), wide valley bottoms on large floodplains along broad, meandering rivers on alluvial soils. They also can occur on finer soils on pond or lake margins and seeps on gentle slopes. Swamps are poorly drained soils that are saturated year-round or may have seasonal flooding in the spring. Environmental information is compiled from several sources: for eastern Washington and Oregon (Kovalchik 1987, 1993, 2001, Crowe and Clausnitzer 1997), for Nevada (Manning and Padgett 1995), for Colorado (Baker 1988, 1989a, 1989b, 1990, Kittel et al. 1994, 1995, 1999a, 1999b), for Montana (Butler 1979, 1985, Malanson and Butler 1984, Hansen et al. 1989), for British Columbia (MacKenzie and Moran 2004), for Utah (Padgett et al. 1989, Tuhy et al. 2002), for New Mexico and Arizona (Szaro 1989, Muldavin et al. 2000a), and for Wyoming (Walford 1996, Walford et al. 2001).

**Dynamics:** Cottonwood and other deciduous dominants of riparian forests and woodlands require flooding, scour and deposition for germination and maintenance. Historically trees were most often replaced by flooding from which most tree regeneration depends. Stands often germinate on open, wet point bars and other freshly deposited alluvial surfaces at some distance from parent trees. Over time healthy riparian corridor supports several stages of cottonwood communities, reaches with seedling, sapling and mature clumps of cottonwoods are a sign of healthy flooding regime (Kittel et al. 1999b). In winter, rafted ice and logs in flow pulses may cause considerable damage to tree boles. It has been documented that ice sheets formed in shallows around cottonwood seedlings lift and rip seedlings out of the ground with spring flows. Beavers crop younger cottonwood and willows and frequently dam side channels occurring in these stands. In steep-sided canyons, streams typically have perennial flow on mid to high gradients. Grazing and human-modifications to streamflow are major influences in altering structure, composition, and function of these communities.

#### DISTRIBUTION

**Geographic Range:** This macrogroup occurs in the northern and southern Rocky Mountains, northwestern Wyoming and central Montana, north into the Canadian Rockies of Alberta and British Columbia and west into Idaho, eastern Oregon and Washington, on the east slopes of the Cascades, in mountains surrounding the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations except west of the Cascades, on the Colorado Plateau, in the Great Basin basins and ranges as well as the eastern slope of the Sierra Nevada, extending to the mountains of Arizona, New Mexico and into Mexico (Szaro 1989).

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX, US

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

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

- < AC Trembling Aspen Copse (Ecosystems Working Group 1998)
- >< Black Cottonwood - Willow: 222 (Eyre 1980)
- = Blue Spruce: 216 (Eyre 1980) [Blue spruce commonly occurs in riparian zones]
- < CR Black Cottonwood Riparian Habitat Class (Ecosystems Working Group 1998)
- < Cottonwood - Willow: 235 (Eyre 1980)
- = ER Engelmann Spruce Riparian (Ecosystems Working Group 1998)
- < Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980) [Engelmann spruce occurs as a dominant in riparian zones. Swamps dominated by Engelmann spruce occur in G505.]

#### WA groups

- < Inland Freshwater Wooded Swamp (Shaw and Fredine 1971)
- < Riparian (422) (Shiflet 1994)
- < Riparian Woodland (203) (Shiflet 1994) [Group and SRM type overlap along eastern Sierran foothills region of California.]
- ? Swamp (Warner and Rubec 1997)
- < Swamp (National Wetlands Working Group 1988)
- < Swamp Wetland Class: Forested (MacKenzie and Moran 2004)
- < Western Redcedar - Western Hemlock: 227 (Eyre 1980)
- < Western Redcedar: 228 (Eyre 1980)

#### LOWER LEVEL UNITS

##### Groups:

- G506 Rocky Mountain & Great Basin Montane Riparian Forest
- G505 Rocky Mountain & Great Basin Swamp Forest
- G796 Northern Rocky Mountain Lowland & Foothill Riparian Forest

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel and M. Reid

**Acknowledgments:**

**Version Date:** 05/11/2015

**Classif Resp Region:** West

**Internal Author:** GK 10-14, 5-15

#### REFERENCES

**References:** Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Butler 1979, Butler 1985, Carsey et al. 2003b, Crowe and Clausnitzer 1997, Daubenmire 1952, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2015, Hansen et al. 1989, Kittel 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, MacKenzie and Moran 2004, Malanson and Butler 1984, Manning and Padgett 1995, Mincemoyer 2005, Muldavin et al. 2000a, NCC 2002, Nachlinger et al. 2001, National Wetlands Working Group 1988, Padgett et al. 1988b, Padgett et al. 1989, Shaw and Fredine 1971, Shiflet 1994, Szaro 1989, Tuhy et al. 2002, Walford 1996, Walford et al. 2001, Warner and Rubec 1997

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#### 1. Forest & Woodland

1.B.3.Nc. Rocky Mountain & Great Basin Montane Flooded & Swamp Forest

M034. Rocky Mountain & Great Basin Montane Riparian Forest

### G506. Rocky Mountain & Great Basin Montane Riparian Forest

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Picea engelmannii* - *Picea pungens* - *Populus angustifolia* Riparian Forest Group

**Common Name (Translated Scientific Name):** Engelmann Spruce - Blue Spruce - Narrowleaf Cottonwood Riparian Forest Group

**Type Concept:** This group contains woodlands dominated by cottonwood, conifer and aspen that line montane streams. Dominant tree species usually include *Abies lasiocarpa*, *Picea engelmannii*, *Pinus ponderosa*, *Juniperus scopulorum*, and/or *Populus angustifolia*; other important species include *Pseudotsuga menziesii*, *Picea pungens*, *Picea engelmannii* x *glauca*, and *Populus tremuloides*. Other trees possibly present but not usually dominant include *Alnus incana*, *Abies concolor*, *Abies grandis*, *Pinus contorta*, and *Juniperus osteosperma*. Shrub cover tends to be limited but may include *Alnus incana*, *Betula occidentalis*, *Cornus sericea*, *Crataegus rivularis*, *Forestiera pubescens* var. *pubescens*, *Ribes* spp., *Rosa woodsii*, *Salix* spp., and others. The herbaceous undergrowth can be lush to depauperate. Herbaceous species include *Calamagrostis canadensis*, *Carex aquatilis* var. *aquatilis*, *Carex obnupta*, *Carex pellita*, *Equisetum arvense*, *Heracleum maximum*, *Ranunculus alismifolius*, *Senecio bigelovii* var. *bigelovii*, *Streptopus amplexifolius*, and *Veratrum californicum*. This riparian forest and woodland group comprises seasonally flooded forests and woodlands found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, and west into the Intermountain West region and the Colorado Plateau. It occurs throughout the interior of British Columbia and the eastern slopes of the Cascade Range. These are communities tolerant of periodic flooding and high water tables. Snowmelt moisture may create shallow water tables or seeps for a portion of the growing season. Stands typically occur at elevations between 1500 and 3300 m (4920-10,830 feet); farther north, elevation ranges between 900 and 2000 m. This is confined to specific riparian environments occurring on floodplains or terraces of rivers and streams, in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, occurrences are found in moderately wide valley bottoms on large floodplains along broad, meandering rivers, and on pond or lake margins.



**Classification Comments:** This group is restricted to montane riparian areas and avalanche chutes between lower and upper treeline.

**Internal Comments:** mjr 10-12: CA added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G505 Rocky Mountain & Great Basin Swamp Forest: occurs on saturated, extremely poorly drained soil.
- G507 North Pacific Montane Riparian Woodland

**Diagnostic Characteristics:** This group contains the conifer and aspen woodlands that line montane streams. These are communities tolerant of periodic flooding and high water tables.

**VEGETATION**

**Physiognomy and Structure:** Open to closed woodlands of tall conifer or deciduous trees with or without an understory of deciduous shrubs, generally forming linear bands following streams. These can blend into the surrounding upland forest, and often only the understory herbaceous species indicate the wet nature of the soils.

**Floristics:** Dominant tree species usually include *Abies lasiocarpa*, *Abies grandis*, *Picea engelmannii*, *Picea pungens*, *Populus angustifolia*, *Pinus ponderosa*, *Pinus contorta*, and/or *Juniperus scopulorum*; other important species include *Pseudotsuga menziesii*, *Picea engelmannii* x *glauca*, and *Populus tremuloides*. Other trees possibly present and dominant or codominant include *Abies concolor*, *Abies grandis*, *Pinus contorta*, and *Juniperus osteosperma*. Shrub cover tends to be limited but may include *Alnus incana*, *Betula occidentalis*, *Cornus sericea*, *Crataegus rivularis*, *Forestiera pubescens* var. *pubescens*, *Ribes* spp., *Rosa woodsii*, *Salix* spp., and others. The herbaceous undergrowth can be lush to depauperate. Herbaceous species include *Calamagrostis canadensis*, *Carex aquatilis* var. *aquatilis*, *Carex obnupta*, *Carex pellita*, *Equisetum arvense*, *Heracleum maximum*, *Ranunculus alismifolius*, *Senecio bigelovii* var. *bigelovii*, *Streptopus amplexifolius*, and *Veratrum californicum*. Floristic information is compiled from several sources for eastern Washington and Oregon (Kovalchik 1987, 1993, Crowe and Clausnitzer 1997), Nevada (Manning and Padgett 1995), Colorado (Kittel et al. 1999b), Montana (Butler 1979, 1985, Malanson and Butler 1984, Hansen et al. 1989), British Columbia (MacKenzie and Moran 2004), Utah (Padgett et al. 1989, Tuhy et al. 2002), New Mexico and Arizona (Szaro 1989, Muldavin et al. 2000a), and Wyoming (Walford 1996, Walford et al. 2001).

G506 Rocky Mountain & Great Basin Montane Riparian Forest	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies grandis</i> - <i>Thuja plicata</i> / <i>Alnus viridis</i> ssp. <i>sinuata</i> / <i>Achlys triphylla</i> Forest	GNR/SNR	CWWA000275
<i>Abies grandis</i> / <i>Athyrium filix-femina</i> Forest	G3Q/S1	CEGL000270
<i>Abies grandis</i> / <i>Gymnocarpium dryopteris</i> Forest	GNR/SNR	CWWA000276
<i>Abies grandis</i> / <i>Symphoricarpos albus</i> Riparian Forest	GNR/SNR	CWWA000277
<i>Abies lasiocarpa</i> / <i>Rubus lasiococcus</i> Forest	GNR/SNR	CWWA000278
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Oplopanax horridus</i> Forest	G3/SNR	CEGL000322
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Streptopus amplexifolius</i> Forest	G4/S2S3	CEGL000336
<i>Abies lasiocarpa</i> / <i>Athyrium filix-femina</i> Woodland	G2/S2	CWWA000002
<i>Abies lasiocarpa</i> / <i>Gymnocarpium dryopteris</i> Forest	GNRQ/SNR	CEGL002611
<i>Abies lasiocarpa</i> / <i>Ledum glandulosum</i> Forest	G4/S1S2	CEGL000314
<i>Abies lasiocarpa</i> / <i>Rhododendron albiflorum</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Forest	GNR/SNR	CWWA000279
<i>Abies lasiocarpa</i> / <i>Rhododendron albiflorum</i> / <i>Senecio triangularis</i> Woodland	G3G4/S2S3	CEGL002613
<i>Abies lasiocarpa</i> / <i>Senecio triangularis</i> - <i>Saxifraga odontoloma</i> Forest	GNR/SNR	CWWA000280
<i>Abies lasiocarpa</i> / <i>Trautvetteria caroliniensis</i> Forest	G3/S3	CEGL000339
<i>Abies lasiocarpa</i> / <i>Vaccinium caespitosum</i> Forest	GNR/SNR	CWWA000281
<i>Abies lasiocarpa</i> / <i>Vaccinium membranaceum</i> Forest	G4/S4	CEGL000342
<i>Larix lyallii</i> / <i>Cassiope mertensiana</i> - <i>Phyllodoce empetriformis</i> Riparian Woodland	GNR/SNR	CWWA000361
<i>Picea engelmannii</i> - <i>Abies lasiocarpa</i> / <i>Valeriana sitchensis</i> Forest	GNR/SNR	CWWA000374
<i>Picea engelmannii</i> - ( <i>Abies lasiocarpa</i> ) / <i>Trollius laxus</i> Forest	GNR/SNR	CWWA000375

G506 Rocky Mountain & Great Basin Montane Riparian Forest	Global/ State Rank	NatureServe/ WANHP Code
<i>Picea engelmannii</i> - <i>Thuja plicata</i> / <i>Vaccinium membranaceum</i> Riparian Forest	GNR/SNR	CWWA000412
<i>Picea engelmannii</i> / <i>Alnus viridis</i> ssp. <i>sinuata</i> Forest	GNR/SNR	CWWA000377
<i>Picea engelmannii</i> / <i>Aralia nudicaulis</i> Forest	GNR/SNR	CWWA000378
<i>Picea engelmannii</i> / <i>Athyrium filix-femina</i> Woodland	G2?/S1?	CWWA000183
<i>Picea engelmannii</i> / <i>Cornus canadensis</i> Forest	GNR/SNR	CWWA000380
<i>Picea engelmannii</i> / <i>Cornus sericea</i> Woodland	G3/S2?	CEGL002677
<i>Populus tremuloides</i> / <i>Cornus sericea</i> Forest	G4/S1S2	CEGL000582
<i>Populus tremuloides</i> / <i>Symphoricarpos albus</i> Forest	G3?/S2	CEGL000609
<i>Picea engelmannii</i> / <i>Gymnocarpium dryopteris</i> Forest [Provisional]	GNR/SNR	CWWA000381
<i>Thuja plicata</i> - ( <i>Abies grandis</i> ) / <i>Acer circinatum</i> Riparian Forest	GNR/SNR	CWWA000409
<i>Thuja plicata</i> - ( <i>Tsuga heterophylla</i> ) / <i>Oplopanax horridus</i> Forest	G3/S2S3	CEGL000479
<i>Thuja plicata</i> / <i>Alnus incana</i> Forest	GNR/SNR	CWWA000410
<i>Thuja plicata</i> / <i>Paxistima myrsinites</i> / <i>Clintonia uniflora</i> Forest	GNR/SNR	CWWA000411
<i>Tsuga heterophylla</i> / <i>Acer circinatum</i> Riparian Forest	GNR/SNR	CWWA000414

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Temperate cold. *Soil/substrate/hydrology:* Stands typically occur at elevations between 1500 and 3300 m (4920-10,830 feet); farther north, elevation ranges between 900 and 2000 m. This group is confined to specific riparian environments occurring on floodplains or terraces of rivers and streams, in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, occurrences are found in moderately wide valley bottoms on large floodplains along broad, meandering rivers, on pond or lake margins, and seeps on gentle slopes. Environmental information is compiled from several sources: for eastern Washington and Oregon (Kovalchik 1987, 1992, 2001, Crowe and Clausnitzer 1997); for Nevada (Manning and Padgett 1995); for Colorado (Baker 1988, 1989a, 1989b, 1990, Kittel et al. 1994, 1995, 1999a, 1999b); for Montana (Butler 1979, 1985, Malanson and Butler 1984, Hansen et al. 1989); for British Columbia (MacKenzie and Moran 2004); for Utah (Padgett et al. 1989, Tuhy et al. 2002); for New Mexico and Arizona (Szaro 1989, Muldavin et al. 2000a); and for Wyoming (Walford 1996, Walford et al. 2001).

#### Dynamics:

### DISTRIBUTION

**Geographic Range:** This group is found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, Alberta and British Columbia, and west into the Intermountain West region and the Colorado Plateau.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

### SYNONYMY

- = Blue Spruce: 216 (Eyre 1980) [Blue spruce commonly occurs in riparian zones]
- = ER Engelmann Spruce Riparian (Ecosystems Working Group 1998)
- < Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980) [Engelmann spruce occurs as a dominant in riparian zones.]
- < Riparian (422) (Shiflet 1994)

### LOWER LEVEL UNITS

#### Alliances:

- A3761 *Picea pungens* Riparian Forest & Woodland Alliance
- A4154 *Acer negundo* - *Alnus incana* ssp. *tenuifolia* - *Cornus sericea* Riparian Woodland Alliance
- A3758 *Pinus contorta* var. *murrayana* - *Pinus contorta* var. *latifolia* Riparian/Seep Forest & Woodland Alliance

#### WA groups

- A3759 *Populus angustifolia* Riparian Woodland & Forest Alliance
- A3797 *Pinus ponderosa* - *Juniperus scopulorum* - *Abies concolor* Riparian Woodland Alliance
- A3760 *Populus tremuloides* Riparian Forest & Woodland Alliance
- A3762 *Abies grandis* Rocky Mountain Riparian Forest & Woodland Alliance
- A3757 *Abies lasiocarpa* - *Picea engelmannii* Riparian/Seep Forest & Woodland Alliance

#### AUTHORSHIP

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2015/05/11

#### REFERENCES

**References:** Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Butler 1979, Butler 1985, Crowe and Clausnitzer 1997, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2015, Hansen et al. 1989, Kittel 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, MacKenzie and Moran 2004, Malanson and Butler 1984, Manning and Padgett 1995, Muldavin et al. 2000a, Nachlinger et al. 2001, Padgett et al. 1988b, Padgett et al. 1989, Shiflet 1994, Szaro 1989, Tuhy et al. 2002, Walford 1996, Walford et al. 2001

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#### 1. Forest & Woodland

1.B.3.Nc. Rocky Mountain & Great Basin Montane Flooded & Swamp Forest

M034. Rocky Mountain & Great Basin Montane Riparian Forest

### G505. Rocky Mountain & Great Basin Swamp Forest

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Thuja plicata* - *Picea engelmannii* / *Lysichiton americanus* Swamp Forest Group

**Common Name (Translated Scientific Name):** Western Red-cedar - Engelmann Spruce / American Skunk-cabbage Swamp Forest Group

**Type Concept:** This wetland group occurs in the Northern Rocky Mountains from northwestern Wyoming north into the Canadian Rockies and west into eastern Oregon and Washington. It is dominated by conifers on poorly drained soils that are saturated year-round or may have seasonal flooding in the spring. These are primarily on flat to gently sloping lowlands, but also occur up to near the lower limits of continuous forest (below the subalpine parkland). It can occur on steeper slopes where soils are shallow over unfractured bedrock (aka on seeps). This group is indicative of poorly drained, mucky areas, and areas are often bathed in a mosaic of moving and stagnant water. It can also occur around vernal ponds (usually <1 m but can be as much as 2 m deep) that usually fill with water over the fall, winter and early spring, but then at least partially dry up towards the end of the growing season. Trees that ring these ponds shade the water and influence the hydrology of the ponds themselves. Soils can be woody peat, muck or mineral but tend toward mineral. Stands generally occupy sites on benches, toeslopes or valley bottoms along mountain streams. Stands are usually dominated by conifers, but can have hardwoods mixed or dominant. Abundant tree species include *Abies grandis*, *Abies lasiocarpa*, *Betula papyrifera*, *Fraxinus latifolia*, *Larix occidentalis*, *Picea engelmannii*, *Picea glauca*, *Pinus contorta*, *Populus balsamifera ssp. trichocarpa* (= *Populus trichocarpa*), *Populus tremuloides*, *Pseudotsuga menziesii*, *Thuja plicata*, or *Tsuga heterophylla*. These wetland types are generally distinguishable from other upland forests and woodlands by shallow water tables and mesic or hydric undergrowth vegetation; some of the most typical herbaceous species include *Alopecurus aequalis*, *Athyrium filix-femina*, *Calamagrostis canadensis*, *Callitriche heterophylla*, *Carex disperma*, *Carex vesicaria*, *Dryopteris* spp., *Eleocharis palustris*, *Equisetum arvense*, *Lysichiton americanus*, *Mitella breweri*, *Mitella pentandra*, *Phalaris arundinacea*, *Senecio triangularis*, and *Streptopus amplexifolius*. Common shrubs include *Alnus incana*, *Cornus sericea* (= *Cornus stolonifera*), *Rhamnus alnifolia*, and *Salix* spp.

**Classification Comments:**

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G506 Rocky Mountain & Great Basin Montane Riparian Forest: is found in aerated, better drained areas.
- G256 North Pacific Maritime Hardwood - Conifer Swamp

- G610 North Pacific Maritime Poor Fen & Bog Forest & Woodland: is a very similar group that occurs farther west and has Pacific Northwest Coastal indicator species.

**Diagnostic Characteristics:** This group is dominated by conifers on poorly drained soils that are saturated year-round or may have seasonal flooding in the spring.

#### VEGETATION

**Physiognomy and Structure:** Wetlands dominated by tall conifer trees, tall deciduous hardwood trees or both, often surrounding a perennial or ephemeral water body. Herbaceous undergrowth is often very dense and ranges from 0.1-1.5 m in height.

**Floristics:** Abundant tree species include *Abies grandis*, *Abies lasiocarpa*, *Betula papyrifera*, *Fraxinus latifolia*, *Larix occidentalis*, *Picea engelmannii*, *Picea glauca*, *Pinus contorta*, *Populus balsamifera ssp. trichocarpa* (= *Populus trichocarpa*), *Populus tremuloides*, *Pseudotsuga menziesii*, *Thuja plicata*, or *Tsuga heterophylla*. These wetland types are generally distinguishable from other upland forests and woodlands by shallow water tables and mesic or hydric undergrowth vegetation; some of the most typical herbaceous species include *Alopecurus aequalis*, *Athyrium filix-femina*, *Calamagrostis canadensis*, *Callitriche heterophylla*, *Carex disperma*, *Carex vesicaria*, *Dryopteris* spp., *Eleocharis palustris*, *Equisetum arvense*, *Lysichiton americanus*, *Mitella breweri*, *Mitella pentandra*, *Phalaris arundinacea*, *Senecio triangularis*, and *Streptopus amplexifolius*. Common shrubs include *Alnus incana*, *Cornus sericea* (= *Cornus stolonifera*), *Rhamnus alnifolia*, and *Salix* spp. Floristic descriptions are compiled from Crowe and Clausnitzer (1997), Canadian Rockies Ecoregional Plan (2002), MacKenzie and Moran (2004), and Mincemoyer (2005).

G505 Rocky Mountain & Great Basin Swamp Forest Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Calamagrostis canadensis</i> Forest	G5/SNA	CEGL000300
<i>Betula papyrifera</i> / <i>Alnus incana</i> Woodland	G2?/S1	CWWA000174
<i>Betula papyrifera</i> / <i>Aralia nudicaulis</i> Woodland	G2?/S1	CWWA000175
<i>Betula papyrifera</i> / <i>Cornus canadensis</i> Forest	GNR/SNR	CWWA000317
<i>Betula papyrifera</i> / <i>Cornus sericea</i> Forest	GNR/SNR	CWWA000318
<i>Picea (engelmannii x glauca, engelmannii)</i> / <i>Carex disperma</i> Forest	G2Q/SNR	CEGL000405
<i>Picea engelmannii</i> - <i>Thuja plicata</i> / <i>Equisetum arvense</i> Forest	GNR/SNR	CWWA000373
<i>Picea engelmannii</i> - <i>Tsuga heterophylla</i> / <i>Lysichiton americanus</i> Forest	GNR/SNR	CWWA000376
<i>Picea engelmannii</i> / <i>Betula glandulosa</i> / <i>Tomentypnum nitens</i> Woodland	GNR/SNR	CWWA000372
<i>Picea engelmannii</i> / <i>Carex interior</i> Woodland	GNR/SNR	CWWA000379
<i>Picea engelmannii</i> / <i>Carex scopulorum var. prionophylla</i> Woodland	G3/S3	CEGL002630
<i>Picea engelmannii</i> / <i>Carex scopulorum var. prionophylla</i> Woodland	G3/S3	CEGL002630
<i>Picea engelmannii</i> / <i>Equisetum arvense</i> Forest	G4/S3	CEGL005927
<i>Pinus contorta</i> / <i>Calamagrostis canadensis</i> Forest	G5/SNR	CEGL000138
<i>Pinus contorta</i> / <i>Spiraea douglasii</i> Forest	G3G4/SNR	CEGL002604
<i>Pinus contorta var. latifolia</i> / <i>Betula glandulosa</i> / <i>Carex utriculata</i> Woodland	GNR/SNR	CWWA000371
<i>Populus tremuloides</i> / <i>Calamagrostis canadensis</i> Forest	G3/S1	CEGL000574
<i>Populus tremuloides</i> / <i>Carex pellita</i> Forest	G2/S1	CEGL000577
<i>Thuja plicata</i> – ( <i>Tsuga heterophylla</i> ) / <i>Oplopanax horridus</i> Rocky Mountain Forest	G3/S2S3	CEGL000479
<i>Thuja plicata</i> / <i>Athyrium filix-femina</i> Forest	G3G4/SNR	CEGL000473
<i>Thuja plicata</i> / <i>Gymnocarpium dryopteris</i> Forest	G3/SNR	CEGL000476
<i>Tsuga heterophylla</i> / <i>Gymnocarpium dryopteris</i> Forest	G3G4/S3	CEGL000494

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Temperate cool. *Soil/substrate/hydrology:* This group is dominated by conifers on poorly drained soils that are saturated year-round or may have seasonal flooding in the spring. These are primarily on flat to gently sloping lowlands, but also occur up to near the lower limits of continuous forest (below the subalpine parkland). It can occur on steeper slopes where soils are shallow over unfractured bedrock. This group is indicative of poorly drained, mucky areas, and areas are often a mosaic of moving and stagnant water. It can also occur around vernal ponds (usually <1 m but can be as much as 2 m deep) that usually fill with water over the fall, winter and early spring, but then at least partially dry up towards the end of the growing season.

Trees that ring these ponds shade the water and influence the hydrology of the ponds themselves. Soils can be woody peat, muck or mineral but tend toward mineral. Stands generally occupy sites on benches, toeslopes or valley bottoms along mountain streams. Environmental descriptions are compiled from Crowe and Clausnitzer (1997), NCC (2002), MacKenzie and Moran (2004), and Mincemoyer (2005).

**Dynamics:**

**DISTRIBUTION**

**Geographic Range:** This group occurs in the Northern Rocky Mountains from northwestern Wyoming and central Montana, north into the Canadian Rockies of Alberta and British Columbia and west into Idaho, eastern Oregon and Washington.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 7:C, 8:C, 9:P, 26:C, 68:C

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

- < Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980) [Swamps dominated by Engelmann spruce occur in this group.]
- < Inland Freshwater Wooded Swamp (Shaw and Fredine 1971)
- ? Swamp (Warner and Rubec 1997)
- < Swamp (National Wetlands Working Group 1988)
- < Swamp Wetland Class: Forested (MacKenzie and Moran 2004)
- < Western Redcedar - Western Hemlock: 227 (Eyre 1980)
- < Western Redcedar: 228 (Eyre 1980)

**LOWER LEVEL UNITS**

**Alliances:**

- A3775 *Picea engelmannii* Swamp Forest Alliance
- A3776 *Thuja plicata* - *Tsuga heterophylla* Rocky Mountain Swamp Forest Alliance

**AUTHORSHIP**

**Primary Concept Source:** S. Shaw and C.G. Fredine (1971)

**Author of Description:** G. Kittel and M. Reid

**Acknowledgments:**

**Version Date:** 2013/09/06

**REFERENCES**

**References:** Crowe and Clausnitzer 1997, Eyre 1980, Faber-Langendoen et al. 2015, MacKenzie and Moran 2004, Mincemoyer 2005, NCC 2002, National Wetlands Working Group 1988, Shaw and Fredine 1971, Warner and Rubec 1997

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1. Forest & Woodland

1.B.3.Nc. Rocky Mountain & Great Basin Montane Flooded & Swamp Forest

M034. Rocky Mountain & Great Basin Montane Riparian Forest

**G796. Northern Rocky Mountain Lowland & Foothill Riparian Forest**

**Type Concept Sentence:**

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**OVERVIEW**

**Scientific Name:** Northern Rocky Mountain Lowland & Foothill Riparian Forest Group

**Common Name (Translated Scientific Name):** Northern Rocky Mountain Lowland & Foothill Riparian Forest Group

**Type Concept:** Vegetation within this group is characterized by an open to moderately dense tree layer that is dominated by *Populus balsamifera* ssp. *trichocarpa* and *Populus balsamifera* ssp. *balsamifera*. Tree associates include *Populus deltoides*, *Populus angustifolia*, *Pinus ponderosa*, and *Picea* spp. A shrub layer is usually present and may be dominated by *Alnus incana*, *Betula papyrifera*, *Cornus sericea*, *Crataegus douglasii*, *Prunus virginiana*, *Ribes americanum*, *Salix exigua*, and *Symphoricarpos albus*. The herbaceous layer is usually relatively sparse and is dominated by either forbs or graminoids. Common species include *Actaea rubra*, *Cicuta douglasii*, *Equisetum sylvaticum*, *Mentha arvensis*, and *Symphotrichum spathulatum* (= *Aster occidentalis*). This riparian

forest group occurs on alluvial terraces along major streams and rivers throughout the northwestern United States. It can occur on alluvial terraces of major streams and rivers, margins of lakes, meadows, deltas, river mouths, and terraces. Stands can occupy broad floodplains or form narrow stringers adjacent to streams with a much steeper slope. Soils typically overlay river gravel and/or cobbles and are coarse-textured. Water tables may drop below 1 m of the soil surface in summer, but can remain moist due to capillary action.

**Classification Comments:**

**Internal Comments:** MSR 11-14: this group needs review with Canadians regarding the sub-boreal and interior BC riparian; whether they belong in this MG/group or elsewhere.

**Other Comments:**

**Similar NVC Types:**

**Diagnostic Characteristics:** Stands dominated by *Populus balsamifera* ssp. *trichocarpa* or *Populus balsamifera* ssp. *balsamifera*.

**VEGETATION**

**Physiognomy and Structure:** This group is characterized by a tall (<25 m) broad-leaved deciduous tree. The canopy is moderately dense with 50-80% cover on average, but in some stands can total over 90%. The tall- and short-shrub layers vary between 10-50% cover. The forb layer is sparse with up to 20% cover. Ferns can dominate the herbaceous layer with up to 40% cover. Graminoids can be dominant in some stands (particularly recently disturbed ones), or can be sparse.

**Floristics:** This group is dominated by *Populus balsamifera* ssp. *trichocarpa* and/or *Populus balsamifera* ssp. *balsamifera*. Other trees present may include *Populus deltoides*, *Populus angustifolia*, *Pinus ponderosa*, and *Picea* spp. and can occur in the canopy with *Populus balsamifera* in Montana stands. The shrub layer is dominated by *Alnus incana*, *Betula papyrifera*, *Cornus sericea*, *Prunus virginiana*, and *Ribes americanum*. The forb layer can be dominated by *Actaea rubra*, *Mentha arvensis*, and *Symphytotrichum spathulatum* (= *Aster occidentalis*). The graminoid cover is usually less than 10%, but can be up to 80%, and mainly consists of introduced hay grasses. *Equisetum sylvaticum* can dominate the fern layer with up to 40% cover.

G796 Northern Rocky Mountain Lowland & Foothill Riparian Forest Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Acer macrophyllum</i> / <i>Holodiscus discolor</i> Woodland	GNR/SNR	CWWA000283
<i>Alnus rhombifolia</i> / <i>Betula occidentalis</i> Forest	G1/S1	CEGL000632
<i>Alnus rhombifolia</i> / <i>Celtis laevigata</i> var. <i>reticulata</i> Forest	G1?/S1?	CEGL000633
<i>Alnus rhombifolia</i> / <i>Cornus sericea</i> Forest	GNR/SNR	CWWA000296
<i>Alnus rhombifolia</i> / <i>Equisetum arvense</i> Forest	GNR/SNR	CWWA000297
<i>Alnus rhombifolia</i> / <i>Philadelphus lewisii</i> Forest	G1/S1	CEGL000634
<i>Celtis laevigata</i> var. <i>reticulata</i> / <i>Philadelphus lewisii</i> Woodland	G1/S1	CEGL000792
<i>Celtis laevigata</i> var. <i>reticulata</i> / <i>Toxicodendron rydbergii</i> Woodland	G2/SNR	CEGL003451
<i>Juniperus occidentalis</i> / <i>Philadelphus lewisii</i> - <i>Salix lasiolepis</i> Intermittently Flooded Woodland [Provisional]	GNR/SNR	CWWA000360
<i>Pinus ponderosa</i> - <i>Quercus garryana</i> / <i>Symphoricarpos albus</i> Woodland	GNR/SNR	CEGL000884
<i>Pinus ponderosa</i> / <i>Camassia quamash</i> Woodland	GNR/SNR	CWWA000382
<i>Pinus ponderosa</i> / <i>Crataegus douglasii</i> Woodland	G1/S1	CEGL000855
<i>Pinus ponderosa</i> / <i>Lomatium nudicaule</i> Woodland	GNR/SNR	CWWA000383
<i>Pinus ponderosa</i> / <i>Symphoricarpos albus</i> Temporarily Flooded Woodland	G2/S1	CEGL000866
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Alnus rhombifolia</i> Forest	G1/S1	CEGL000668
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Betula occidentalis</i> / <i>Philadelphus lewisii</i> Forest	GNR/SNR	CWWA000385
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Acer glabrum</i> Woodland	GNR/SNR	CWWA000020
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Alnus incana</i> - <i>Cornus sericea</i> Forest	GNR/SNR	CWWA000387
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Alnus incana</i> Forest	G3/S3	CEGL000667
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Cicuta douglasii</i> Forest	G1/S1	CEGL000671
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Cornus sericea</i> Forest	G3G4/S2?	CEGL000672

<b>G796 Northern Rocky Mountain Lowland &amp; Foothill Riparian Forest Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Populus balsamifera ssp. trichocarpa</i> / <i>Crataegus douglasii</i> Forest	G1/SH	CEGL000673
<i>Populus balsamifera ssp. trichocarpa</i> / <i>Equisetum hyemale</i> Forest	GNRQ/S1	CWWA000185
<i>Populus balsamifera ssp. trichocarpa</i> / <i>Juniperus scopulorum</i> Forest	GNR/SNR	CWWA000388
<i>Populus balsamifera ssp. trichocarpa</i> / <i>Philadelphus lewisii</i> Forest	GNR/SNR	CWWA000389
<i>Populus balsamifera ssp. trichocarpa</i> / <i>Salix exigua</i> Forest	G1/S1	CEGL000676
<i>Populus balsamifera ssp. trichocarpa</i> / <i>Salix lucida ssp. caudata</i> Woodland	GNR/SNR	CEGL003431
<i>Populus balsamifera</i> (ssp. <i>trichocarpa</i> , ssp. <i>balsamifera</i> ) / <i>Symphoricarpos</i> ( <i>albus</i> , <i>oreophilus</i> , <i>occidentalis</i> ) Forest	G2/S1S2	CEGL000677
<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> Temporarily Flooded Woodland	G2?/S1S2	CWWA000021
<i>Pseudotsuga menziesii</i> / <i>Trautvetteria caroliniensis</i> Woodland	GNR/SNR	CWWA000391
<i>Quercus garryana</i> / <i>Corylus cornuta</i> - <i>Symphoricarpos albus</i> Woodland	GNR/SNR	CWWA000392
<i>Quercus garryana</i> / <i>Elymus glaucus</i> Woodland	G1S2/S1	CEGL000550
<i>Quercus garryana</i> / <i>Symphoricarpos albus</i> Woodland	G2G3/S2S3	CEGL000553
<i>Salix amygdaloides</i> / <i>Salix exigua</i> Woodland	G1Q/S1	CEGL000948

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This group occurs on alluvial terraces along major streams and rivers. It can occur on alluvial terraces of major streams and rivers, margins of lakes, meadows, deltas, river mouths, and terraces. Stands can occupy broad floodplains (1-3% slopes) or form narrow stringers adjacent to streams with a much steeper slope (10-15%). Soils are typically Entisols, usually up to 1 m of mineral soil overlying river gravel and/or cobbles. Soil texture varies from loam to coarse sand. Water tables usually drop below 1 m of the soil surface in summer, but can remain moist due to capillary action. A fluctuating water table in these soils is evidenced by the common presence of mottles.

**Dynamics:** *Populus* species are dependent on flooding for successful sexual reproduction.

### DISTRIBUTION

**Geographic Range:** This group is found throughout the northern Interior West from the foothills of the Sierra Nevada to Montana, and from southern British Columbia to Nevada, Utah and western Wyoming.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Unassigned.

### SYNONYMY

### LOWER LEVEL UNITS

**Alliances:**

- A0311 *Populus balsamifera ssp. trichocarpa* Northern Rocky Mountain Riparian Forest & Woodland Alliance

### AUTHORSHIP

**Primary Concept Source:** D. Culver

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2015/05/11

### REFERENCES

**References:** Faber-Langendoen et al. 2015

## 1.B.3.Nd. Interior Lowland West Flooded & Swamp Forest

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1. Forest & Woodland

1.B.3.Nd. Interior Lowland West Flooded & Swamp Forest

### M298. Interior West Ruderal Flooded & Swamp Forest

Type Concept Sentence:

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#### OVERVIEW

**Scientific Name:** Interior West Ruderal Flooded & Swamp Forest Macrogroup

**Common Name (Translated Scientific Name):** Interior West Ruderal Flooded & Swamp Forest Macrogroup

**Type Concept:**

**Classification Comments:**

**Similar NVC Types:**

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**Diagnostic Characteristics:**

#### VEGETATION

**Physiognomy and Structure:**

**Floristics:**

#### ENVIRONMENT & DYNAMICS

**Environmental Description:**

**Dynamics:**

#### DISTRIBUTION

**Geographic Range:**

**Spatial Scale & Pattern [optional]:**

**Nations:**

**States/Provinces:**

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:**

#### SYNONYMY

#### LOWER LEVEL UNITS

**Groups:**

- G510 Interior West Ruderal Riparian Forest & Scrub

#### AUTHORSHIP

**Primary Concept Source:**

**Author of Description:**

**Acknowledgments:**

**Version Date:**

**Classif Resp Region:**

**Internal Author:**

#### REFERENCES

**References:**



1. Forest & Woodland  
 1.B.3.Nd. Interior Lowland West Flooded & Swamp Forest  
 M298. Interior West Ruderal Flooded & Swamp Forest

## G510. Interior West Ruderal Riparian Forest & Scrub

### Type Concept Sentence:

#### OVERVIEW

**Scientific Name:** Interior West Ruderal Riparian Forest & Scrub

**Common Name (Translated Scientific Name):** Interior West Ruderal Riparian Forest & Scrub

**Type Concept:**

**Classification Comments:**

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

**Diagnostic Characteristics:**

#### VEGETATION

**Physiognomy and Structure:**

**Floristics:**

G510 Interior West Ruderal Riparian Forest & Scrub	Global/ State Rank	NatureServe/ WANHP Code
<i>Acer negundo</i> Ruderal Woodland	GNR/SNR	CWWA000284
<i>Elaeagnus angustifolia</i> Ruderal Woodland	GNR/SNR	CEGL005269
<i>Salix alba</i> Ruderal Riparian Forest	GNR/SNR	CWWA000396
<i>Tamarix spp.</i> Temporarily Flooded Ruderal Shrubland	GNR/SNR	CEGL003114

## 1.B.3.Ng. Vancouverian Flooded & Swamp Forest

1. Forest & Woodland  
 1.B.3.Ng. Vancouverian Flooded & Swamp Forest

## M035. Vancouverian Flooded & Swamp Forest

**Type Concept Sentence:** This macrogroup covers forested wetlands of coastal lowlands and mountains from Oregon north into southern Alaska. It includes cottonwood and conifer dominated riparian forests, conifer swamps, and treed peatlands (fens and bogs). Dominant species in lowland riparian areas include *Abies grandis*, *Acer macrophyllum*, *Alnus rubra*, *Fraxinus latifolia*, *Picea sitchensis*, *Populus balsamifera ssp. trichocarpa*, *Salix lucida ssp. lasiandra*, and/or *Thuja plicata*; in montane riparian areas include *Abies amabilis*, *Abies concolor*, *Abies magnifica*, *Pinus contorta var. murrayana*, *Populus tremuloides*, and/or *Tsuga mertensiana*; and in bogs at a variety of elevations include *Chamaecyparis nootkatensis*, *Picea sitchensis*, *Pinus contorta var. contorta*, *Tsuga heterophylla*, and *Tsuga mertensiana* are some of the common characteristic tree species.

#### OVERVIEW

**Scientific Name:** Vancouverian Flooded & Swamp Forest Macrogroup

**Common Name (Translated Scientific Name):** Vancouverian Flooded & Swamp Forest Macrogroup

**Type Concept:** This macrogroup consists of woodlands and forests of wetland and riparian areas. It includes lowland and montane riparian forests, forested mineral-soil swamps, and treed fens and bogs. In lowland riparian forests, broadleaf dominant species are *Acer macrophyllum*, *Alnus rubra*, *Populus balsamifera ssp. trichocarpa*, *Salix lucida ssp. lasiandra*, and/or *Fraxinus latifolia* (in southern part of range), and conifer-dominated types have *Abies grandis*, *Picea sitchensis*, or *Thuja plicata*. Montane riparian areas are more often conifer-dominated by such species as *Abies amabilis*, *Abies concolor*, *Abies magnifica*, *Pinus contorta var. murrayana*,

*Populus tremuloides*, and/or *Tsuga mertensiana*. Shrubs include *Alnus viridis* ssp. *sinuata* (= *Alnus sinuata*), *Oplopanax horridus*, *Salix* spp., *Spiraea douglasii*, and *Vaccinium uliginosum*. Treed swamps are more common in southeastern Alaska, less so farther south. Swamps are small in size and indicative of poorly drained, mostly mineral soil areas often in a mosaic of moving and stagnant water and are dominated by any one or a number of conifer (*Chamaecyparis nootkatensis*, *Picea sitchensis*, *Pinus contorta*, *Tsuga heterophylla*, *Tsuga mertensiana*) and hardwood species (*Alnus rubra*, *Betula papyrifera*, *Fraxinus latifolia*) that are capable of growing on saturated or seasonally flooded soils. Treed peatlands (fens and bogs) are common in southeastern Alaska and central British Columbia, less so farther south, and occur on poorly drained peat soils with little to no influence of groundwater. These can be dominated by any one of a number of conifer species (*Chamaecyparis nootkatensis*, *Picea sitchensis*, *Pinus contorta* var. *contorta*, *Tsuga heterophylla*, *Tsuga mertensiana*) that are capable of growing on saturated or seasonally flooded soils. Overstory is often less than 50% cover, but shrub understory can have high cover. Common shrubs include *Elliottia pyroliflorus*, *Gaultheria shallon* (southern portion of the Alaska distribution only), *Ledum groenlandicum* (= *Rhododendron groenlandicum*), and *Vaccinium ovalifolium*.

#### Classification Comments:

#### Similar NVC Types:

- M034 Rocky Mountain & Great Basin Montane Riparian Forest

**Diagnostic Characteristics:** Dominance by *Alnus rubra*, *Chamaecyparis nootkatensis*, *Fraxinus latifolia*, *Picea sitchensis*, *Pinus contorta* var. *contorta*, *Populus balsamifera* ssp. *trichocarpa*, *Salix lucida* ssp. *lasianдра*, *Tsuga heterophylla*, *Thuja plicata*, or *Tsuga mertensiana*, and herbaceous indicators of the saturated or floodplain soil conditions such as *Carex deweyana*, *Lysichiton americanus*, *Rubus spectabilis*, *Trichophorum caespitosum*, and/or *Sphagnum* species.

### VEGETATION

**Physiognomy and Structure:** Closed- to open-canopy forests of tall or stunted (but at least 5 m in height) cold-deciduous trees, evergreen trees, or a mix of deciduous and evergreen trees, often with deciduous or evergreen shrub undergrowth and/or an herbaceous undergrowth layer.

**Floristics:** Riparian trees occurring throughout most of the range are *Alnus rubra*, *Picea sitchensis*, *Populus balsamifera* ssp. *trichocarpa*, *Thuja plicata*, and *Tsuga heterophylla*. Additional trees in southern areas include *Acer macrophyllum*, *Salix lucida* ssp. *lasianдра*, *Fraxinus latifolia*, and *Abies grandis*. *Populus balsamifera* is much less common on the islands of southeastern Alaska and off British Columbia due to a lack of larger floodplains. Dominant species of higher montane riparian areas include *Abies amabilis*, *Abies concolor*, *Abies magnifica*, *Picea engelmannii*, *Pinus contorta* var. *murrayana*, *Tsuga mertensiana*, and, more rarely, *Populus tremuloides*. Key understory diagnostics include *Cornus sericea*, *Maianthemum dilatatum*, *Oplopanax horridus*, and *Rubus spectabilis*. Swamp tree species may include *Alnus rubra*, *Betula papyrifera*, *Chamaecyparis nootkatensis*, *Fraxinus latifolia*, *Picea sitchensis*, *Pinus contorta* var. *contorta*, *Thuja plicata*, *Tsuga heterophylla*, and/or *Tsuga mertensiana*. Shrub species include *Cornus sericea*, *Elliottia pyroliflorus*, *Gaultheria shallon* (southern portion of the Alaska distribution only), *Ledum groenlandicum* (= *Rhododendron groenlandicum*), *Oplopanax horridus*, *Rubus spectabilis*, *Spiraea douglasii*, *Vaccinium ovalifolium*, and/or *Vaccinium uliginosum*. Tree species dominant on peatlands (fens and bogs) are mostly *Pinus contorta* var. *contorta* or *Chamaecyparis nootkatensis* but can include some *Tsuga heterophylla*, *Tsuga mertensiana*, or *Thuja plicata*. *Ledum groenlandicum* is generally the dominant shrub understory species; other shrubs include *Vaccinium uliginosum*, *Juniperus communis*, *Myrica gale*, or *Gaultheria shallon*. Low-shrub species include *Empetrum nigrum*, *Kalmia microphylla*, and *Rubus chamaemorus*. Herbaceous species include sedges such as *Eriophorum angustifolium*, *Trichophorum caespitosum*, *Carex livida*, or herbs such as *Sanguisorba officinalis*, *Triantha glutinosa*, or *Drosera rotundifolia*. Dominant bryophytes include *Sphagnum* spp. and *Racomitrium lanuginosum*.

### ENVIRONMENT & DYNAMICS

**Environmental Description:** All of the communities within this macrogroup occur within a cool temperate climate and are wetlands or riparian areas with permanently saturated soils or seasonal water table fluctuations. They occur at low and high elevations throughout the coastal regions of the Pacific Northwest, ranging from sea level to as high as 3300 m (10,000 feet). Soils range from thin, to poorly developed and coarse to deep peat. Riparian settings may have frequent flooding, shifting channels, and significant sediment deposition. Swamps and bogs are mostly small-patch size, but can be extensive in size as well, occurring in glacial depressions or river valleys and are poorly-drained with slow-moving groundwater, and on deep organic or gleysolic soils. This environmental information was compiled from several sources: for Alaska (DeMeo et al. 1992, Viereck et al. 1992, Martin et al. 1995, Shephard 1995, DeVelice et al. 1999, Boggs 2002, Boggs et al. 2008b), for Washington (Chappell 1999, Chappell et al. 2001), for Oregon and Washington (Franklin and Dyrness 1973), and for British Columbia (Banner et al. 1993, Green and Klinka 1994, MacKenzie and Moran 2004).

**Dynamics:** This macrogroup includes highly disturbed broad shifting alluvial glacial run-off river beds and banks, snowmelt or rainfall driven hydrology rivers that have seasonal rise in soil water tables and overbank flooding to very stable wetlands with groundwater or precipitation that causes no change to surface soils. All sites depend on high moisture content of soils during the growing season. Succession can be large scale post-flood regeneration of many tree seedlings or small single tree-fall microsite gap dynamics.

#### DISTRIBUTION

**Geographic Range:** This macrogroup occurs at low and high elevations throughout the coastal regions of the Pacific Northwest from southern Oregon north through British Columbia, Vancouver Island and Haida Gwaii to along the coast of the Gulf of Alaska, including central and southeastern Alaska.

**Spatial Scale & Pattern [optional]:**

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 242A:CC, 242B:CC, 342I:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CP, M261G:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

#### LOWER LEVEL UNITS

**Groups:**

- G254 North Pacific Lowland Riparian Forest & Woodland
- G507 North Pacific Montane Riparian Woodland
- G256 North Pacific Maritime Hardwood - Conifer Swamp
- G610 North Pacific Maritime Poor Fen & Bog Forest & Woodland

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel and D. Meidinger

**Acknowledgments:** With contributions from T. Boucher, C. Chappell, M.S. Reid, and D. Faber-Langendoen.

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 10-14

#### REFERENCES

**References:** Banner et al. 1993, Banner et al. 2004, Banner et al. 2005, Boggs 2000, Boggs 2002, Boggs et al. 2008b, Brockway and Topik 1984, Chappell 1999, Chappell and Christy 2004, Chappell et al. 2001, Christy 2004, Cowardin et al. 1979, Crowe et al. 2004, DeMeo et al. 1992, DeVelice et al. 1999, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Franklin et al. 1988, Green and Klinka 1994, Hemstrom et al. 1982, Henderson et al. 1989, Henderson et al. 1992, Hennon et al. 2008, Kovalchik and Clausnitzer 2004, Kunze 1994, MacKenzie and Moran 2004, Martin et al. 1995, McCain and Diaz 2002b, National Wetlands Working Group 1988, Shaw and Fredine 1971, Shephard 1995, Viereck et al. 1992, Warner and Rubec 1997

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1. Forest & Woodland

1.B.3.Ng. Vancouverian Flooded & Swamp Forest

M035. Vancouverian Flooded & Swamp Forest

### G254. North Pacific Lowland Riparian Forest & Woodland

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Picea sitchensis* - *Populus balsamifera* ssp. *trichocarpa* - *Alnus rubra* Lowland Riparian Forest & Woodland Group

**Common Name (Translated Scientific Name):** Sitka Spruce - Black Cottonwood - Red Alder Lowland Riparian Forest & Woodland Group

**Type Concept:** This lowland riparian forest and woodland group occurs throughout the Pacific Northwest, from southern Oregon to the gulf coast of Alaska. It consists of the forest and woodland vegetation found on low-elevation, alluvial floodplains that are confined by valleys and inlets and are more abundant in the central and southern portions of the Pacific Northwest Coast. These forests are linear in character, occurring on floodplains or lower terraces of rivers and streams. Major broadleaf dominant species

are *Acer macrophyllum*, *Alnus rubra*, *Populus balsamifera* ssp. *trichocarpa*, *Salix lucida* ssp. *lasiandra*, and *Fraxinus latifolia* (in southern part of range). Conifers tend to increase with succession in the absence of major disturbance. Conifer-dominated types include floodplain or riparian forests dominated by *Abies grandis*, *Picea sitchensis*, and *Thuja plicata*. Riverine flooding and the succession that occurs after major flooding events are the major natural processes that support this group. Along the Gulf of Alaska, glacial-fed rivers (uncommon on the islands) have frequent flooding, shifting channels, and significant sediment deposition, and *Picea sitchensis* is the dominant tree. Glacial outwash occurs near the terminus of glaciers, resulting in active proximal outwash with high flood frequency and high sediment input such that the channels are scoured and braided, and the substrate is well-drained to excessively well-drained gravel or cobble. Along these rivers the riparian forests are patchy and prone to disturbance. Low benches dominated by shrub seedlings and herbaceous species belong to another NVC group. Mid benches have early-seral forests, and high benches have more mature forests with a more diverse shrub understory. *Populus balsamifera* is much less common on the islands of southeastern Alaska and is more commonly found on larger rivers with glacial input. Freshwater tidally-influenced rivers, with daily tidal flooding of freshwater and associated soil saturation also support riparian forests along rivers where they may otherwise not occur, or support a more saturated type of forest association than may otherwise occur without the daily tidal input of freshwater. Regardless of physical setting, the range of species composition is similar among all these variations.

**Classification Comments:** While the dominant woody species composition is similar across the range of this group, additional information about the herbaceous species component is needed. Further review of species lists is needed to ensure riparian/floodplain species are emphasized; some species such as *Spiraea douglasii* and *Carex obnupta* may be more common in swamps.

**Internal Comments:** MSR 11-14: some additional POPBALT from California and Northern Rockies will get moved here possibly. mjr 10-12: CA added based on member association distribution.

**Other Comments:**

#### Similar NVC Types:

- G610 North Pacific Maritime Poor Fen & Bog Forest & Woodland: includes forests that have saturated to very poorly drained soils, occur in swales and depressions, and tend to be small patch in size.
- G256 North Pacific Maritime Hardwood - Conifer Swamp
- G507 North Pacific Montane Riparian Woodland: includes forests higher in elevation that are dominated by *Tsuga mertensiana*, *Abies amabilis*, *Pinus contorta* var. *murrayana*, *Abies concolor*, *Abies magnifica*, and *Populus tremuloides*.
- G322 Vancouverian Wet Shrubland: has shrub-dominated communities of low bench floodplains.

**Diagnostic Characteristics:** Major dominant tree species occurring throughout most of the range are *Picea sitchensis*, *Thuja plicata*, *Tsuga heterophylla*, *Alnus rubra*, and *Populus balsamifera* ssp. *trichocarpa*. Additional trees in southern areas include *Acer macrophyllum*, *Salix lucida* ssp. *lasiandra*, *Fraxinus latifolia*, and *Abies grandis*. Key understory diagnostics include *Cornus sericea*, *Rubus spectabilis*, *Oplopanax horridus*, and *Maianthemum dilatatum*. Stands are found next to streams and rivers and depend on flooding or seasonal high water tables.

### VEGETATION

**Physiognomy and Structure:** Closed- to open-canopy forests of tall cold-deciduous trees, evergreen trees, or a mix of deciduous and evergreen trees, often with deciduous shrub undergrowth and/or an herbaceous undergrowth layer. The trees can be phreatophytic, whose taproots remain in contact with the water table year-round; other stands have only shallow-rooted trees. Stands often form somewhat parallel to streams and rivers on narrow to broad floodplains.

**Floristics:** Trees occurring throughout most of the range are *Picea sitchensis*, *Thuja plicata*, *Tsuga heterophylla*, *Alnus rubra*, and *Populus balsamifera* ssp. *trichocarpa*. Additional trees in southern areas include *Acer macrophyllum*, *Salix lucida* ssp. *lasiandra*, *Fraxinus latifolia*, and *Abies grandis*. Conifer-dominated types are less common in the south and are not well-described. *Populus balsamifera* is much less common on the islands of southeastern Alaska and smaller islands off British Columbia due to a lack of larger floodplains. In southeastern Alaska, it is more commonly found on larger rivers with glacial input, whereas *Picea sitchensis* is a common dominant on non-glacially-fed rivers. Key understory diagnostics include *Cornus sericea*, *Rubus spectabilis*, *Oplopanax horridus*, and *Maianthemum dilatatum*. Several species may be present that are indicative of more swamp-like conditions such as *Spiraea douglasii* and *Carex obnupta* but can be present in floodplain settings, especially in the southern end of the range. Understory shrubs may include *Acer circinatum*, *Alnus rhombifolia*, *Alnus viridis* ssp. *sinuata*, *Corylus cornuta*, *Morella californica*, *Menziesia ferruginea*, *Physocarpus capitatus*, *Rubus ursinus*, *Salix fluviatilis*, *Salix hookeriana*, *Ribes bracteosum*, *Lonicera involucrata*, *Sambucus racemosa*, *Salix sitchensis*, *Symphoricarpos albus*, *Viburnum edule*, *Vaccinium parvifolium*, *Vaccinium alaskaense*, and *Vaccinium ovalifolium*. Herbaceous species include *Carex leptopoda*, *Claytonia sibirica*, *Elymus glaucus*, *Equisetum hyemale*, *Equisetum arvense*, *Circaea alpina*, *Athyrium filix-femina*, *Blechnum spicant*, *Dryopteris expansa*, *Gymnocarpium dryopteris*, *Polystichum munitum*, *Tiarella trifoliata*, *Trisetum canescens* (= *Trisetum cernuum*), *Trautvetteria carolinensis*, *Impatiens capensis*, *Juncus patens*, *Oenanthe sarmentosa*, *Orthilia secunda*, *Oxalis oregana*, *Oxalis trilliifolia*, *Petasites frigidus*, *Stachys chamissonis* var.

*cooleyae*, *Streptopus lanceolatus* var. *roseus* (= *Streptopus roseus*), *Streptopus amplexifolius*, *Tolmiea menziesii*, *Achlys triphylla*, and *Urtica dioica* ssp. *gracilis*. The bryophyte layer (in British Columbia) includes *Mnium* spp., *Rhizomnium glabrescens*, *Plagiomnium insigne*, *Leucolepis acanthoneuron* (= *Leucolepis menziesii*), *Hylocomium splendens*, *Eurhynchium praelongum* (= *Kindbergia praelonga*), *Eurhynchium oregonum* (= *Kindbergia oregana*), and *Rhytidiadelphus loreus*. Floristic information was compiled from several sources: Viereck et al. (1992) and Boggs (2000, 2002) from Alaska; Franklin and Dyrness (1973), Kunze (1994), Chappell and Christy (2004), and Christy 2004 from western Oregon and Washington; and Banner et al. (1993), Green and Klinka (1994), and Mackenzie and Moran (2004) from British Columbia.

<b>G254 North Pacific Lowland Riparian Forest &amp; Woodland Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Acer macrophyllum</i> / <i>Oxalis oregana</i> Forest	G3G4/S2S3	CWWA000205
<i>Acer macrophyllum</i> / <i>Polystichum munitum</i> - <i>Tolmiea menziesii</i> Forest	G3G4/S3S4	CWWA000206
<i>Acer macrophyllum</i> / <i>Rubus spectabilis</i> Forest	G4/S3S4	CEGL000561
<i>Acer macrophyllum</i> / <i>Rubus ursinus</i> Forest	G3/SNA	CEGL003395
<i>Acer macrophyllum</i> / <i>Symphoricarpos albus</i> / <i>Urtica dioica</i> ssp. <i>gracilis</i> Forest	G3/SU	CEGL003396
<i>Acer macrophyllum</i> / <i>Urtica dioica</i> ssp. <i>gracilis</i> Forest	G3/SU	CEGL003397
<i>Alnus rubra</i> / <i>Acer circinatum</i> / <i>Claytonia sibirica</i> Forest	G4G5/S4	CEGL003298
<i>Alnus rubra</i> / <i>Acer circinatum</i> Forest	GNR/SNR	CWWA000298
<i>Alnus rubra</i> / <i>Achlys triphylla</i> Forest	GNR/SNR	CWWA000299
<i>Alnus rubra</i> / <i>Alnus viridis</i> ssp. <i>sinuata</i> Forest	GNR/SNR	CWWA000301
<i>Alnus rubra</i> / <i>Elymus glaucus</i> Forest	G4/S3S4	CEGL003398
<i>Alnus rubra</i> / <i>Oplopanax horridus</i> - <i>Rubus spectabilis</i> Forest	G4G5/S4	CEGL003399
<i>Alnus rubra</i> / <i>Oplopanax horridus</i> / <i>Athyrium filix-femina</i> Forest	GNR/SNR	CWWA000303
<i>Alnus rubra</i> / <i>Oxalis</i> ( <i>oregana</i> , <i>trilliifolia</i> ) Forest	G4/S3S4	CEGL003400
<i>Alnus rubra</i> / <i>Rubus parviflorus</i> Forest	G4/S4	CEGL003402
<i>Alnus rubra</i> / <i>Rubus spectabilis</i> Forest	G4G5/S4S5	CEGL000639
<i>Alnus rubra</i> / <i>Rubus spectabilis</i> / <i>Carex obnupta</i> - <i>Lysichiton americanus</i> Woodland	G3G4/S3S4	CEGL003389
<i>Alnus rubra</i> / <i>Stachys chamissonis</i> var. <i>cooleyae</i> - <i>Tolmiea menziesii</i> Forest	G4/S3S4	CEGL003403
<i>Fraxinus latifolia</i> - ( <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> ) / <i>Cornus sericea</i> Forest	G4/S2	CEGL003390
<i>Fraxinus latifolia</i> - <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Acer circinatum</i> Forest	G3/S1Q	CEGL003404
<i>Fraxinus latifolia</i> - <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Carex deweyana</i> - <i>Urtica dioica</i> ssp. <i>gracilis</i> Forest	G1/S1	CEGL003365
<i>Fraxinus latifolia</i> - <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Corylus cornuta</i> - <i>Physocarpus capitatus</i> Forest	G3/S1?	CEGL003364
<i>Fraxinus latifolia</i> - <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Rubus spectabilis</i> Forest	G2/S1	CEGL003405
<i>Fraxinus latifolia</i> - <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Symphoricarpos albus</i> Forest	G4/S2?	CEGL000641
<i>Fraxinus latifolia</i> / <i>Symphoricarpos albus</i> Forest	G4/S2?	CEGL003393
<i>Picea sitchensis</i> / <i>Scirpus microcarpus</i> Woodland		CWWA000434
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Acer macrophyllum</i> / <i>Equisetum hyemale</i> Forest	G3/S2?	CEGL003406
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Acer macrophyllum</i> / <i>Symphoricarpos albus</i> Forest	G3/S2S3	CEGL003363
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Alnus rubra</i> / <i>Carex obnupta</i> Forest	G2/S2	CEGL003361
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Alnus rubra</i> / <i>Rubus spectabilis</i> Forest	G2G3/S2?	CEGL003407
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Alnus rubra</i> / <i>Symphoricarpos albus</i> Forest	G3/S2?	CEGL003362
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Picea sitchensis</i> - ( <i>Acer macrophyllum</i> ) / <i>Oxalis oregana</i> Forest	G2G3/S2	CEGL003418

G254 North Pacific Lowland Riparian Forest & Woodland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Cornus sericea</i> / <i>Carex obnupta</i> Forest	GNR/SNR	CEGL002844
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Cornus sericea</i> / <i>Impatiens capensis</i> Forest	G1/S1	CEGL003408
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Oplopanax horridus</i> Woodland	G3/SNR	CEGL003284
<i>Quercus garryana</i> - ( <i>Fraxinus latifolia</i> ) / <i>Symphoricarpos albus</i> Forest	G2/S2	CEGL003299
<i>Salix lucida</i> ssp. <i>lasiandra</i> / <i>Salix fluviatilis</i> Woodland	G3Q/S2	CEGL000949
<i>Salix lucida</i> ssp. <i>lasiandra</i> / <i>Urtica dioica</i> ssp. <i>gracilis</i> Forest	G2/S1S2	CEGL003409

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Cool temperate. *Soil/substrate/hydrology:* This group consists of the forest and woodland vegetation found on low-elevation, alluvial floodplains that are confined by valleys and inlets and are more abundant in the central and southern portions of the Pacific Northwest Coast. Stands are found next to streams and rivers and depend on flooding or seasonal high water tables. These forests are usually long, thin bands found parallel to current or past direction of river flow, occurring on floodplains or lower terraces of rivers and streams. High bench systems experience seasonal water table fluctuations, with infrequent flood events; medium bench systems are subject to annual flooding, often with prolonged high water tables, limiting conifer development. Soils are often thin, poorly developed and coarse; silty or clay layers may be found within the soil profile. Parent material is usually Quaternary Alluvium. Along the Gulf of Alaska and coast of British Columbia, glacial-fed rivers (uncommon on the islands) have frequent flooding, shifting channels, and significant sediment deposition. Glacial outwash occurs near the terminus of glaciers, resulting in active proximal outwash with high flood frequency and high sediment input such that the channels are scoured and braided, and the substrate is well-drained to excessively well-drained gravel or cobbly. Along these rivers the riparian forests are patchy and prone to disturbance. Low benches dominated by shrub seedlings and herbaceous species belong to another NVC group. Mid benches have early-seral forests, and high benches have more mature forests (typically conifer-dominated) with a more diverse shrub understory. Non-glacially-fed floodplains occurring along the Gulf of Alaska are common on the Alexander Archipelago but also occur on the mainland of southeastern Alaska. *Picea sitchensis* is the dominant conifer. These floodplains tend to be smaller than the glacially-fed systems. Environmental information was compiled from several sources: Viereck et al. (1992) and Boggs (2000, 2002) from Alaska; Franklin and Dyrness (1973), Kunze (1994), Chappell and Christy (2004), and Christy 2004 from western Oregon and Washington; and Banner et al. (1993), Green and Klinka (1994), and Mackenzie and Moran (2004) from British Columbia.

**Dynamics:** This group is supported by glacial, snowmelt and/or rainfall hydrology, causing seasonal rise in soil water tables and is adapted to overbank flooding.

### DISTRIBUTION

**Geographic Range:** This group occurs at lower elevations throughout the coastal regions of the Pacific Northwest from southern Oregon north through British Columbia, Vancouver Island and Haida Gwaii to along the coast of the Gulf of Alaska, including central and southeastern Alaska.

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 69:C, 70:C

**USFS Ecoregions (2007):** 242A:CC, 242B:CC, 342I:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CP

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

### SYNONYMY

- >< Black Cottonwood - Willow: 222 (Eyre 1980)
- < Flood Associations (MacKenzie and Moran 2004)
- >< I.A.1.a - Sitka spruce (closed) (Viereck et al. 1992)
- >< I.A.2.a - Sitka spruce (open) (Viereck et al. 1992)
- > I.B.1.a - Red alder (Viereck et al. 1992)
- >< I.B.1.b - Black cottonwood (Viereck et al. 1992)
- >< I.B.2.c - Balsam poplar (black cottonwood) (Viereck et al. 1992)
- >< Red Alder: 221 (Eyre 1980)

## LOWER LEVEL UNITS

### Alliances:

- A3745 *Acer macrophyllum* - *Alnus rubra* Riparian Forest Alliance
- A3744 *Populus balsamifera* ssp. *trichocarpa* - *Picea sitchensis* - *Tsuga heterophylla* Riparian Forest Alliance
- A3743 *Fraxinus latifolia* - *Populus balsamifera* ssp. *trichocarpa* - *Alnus* spp. Deciduous Riparian Forest Alliance
- A3748 *Salix lucida* - *Salix hookeriana* Riparian Woodland/Thicket Alliance
- A3746 *Picea sitchensis* - *Tsuga heterophylla* - *Alnus rubra* Riparian Forest Alliance
- A3747 *Picea sitchensis* Coniferous Riparian Forest Alliance
- A3777 *Alnus rhombifolia* Riparian Forest Alliance

### AUTHORSHIP

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel, T. Boucher, C. Chappell, M.S. Reid, D. Meidinger

**Acknowledgments:** contributing author J. Christy

**Version Date:** 2013/09/06

### REFERENCES

**References:** Banner et al. 1993, Boggs 2000, Boggs 2002, Chappell and Christy 2004, Christy 2004, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Green and Klinka 1994, Kunze 1994, MacKenzie and Moran 2004, Viereck et al. 1992

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#### 1. Forest & Woodland

1.B.3.Ng. Vancouverian Flooded & Swamp Forest

M035. Vancouverian Flooded & Swamp Forest

## G507. North Pacific Montane Riparian Woodland

### Type Concept Sentence:

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### OVERVIEW

**Scientific Name:** *Tsuga mertensiana* - *Abies* spp. / *Salix* spp. Montane Riparian Woodland Group

**Common Name (Translated Scientific Name):** Mountain Hemlock - Fir species / Willow species Montane Riparian Woodland Group

**Type Concept:** This riparian woodland group occurs throughout mountainous areas of the Pacific Northwest coast from Oregon to northern British Columbia, and east into Idaho along the tributaries of the Columbia River. It occurs on steep streams and narrow floodplains above foothills but below the alpine environments, e.g., above 1500 m (4550 feet) elevation in the Klamath Mountains and western Cascades of Oregon, up as high as 3300 m (10,000 feet) in the southern Cascades, and above 610 m (2000 feet) in northern Washington. This group occurs for the most part on the west side of the Cascade crest, but also occurs around the Columbia Basin along the tributaries of the Columbia River. Surrounding habitats include subalpine parklands and montane forests. Dominant species include *Abies amabilis*, *Abies concolor*, *Abies magnifica*, *Pinus contorta* var. *murrayana*, *Populus tremuloides*, and *Tsuga mertensiana*. In the Columbia Basin, *Alnus rhombifolia* is the dominant tree, sometimes with *Alnus rubra* or *Populus balsamifera* ssp. *trichocarpa*. Shrubs include *Alnus viridis* ssp. *sinuata* (= *Alnus sinuata*), *Betula occidentalis*, *Crataegus douglasii*, *Frangula purshiana*, *Oplopanax horridus*, *Philadelphus lewisii*, *Salix* spp., *Spiraea douglasii*, and *Vaccinium uliginosum*. Herbaceous wetland indicator species include *Achlys triphylla*, *Athyrium filix-femina*, *Carex angustata*, *Carex disperma*, *Clintonia uniflora*, *Gymnocarpium dryopteris*, and others. These woodlands are dependent on seasonally high water tables and frequent (once every 3-5 years) flooding to provide channel scour and deposition for germination and maintenance. They occur on streambanks and overflow channels, seeps and edges of waterbodies. They are distinguished from the surrounding forest by riparian/ wetland indicators, when dominated by deciduous tree species, are visually a sharp contrast to immediate upland conifer forests.

**Classification Comments:** The concept for this group is new as it divides upper elevation from lower elevation riparian forests. Higher elevation riparian plant associations are well documented by several authors (McCain and Diaz 2002b, Crowe et al. 2004, Kovalchik and Clausnitzer 2004, and others). However, probably due to the lack of areal extent and the difficulty in mapping them, these montane riparian habitats have not been described as a group per se. Flood ecosystems are "infrequent at higher elevations where there are fewer topographic positions for floodplain development" (MacKenzie and Moran 2004). This group includes these streamside communities that may not have "floodplains" per se. Individual plant associations and sub-associations or site series have detailed floristics of units that are included in this group. More clarification is needed on the amount of woodland-dominated riparian areas at high altitudes in the Coast and Cascade ranges, for example the *Alnus viridis* ssp. *sinuata* (= *Alnus sinuata*) types described from Prince Rupert Forest by Banner et al. (1993). There are other associations to consider including in this group that are labeled "herbaceous" but contain stands with up to 90% tree cover [see Christy (2004), p. 100].

**Internal Comments:** DFL 5-11: AK? added.

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

- G506 Rocky Mountain & Great Basin Montane Riparian Forest: also occurs at high elevations, but only in the colder interior mountains, and has Rocky Mountain, not Pacific Northwest Coastal, species.
- G254 North Pacific Lowland Riparian Forest & Woodland: occurs at lower elevations, is dominated by lower elevation conifer and deciduous tree species, and is not tolerant of snow.
- G256 North Pacific Maritime Hardwood - Conifer Swamp
- G610 North Pacific Maritime Poor Fen & Bog Forest & Woodland
- G527 Western Montane-Subalpine Riparian & Seep Shrubland: currently houses the Pacific Northwest *Salix commutata* and *Salix farriar* low-statured montane shrublands that may be adjacent to forested riparian types in G507.

**Diagnostic Characteristics:** Forests that occur along streambanks or narrow alluvial areas that are actively influenced by stream waters above 1500 m in elevation in Oregon and the southern Cascades, above 610 m in northern Washington and British Columbia, in the coastal mountains throughout the Pacific Northwest and are dominated by *Tsuga mertensiana*, *Abies amabilis*, *Pinus contorta* var. *murrayana*, *Abies concolor*, and *Abies magnifica*.

**VEGETATION**

**Physiognomy and Structure:** Open to closed-canopy tall woodlands, often linear, following river courses and floodplains, dominated mostly by coniferous trees, but can be dominated by cold-deciduous trees or a mix of or conifer and deciduous trees.

**Floristics:** Dominant species include *Tsuga mertensiana*, *Abies amabilis*, *Pinus contorta* var. *murrayana*, *Picea engelmannii*, *Abies concolor*, *Abies magnifica*, and, more rarely, *Populus tremuloides*. These woodlands are dependent on seasonally high water tables and frequent (once every 3-5 years) flooding to provide channel scour and deposition for germination and maintenance. These woodlands occur on streambanks and overflow channels. They are distinguished from the surrounding uplands by riparian/wetland indicator species. When dominated by deciduous tree species, it can form a visually sharp contrast to immediate upland conifer forests. Common understory shrubs include *Oplopanax horridus*, *Cornus sericea*, *Alnus incana*, *Spiraea douglasii*, *Vaccinium uliginosum*, and others. Herbaceous understory can include *Carex angustata* and *Carex disperma*. Floristic information was compiled from several sources: from Washington (Hemstrom et al. 1982, Brockway and Topik 1984, Franklin et al. 1988, Henderson et al. 1989, 1992, Kovalchik and Clausnitzer 2004); and from Oregon (McCain and Diaz 2002b, Christy 2004, Crowe et al. 2004).

<b>G507 North Pacific Montane Riparian Woodland Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Abies amabilis</i> - <i>Picea engelmannii</i> / <i>Vaccinium membranaceum</i> Forest	GNR/SNR	CWWA000270
<i>Abies amabilis</i> / <i>Oplopanax horridus</i> Forest	G5/S5	CEGL000004
<i>Abies amabilis</i> - <i>Tsuga heterophylla</i> / <i>Tiarella trifoliata</i> var. <i>unifoliata</i> Forest	GNR/SNR	CWWA000271
<i>Abies amabilis</i> / <i>Acer circinatum</i> Forest	GNR/SNR	CWWA000272
<i>Abies amabilis</i> / <i>Achlys triphylla</i> Forest	G4/S4	CEGL000003
<i>Abies amabilis</i> / <i>Athyrium filix-femina</i> Forest	GNR/SNR	CWWA000273
<i>Abies amabilis</i> / <i>Rubus spectabilis</i> - <i>Vaccinium alaskaense</i> Forest [Provisional]	G2G4Q/S2S4	CWWA000200
<i>Abies lasiocarpa</i> / <i>Rubus spectabilis</i> Forest [Provisional]	G2G4Q/S2S4	CWWA000203
<i>Alnus rubra</i> / Alluvial Bar Forest	GNR/SNR	CWWA000300
<i>Alnus rubra</i> / <i>Symphoricarpos albus</i> Forest	GNR/SNR	CWWA000304
<i>Alnus rubra</i> / <i>Vaccinium ovalifolium</i> / <i>Trautvetteria caroliniensis</i> Shrubland	G3G4/S3S4	CWWA000044
<i>Thuja plicata</i> / <i>Athyrium filix-femina</i> - <i>Stachys chamissonis</i> var. <i>cooleyae</i> Forest	GNR/S3?	CWWA000240
<i>Thuja plicata</i> / <i>Rubus spectabilis</i> / <i>Oxalis oregana</i> Forest	G3/S2	CWWA000157
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Oplopanax horridus</i> Forest	G3G4/S3	CEGL000507
<i>Alnus rubra</i> / <i>Athyrium filix-femina</i> - <i>Asarum caudatum</i> Forest	G1/S1	CEGL000008
<i>Alnus rubra</i> / <i>Athyrium filix-femina</i> Forest	G1/S1	CWWA000171
<i>Alnus rubra</i> / <i>Cornus sericea</i> Forest	GNR/SNR	CWWA000302
<i>Alnus rubra</i> / <i>Petasites frigidus</i> Forest	G4/S4	CEGL003401
<i>Alnus rubra</i> / <i>Physocarpus capitatus</i> - <i>Philadelphus lewisii</i> Forest	G1/S1	CEGL000002



**ENVIRONMENT & DYNAMICS**

**Environmental Description:** *Climate:* Cool temperate. *Soil/substrate/hydrology:* This group occurs on steep streams and narrow floodplains above foothills but below the alpine environments, e.g., above 1500 m (4550 feet) elevation to as high as 3300 m (10,000 feet) in the south and central part of the range, and at lower elevations in the northern part of the range. By the steep nature of the streams and adjacent slopes, these riparian forests are very narrow. Surrounding habitats include subalpine parklands and montane forests. These woodlands are dependent on seasonally high water tables and frequent (once every 3-5 years) flooding to provide channel scour and deposition for germination and maintenance. These woodlands occur on streambanks and overflow channels. They are distinguished from the surrounding forest by riparian/wetland understory species. When dominated by deciduous tree species, they are visually a sharp contrast to immediate upland conifer forests. Environmental information was compiled from several sources: from Washington (Hemstrom et al. 1982, Brockway and Topik 1984, Franklin et al. 1988, Henderson et al. 1989, 1992, Kovalchik and Clausnitzer 2004); and from Oregon (McCain and Diaz 2002b, Christy 2004, Crowe et al. 2004).

**Dynamics:****DISTRIBUTION**

**Geographic Range:** This group is found throughout high mountainous areas of the Pacific Northwest coast.

**Nations:** CA, US

**States/Provinces:** AK?, BC, OR, WA

**TNC Ecoregions [optional]:** 1:C, 3:C, 4:C, 69:?, 81:C

**USFS Ecoregions (2007):** 242A:CC, 242B:C?, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CP, M261G:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Low.

**SYNONYMY**

- < High Elevation Tree Associations (Crowe et al. 2004)
- < Mid Elevation Tree Associations (Crowe et al. 2004)
- < Mountain Hemlock Series (Kovalchik and Clausnitzer 2004)
- < Mountain Hemlock Series (McCain and Diaz 2002b)
- < Pacific Silver Fir Series (Kovalchik and Clausnitzer 2004)
- < Silver Fir Series (McCain and Diaz 2002b)
- < Western Hemlock Series (McCain and Diaz 2002b)
- < Western Hemlock Series (Kovalchik and Clausnitzer 2004)
- < Willow Series (Kovalchik and Clausnitzer 2004)

**LOWER LEVEL UNITS****Alliances:**

- A3767 *Picea engelmannii* Cascadian Riparian/Seep Woodland Alliance
- A0306 *Alnus rhombifolia* Cascadian Riparian Woodland Alliance
- A4118 *Pinus jeffreyi* Riparian Woodland Alliance
- A3766 *Tsuga mertensiana* - *Abies amabilis* Riparian/Seep Woodland Alliance
- A3768 *Populus tremuloides* - *Alnus rubra* Riparian/Seep Forest & Woodland Alliance

**AUTHORSHIP**

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel and C. Chappell

**Acknowledgments:**

**Version Date:** 2015/05/11

**REFERENCES**

**References:** Banner et al. 1993, Brockway and Topik 1984, Christy 2004, Crowe et al. 2004, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Franklin et al. 1988, Hemstrom et al. 1982, Henderson et al. 1989, Henderson et al. 1992, Kovalchik and Clausnitzer 2004, MacKenzie and Moran 2004, McCain and Diaz 2002b

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1. Forest & Woodland

1.B.3.Ng. Vancouverian Flooded & Swamp Forest

M035. Vancouverian Flooded & Swamp Forest

**G256. North Pacific Maritime Hardwood - Conifer Swamp****Type Concept Sentence:****OVERVIEW**

**Scientific Name:** *Tsuga heterophylla* - *Alnus rubra* / *Lysichiton americanus* Hardwood - Conifer Swamp Group

**Common Name (Translated Scientific Name):** Western Hemlock - Red Alder / Yellow Skunk-cabbage Hardwood - Conifer Swamp Group

**Type Concept:** This wetland forested group occurs from southern coastal Alaska (Kenai Fjords), coastal British Columbia south into coastal Washington and Oregon, and west of the coastal mountain summits (not interior). Treed swamps are common in southeastern Alaska, less so farther south. Forested swamps are mostly small-patch size, occurring sporadically in glacial depressions, in river valleys, benches, around the edges of lakes and marshes, or on slopes with seeps that form subirrigated soils. These are primarily on flat to gently sloping lowlands up to 457 m (1500 feet) elevation but also occur up to near the lower limits of continuous forest (below the subalpine parkland). It can occur on steeper slopes where soils are shallow over unfractured bedrock. This group is indicative of poorly-drained, mucky areas, and areas are often a mosaic of moving and stagnant water. Soils can be organic or mineral, but are not deep peatlands. It can be dominated by any one or a number of conifer (*Tsuga heterophylla*, *Tsuga mertensiana*, *Picea sitchensis*, *Pinus contorta*, *Chamaecyparis nootkatensis*) and hardwood species (*Alnus rubra*, *Fraxinus latifolia*, *Betula papyrifera*) that are capable of growing on saturated or seasonally flooded soils. Overstory is often less than 50% cover, but shrub understory can have high cover. Common shrubs include *Vaccinium ovalifolium*, *Gaultheria shallon* (southern portion of the Alaska distribution only), and *Elliottia pyroliflorus*. Common understory species include *Nephrophyllidium crista-galli*, *Thelypteris quelpaertensis*, *Phegopteris connectilis*, *Trichophorum caespitosum*, *Carex anthoxanthea*, *Carex pluriflora*, *Carex stylosa*, *Eriophorum* spp., and *Lysichiton americanus*. Dominant bryophytes include *Mnium* spp., *Rhizomnium* spp. and *Plagiomnium* spp. In the southern end of the range of this type, e.g., the southern Willamette Valley, it tends to have more hardwood-dominated stands (especially *Fraxinus latifolia*) and very little in the way of conifer-dominated stands. While the typical landscape context for the type is extensive upland forests, for the *Fraxinus latifolia* stands, landscapes were very often formerly dominated by prairies and now by agriculture. Many conifer-dominated stands have been converted to dominance by *Alnus rubra* due to timber harvest.

**Classification Comments:** These are wetlands with poorly drained often organic soils but not deep peat soils that would be considered fens or bogs. The concept of treed swamps is not new and has been described by Cowardin et al. (1979) for the U.S. and by Warner and Rubec (1997) for Canada. The concept here is a refinement based on regional climate and regional characteristic vascular plant species.

**Internal Comments:** mjr 10-12: CA added based on member association distribution. AK workshope 3-21-11: new; Suggest splitting into acidic and alkaline groups. Acidic would include both poor swamps and bogs. These are fine in this group, but description needs editing. Remove lowland from name for AK. DFL: Agree that we should split into "North Pacific Acid Swamp & Forested Bog Group." and "North Pacific Alkaline Swamp Group" Shore Pine Bogs will end up here.

**Other Comments:**

**Similar NVC Types:**

- G505 Rocky Mountain & Great Basin Swamp Forest: is a similar saturated, forested group, but occurs in the interior with Rocky Mountain indicator species.
- G610 North Pacific Maritime Poor Fen & Bog Forest & Woodland: has poorer, peaty organic or mineral soils and lacks *Lysichiton americanus*.
- G507 North Pacific Montane Riparian Woodland: has more aerated / less saturated, more well-drained soils, and lacks *Lysichiton americanus*.
- G254 North Pacific Lowland Riparian Forest & Woodland: has more aerated / less saturated, more well-drained soils, and lacks *Lysichiton americanus*.

**Diagnostic Characteristics:** Wetlands with saturated, shallow organic (all but >40 cm deep peat) or mineral soils that are slightly acidic to slightly alkaline on flat to gently sloping lowlands up to 457 m (1500 feet) in the temperate Pacific Northwest with a tall to moderate height conifer (and sometimes deciduous) tree layer (dominated by *Tsuga heterophylla*, *Thuja plicata*, *Tsuga mertensiana*, *Picea sitchensis*, *Chamaecyparis nootkatensis*, *Alnus rubra*, *Fraxinus latifolia*, and/or *Betula papyrifera*) growing in saturated, very poorly drained mineral or organic, but not peaty, soils, usually with herbaceous indicators of the saturated soil conditions such as *Lysichiton americanus* and/or *Carex deweyana*.

**VEGETATION**

**Physiognomy and Structure:** Wooded swamp wetland with an open to closed canopy of conifer or deciduous trees (at least 5 m in height), abundant to sparse low deciduous shrubs, and often a dense cover of herbaceous plants.

**Floristics:** Tree species may include *Tsuga heterophylla*, *Thuja plicata*, *Tsuga mertensiana*, *Picea sitchensis*, *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Alnus rubra*, *Fraxinus latifolia*, and/or *Betula papyrifera*, either singly or in various combinations, and not all species occur throughout the range of the group. Shrub species include *Vaccinium ovalifolium*, *Vaccinium uliginosum*, *Gaultheria shallon* (southern portion of the Alaska distribution only), *Cornus sericea*, *Rubus spectabilis*, *Oplopanax horridus*, *Spiraea douglasii*, and/or *Elliottia pyroliflorus*. Herbaceous understory species include *Nephrophyllidium crista-galli*, *Thelypteris quelpaertensis*, *Phegopteris connectilis*, *Trichophorum caespitosum*, *Carex anthoxanthea*, *Carex aquatilis*, *Carex angustata*, *Carex pluriflora*, *Carex stylosa*, *Carex obnupta*, *Carex deweyana*, *Deschampsia caespitosa*, *Juncus patens*, *Eriophorum* spp., and *Lysichiton americanus*. Dominant bryophytes include *Mnium* spp., *Rhizomnium* spp., and *Plagiomnium* spp. Floristic information is compiled from Alaska (DeMeo et al. 1992, Viereck et al. 1992, Martin et al. 1995, Shephard 1995, DeVelice et al. 1999, Boggs 2002, Boggs et al. 2008b), Washington (Chappell 1999, Chappell et al. 2001), Oregon and Washington (Franklin and Dyrness 1973), and British Columbia (Banner et al. 1993, Green and Klinka 1994, MacKenzie and Moran 2004).

G256 North Pacific Maritime Hardwood-Conifer Swamp Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Abies amabilis</i> - <i>Tsuga heterophylla</i> / <i>Oplopanax horridus</i> Forest	G5/S5	CEGL000004
<i>Abies amabilis</i> / <i>Gymnocarpium dryopteris</i> Forest	GNR/SNR	CWWA000274
<i>Alnus rubra</i> / <i>Athyrium filix-femina</i> - <i>Lysichiton americanus</i> Forest	G3G4/S3	CEGL003388
<i>Alnus rubra</i> / <i>Glyceria striata</i> Woodland	GNR/S3S4	CWWA000207
<i>Alnus rubra</i> / <i>Rubus spectabilis</i> / <i>Carex obnupta</i> - <i>Lysichiton americanus</i> Forest	G3G4/S3S4	CEGL003389
<i>Alnus rubra</i> / <i>Rubus spectabilis</i> / <i>Chrysosplenium glechomifolium</i> Forest	G3G4/S3S4	CWWA000208
<i>Fraxinus latifolia</i> / <i>Carex obnupta</i> Forest	G4/S2?	CEGL000640
<i>Fraxinus latifolia</i> / <i>Spiraea douglasii</i> Forest	G3/S2?	CEGL003392
<i>Picea sitchensis</i> - ( <i>Alnus rubra</i> ) / <i>Rubus spectabilis</i> / <i>Polystichum munitum</i> Forest	G3/S3	CEGL000060
<i>Picea sitchensis</i> - <i>Alnus rubra</i> / <i>Lysichiton americanus</i> - <i>Chrysosplenium glechomifolium</i> Forest	GNR/S2	CWWA000233
<i>Picea sitchensis</i> - <i>Tsuga heterophylla</i> - ( <i>Alnus rubra</i> ) / <i>Oplopanax horridus</i> / <i>Polystichum munitum</i> Forest	G2G3/S2S3	CWWA000234
<i>Picea sitchensis</i> / <i>Cornus sericea</i> / <i>Lysichiton americanus</i> Forest	G2/S1	CEGL000055
<i>Picea sitchensis</i> / <i>Rubus spectabilis</i> / <i>Carex obnupta</i> - <i>Lysichiton americanus</i> Forest	G2G3/S2	CEGL000400
<i>Pinus contorta</i> var. <i>contorta</i> / <i>Carex obnupta</i> Forest	G2/S2	CEGL000142
<i>Populus tremuloides</i> / <i>Carex obnupta</i> Forest	G2/S1?	CEGL003371
<i>Tsuga heterophylla</i> - ( <i>Pseudotsuga menziesii</i> - <i>Thuja plicata</i> ) / <i>Polystichum munitum</i> - <i>Athyrium filix-femina</i> Forest	G4G5/4	CEGL002627
<i>Tsuga heterophylla</i> - ( <i>Thuja plicata</i> - <i>Alnus rubra</i> ) / <i>Lysichiton americanus</i> - <i>Athyrium filix-femina</i> Forest	G3?/S2S3	CEGL002670
<i>Tsuga heterophylla</i> - <i>Abies amabilis</i> / <i>Vaccinium alaskaense</i> / <i>Lysichiton americanus</i> Forest	G3/S3	CEGL000223
<i>Tsuga heterophylla</i> - <i>Pseudotsuga menziesii</i> - ( <i>Thuja plicata</i> ) / <i>Oplopanax horridus</i> / <i>Polystichum munitum</i> Forest	G3/S2S3	CEGL000497
<i>Tsuga heterophylla</i> - <i>Thuja plicata</i> / <i>Gaultheria shallon</i> / <i>Lysichiton americanus</i> Forest	G5/SNR	CEGL003226
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Caltha leptosepala</i> ssp. <i>howellii</i> Forest	G3/S3	CEGL000501

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Cool temperate. *Soil/substrate/hydrology:* Forested swamps are mostly small-patch size, occurring sporadically in glacial depressions, in river valleys, benches, around the edges of lakes and marshes, or on slopes with seeps that form subirrigated soils. The soil water pH ranges from slightly acidic (5.5-6.5) or neutral (6.5-7.4) to alkaline (>7.4). These are primarily on flat to gently sloping lowlands up to 457 m (1500 feet) elevation but also occur up to near the lower limits of continuous forest (below the subalpine parkland). They can occur on steeper slopes where soils are shallow over unfractured bedrock. This group is indicative of poorly-drained, with at least slow-moving ground water. Soils can organic or mineral but are not deep peatlands, and the source of water is minerotrophic groundwater. The water table is below the ground surface, and the

surface is often hummocky, allowing for patches of aerated or partly aerated soil that allow root growth of trees. Treed swamps may grade into drier upland forest on mineral soil, or grade into wetter treed fens, which are wetter with less tree canopy cover and a thicker peat soil layer. Environmental information is compiled from several sources: from Alaska (DeMeo et al. 1992, Viereck et al. 1992, Martin et al. 1995, Shephard 1995, DeVelice et al. 1999, Boggs 2002, Boggs et al. 2008b); from Washington (Chappell 1999, Chappell et al. 2001); from Oregon and Washington (Franklin and Dyrness 1973); from British Columbia (Banner et al. 1993, Green and Klinka 1994, MacKenzie and Moran 2004); and from all of Canada (Warner and Rubec 1997).

**Dynamics:** This group represents a topo-edaphic climax which is relatively stable over time. Short-term succession occurs from single tree mortality from a variety of causes. Tree regeneration frequently occurs on raised organic microsites on the remains of previous trees. Tree growth is generally very slow. Longer-term succession is probably influenced by climatic patterns that dictate drainage, either favoring poorer drainage, increased tree mortality, and more open canopy; or improved drainage, greater tree growth, and a more closed canopy. These patterns can also favor individual tree species based on their tolerance or intolerance of wet soils. The widespread yellow-cedar decline, which covers 200,000 ha in southeastern Alaska, is an example of a climate-induced tree death that has resulted in a composition shift away from yellow-cedar due to this mortality (Hennon et al. 2008).

#### DISTRIBUTION

**Geographic Range:** This group is found in southern coastal Alaska (Kenai Fjords), coastal British Columbia south into coastal Washington and Oregon, and west of the coastal mountain summits (not interior).

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:C, 69:C, 70:C, 81:C

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- > *Alnus rubra* - *Lysichiton americanus* (Ws52) (MacKenzie and Moran 2004)
- > *Chamaecyparis nootkatensis* - *Tsuga mertensiana* - *Lysichiton americanus* (Ws55) (MacKenzie and Moran 2004)
- > *Salix sitchensis* - *Salix lucida* - *Lysichiton americanus* (Ws51) (MacKenzie and Moran 2004)
- > *Thuja plicata* - *Polystichum munitum* - *Lysichiton americanus* (Ws53) (MacKenzie and Moran 2004)
- > *Thuja plicata* - *Tsuga heterophylla* - *Lysichiton americanus* (Ws54) (MacKenzie and Moran 2004)
- < Freshwater Wooded Swamps (Cowardin et al. 1979)
- >> I.A.1.c - Sitka spruce-western hemlock (Viereck et al. 1992)
- >> I.A.2.c - Mountain hemlock (open) (Viereck et al. 1992)
- >> I.A.2.d - Mixed conifer (Viereck et al. 1992)
- < Inland Freshwater Wooded Swamp (Shaw and Fredine 1971)
- ? Swamp (Warner and Rubec 1997)
- < Swamp (National Wetlands Working Group 1988)
- < Swamp Wetland Class: Forested (MacKenzie and Moran 2004)

#### LOWER LEVEL UNITS

##### Alliances:

- A3755 *Pinus contorta* Swamp Forest Alliance
- A3753 *Alnus rubra* - *Fraxinus latifolia* / *Lysichiton americanus* Deciduous Swamp Woodland Alliance
- A3756 *Tsuga heterophylla* - *Picea sitchensis* / *Lysichiton americanus* Swamp Forest & Woodland Alliance

#### AUTHORSHIP

**Primary Concept Source:** G. Kittel, K. Boggs, T. Boucher, and M.S. Reid, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel, D. Meidinger, D. Faber-Langendoen

**Acknowledgments:** additional contributing authors include C. Chappell, P. Hennon, and P. Comer

**Version Date:** 2013/09/06

#### REFERENCES

**References:** Banner et al. 1993, Boggs 2002, Boggs et al. 2008b, Chappell 1999, Chappell et al. 2001, Cowardin et al. 1979, DeMeo et al. 1992, DeVelice et al. 1999, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Green and Klinka 1994, Hennon et al. 2008, MacKenzie and Moran 2004, Martin et al. 1995, National Wetlands Working Group 1988, Shaw and Fredine 1971, Shephard 1995, Viereck et al. 1992, Warner and Rubec 1997

## 1. Forest &amp; Woodland

1.B.3.Ng. Vancouverian Flooded &amp; Swamp Forest

M035. Vancouverian Flooded &amp; Swamp Forest

**G610. North Pacific Maritime Poor Fen & Bog Forest & Woodland****Type Concept Sentence:****OVERVIEW**

**Scientific Name:** *Pinus contorta* var. *contorta* / *Ledum groenlandicum* / *Empetrum nigrum* / *Sphagnum* spp. Poor Fen & Bog Forest & Woodland Group

**Common Name (Translated Scientific Name):** Beach Pine / Bog Labrador-tea / Black Crowberry / Peatmoss species Poor Fen & Bog Forest & Woodland Group

**Type Concept:** This wetland forested group occurs from southern coastal Alaska (Kenai Fjords), coastal British Columbia south into coastal Washington and Oregon, and west of the coastal mountain summits (not interior). Treed poor swamps and bogs are common in southeastern Alaska, less so farther south. Forested swamps are mostly small-patch size, occurring sporadically in glacial depressions, in river valleys, benches, or on slopes with seeps that form subirrigated soils. These are primarily on flat to gently sloping lowlands up to 457 m (1500 feet) elevation but also occur up to near the lower limits of continuous forest (below the subalpine parkland). It can occur on steeper slopes where soils are shallow over unfractured bedrock. This group is indicative of poorly drained, peaty areas, with little to no influence of groundwater. Soils are typically peat. It can be dominated by any one or a number of conifer species (*Tsuga heterophylla*, *Tsuga mertensiana*, *Picea sitchensis*, *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*) that are capable of growing on saturated or seasonally flooded soils. Overstory is often less than 50% cover, but shrub understory can have high cover. Common shrubs include *Vaccinium ovalifolium*, *Gaultheria shallon* (southern portion of the Alaska distribution only), and *Elliottia pyroliflorus*. Common understory species include *Nephrophyllidium crista-galli*, *Thelypteris quelpaertensis*, *Phegopteris connectilis*, *Trichophorum caespitosum*, *Carex anthoxanthea*, *Carex pluriflora*, *Carex stylosa*, *Eriophorum* spp., *Lysichiton americanus*, and *Sphagnum* spp.

**Classification Comments:** These forests and open woodlands are at least 5 m in height. The concept of treed bogs is not new and has been described by Cowardin et al. (1979) for the U.S. and by Warner and Rubec (1997) for Canada. The concept here is a refinement based on regional climate and regional characteristic vascular plant species. Treed bog and fen vegetation can form a gradient from dense forest into very open and extremely stunted trees. Herbaceous- and shrub-dominated areas where stunted trees are dwarfed below 5 m are part of North Pacific Bog & Acidic Fen Group (G284) (Shrubland & Herbaceous Class 2 Formation).

**Internal Comments:** GK 9-13: Type Concept to be rewritten after edits from other fields are reviewed.

**Other Comments:**

**Similar NVC Types:**

- G505 Rocky Mountain & Great Basin Swamp Forest: is a similar saturated, forested group, but occurs in the interior with Rocky Mountain indicator species.
- G507 North Pacific Montane Riparian Woodland: has more aerated / less saturated, more well-drained soils.
- G256 North Pacific Maritime Hardwood - Conifer Swamp: has higher mineral content with indicators such as *Lysichiton americanus* often present.
- G254 North Pacific Lowland Riparian Forest & Woodland: has more aerated / less saturated, more well-drained soils, prone to riverine saturation flooding.

**Diagnostic Characteristics:** Wetlands with saturated, mineral or organic soils on flat to gently sloping lowlands up to 457 m (1500 feet) in the temperate Pacific Northwest with a tall to moderate height conifer tree layer (dominated by *Pinus contorta* var. *contorta* or *Chamaecyparis nootkatensis* but can include some *Tsuga heterophylla*, *Tsuga mertensiana*, or *Thuja plicata*.) growing in saturated, very poorly drained mineral or peaty soils, usually with herbaceous indicators of the saturated, acidic and low nutrient soil conditions.

**VEGETATION**

**Physiognomy and Structure:** Open wooded poor fen or bog wetland with conifer trees (which may be short to slightly stunted, but at least 5 m in height) with abundant to sparse low evergreen shrubs, and an abundant to moderate cover of herbaceous plants.

**Floristics:** Tree species are mostly *Pinus contorta* var. *contorta* or *Chamaecyparis nootkatensis* but can include some *Tsuga heterophylla*, *Tsuga mertensiana*, or *Thuja plicata*. *Ledum groenlandicum* is generally the dominant shrub understory species; other shrubs include *Vaccinium uliginosum*, *Juniperus communis*, *Myrica gale*, or *Gaultheria shallon*. Low-shrub species include *Empetrum nigrum*, *Kalmia microphylla*, and *Rubus chamaemorus*. Herbaceous species include sedges such as *Eriophorum angustifolium*,

*Trichophorum caespitosum*, *Carex livida*, or herbs such as *Sanguisorba officinalis*, *Triantha glutinosa*, or *Drosera rotundifolia*. Dominant bryophytes include *Sphagnum* spp. and *Racomitrium lanuginosum*. This floristic information was compiled from several sources: for Alaska (DeMeo et al. 1992, Viereck et al. 1992, Martin et al. 1995, Shephard 1995, DeVelice et al. 1999, Boggs 2002, Boggs et al. 2008b); for Washington (Kunze 1994, Chappell 1999, Chappell et al. 2001); for Oregon and Washington (Franklin and Dyrness 1973); and for British Columbia (Green and Klinka 1994, MacKenzie and Moran 2004).

G610 North Pacific Maritime Poor Fen & Bog Forest & Woodland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Pinus contorta</i> var. <i>contorta</i> - <i>Thuja plicata</i> / <i>Myrica gale</i> / <i>Sphagnum</i> spp. Woodland	G3G4/S1	CEGL001691
<i>Thuja plicata</i> - <i>Tsuga heterophylla</i> / <i>Lysichiton americanus</i> / <i>Sphagnum</i> spp. Woodland	G3G4/S1	CEGL001787
<i>Pinus contorta</i> var. <i>contorta</i> - <i>Betula papyrifera</i> / <i>Ledum groenlandicum</i> Woodland [Provisional]	GNR/S1Q	CWWA000235
<i>Pinus contorta</i> var. <i>contorta</i> - <i>Thuja plicata</i> / <i>Alnus incana</i> / <i>Carex (aquatilis</i> var. <i>dives, echinata</i> ssp. <i>echinata</i> ) Woodland	GNR/SUQ	CWWA000258
<i>Pinus contorta</i> var. <i>contorta</i> - <i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> / <i>Sphagnum</i> spp. Woodland	GNR/S1	CWWA000257
<i>Pinus contorta</i> var. <i>contorta</i> / <i>Ledum glandulosum</i> / <i>Sphagnum</i> spp. Woodland	G1/SU	CWWA000121
<i>Pinus contorta</i> var. <i>contorta</i> / <i>Ledum groenlandicum</i> / <i>Sphagnum</i> spp. Woodland	G3/S2	CEGL003337
<i>Pinus contorta</i> var. <i>contorta</i> / <i>Ledum groenlandicum</i> / <i>Xerophyllum tenax</i> / <i>Sphagnum</i> spp. Woodland	GNR/S1Q	CWWA000202
<i>Pinus monticola</i> / <i>Ledum groenlandicum</i> / <i>Sphagnum</i> spp. Woodland	G1/S1	CEGL003360
<i>Tsuga heterophylla</i> - ( <i>Thuja plicata</i> ) / <i>Ledum groenlandicum</i> / <i>Carex (obnupta, utriculata)</i> / <i>Sphagnum</i> spp. Woodland	GNR/S1	CWWA000253
<i>Tsuga heterophylla</i> - ( <i>Thuja plicata</i> ) / <i>Ledum groenlandicum</i> / <i>Sphagnum</i> spp. Woodland	G3/S2	CEGL003339
<i>Tsuga heterophylla</i> - ( <i>Thuja plicata</i> ) / <i>Sphagnum</i> spp. Forest	G1/S1	CEGL003417

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Cool temperate. *Soil/substrate/hydrology:* Forested poor fens and bogs are mostly small-patch size, occurring sporadically in glacial depressions or around the edges of lakes and marshes. However, in the hypermaritime climates, they can be extensive, dominating areas of low slopes that do not shed water easily. These occur primarily on flat to gently sloping lowlands but can be found on steeper slopes and up to 800 m (2500 feet) elevation. This group is found on poorly drained soils, ranging from organic veneers over wet mineral soils to deeper organics peaty soils; the peat is mostly deep, mossy peat, but can include woody peat. The peat may also be shallow over rock. The water source is stagnant or slowly moving acidic groundwater or direct precipitation. Treed bogs and poor fens may grade into drier upland forest on mineral soil, or adjacent shrubland or herbaceous poor fen and bogs, or grade into wetter non-treed fens, which have richer soil water (higher pH). This environmental information was compiled from several sources: for Alaska (DeMeo et al. 1992, Viereck et al. 1992, Martin et al. 1995, Shephard 1995, DeVelice et al. 1999, Boggs 2002, Boggs et al. 2008b); for Washington (Chappell 1999, Chappell et al. 2001); for Oregon and Washington (Franklin and Dyrness 1973); and for British Columbia (Banner et al. 1993, Green and Klinka 1994, MacKenzie and Moran 2004).

**Dynamics:** This group represents forests with soils that have taken hundreds to thousands of years to develop, a topoedaphic climax that is relatively stable over time. Tree regeneration frequently occurs on raised organic microsites on the remains of previous trees. Tree growth is very slow. Longer term succession is probably influenced by paludification and climatic patterns that dictate drainage, either favoring poorer drainage, increased tree mortality, and more open canopy; or improved drainage, greater tree growth, and a more closed canopy. These patterns can also favor individual tree species based on their tolerance or intolerance of wet soils. The widespread yellow-cedar decline, which covers 200,000 ha in southeastern Alaska, is an example of a climate-induced tree death that has resulted in a composition shift away from yellow-cedar due to this mortality (Hennon et al. 2008). Windthrow can cause soil mixing that reverses the paludification processes on a small scale, where productivity may be increased (Banner et al 2005).

#### DISTRIBUTION

**Geographic Range:** This group is found in southern coastal Alaska (Kenai Fjords), coastal British Columbia south into coastal Washington and Oregon, mostly west of the coastal mountain summits.

**Nations:** CA, US

**States/Provinces:** AK, BC, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:C, 69:C, 70:C, 81:C

**USFS Ecoregions (2007):** 242A:CC, 242B:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- > *Pinus contorta* - *Chamaecyparis nootkatensis* - *Trichophorum caespitosum* (Wb53) (MacKenzie and Moran 2004)
- > *Pinus contorta* var. *contorta* - *Empetrum nigrum* - *Sphagnum austinii* (Wb51) (MacKenzie and Moran 2004)
- < Inland Freshwater Wooded Swamp (Shaw and Fredine 1971)
- < Lodgepole Pine: 218 (Eyre 1980)
- ? Swamp (Warner and Rubec 1997)
- < Swamp (National Wetlands Working Group 1988)
- < Swamp Wetland Class: Forested (MacKenzie and Moran 2004)

#### LOWER LEVEL UNITS

##### Alliances:

- A3764 *Pinus contorta* - *Picea sitchensis* Alaskan Bog Woodland Alliance
- A3765 *Pinus contorta* / *Ledum groenlandicum* Bog Woodland Alliance
- A3763 *Tsuga heterophylla* - *Thuja plicata* / *Ledum glandulosum* Bog Woodland Alliance

#### AUTHORSHIP

**Primary Concept Source:** G. Kittel, K. Boggs, T. Boucher, and M.S. Reid, in Faber-Langendoen et al. (2011)

**Author of Description:** D. Meidinger, G. Kittel, K. Boggs, T. Boucher, M.S. Reid, D. Faber-Langendoen

**Acknowledgments:** additional contributing authors include C. Chappell, P. Hennon, P. Comer, J. Rocchio, D. Meidinger

**Version Date:** 2013/09/06

#### REFERENCES

**References:** Banner et al. 1993, Banner et al. 2005, Boggs 2002, Boggs et al. 2008b, Chappell 1999, Chappell et al. 2001, Cowardin et al. 1979, DeMeo et al. 1992, DeVelice et al. 1999, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Green and Klinka 1994, Hennon et al. 2008, Kunze 1994, MacKenzie and Moran 2004, Martin et al. 1995, National Wetlands Working Group 1988, Shaw and Fredine 1971, Shephard 1995, Viereck et al. 1992, Warner and Rubec 1997

## 2. SHRUB & HERB VEGETATION

Grasslands, shrublands, open tree savannas, marshes, bogs and fens dominated by broadly mesomorphic (including scleromorphic) shrub and herb growth forms (including *broad-leaved*, *needle-leaved*, and *sclerophyllous shrubs*, and *forb* and *graminoid herbs*) with an irregular horizontal canopy structure, mesomorphic trees typically <10% cover (but tropical tree savannas typically <40%), tropical to boreal and subalpine climates, and wet to dry substrate conditions.

### 2.B. Temperate & Boreal Grassland & Shrubland

Temperate & Boreal Grassland & Shrubland is dominated by mesomorphic grasses and shrubs, with or without scattered trees (and trees typically <10% cover), ranging from temperate coastal to inland lowland and montane grasslands and shrublands, with a strongly seasonal climate and at least some frost to extended cold seasons.

#### 2.B.2. Temperate Grassland & Shrubland

Temperate Grassland, Meadow & Shrubland is dominated by perennial grasses, forbs and shrubs typical of moderately dry to moist habitats, and is found in the mid-latitude regions of all continents (23° to 55°N and S), varying from large open grassland landscapes to droughty hillside meadows in forested landscapes.

## 2.B.2.Na. Western North American Grassland & Shrubland

### 2. Shrub & Herb Vegetation

#### 2.B.2.Na. Western North American Grassland & Shrubland

### M048. Central Rocky Mountain Montane-Foothill Grassland & Shrubland

**Type Concept Sentence:** This macrogroup occurs in the foothills and mountains throughout the Central Rockies, from central and eastern Wyoming north and west into British Columbia and Alberta and is composed of shrub- and/or herbaceous-dominated stands forming shrublands, shrub-steppe, or grasslands. Characteristic shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Holodiscus discolor*, *Menziesia ferruginea*, *Physocarpus malvaceus*, *Symphoricarpos albus*, *Symphoricarpos occidentalis*, and species of *Prunus*, *Rhus*, *Ribes*, *Rosa*, *Rubus parviflorus*, *Spiraea*, and *Vaccinium*. The herbaceous layer is characterized by *Festuca idahoensis*, *Pseudoroegneria spicata*, and other cool-season graminoids.

#### OVERVIEW

**Scientific Name:** *Amelanchier alnifolia* / *Festuca idahoensis* - *Pseudoroegneria spicata* Central Rocky Mountain Montane & Foothill Grassland & Shrubland Macrogroup

**Common Name (Translated Scientific Name):** Saskatoon Serviceberry / Idaho Fescue - Bluebunch Wheatgrass Central Rocky Mountain Montane & Foothill Grassland & Shrubland Macrogroup

**Type Concept:** This macrogroup occurs in the foothills and mountains throughout the Central Rockies and montane Intermountain West region, from central and eastern Wyoming north and west into British Columbia and Alberta. This includes the "island ranges" of central Montana, though it is not common west to the East Cascades. It is broadly defined structurally and is composed of shrub- and/or herbaceous-dominated stands forming shrublands (>25% cover), shrub-steppe (10-25% cover), or open grasslands (shrubs <10% cover). Characteristic shrubs between 1 and 3 m in height are *Acer glabrum*, *Amelanchier alnifolia*, *Holodiscus discolor*, *Menziesia ferruginea*, *Physocarpus malvaceus*, *Prunus emarginata*, *Prunus virginiana*, *Rhus glabra*, *Rhus trilobata*, *Ribes lacustre*, *Rosa nutkana*, *Rosa woodsii*, *Rubus parviflorus*, *Sambucus caerulea*, *Spiraea* spp., and *Symphoricarpos albus*. Stands in central and eastern Wyoming can include *Artemisia tridentata* ssp. *vaseyana* and *Cercocarpus montanus*, but neither of these is dominant. Dwarf-shrubs (<0.3 m tall) composed of *Vaccinium caespitosum*, *Vaccinium myrtillus*, *Vaccinium scoparium*, and *Vaccinium membranaceum* may be also form the characteristic woody layer. Grasslands are dominated by *Festuca idahoensis* and *Pseudoroegneria spicata*, with *Festuca campestris* increasing northward in Alberta. Other characteristic herbaceous graminoids present include *Achnatherum scribneri*, *Achnatherum hymenoides*, *Carex geyeri*, *Carex filifolia*, *Carex petasata*, *Danthonia* spp., *Elymus lanceolatus*, *Festuca campestris*, *Hesperostipa comata*, *Koeleria macrantha*, *Leucopoa kingii*, *Leymus cinereus*, *Pascopyrum smithii*, and *Poa secunda*. Associated forbs are numerous and include species of *Arnica*, *Antennaria*, *Erigeron*, *Eriogonum*, *Gaillardia*, *Galium*, *Geum*, *Heuchera*, *Liatris*, *Lithospermum*, *Lupinus*, *Lomatium*, *Oxytropis*, *Penstemon*, *Phlox*, *Potentilla*, and *Solidago*. On dry, sites with low grazing pressures, *Selaginella densa* and lichens provide significant ground cover between clumps of grasses. Important exotic grasses include *Phleum pratense*, *Bromus inermis*, and *Poa pratensis*. The herbaceous layer of shrublands has similar species composition to many of the grasslands in this macrogroup, except for the mesic shrublands with typically more mesic species such as *Heracleum maximum*, *Luzula glabrata*, or some other species such as *Chamerion angustifolium* and *Xerophyllum tenax*. *Alnus* spp. may occur in avalanche slopes. Stands occur as extensive foothill and valley grasslands and shrublands below the lower treeline and extend up into the high montane zones. Climate is temperate with predominantly dry summers and cold winters. Annual precipitation is approximately 20-80 cm, and primarily occurs in the winter as snow or rain, with moisture increasing with elevation. These communities occur on gentle to steep-gradient slopes. Sites are highly variable. Grasslands tend to occur on warmer, drier sites or climates, especially at higher elevation. Shrublands and dwarf-shrublands often occur on cooler, more mesic sites than grasslands. These shrubland communities also develop near talus slopes as garlands, at the heads of dry drainages, toeslopes in the moist shrub-steppe and steppe zones, and as smaller patches on dry sites that are marginal for tree growth and that have typically also experienced fire. Some site may occupy avalanche areas. Parent materials include basalt colluvium, loess, lava and tuff, glacial outwash composed of fine silts and clays of moderate depth. Soils range from poorly developed, well-drained alluvial or colluvial sands with a high percentage of rock fragments to be moderately deep, silt loam or loam with few rock fragments (less than 15% by volume and no rock cover). This macrogroup also includes grasslands from eastern Washington and Oregon commonly known as Palouse Prairie, which is characterized by rolling topography composed of loess hills and plains over basalt plains.

**Classification Comments:** This macrogroup has been recently modified. Former Columbia Basin Foothill & Canyon Dry Grassland Group (G274) was archived and its contents moved to Intermountain Semi-Desert Grassland Group (G311) in Great Basin & Intermountain Dry Shrubland & Grassland Macrogroup (M171). Former Central Rocky Mountain Montane-Foothill Mesic Deciduous Shrubland Group (G275) was also archived and the *Celtis laevigata* var. *reticulata*- and *Crataegus douglasii*-dominated or -codominated associations were deemed to be mostly riparian and were moved to Western Montane-Subalpine Riparian & Seep



Shrubland Group (G527). The other associations were moved to Central Rocky Mountain High Montane Mesic Shrubland Group (G305) in the same macrogroup. The draft alliances will need to be reviewed and possibly moved.

#### Similar NVC Types:

- M168 Rocky Mountain & Vancouverian Subalpine-High Montane Mesic Meadow
- M171 Great Basin & Intermountain Dry Shrubland & Grassland: is a similar western macrogroup that includes lower elevation, drier grasslands and shrublands. There is some species overlap in foothill zone.

**Diagnostic Characteristics:** This broadly defined macrogroup is characterized by a variety of species forming shrublands, shrub-steppe, or grasslands. Characteristic species include *Acer glabrum*, *Amelanchier alnifolia*, *Holodiscus discolor*, *Menziesia ferruginea*, *Physocarpus malvaceus*, *Philadelphus lewisii*, *Prunus emarginata*, *Prunus virginiana*, *Rhus glabra*, *Rhus trilobata*, *Ribes lacustre*, *Rosa nutkana*, *Rosa woodsii*, *Rubus parviflorus*, *Sambucus caerulea*, *Spiraea betulifolia*, *Spiraea splendens*, and *Symphoricarpos albus*. *Artemisia tridentata* ssp. *vaseyana* and *Cercocarpus montanus* may also be present in the southern extent, but neither dominates. Evergreen dwarf-shrubs <0.5 m tall can also form the characteristic woody layer. Common species include *Mahonia repens*, *Vaccinium caespitosum*, *Vaccinium myrtillus*, *Vaccinium scoparium*, and *Vaccinium membranaceum*, occurring alone or in any combination. Grasslands, whose species are often shared with the shrubland types, are dominated by *Festuca idahoensis* and *Pseudoroegneria spicata*. Other characteristic graminoid species include *Achnatherum occidentale*, *Achnatherum richardsonii*, *Calamagrostis rubescens*, *Danthonia intermedia*, *Danthonia parryi*, *Elymus lanceolatus*, *Elymus trachycaulus*, *Festuca campestris*, *Hesperostipa comata*, *Koeleria macrantha*, *Leucopoa kingii*, *Leymus cinereus*, *Leymus innovatus* (= *Elymus innovatus*), *Pascopyrum smithii*, *Phleum alpinum*, *Poa secunda*, *Trisetum spicatum* and a variety of *Carices*, such as *Carex hoodii*, *Carex elynoides*, *Carex filifolia*, *Carex geyeri*, *Carex obtusata*, and *Carex scirpoidea*. *Chamerion angustifolium*, *Heracleum maximum*, *Luzula glabrata*, and *Xerophyllum tenax* are characteristic of some herbaceous layer in mesic shrubland. Associated forb species are diverse and may include *Achillea millefolium*, *Arnica sororia*, *Antennaria microphylla*, *Artemisia ludoviciana*, *Artemisia frigida*, *Balsamorhiza sagittata*, *Delphinium bicolor*, *Erigeron* spp., *Eriogonum* spp., *Gaillardia aristata*, *Galium boreale*, *Geum triflorum*, *Heuchera* spp., *Liatris punctata*, *Lithospermum ruderale*, *Lupinus argenteus*, *Lupinus sericeus*, *Lomatium macrocarpum*, *Opuntia fragilis*, *Oxytropis* spp., *Penstemon confertus*, *Penstemon eriantherus*, *Phlox alyssifolia*, *Phlox hoodii*, *Potentilla glandulosa*, *Potentilla gracilis*, and *Solidago missouriensis*.

## VEGETATION

**Physiognomy and Structure:** This variable macrogroup is composed of shrub and/or herbaceous stands forming a shrubland, shrub-steppe, or grassland. Shrub layers are typically composed of broad-leaved, cold-deciduous species generally between 1 and 3 m in height. However, dwarf-shrubs <0.3m tall such as *Vaccinium* spp. can be also form the characteristic woody layer. Shrub density will vary with substrate, fire and grazing history, and moisture, but these are rarely dense "thickets." They are typically found in small patches within the lower montane zone of Douglas-fir or ponderosa pine woodlands, or in a mosaic with sage shrub-steppe or valley grasslands. Grasses and forbs are the herbaceous component and can be abundant to sparse. The herbaceous layer is dominated by cool-season bunchgrasses, generally less than 1 m in height, and often dense in cover. Forb diversity is typically high in both mesic and dry aspects of this macrogroup. Shrubs are more common on slightly more mesic or protected sites (north slopes, toeslopes, swales). A soil crust of lichens covers almost all open soil between clumps of grasses; *Cladonia* and *Peltigera* species are the most common lichens. Unvegetated mineral soil is commonly found between clumps of grass and the lichen cover.

**Floristics:** This macrogroup is broadly defined and is composed of shrub- and/or herbaceous-dominated stands forming a shrubland, shrub-steppe, or grassland. If present, the shrub layer is typically composed of broad-leaved, cold-deciduous species generally between 1 and 3 m in height and dominated by one species or a mix of shrubs such as *Acer glabrum*, *Amelanchier alnifolia*, *Holodiscus discolor*, *Menziesia ferruginea*, *Physocarpus malvaceus*, *Prunus emarginata*, *Prunus virginiana*, *Rhus glabra*, *Rhus trilobata*, *Ribes lacustre*, *Rosa nutkana*, *Rosa woodsii*, *Rubus parviflorus*, *Sambucus caerulea*, *Spiraea betulifolia*, *Spiraea splendens*, and *Symphoricarpos albus*. Occurrences in central and eastern Wyoming can include *Artemisia tridentata* ssp. *vaseyana* and *Cercocarpus montanus*, but neither of these is dominant, and where they occur, the stands are truly mixes of shrubs. Evergreen low and dwarf-shrubs (<0.5m tall) can also form the characteristic woody layer. Common species include *Mahonia repens*, *Vaccinium caespitosum*, *Vaccinium myrtillus*, *Vaccinium scoparium*, and *Vaccinium membranaceum*, occurring alone or in any combination. *Juniperus communis* shrublands are found at high elevations in the eastern Cascades and are tentatively included here. Other common woody plants include *Paxistima myrsinites*, *Sorbus scopulina*, and *Sorbus sitchensis*.

The herbaceous layer is variable, ranging from foothill to subalpine grasslands, as well as the understory of shrublands included in this macrogroup. The herbaceous layer of shrublands varies in cover depending on shrub density; the species composition is similar to many of the grasslands in this macrogroup, except for the mesic shrublands with typically more mesic species such as *Heracleum maximum*, *Luzula glabrata*, or some other species such as *Chamerion angustifolium* and *Xerophyllum tenax*.

Throughout much of the macrogroup, *Festuca idahoensis* and *Pseudoroegneria spicata* are the most important grasses and are usually present and often dominant. In the northern extent on moist sites with low grazing pressures, *Festuca campestris* can

form a nearly continuous cover and is interspersed with *Festuca idahoensis* and the rhizomatous ecotype of *Pseudoroegneria spicata*. *Danthonia parryi* becomes codominant moving north into the Alberta foothills. Other graminoids include *Achnatherum occidentale*, *Achnatherum richardsonii*, *Elymus lanceolatus*, *Hesperostipa comata*, *Koeleria macrantha*, *Leymus cinereus*, *Pascopyrum smithii*, and *Poa secunda*. Moist sites support a forb-rich community that includes species such as *Achillea millefolium*, *Balsamorhiza sagittata*, *Castilleja* spp., *Delphinium bicolor*, *Fragaria virginiana*, *Gentiana affinis*, *Geranium viscosissimum*, *Lomatium triternatum*, *Lupinus sericeus*, *Oxytropis* spp., *Penstemon confertus*, *Potentilla glandulosa*, and *Potentilla gracilis*.

On drier sites *Festuca idahoensis* and the bunchgrass ecotype of *Pseudoroegneria spicata* dominate with forbs such as *Achillea millefolium*, *Arnica sororia*, *Antennaria microphylla*, *Artemisia ludoviciana*, *Artemisia frigida*, *Erigeron* spp., *Eriogonum* spp., *Gaillardia aristata*, *Galium boreale*, *Geum triflorum*, *Heuchera* spp., *Liatis punctata*, *Lithospermum ruderales*, *Lupinus argenteus*, *Lupinus sericeus*, *Lomatium macrocarpum*, *Penstemon eriantherus*, *Phlox alyssifolia*, *Phlox hoodii*, *Potentilla gracilis*, *Opuntia fragilis*, *Oxytropis* spp., *Pulsatilla patens*, and *Solidago missouriensis*. Other graminoids present within this drier community include *Achnatherum scribneri*, *Achnatherum hymenoides*, *Carex geeyeri*, *Carex filifolia*, *Carex petasata*, *Danthonia intermedia*, *Koeleria macrantha*, and *Poa secunda*. On dry sites with low grazing pressures, *Selaginella densa* and a soil crust of lichens cover almost all open soil between clumps of grasses. *Cladonia* and *Peltigera* spp. are the most common lichens present. Important exotic grasses include *Phleum pratense*, *Bromus inermis*, and *Poa pratensis*.

Higher elevation montane grasslands are also typically dominated by *Festuca idahoensis* and *Pseudoroegneria spicata*. Other typical species include *Achnatherum occidentale*, *Achnatherum richardsonii*, *Calamagrostis rubescens*, *Danthonia intermedia*, *Elymus trachycaulus*, *Leucopoa kingii*, *Leymus innovatus* (= *Elymus innovatus*), *Phleum alpinum*, *Trisetum spicatum*, a variety of *Carices*, such as *Carex hoodii*, *Carex elynoides*, *Carex filifolia*, *Carex geeyeri*, *Carex obtusata*, and *Carex scirpoidea*. Important forbs are *Eriogonum* spp., *Fragaria virginiana*, *Geranium viscosissimum*, *Lupinus argenteus* var. *laxiflorus*, *Lupinus sericeus*, *Oxytropis campestris*, *Phlox pulvinata*, *Potentilla diversifolia*, and *Potentilla flabellifolia*.

Shrub species may be scattered or patchy, including *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus communis*, *Rosa arkansana*, *Rosa nutkana*, *Rosa woodsii*, *Symphoricarpos* spp., and in Wyoming *Artemisia tripartita* ssp. *rupicola*. Several species of *Eriogonum* are also common. *Amelanchier alnifolia*, *Crataegus douglasii*, and *Prunus virginiana* often occur as patches on north-facing slopes of foothills where snow persists longer into the growing season. *Salix bebbiana* copses form a unique shrubland area in Alberta. *Alnus* spp. may occur on avalanche slopes.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** The grasslands, shrub-steppe, shrubland and dwarf-shrublands included in this macrogroup are found in the central Rocky Mountains and Intermountain West regions. They have a broad elevational range and occur as extensive foothill and valley grasslands and shrublands below the lower treeline and on drier sites, particularly south-facing slopes or ridgetops. They are also found at montane elevations along the mountain flanks and large intermountain valleys up into the subalpine zone to near upper treeline, ranging from small meadows to large open parks surrounded by conifers. Depending on latitude, the lower elevation stands occur from 300 to 1650 m (990-5410 feet) and the upper montane to subalpine grassland and shrubland range from 600 to 2011 m (2000-7500 feet) in northern Montana and southwestern Alberta, and up to 2286 to 2682 m (7500-8800 feet) in the mountains of southwestern Montana and Wyoming. These communities occur on gentle to steep-gradient slopes. Sites are highly variable. Grasslands tend to occur on warmer, drier sites, especially at higher elevation. Shrublands and dwarf-shrublands often occur on cooler, more mesic sites than grasslands. The high-elevation stands typically have plentiful snow, along with wind desiccation, in the subalpine-alpine transition. Fire, flooding and erosion all impact the shrubland communities, but they typically will persist on sites for long periods. Avalanches slopes may also occur. These shrubland communities also develop near talus slopes as garlands, at the heads of dry drainages, toeslopes in the moist shrub-steppe and steppe zones, and as smaller patches on dry sites that are marginal for tree growth and that have typically also experienced fire. This macrogroup also includes grasslands from eastern Washington and Oregon commonly known as Palouse Prairie, which is characterized by rolling topography composed of loess hills and plains over basalt plains.

**Climate:** This vegetation reflects a shift in the precipitation regime from summer rain and cold snowy winters found in the Southern Rockies to predominantly dry summers and winter precipitation found in the Central Rockies. Summers are short and winters are cold. Annual precipitation is approximately 20-800 cm, and primarily occurs in the winter as snow or rain. Moisture is stored in the soil and utilized during the dry summers. In the eastern portion of its range in Montana, winter precipitation is replaced by a huge spring peak in precipitation. In the Palouse region the climate has warm-hot, dry summers and cool, wet winters. Annual precipitation is high, 38-76 cm (15-30 inches).

**Soil/substrate/hydrology:** Parent materials include basalt colluvium, loess, lava and tuff, glacial outwash or till, composed of fine silts and clays of moderate depth. Soils are poorly developed, well-drained alluvial or colluvial sands that often have a high percentage of rock fragments; or they may be moderately deep, silt loam or loam with few rock fragments (less than 15% by volume and no rock cover). Some of these sites are occasionally scoured by flash floods or high runoff events. The Palouse Prairie region is characterized by rolling topography composed of loess hills and plains over basalt plains. The soils are typically deep, well-developed, and old. Outside of the Palouse Prairie region, these grasslands occur on young soils derived from recent glacial and alluvial material. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline, often with a microphytic crust.

**Dynamics:** The natural fire regime of this macrogroup is variable. The grasslands tend to have a fire regime with rapid fire return that slows or sets back shrub invasion and maintains a low or patchy shrub distribution. Fire frequency is presumed to be less than 20 years. These are extensive grasslands, though they are similar to grass-dominated patches within the sagebrush shrublands of Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup (M169). Shrubs, and even trees, including *Pinus ponderosa* and *Pseudotsuga menziesii*, may increase following heavy grazing and/or with fire suppression. Shrublands included in this macrogroup have a fire regime with a longer fire-return interval or fire-adapted shrubs such as *Physocarpus malvaceus* that vigorously sprout after burning and may competitively exclude *Pseudotsuga menziesii* seedlings (Johnson and Simon 1987).

On grassy sites, summer overgrazing for two to three years can result in the loss of *Festuca campestris*, which is very grazing-sensitive. Long-term heavy grazing on moister sites can result in a shift to a *Poa pratensis* - *Phleum pratense* type. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris*, tolerates dormant-period grazing well but is sensitive to defoliation during the growing season. Reaction of *Festuca idahoensis* to grazing needs to be documented. Light spring use or fall grazing can help retain plant vigor. Exotic species threatening this macrogroup through invasion and potential complete replacement of native species include *Bromus japonicus*, *Euphorbia esula*, *Phleum pratense*, *Potentilla recta*, and all manner of knapweed, especially *Centaurea biebersteinii* (= *Centaurea maculosa*). In the Palouse Prairie, excessive grazing, past land use and invasion by introduced annual species have resulted in a massive conversion to agriculture or shrub-steppe and annual grasslands dominated by *Artemisia* spp. and *Bromus tectorum* or *Poa pratensis*. Remnant grasslands are now typically associated with steep and rocky sites or small and isolated sites within an agricultural landscape.

### DISTRIBUTION

**Geographic Range:** This macrogroup occurs in the foothills and mountains throughout the Central Rockies and montane Intermountain West regions, from central and eastern Wyoming north and west into British Columbia and Alberta. This includes the "island ranges" of central Montana, though it is not common. It also occurs in the East Cascades, but how far south into the Sierra Nevada is as yet unclear.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

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

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 331A:CC, 331D:CC, 331N:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CP, 342H:CC, 342I:CC, 342J:CC, M242B:CC, M242C:CC, M242D:CC, M261D:PP, M261G:P?, M331A:CC, M331B:CC, M331D:CC, M331E:CP, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341A:PP

#### Omernik Ecoregions:

#### Federal Lands [optional]:

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Low. See Classification Comments section above. This macrogroup has had recent edits and may need to be revisited along with the other northern Rocky Mountain temperate shrublands (M168).

### SYNONYMY

- >< Bittercherry (419) (Shiflet 1994)
- >< Bluebunch Wheatgrass (101) (Shiflet 1994)
- > Bluebunch Wheatgrass - Blue Grama (301) (Shiflet 1994) [Several SRM range types of Northern Rocky Mountains correspond to this group.]
- > Bluebunch Wheatgrass - Sandberg Bluegrass (302) (Shiflet 1994) [Several SRM range types of Northern Rocky Mountains correspond to this group.]
- > Bluebunch Wheatgrass - Western Wheatgrass (303) (Shiflet 1994) [Several SRM range types of Northern Rocky Mountains correspond to this group.]
- ? Bunchgrass Grassland (BCCDC unpubl. data)
- >< Chokecherry - Serviceberry - Rose (421) (Shiflet 1994)
- >< Fescue Grassland (613) (Shiflet 1994) [*Festuca campestris* grasslands are important components of this group.]
- >< Idaho Fescue (102) (Shiflet 1994)
- < Idaho Fescue - Bluebunch Wheatgrass (304) (Shiflet 1994)
- >< Idaho Fescue - Richardson Needlegrass (305) (Shiflet 1994) [This SRM type is described as occurring at "medium to high elevations", which suggests it primarily crosswalks to this group.]
- > Idaho Fescue - Slender Wheatgrass (306) (Shiflet 1994)
- > Idaho Fescue - Threadleaf Sedge (307) (Shiflet 1994)
- > Idaho Fescue - Tufted Hairgrass (308) (Shiflet 1994)
- > Idaho Fescue - Western Wheatgrass (309) (Shiflet 1994)

- < MS Montane Shrub/Grassland Dry Subdivision sites (Ecosystems Working Group 1998)
- > Needle-and-thread - Blue Grama (310) (Shiflet 1994)
- > Rough Fescue - Bluebunch Wheatgrass (311) (Shiflet 1994)
- >> Rough Fescue - Idaho Fescue (312) (Shiflet 1994)
- >> Shrubby Cinquefoil - Rough Fescue (323) (Shiflet 1994)
- >> Tufted Hairgrass - Sedge (313) (Shiflet 1994) [Drier portions of this SRM type overlap with this group.]
- >> no data (BGxh3/01) (Steen and Coupé 1997)
- >> no data (BGxw2/01) (Steen and Coupé 1997)

#### LOWER LEVEL UNITS

##### Groups:

- G267 Central Rocky Mountain Montane Grassland
- G272 Central Rocky Mountain Montane-Foothill Deciduous Shrubland
- G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
- G305 Central Rocky Mountain High Montane Mesic Shrubland

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

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

**Acknowledgments:** Todd Keeler-Wolf and Julie Evens for review of draft macrogroup.

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** KAS 10-14

#### REFERENCES

**References:** Achuff et al. 1997, BCCDC unpubl. data, Butler 1979, Butler 1985, Cooper et al. 1995, Daubenmire 1970, Daubenmire 1988, Ecosystems Working Group 1998, FEIS 2000, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Hall 1973, Jankovsky-Jones et al. 2001, Johnson 2004, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Johnson and Simon 1987, Knight 1994, Kovalchik 1987, Lea et al 1985, Lloyd et al. 1990, Malanson and Butler 1984, McLean 1969, Mueggler and Stewart 1980, Natural Regions Committee 2006, Nicholson et al. 1982, Nicholson et al. 1991, Poulton 1955, Shiflet 1994, Steen and Coupé 1997, Tisdale 1947, Tisdale 1982, Tisdale 1986, Tisdale and Bramble-Brodahl 1983, van Ryswyk et al. 1966

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2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

M048. Central Rocky Mountain Montane-Foothill Grassland & Shrubland

### G267. Central Rocky Mountain Montane Grassland

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Leymus innovatus* - *Festuca idahoensis* - *Leucopoa kingii* Grassland Group

**Common Name (Translated Scientific Name):** Downy Ryegrass - Idaho Fescue - Spike Fescue Grassland Group

**Type Concept:** This is an upper montane to subalpine grassland group dominated by perennial grasses and forbs on dry sites (in the context of the Northern Rocky Mountains and Cascades), particularly south-facing slopes or ridgetops. It is most extensive in the Canadian Rockies portion of the Rocky Mountain cordillera, extending south into western Montana, northern Wyoming, eastern Oregon, eastern Washington, and Idaho. Subalpine dry grasslands are small meadows to large open parks surrounded by conifer trees but lack tree cover within them. In general, soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. Although these grasslands are composed primarily of tussock-forming species, they do exhibit a dense sod that makes root penetration difficult for tree species. Disturbance such as fire also plays a role in maintaining these open grassy areas. Typical dominant species include *Leymus innovatus* (= *Elymus innovatus*), *Koeleria macrantha*, *Festuca idahoensis*, *Pseudoroegneria spicata*, *Danthonia intermedia*, *Achnatherum occidentale* (= *Stipa occidentalis*), *Achnatherum richardsonii* (= *Stipa richardsonii*), *Elymus trachycaulus*, *Leucopoa kingii*, *Phleum alpinum*, *Trisetum spicatum*, and a variety of Carices, such as *Carex hoodii*, *Carex obtusata*, and *Carex scirpoidea*. Important forbs include *Lupinus argenteus* var. *laxiflorus*, *Potentilla diversifolia*, *Potentilla flabellifolia*, *Fragaria virginiana*, and *Chamerion angustifolium* (= *Epilobium angustifolium*). This group is similar to Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group (G273) but is found at higher elevations and is more often composed of species of *Festuca*, *Achnatherum*, and/or *Hesperostipa* with additional floristic components of more subalpine taxa. It is also similar to the Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow Group (G271), differing by occurring in drier settings and being predominantly grasslands rather than forby and grassy mesic meadows. Occurrences of this group are often more forb-rich than Southern Rocky Mountain Montane-Subalpine Grassland Group (G268), which tends to be drier.

**Classification Comments:** For now, this group is kept as a separate unit, but it is possible it should be merged with Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow Group (G271). Another possibility is to consider this "grassland" group to contain what people refer to as "mesic grassy meadows," and the mesic herbaceous meadow group to contain predominantly forb meadows and tall forblands which in many cases are more seasonally wet than mesic. In addition, the Rockies and Cascades support a number of forb types found on talus and rocky scree slopes, which are not sparsely vegetated, and which often have little to no grass component, though Carices may be abundant. These types often have heavy snow loading in winter, or are adjacent to snow fields, and sub-surface moisture below the rocks/scree is significant throughout the growing season. These forb types are poorly documented, and their group placement presently is in Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow Group (G271).

**Internal Comments:** MSR 11-12: not in CA; one association is CA? & is doubtful occurs (FEID-Eriogonum caespitosum); association may need to be split, but not until I know if it's in CA. mjr 10-12: CA? added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
- G271 Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow
- G268 Southern Rocky Mountain Montane-Subalpine Grassland

**Diagnostic Characteristics:** This meadow group is dominated by graminoids, typically forming 70 to 80% cover. Bunch grasses are the major lifeform, and the important taxa include *Leymus innovatus*, *Koeleria macrantha*, *Festuca idahoensis*, *Achnatherum occidentale*, *Achnatherum richardsonii*, *Elymus trachycaulus*, and a variety of sedges such as *Carex hoodii*, *Carex obtusata*, and *Carex scirpoidea*.

#### VEGETATION

**Physiognomy and Structure:** Structurally simple grasslands dominated by perennial bunch grasses and forbs on relatively dry sites.

**Floristics:** Typical dominant species include *Leymus innovatus* (= *Elymus innovatus*), *Koeleria macrantha*, *Festuca idahoensis*, *Pseudoroegneria spicata*, *Danthonia intermedia*, *Achnatherum occidentale* (= *Stipa occidentalis*), *Achnatherum richardsonii* (= *Stipa richardsonii*), *Elymus trachycaulus*, *Leucopoa kingii*, *Phleum alpinum*, *Trisetum spicatum*, and a variety of Carices, such as *Carex hoodii*, *Carex elynoides*, *Carex filifolia*, *Carex geyeri*, *Carex obtusata*, and *Carex scirpoidea*. Important forbs include *Geranium viscosissimum*, *Lupinus argenteus* var. *laxiflorus*, *Lupinus sericeus*, *Phlox pulvinata*, *Potentilla diversifolia*, *Potentilla flabellifolia*, *Oxytropis campestris*, *Eriogonum* spp., *Fragaria virginiana*, and *Chamerion angustifolium* (= *Epilobium angustifolium*). Grasslands dominated by *Calamagrostis rubescens* are also in this group.

G267 Central Rocky Mountain Montane Grassland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Carex hoodii</i> - <i>Festuca idahoensis</i> Herbaceous Vegetation	G2/S2	CEGL001595

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This is an upper montane to subalpine grassland group dominated by perennial grasses and forbs on dry sites (in the context of the Northern Rocky Mountains and Cascades), particularly south-facing slopes or ridgetops. Many occurrences are small patch in spatial character, and are often found in mosaics with woodlands, more dense shrublands, or just below alpine communities. Elevations range from 600 to 2011 m (2000-7500 feet) in the Northern Rocky Mountains and up to 2286 to 2682 m (7500-8800 feet) in the mountains of southwestern Montana and Wyoming. These communities occur on gentle to moderate-gradient slopes, although occasionally on steep slopes. Soils are typically seasonally moist in the spring, but dry out later in the growing season. In general, soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. Although these grasslands are composed primarily of tussock-forming species (bunch grasses), they do exhibit a dense sod that makes root penetration difficult for tree species.

**Dynamics:** Disturbance such as fire plays a role in maintaining these open grassy areas in predominantly forested landscapes.

#### DISTRIBUTION

**Geographic Range:** This group is most extensive in the Canadian Rockies portion of the Rocky Mountain cordillera, extending south into western Montana, northwestern Wyoming, central and eastern Oregon, eastern Washington, and Idaho. It also occurs in the "island ranges" of central Montana, though it is not common, and is also found in the Bighorn Range of north-central Wyoming. A couple of associations in this group also occur in Colorado.

**Nations:** CA, US

**States/Provinces:** AB, BC, CO, ID, MT, OR, WA, WY

**TNC Ecoregions [optional]:** 3:P, 4:P, 7:C, 8:C, 9:C, 26:C, 68:C

**USFS Ecoregions (2007):** 331A:??, 341G:CC, 342A:CP, 342C:CC, 342D:CC, 342H:CC, 342I:C?, 342J:CC, M242B:C?, M242C:CP, M242D:CC, M331A:PP, M331B:PP, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Low.

#### SYNONYMY

- >< Idaho Fescue - Bluebunch Wheatgrass (304) (Shiflet 1994)
- >< Idaho Fescue - Richardson Needlegrass (305) (Shiflet 1994) [This SRM type is described as occurring at "medium to high elevations", which suggests it primarily crosswalks to this group.]
- > Idaho Fescue - Slender Wheatgrass (306) (Shiflet 1994)
- > Idaho Fescue - Threadleaf Sedge (307) (Shiflet 1994)
- > Idaho Fescue - Tufted Hairgrass (308) (Shiflet 1994)
- >< Rough Fescue - Idaho Fescue (312) (Shiflet 1994)
- >< Tufted Hairgrass - Sedge (313) (Shiflet 1994) [Drier portions of this SRM type overlap with this group.]

#### LOWER LEVEL UNITS

##### Alliances:

- A3966 *Festuca idahoensis* - *Calamagrostis rubescens* - *Achnatherum nelsonii* Central Rocky Mountain Montane Mesic Grassland Alliance
- A3965 *Festuca idahoensis* - *Carex scirpoidea* - *Danthonia intermedia* Central Rocky Mountain Subalpine Dry Grassland Alliance
- A1323 *Leucopoa kingii* - *Carex elynoides* - *Phlox pulvinata* Central Rocky Mountain Upper Subalpine - Alpine Grassland Alliance

#### AUTHORSHIP

**Primary Concept Source:** W.F. Mueggler and W.L. Stewart (1980)

**Author of Description:** M.S. Reid

**Acknowledgments:**

**Version Date:** 2012/07/20

#### REFERENCES

**References:** Cooper et al. 1995, Faber-Langendoen et al. 2015, Johnson 2004, Mueggler and Stewart 1980, Shiflet 1994

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2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

M048. Central Rocky Mountain Montane-Foothill Grassland & Shrubland

## G272. Central Rocky Mountain Montane-Foothill Deciduous Shrubland

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Amelanchier alnifolia* - *Symphoricarpos* spp. - *Rhus glabra* Central Rocky Mountain Shrubland Group

**Common Name (Translated Scientific Name):** Saskatoon Serviceberry - Snowberry species - Smooth Sumac Central Rocky Mountain Shrubland Group

**Type Concept:** This shrubland group is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Northern Rockies. The most common dominant shrubs are *Amelanchier alnifolia*, *Holodiscus discolor*, *Physocarpus malvaceus*, *Prunus emarginata*, *Prunus virginiana*, *Rhus glabra*, *Rosa nutkana*, *Rosa woodsii*, *Symphoricarpos albus*, and *Symphoricarpos oreophilus*, occurring alone or any combination. Stands in central and eastern Wyoming can include *Artemisia tridentata* ssp. *vaseyana* and *Cercocarpus montanus*, but neither of these species are dominant, and where they occur the stands are truly mixes of shrubs, often with *Amelanchier alnifolia*, *Prunus virginiana*, and others being the predominant taxa. *Aristida purpurea*, *Calamagrostis rubescens*, *Carex geyeri*, *Deschampsia caespitosa*, *Festuca campestris*, *Festuca idahoensis*, *Koeleria macrantha*, *Poa secunda*, and *Pseudoroegneria spicata* are the most important grasses. *Achnatherum thurberianum* and *Leymus cinereus* can be locally important. *Bromus tectorum* and *Phleum pratense* are common introduced grasses. *Balsamorhiza sagittata*, *Geum triflorum*, *Lomatium triternatum*, *Oenanthe sarmentosa*, *Potentilla gracilis*, *Xerophyllum tenax*, and species of *Eriogonum*, *Phlox*, and *Erigeron*

are important forbs. These shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands. They also occur in the ponderosa pine and Douglas-fir zones, but rarely up into the subalpine zone, where they are restricted to dry sites. The shrublands are usually found on steep slopes of canyons and in areas with some soil development, either loess deposits or volcanic clays; they occur on all aspects. Fire, flooding and erosion all impact these shrublands, but they typically will persist on sites for long periods. These communities also develop near talus slopes as garlands, at the heads of dry drainages, and toeslopes in the moist shrub-steppe and steppe zones.

**Classification Comments:** This group needs review from Northern Rockies ecologists. Its transition to Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland Group (G276) will need to be further clarified, but there are definitely distinct floristics separating the two groups. In addition, the southern Rocky Mountain group tends to be drier than this group.

**Internal Comments:** mjr 10-12: CA? added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G276 Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland
- G277 Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland

**Diagnostic Characteristics:** Shrublands found in lower montane or foothill settings of the northern Rocky Mountains, typically in dry and warm settings.

### VEGETATION

**Physiognomy and Structure:** These are variable shrublands composed of broad-leaved, cold-deciduous taxa, generally between 1 and 3 m in height. Shrub density will vary with substrate, fire and grazing history, and moisture, but these are rarely dense "thickets." They are typically found in small patches within the lower montane zone of Douglas-fir or ponderosa woodlands, or in a mosaic with sage shrub-steppe or valley grasslands. Grasses and forbs are the herbaceous component and can be abundant to sparse.

**Floristics:** The most common dominant shrubs are *Amelanchier alnifolia*, *Holodiscus discolor*, *Physocarpus malvaceus*, *Prunus emarginata*, *Prunus virginiana*, *Rhus glabra*, *Rosa nutkana*, *Rosa woodsii*, *Symphoricarpos albus*, and *Symphoricarpos oreophilus* occurring alone or any combination. Occurrences in central and eastern Wyoming can include *Artemisia tridentata ssp. vaseyana* and *Cercocarpus montanus*, but neither of these species are dominant, and where they occur the stands are truly mixes of shrubs, often with *Amelanchier alnifolia*, *Prunus virginiana*, and others being the predominant taxa. The open to moderately dense herbaceous layer is dominated by bunchgrasses, especially *Festuca idahoensis* and *Pseudoroegneria spicata*. *Aristida purpurea*, *Festuca campestris*, *Calamagrostis rubescens*, *Carex geyeri*, *Deschampsia caespitosa*, *Koeleria macrantha*, and *Poa secunda* are other important grasses. *Achnatherum thurberianum* and *Leymus cinereus* can be locally important. *Bromus tectorum* and *Phleum pratense* are common introduced grasses. Important forbs are *Balsamorhiza sagittata*, *Geum triflorum*, *Lomatium triternatum*, *Oenanthe sarmentosa*, *Potentilla gracilis*, *Xerophyllum tenax* and species of *Eriogonum*, *Phlox*, and *Erigeron*.

G272 Central Rocky Mountain Montane-Foothill Deciduous Shrubland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Amelanchier alnifolia</i> / <i>Xerophyllum tenax</i> Herbaceous Vegetation	GNRQ/SNR	CEGL001066
<i>Celtis laevigata</i> var. <i>reticulata</i> / <i>Pseudoroegneria spicata</i> Woodland	G2G3/S1	CEGL001085
<i>Physocarpus malvaceus</i> - <i>Symphoricarpos albus</i> Shrubland	G3/SNA	CEGL001171
<i>Rhus glabra</i> / <i>Aristida purpurea</i> var. <i>longiseta</i> Shrub Herbaceous Vegetation	G1/S1	CEGL001507
<i>Rhus glabra</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	G2/S1	CEGL001122
<i>Symphoricarpos albus</i> - <i>Rosa nutkana</i> Shrubland	G3/S1	CEGL001130

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This small-patch shrubland group is found in foothill and lower montane sites around the Columbia Basin and Northern Rockies and extends into the northwestern Great Plains at elevations of 500-2500 m depending on latitude. These shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands. They also occur in the ponderosa pine and Douglas-fir zones, but rarely up into the subalpine zone, where they are restricted to dry sites. The shrublands are usually found on steep slopes of canyons and in areas with some soil development, either loess deposits or volcanic clays; they occur on all aspects. Fire, flooding and erosion all impact these shrublands, but they typically will persist on sites for long periods. These communities also develop near talus slopes as garlands, at the heads of dry drainages, and toeslopes in the moist shrub-steppe and steppe zones.

**Dynamics:****DISTRIBUTION**

**Geographic Range:** This group is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the Northern Rockies, including east into central Montana around the "Sky Island" ranges. It also occurs farther south into central and eastern Wyoming, where it forms compositionally diverse shrublands. They also extend north into Alberta along the foothills of the Front Range.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 3:?, 4:?, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 26:C, 68:C

**USFS Ecoregions (2007):** 331A:CC, 331D:CP, 331N:CC, 341G:PP, 342A:CP, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:PP, M261G:P?, M331A:CC, M331B:CC, M331D:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341A:PP

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

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

**SYNONYMY**

- >< Bittercherry (419) (Shiflet 1994)
- >< Chokecherry - Serviceberry - Rose (421) (Shiflet 1994)
- < MS Montane Shrub/Grassland Dry Subdivision sites (Ecosystems Working Group 1998)

**LOWER LEVEL UNITS****Alliances:**

- A3963 *Amelanchier alnifolia* Central Rocky Mountain Montane-Foothill Shrubland Alliance
- A3964 *Rhus glabra* - *Rhus trilobata* Central Rocky Mountain Montane-Foothill Shrubland Alliance
- A3975 *Physocarpus malvaceus* - *Symphoricarpos albus* Mesic Shrubland Alliance
- A3967 *Rosa nutkana* Shrubland Alliance

**AUTHORSHIP**

**Primary Concept Source:** E.W. Tisdale (1986)

**Author of Description:** M.S. Reid, mod. K.A. Schulz

**Acknowledgments:**

**Version Date:** 2015/05/20

**REFERENCES**

**References:** Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Knight 1994, Mueggler and Stewart 1980, Poulton 1955, Shiflet 1994, Tisdale 1986

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

M048. Central Rocky Mountain Montane-Foothill Grassland & Shrubland

**G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland**

**Type Concept Sentence:**

**OVERVIEW**

**Scientific Name:** *Festuca campestris* - *Festuca idahoensis* - *Pseudoroegneria spicata* Central Rocky Mountain Foothill Grassland Group

**Common Name (Translated Scientific Name):** Rough Fescue - Idaho Fescue - Bluebunch Wheatgrass Central Rocky Mountain Foothill Grassland Group

**Type Concept:** These grasslands of the Northern Rocky Mountains are found at lower montane to foothill elevations in the mountains and large valleys of northwestern Wyoming and western Montana, west through Idaho into the Blue Mountains of Oregon, and north into the Okanagan and Fraser plateaus of British Columbia and the Canadian Rockies. They also occur to the east in the central Montana mountain "islands" foothills, as well as the Rocky Mountain Front and Big and Little Belt ranges. They also extend along the eastern slopes of the Alberta Rockies. This group also includes grasslands commonly known as "Palouse Prairie." These northern lower montane and valley grasslands represent a shift in the precipitation regime from summer monsoons and cold



snowy winters found in the Southern Rockies to predominantly dry summers and winter precipitation. The Palouse region is characterized by rolling topography composed of loess hills and plains over basalt plains. The climate of this region has warm-hot, dry summers and cool, wet winters. Annual precipitation is high, 38-76 cm (15-30 inches). The soils are typically deep, well-developed, and old.

Outside of the Palouse Prairie region, these grasslands are influenced by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. In the eastern portion of its range in Montana, winter precipitation is replaced by a huge spring peak in precipitation. Elevations range from 300 to 1650 m, ranging from small meadows to large open parks surrounded by conifers in the lower montane, to extensive foothill and valley grasslands below the lower treeline. Many of these valleys may have been primarily sage-steppe with patches of grassland in the past, but because of land-use history post-settlement (herbicide, grazing, fire suppression, pasturing, etc.), they have been converted to grassland-dominated areas. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline, often with a microphytic crust.

In Alberta, this group occurs along the lower and eastern flanks of the Foothills Geologic Belt, primarily in the Foothills Fescue Grassland and Foothills Parkland Natural subregions. Glaciation and bedrock topography in combination result in a complex physiography from sloping lower foothills to hummocky to rolling uplands, mainly on glacial till, with significant lacustrine materials in valleys. Elevation ranges from 500 to 1525 m. At upper elevations, stands may be small-patch grasslands on southern slopes between *Populus tremuloides* woodlands or *Salix bebbiana* shrublands becoming quite extensive on moister sites at lower elevation. Soils are deep, usually Black Chernozems.

The most important species are cool-season perennial bunchgrasses and forbs (>25% cover), sometimes with a sparse (<10% cover) shrub layer. *Festuca campestris* and *Festuca idahoensis* are dominants, and *Pseudoroegneria spicata* occurs as a codominant, as well as a diversity of other native grasses. To the north, *Danthonia parryi* becomes codominant. Forb diversity is typically high in both mesic and dry aspects of this group. A soil crust of lichen covers almost all open soil between clumps of grasses; *Cladonia* and *Peltigera* species are the most common lichens. Unvegetated mineral soil is commonly found between clumps of grass and the lichen cover. *Festuca campestris* is easily eliminated by grazing and does not occur in all areas of this group.

**Classification Comments:** This is the same as the Interior Plateau Grassland also called "Northern Plateau Grassland" of the Okanagan Ecoregional Plan. In Wyoming, this is distinguished from northwestern Great Plains mixedgrass prairies by the presence of *Festuca idahoensis* or *Carex rossii*, the lack of *Bouteloua gracilis* (which is common in mixedgrass prairie), or the presence of *Artemisia nova* or *Artemisia tripartita ssp. rupicola*, neither of which occur in mixedgrass prairie. This group is also similar to Central Rocky Mountain Montane Grassland Group (G267) in that some of the dominant grasses are shared between the lower and higher elevation grasslands, but the associated forbs shift, as do some of the other graminoid taxa.

**Internal Comments:** mjr 10-12: CA added based on member association distribution. MSR 3-10: An outlier of this group is found in se WY in the Laramie basin foothills (west of Laramie) and includes *Muhlenbergia filiculmis*, but it seems to be more similar to this group than the SRM Montane-subalpine grassland. Edges of Wind Rivers, eastern Bighorn foothills, edges of Ferris Mountains.

**Other Comments:**

#### Similar NVC Types:

- G267 Central Rocky Mountain Montane Grassland
- G271 Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow
- G331 Northern Great Plains Dry Mixedgrass Prairie
- G332 Northern Great Plains Rough Fescue Prairie
- G141 Northern Great Plains Mixedgrass Prairie
- G311 Intermountain Semi-Desert Grassland

**Diagnostic Characteristics:** Herbaceous communities dominated by cool-season bunch grasses, found in the lower montane and foothill zones of the Northern Rocky Mountains and in the inter-montane valleys. These are typically extensive grasslands, not grass-dominated patches within the sagebrush shrub-steppe group. *Festuca campestris*, *Pseudoroegneria spicata*, and *Festuca idahoensis* are the major grasses, although a number of other species occur, including *Hesperostipa comata*, *Achnatherum hymenoides*, *Achnatherum occidentale*, *Achnatherum richardsonii*, *Achnatherum scribneri*, *Danthonia* species, *Elymus lanceolatus*, *Leymus condensatus*, *Leymus cinereus*, *Koeleria macrantha*, *Pascopyrum smithii*, or *Poa secunda*.

#### VEGETATION

**Physiognomy and Structure:** Herbaceous communities dominated by cool-season bunch grasses, generally less than 1 m in height, and often dense in cover. Forb diversity is typically high in both mesic and dry aspects of this group. On slightly more mesic or protected sites (north slopes, toeslopes, swales), scattered or even dense patches of deciduous, broadleaf shrubs can occur (when the patches are large enough they can form associations that are included in one of the shrubland groups). A soil crust of lichen covers almost all open soil between clumps of grasses; *Cladonia* and *Peltigera* species are the most common lichens. Unvegetated mineral soil is commonly found between clumps of grass and the lichen cover.

**Floristics:** On pristine moist sites, *Festuca campestris* can form a nearly continuous cover and is interspersed with *Festuca idahoensis* and the rhizomatous ecotype of *Pseudoroegneria spicata*. *Danthonia parryi* becomes codominant moving north into the Alberta foothills. Other graminoids include *Achnatherum occidentale*, *Achnatherum richardsonii*, *Danthonia* spp., *Koeleria macrantha*, *Poa secunda*, *Pascopyrum smithii*, *Elymus lanceolatus*, and *Leymus cinereus*. These moister sites support a forb-rich community that includes species such as *Balsamorhiza sagittata*, *Achillea millefolium*, *Lupinus sericeus*, *Geranium viscosissimum*, *Lomatium triternatum*, *Potentilla glandulosa*, *Potentilla gracilis*, *Penstemon confertus*, *Delphinium bicolor*, *Oxytropis* spp., *Gentiana affinis*, *Fragaria virginiana*, and *Castilleja* spp. Endemic rare species such as *Silene spaldingii* inhabit the moister aspects of this group.

On drier sites dominated by *Festuca idahoensis* and the bunchgrass ecotype of *Pseudoroegneria spicata*, common forbs include *Achillea millefolium*, *Gaillardia aristata*, *Galium boreale*, *Geum triflorum*, *Arnica sororia*, *Antennaria microphylla*, *Potentilla gracilis*, *Lupinus argenteus*, *Lupinus sericeus*, *Lomatium macrocarpum*, *Phlox alyssifolia*, *Phlox hoodii*, *Liatris punctata*, *Lithospermum ruderales*, *Eriogonum* spp., *Penstemon eriantherus*, *Solidago missouriensis*, *Oxytropis* spp., *Heuchera* spp., *Pulsatilla patens*, *Opuntia fragilis*, *Artemisia ludoviciana*, *Artemisia frigida*, and *Erigeron* spp. Endemic species in the northwestern Great Plains, such as *Douglasia montana*, *Penstemon nitidus*, and *Penstemon albertinus*, are common in the drier, rocky sites of this group. Other graminoids present within this drier community include *Achnatherum scribneri*, *Achnatherum hymenoides*, *Danthonia intermedia*, *Koeleria macrantha*, *Poa secunda*, *Carex geyeri*, *Carex filifolia*, and *Carex petasata*. On pristine sites, *Selaginella densa* and a soil crust of lichen covers almost all open soil between clumps of grasses. *Cladonia* and *Peltigera* spp. are the most common lichens present. Important exotic grasses include *Phleum pratense*, *Bromus inermis*, and *Poa pratensis*.

Shrub species may be scattered or patchy, including *Dasiphora fruticosa* ssp. *floribunda*, *Rosa nutkana*, *Rosa woodsii*, *Rosa arkansana*, *Arctostaphylos uva-ursi*, *Symphoricarpos* spp., *Artemisia tridentata*, *Juniperus communis*, and in Wyoming *Artemisia tripartita* ssp. *rupicola*. Several species of *Eriogonum* are also common. *Amelanchier alnifolia*, *Crataegus douglasii*, and *Prunus virginiana* often occur as patches on north-facing slopes of foothills where snow persists longer into the growing season. *Salix bebbiana* copses form a unique groveland area in Alberta.

G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>(Balsamorhiza serrata) - Poa secunda</i> Herbaceous Vegetation	G2/SNA	CEGL001782
<i>Achnatherum hymenoides - Psoralidium lanceolatum</i> Herbaceous Vegetation	GNR/SNR	TBD (Hallock et al. 2007)
<i>Corispermum</i> spp. Herbaceous Vegetation	GNR/SNR	TBD (Hallock et al. 2007)
<i>Elymus lanceolatus - Hesperostipa comata</i> Herbaceous Vegetation	G1/S1	CEGL001746
<i>Ericameria nauseosa – Chrysothamnus viscidiflorus – Eriogonum niveum</i> Herbaceous Vegetation	GNR/SNR	TBD (Hallock et al. 2007)
<i>Festuca campestris - (Festuca idahoensis) - Achnatherum richardsonii</i> Herbaceous Vegetation	G2G3/SNR	CEGL005869
<i>Festuca campestris - Festuca idahoensis - Geranium viscosissimum</i> Herbaceous Vegetation	G3?/SNR	CEGL005870
<i>Festuca campestris - Festuca idahoensis</i> Herbaceous Vegetation	G3/S1	CEGL005875
<i>Festuca idahoensis - Eriogonum heracleoides</i> Herbaceous Vegetation	G2/S2	CEGL001616
<i>Festuca idahoensis - Hieracium cynoglossoides</i> Herbaceous Vegetation	G1G2/S1	CEGL001619
<i>Festuca idahoensis - Koeleria macrantha</i> Herbaceous Vegetation	G3Q/S1	CEGL001620
<i>Festuca idahoensis - Pseudoroegneria spicata</i> Herbaceous Vegetation	G4/S2	CEGL001624
<i>Festuca idahoensis - Symphoricarpos albus</i> Herbaceous Vegetation	G1/S1	CEGL001509
<i>Hesperostipa comata - Poa secunda</i> Herbaceous Vegetation	G1/S1	CEGL001704
<i>Hesperostipa comata</i> Herbaceous Vegetation	GNR/SNR	TBD (Hallock et al. 2007)
<i>Leymus flavescens</i> Herbaceous Vegetation	G2/SNR	CEGL001563
<i>Lomatium cous - Poa secunda</i> Herbaceous Vegetation	G4/SNA	CEGL001790
<i>Pseudoroegneria spicata - Festuca idahoensis</i> Palouse Herbaceous Vegetation	G1G2/S1	CEGL001670
<i>Pseudoroegneria spicata - Poa secunda</i> Herbaceous Vegetation	G4?/S2	CEGL001677
<i>Rosa nutkana - Festuca idahoensis</i> Herbaceous Vegetation	G1G2Q/S1	CEGL001626
<i>Rumex venosus</i> Herbaceous Vegetation	GNR/SNR	TBD (Hallock et al. 2007)

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** These grasslands of the Northern Rocky Mountains are found at lower montane to foothill elevations along the mountain flanks, in the mountains and in large intermountain valleys. This group also includes grasslands commonly

known as Palouse Prairie. These northern lower montane and valley grasslands reflect a shift in the precipitation regime from summer monsoons and cold snowy winters found in the Southern Rockies to predominantly dry, cool summers and winter precipitation. The Palouse region is characterized by rolling topography composed of loess hills and plains over basalt plains. The climate of this region has warm-hot, dry summers and cool, wet winters. Annual precipitation is high, 38-76 cm (15-30 inches). The soils are typically deep, well-developed, and old. Outside of the Palouse Prairie region, these grasslands are influenced by shorter cooler summers, colder winters, and young soils derived from recent glacial and alluvial material. In the eastern portion of its range in Montana, winter precipitation is replaced by a huge spring peak in precipitation. Elevations range from 300 to 1650 m, ranging from small meadows to large open parks surrounded by conifers in the lower montane, to extensive foothill and valley grasslands below the lower treeline.

**Climate:** These northern lower montane and valley grasslands reflect a shift in the precipitation regime from summer monsoons and cold snowy winters found in the southern Rockies to predominantly dry summers and winter precipitation. In the Palouse region the climate has warm-hot, dry summers and cool, wet winters. Annual precipitation is high, 38-76 cm (15-30 inches). Outside of the Palouse Prairie region, these grasslands are influenced by shorter summers and colder winters. In the eastern portion of its range in Montana, winter precipitation is replaced by a huge spring peak in precipitation. **Soil/substrate/hydrology:** The Palouse region is characterized by rolling topography composed of loess hills and plains over basalt plains. The soils are typically deep, well-developed, and old. Outside of the Palouse Prairie region, these grasslands occur on young soils derived from recent glacial and alluvial material. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline, often with a microphytic crust.

**Dynamics:** The natural fire regime of this group likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. The fire regime of this group maintains a grassland due to rapid fire return that retards shrub invasion or landscape isolation and fragmentation that limits seed dispersal of native shrub species. Fire frequency is presumed to be less than 20 years. These are extensive grasslands, not grass-dominated patches within the sagebrush shrub steppe group. Shrubs may increase following heavy grazing and/or with fire suppression. Microphytic crust is very important in this group. Summer overgrazing for 2 to 3 years can result in the loss of *Festuca campestris*, which is very grazing sensitive. Long-term heavy grazing on moister sites can result in a shift to a *Poa pratensis* - *Phleum pratense* type. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris*, tolerates dormant-period grazing well but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. Exotic species threatening this group through invasion and potential complete replacement of native species include *Bromus japonicus*, *Potentilla recta*, *Euphorbia esula*, and all manner of knapweed, especially *Centaurea biebersteinii* (= *Centaurea maculosa*). In the Palouse Prairie, excessive grazing, past land use and invasion by introduced annual species have resulted in a massive conversion to agriculture or shrub-steppe and annual grasslands dominated by *Artemisia* spp. and *Bromus tectorum* or *Poa pratensis*. Remnant grasslands are now typically associated with steep and rocky sites or small and isolated sites within an agricultural landscape.

#### DISTRIBUTION

**Geographic Range:** This lower montane, foothill and valley grassland group occurs throughout the southern interior and southern portion of the Fraser Plateau, as well as the valleys around the Fraser River in the Pavilion Ranges, the Nicola River and the Similkameen River in British Columbia. It includes high-elevation grasslands along the eastern mountain slopes down to rolling valleys in Alberta. It also occurs in the mountains and large valleys of northwestern Wyoming and western Montana, east to the central Montana Rocky Mountain Front and mountain "island" ranges, west through Idaho into the Blue Mountains of Oregon, and central Washington.

**Nations:** CA, US

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

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

**USFS Ecoregions (2007):** 331A:CC, 331D:CC, 331N:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CP, 342F:CP, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M331A:CP, M331B:CC, M331D:CP, M331J:CP, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CP, M333C:CC, M333D:CP, M341A:C?

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

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

#### SYNONYMY

- ? BS Bunchgrass Grassland (BCCDC unpubl. data)
- >< Bluebunch Wheatgrass (101) (Shiflet 1994)
- > Bluebunch Wheatgrass - Blue Grama (301) (Shiflet 1994) [Several SRM range types of Northern Rocky Mountains correspond to this group.]

#### WA groups

- > Bluebunch Wheatgrass - Sandberg Bluegrass (302) (Shiflet 1994) [Several SRM range types of Northern Rocky Mountains correspond to this group.]
- > Bluebunch Wheatgrass - Western Wheatgrass (303) (Shiflet 1994) [Several SRM range types of Northern Rocky Mountains correspond to this group.]
- >> Fescue Grassland (613) (Shiflet 1994) [Festuca campestris grasslands are important components of this group.]
- >> Idaho Fescue (102) (Shiflet 1994)
- < Idaho Fescue - Bluebunch Wheatgrass (304) (Shiflet 1994)
- >> Idaho Fescue - Richardson Needlegrass (305) (Shiflet 1994)
- > Idaho Fescue - Western Wheatgrass (309) (Shiflet 1994)
- > Needle-and-thread - Blue Grama (310) (Shiflet 1994)
- > Rough Fescue - Bluebunch Wheatgrass (311) (Shiflet 1994)
- >> Rough Fescue - Idaho Fescue (312) (Shiflet 1994)
- >> Shrubby Cinquefoil - Rough Fescue (323) (Shiflet 1994)
- >> no data (BGxh3/01) (Steen and Coupé 1997)
- >> no data (BGxw2/01) (Steen and Coupé 1997)

#### LOWER LEVEL UNITS

##### Alliances:

- A3985 *Elymus lanceolatus* - *Hesperostipa comata* - *Phacelia hastata* Central Rocky Mountain Sand Deposit Grassland Alliance
- A3987 *Festuca idahoensis* - *Pseudoroegneria spicata* - *Poa secunda* Dry Grassland Alliance
- A3989 *Festuca idahoensis* - *Pseudoroegneria spicata* Palouse Grassland Alliance
- A3988 *Festuca idahoensis* - *Pseudoroegneria spicata* - *Pascopyrum smithii* Mesic Grassland Alliance
- A4095 *Arctostaphylos uva-ursi* / *Festuca* spp. - *Pseudoroegneria spicata* Dwarf-shrub Herbaceous Alliance
- A3986 *Festuca campestris* - *Festuca idahoensis* Mesic Grassland Alliance
- A4096 *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* - *Festuca idahoensis* Shrub Herbaceous Alliance

#### AUTHORSHIP

**Primary Concept Source:** E.W. Tisdale (1982)

**Author of Description:** M.S. Reid, mod. L. Allen

**Acknowledgments:**

**Version Date:** 2013/09/25

#### REFERENCES

**References:** BCCDC unpubl. data, Daubenmire 1988, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Mueggler and Stewart 1980, Natural Regions Committee 2006, Shiflet 1994, Steen and Coupé 1997, Tisdale 1982

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2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

M048. Central Rocky Mountain Montane-Foothill Grassland & Shrubland

### G305. Central Rocky Mountain High Montane Mesic Shrubland

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Vaccinium* spp. - *Menziesia ferruginea* / *Xerophyllum tenax* Central Rocky Mountain-Vancouverian Mesic Shrubland Group

**Common Name (Translated Scientific Name):** Blueberry species - Rusty Menziesia / Common Beargrass Central Rocky Mountain-Vancouverian Mesic Shrubland Group

**Type Concept:** This shrubland group is found within the zone of continuous forest in the upper montane and subalpine zones of the northern Rocky Mountains, from Wyoming north and west into British Columbia and Alberta. It is composed of a diverse mix of deciduous shrubs. Soils tend to be moist, but will typically dry out in late spring or summer. Stands are typically initiated by fires and will persist on sites for long periods because of repeated burns and changes in the presence of volatile oils in the soil which impedes tree regeneration. It also occurs as smaller patches of shrubland on dry sites that are marginal for tree growth and that have typically also experienced fire. Sites often are ridgetops and upper to middle mountain slopes and more commonly on sunny southern aspects. Vegetation is mostly deciduous broadleaf shrubs, sometimes mixed with shrub-statured trees or sparse evergreen needleleaf trees and *Populus tremuloides*. Common species include *Acer glabrum*, *Menziesia ferruginea*, *Ribes lacustre*, *Rubus parviflorus*, *Spiraea betulifolia*, *Spiraea splendens*, *Vaccinium caespitosum*, *Vaccinium myrtillus*, *Vaccinium scoparium*, and *Vaccinium membranaceum*, occurring alone or in any combination. *Juniperus communis* shrublands are found at high elevations in the eastern

Cascades and are tentatively included here. Important graminoids and forbs include *Xerophyllum tenax*, *Luzula glabrata* var. *hitchcockii*, *Chamerion angustifolium*, and *Pteridium aquilinum*, reflecting the mesic nature of many of these shrublands.

**Classification Comments:** This group seems tenuous, but the best way to address these shrublands is unclear. The most distinguishing feature of this group floristically is the *Vaccinium* spp., almost all of which occur from lower montane into the high subalpine in the Rockies and the Cascades. A possible alternative treatment is to combine the subalpine mesic shrublands with the montane-foothill dry shrublands as one group. The wetter (avalanche slopes primarily) shrub types are combined into a yet-to-be-described northern Rocky Mountain montane riparian and wet slope shrubland. Floristically, this is what the avalanche and wet slope shrublands are most related to. The proposed split of the subalpine shrubland into mesic and wet is not substantiated by the association lists or floristics.

**Internal Comments:** MSR 11-14: this group is being reconceptualized by removing 2 alliances that are low montane and not as mesic as the other alliances. DFL 9-13: AK? added.

**Other Comments:**

**Similar NVC Types:**

- G317 North Pacific Alpine-Subalpine Dwarf-Shrubland & Heath

**Diagnostic Characteristics:** Deciduous shrublands found in the high montane of the northern Rocky Mountains and northern Cascades. Composed of one of several *Vaccinium* species, *Menziesia ferruginea*, *Spiraea splendens*, and *Acer glabrum*. The graminoid/shrubby forb *Xerophyllum tenax* is a good indicator of these high montane, mesic settings in the Cascades and Northern Rockies.

### VEGETATION

**Physiognomy and Structure:** Cold-deciduous shrublands, sometimes of dwarf stature (the *Vaccinium* spp. can be <0.5m), often with significant herbaceous cover, of both perennials graminoids, forbs and ferns.

**Floristics:** Common species include mesic subalpine shrubs such as *Acer glabrum*, *Menziesia ferruginea*, *Ribes lacustre*, *Rubus parviflorus*, *Spiraea betulifolia*, *Spiraea splendens*, *Vaccinium caespitosum*, *Vaccinium myrtillus*, *Vaccinium scoparium*, and *Vaccinium membranaceum*, occurring alone or in any combination. *Juniperus communis* shrublands are found at high elevations in the eastern Cascades and are tentatively included here. Other common woody plants include *Paxistima myrsinites*, *Sorbus scopulina*, and *Sorbus sitchensis*. The ground cover is moderately dense to dense and forb-rich; important graminoids and forbs include *Athyrium filix-femina*, *Castilleja* spp., *Chamerion angustifolium*, *Erythronium grandiflorum*, *Luzula glabrata*, *Myosotis asiatica* (= *Myosotis alpestris*), *Pteridium aquilinum*, *Thalictrum occidentale*, *Urtica dioica*, and *Xerophyllum tenax*, reflecting the mesic nature of many of these shrublands. Mosses and ferns are often present. Occasional seedlings or saplings of conifers may be present, reflecting the occurrence of these shrublands within a predominantly forested landscape. In disturbance-maintained avalanche chute shrublands, stunted and broken trees may comprise significant cover. Species might include *Populus tremuloides* and conifers *Abies lasiocarpa*, *Picea engelmannii*, *Pseudotsuga menziesii*, *Pinus albicaulis*, or *Pinus flexilis*.

G305 Central Rocky Mountain High Montane Mesic Shrubland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Rubus parviflorus</i> / <i>Chamerion angustifolium</i> - <i>Heracleum maximum</i> Shrubland	G4/S4	CEGL001127
<i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Shrubland	G3?/SNR	CEGL005891

### ENVIRONMENT & DYNAMICS

**Environmental Description:** Cold, wet winters with plentiful snow are typical, along with wind desiccation in the subalpine-alpine transition. Soils tend to be moist, but will typically dry out in late spring or summer. Stands are typically initiated by fires and will persist on sites for long periods because of repeated burns and changes in the presence of volatile oils in the soil which impedes tree regeneration. These shrublands also occur as smaller patches of shrubland on dry sites that are marginal for tree growth and that have typically also experienced fire. Sites often are ridgetops and upper to middle mountain slopes and more commonly on sunny southern aspects.

**Dynamics:** Stands are typically initiated by fires and will persist on sites for long periods because of repeated burns and changes in the presence of volatile oils in the soil which impedes tree regeneration. It also occurs as smaller patches of shrubland on dry sites that are marginal for tree growth and that have typically also experienced fire.

**DISTRIBUTION**

**Geographic Range:** This group occurs in the mountains throughout the Northern Rockies, from Wyoming north and west into British Columbia and Alberta. It also occurs in the East Cascades, but how far south into the Sierra Nevada is as yet unclear.

**Nations:** CA, US

**States/Provinces:** AB, AK?, BC, ID, MT, OR, WA, WY

**TNC Ecoregions [optional]:** 6:C, 7:C, 8:C, 9:C, 10:P, 26:C, 68:C

**USFS Ecoregions (2007):** M242B:CC, M242C:CC, M242D:CC, M331A:CP, M331B:CC, M331D:CP, M331E:CP, M331J:C?, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

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

**SYNONYMY****LOWER LEVEL UNITS****Alliances:**

- A3970 *Menziesia ferruginea* - *Spiraea betulifolia* Montane-Subalpine Shrubland Alliance
- A3969 *Vaccinium membranaceum* - *Vaccinium myrtillus* - *Vaccinium scoparium* Montane-Subalpine Shrubland Alliance
- A3968 *Abies lasiocarpa* - *Populus tremuloides* / *Acer glabrum* Avalanche Chute Shrubland Alliance

**AUTHORSHIP**

**Primary Concept Source:** M.S. Reid, in Faber-Langendoen et al. (2011)

**Author of Description:** M.S. Reid, mod. K.A. Schulz

**Acknowledgments:**

**Version Date:** 2015/05/20

**REFERENCES**

**References:** Butler 1979, Butler 1985, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Malanson and Butler 1984, Poulton 1955, Shiflet 1994

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

**M168. Rocky Mountain & Vancouverian Subalpine-High Montane Mesic Meadow**

**Type Concept Sentence:** This macrogroup includes montane and subalpine mesic meadows from the Rocky Mountains west to the Sierra Nevada and eastern Cascades, and drier grasslands from the southern Rocky Mountains west in the high plateaus and ranges. Vegetation is composed of low (<1 m) open to dense perennial graminoid layer. Characteristic grassland species include *Danthonia intermedia*, *Danthonia parryi*, *Festuca arizonica*, *Festuca thurberi*, and *Muhlenbergia montana* in montane and subalpine grasslands in the southern Rocky Mountains. Dominant mesic meadow species include *Achillea millefolium*, *Carex spectabilis*, *Chamerion angustifolium*, *Erigeron speciosus*, *Lupinus latifolius*, *Senecio hydrophiloides*, *Senecio serra*, *Solidago canadensis*, *Symphotrichum* spp., *Thalictrum occidentale*, and *Zigadenus elegans*.

**OVERVIEW**

**Scientific Name:** *Deschampsia caespitosa* - *Ligusticum* spp. - *Muhlenbergia montana* Rocky Mountain-Vancouverian Subalpine & High Montane Mesic Meadow Macrogroup

**Common Name (Translated Scientific Name):** Tufted Hairgrass - Licorice-root species - Mountain Muhly Rocky Mountain-Vancouverian Subalpine & High Montane Mesic Meadow Macrogroup

**Type Concept:** This herbaceous macrogroup is widespread in the Rocky Mountain cordillera from New Mexico and Colorado north into Canada, and west to high plateaus and mountains in the Colorado Plateau, higher mountain ranges of Nevada, and the Sierra Nevada into the eastern Cascades. It also occurs in the "island ranges" of central Montana. Vegetation is composed of an open to dense perennial graminoid layer that is generally less than 1 m tall. Characteristic grassland species include *Danthonia parryi*, *Danthonia intermedia*, *Festuca arizonica*, *Festuca thurberi*, and *Muhlenbergia montana* in montane and subalpine grasslands in the southern Rocky Mountains. Associated graminoid species include *Blepharoneuron tricholepis*, *Bouteloua gracilis*, *Festuca idahoensis*, *Hesperostipa comata*, *Muhlenbergia filiculmis*, and *Pseudoroegneria spicata*. Forb associates may be diverse and composed of relatively dry forbs such as *Castilleja* spp., *Erigeron simplex*, *Eriogonum umbellatum*, *Hymenoxys richardsonii*, *Penstemon secundiflorus*, *Potentilla hippiana*, and *Solidago multiradiata*. Mesic meadows are typically composed of a wide diversity of genera and contribute more to overall herbaceous cover than graminoids. Important forbs include *Achillea millefolium*, *Allium*

*schoenoprasum*, *Angelica* spp., *Athyrium filix-femina*, *Camassia quamash*, *Campanula rotundifolia*, *Chamerion angustifolium*, *Erigeron speciosus*, *Eucephalus* spp., *Geum macrophyllum*, *Hackelia* spp., *Heracleum maximum*, *Ligusticum* spp., *Lupinus latifolius*, *Mertensia* spp., *Osmorhiza occidentalis*, *Pteridium aquilinum*, *Senecio hydrophiloides*, *Senecio serra*, *Senecio triangularis*, *Solidago canadensis*, *Symphotrichum* spp., *Thalictrum occidentale*, *Valeriana* spp., *Veratrum viride*, and *Zigadenus elegans*. Forb diversity can be quite high and intergrades with grasses in adjacent grassland stands. At montane elevations, graminoids form a minor component and are usually taxa with relatively broad and soft blades such as *Bromus carinatus*, *Bromus sitchensis*, *Carex hoodii*, *Carex microptera*, *Carex raynoldsii*, *Deschampsia caespitosa*, and *Elymus glaucus*. Broadleaf deciduous shrubs such as *Dasiphora fruticosa* ssp. *floribunda* and *Symphoricarpos* spp. are often present, but do not dominate. Other locally abundant forbs include *Hydrophyllum fendleri*, *Phacelia hastata*, *Phlox diffusa*, *Saussurea americana*, and *Xerophyllum tenax*. Burrowing mammals can increase the forb diversity. Stands occupy a wide variety of environments where finely-textured soils, snow deposition, rocky substrates, or windswept dry conditions limit tree establishment. The grasslands occur on flat to rolling plains, in inter-montane parks and on dry sideslopes, especially with south and west aspects. Mesic meadow stands occur in swales that lose their snow cover relatively late in the season. Southern Rocky Mountain stands range from 2200 to 3000 m elevation extending up to 3350 m on warm aspects. Central Rocky Mountain stands typically occur above 2000 m in elevation in the southern extent and above 600 m in the north. These upland communities occur on gentle to moderate-gradient slopes and relatively moist habitats. At montane elevations, this macrogroup occurs within *Pinus-Pseudotsuga* or mixed conifer-dominated forests. At subalpine elevations, these meadows are found below treeline, usually within *Abies lasiocarpa*-*Picea*-dominated forests.

**Classification Comments:** This macrogroup contains three groups: two montane mesic meadow groups that include all montane mesic meadows from the Rocky Mountains west to the Sierra Nevada, and the drier-site montane grasslands from the southern Rocky Mountains. Other montane grasslands from the central Rocky Mountains are included in Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macrogroup (M048). Due to the different environmental setting, few diagnostic species are shared at the macrogroup level. However, *Festuca idahoensis* and *Pseudoroegneria spicata* are included in this description, and they also define M048. Also see *Achillea millefolium*, *Danthonia intermedia*, *Lupinus*, *Solidago*, *Chamerion angustifolium*, etc. This suggests a certain overlap between M048 and M168.

**Similar NVC Types:** While there is overlap in herbaceous floristics and ecological parameters between this macrogroup (M168) and Western North American Montane-Subalpine Wet Shrubland & Wet Meadow Macrogroup (M075), types in M168 occur in wetter meadows.

- M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland: contains similar montane mesic meadow and drier montane grasslands.
- M172 Northern Vancouverian Lowland-Montane Grassland & Shrubland
- M075 Western North American Montane-Subalpine Wet Shrubland & Wet Meadow: occurs in drier meadows.

**Diagnostic Characteristics:** This herbaceous macrogroup typically occurs where finely-textured soils, snow deposition, snow avalanches, or windswept dry conditions limit tree establishment. Vegetation is composed of an open to dense perennial graminoid layer that is generally less than 1 m tall. Characteristic grassland species include *Danthonia parryi*, *Festuca arizonica*, and *Muhlenbergia montana* in montane grasslands and *Danthonia intermedia* and *Festuca thurberi* in subalpine grasslands in the southern Rocky Mountains. Dominant mesic meadow species include *Achillea millefolium*, *Carex spectabilis*, *Chamerion angustifolium*, *Erigeron speciosus*, *Lupinus latifolius*, *Senecio hydrophiloides*, *Senecio serra*, *Senecio triangularis*, *Solidago canadensis*, *Symphotrichum* spp., *Thalictrum occidentale*, and *Zigadenus elegans*, although forb diversity can be quite high. Associated graminoid species include *Blepharoneuron tricholepis*, *Bouteloua gracilis*, *Festuca idahoensis*, *Hesperostipa comata*, *Muhlenbergia filiculmis*, and *Pseudoroegneria spicata*. Forb communities found on talus and scree slopes with subsurface moisture are included here, in particular when they are not sparsely vegetated.

## VEGETATION

**Physiognomy and Structure:** This macrogroup includes herbaceous communities dominated by flowering forbs, often tall (but still usually <1 m in height) and/or an open to dense perennial graminoid layer also less than 1 m tall. Cover is generally dense or can be patchy.

**Floristics:** Vegetation in this herbaceous macrogroup typically occurs where local conditions limit tree establishment. It is composed of an open to dense perennial graminoid layer that is generally less than 1 m tall. Characteristic grassland species include *Danthonia parryi*, *Festuca arizonica*, and *Muhlenbergia montana* in montane grasslands and *Danthonia intermedia* and *Festuca thurberi* in subalpine grasslands in the southern Rocky Mountains. Associated graminoid species include *Blepharoneuron tricholepis*, *Bouteloua gracilis*, *Festuca idahoensis*, *Hesperostipa comata*, *Muhlenbergia filiculmis*, and *Pseudoroegneria spicata*. Forb components in grasslands include drier-site species such as *Castilleja* spp., *Erigeron simplex*, *Erigeron ursinus*, *Eriogonum umbellatum*, *Hymenoxys richardsonii*, *Penstemon secundiflorus*, *Potentilla hippiana*, *Solidago multiradiata*, and *Symphotrichum foliaceum* (= *Aster foliaceus*) which may be present to codominant. In disturbed stands, species such as *Heterotheca villosa* may codominate. Tall forb-dominated

mesic meadows are typically composed of a wide diversity of genera and contribute more to overall herbaceous cover than graminoids. At montane elevations, important forbs include *Achillea millefolium*, *Allium schoenoprasum*, *Angelica arguta*, *Arnica chamissonis*, *Athyrium filix-femina*, *Camassia quamash*, *Campanula rotundifolia*, *Chamerion angustifolium*, *Erigeron speciosus*, *Eucephalus* spp., *Geum macrophyllum*, *Hackelia* spp., *Heracleum maximum*, *Lupinus latifolius*, *Mertensia* spp., *Osmorhiza occidentalis*, *Pteridium aquilinum*, *Senecio hydrophiloides*, *Senecio serra*, *Solidago canadensis*, *Symphotrichum* spp., *Thalictrum occidentale*, and *Zigadenus elegans*. Forb diversity can be quite high and intergrades with grasses in adjacent grassland stands. At montane elevations, graminoids form a minor component and are usually taxa with relatively broad and soft blades such as *Bromus carinatus*, *Bromus sitchensis*, *Carex hoodii*, *Carex microptera*, *Carex raynoldsii*, *Deschampsia caespitosa*, *Elymus glaucus*, and *Melica spectabilis*. Broadleaf deciduous shrubs such as *Dasiphora fruticosa* ssp. *floribunda* and *Symphoricarpos* spp. are occasional but not abundant. At subalpine and low alpine elevations, *Angelica* spp., *Arnica latifolia*, *Castilleja miniata*, *Erigeron peregrinus*, *Erythronium grandiflorum*, *Ligusticum* spp., *Senecio triangularis*, *Valeriana* spp., and *Veratrum viride* are commonly the dominant forbs. Other locally abundant forbs include *Hydrophyllum fendleri*, *Phacelia hastata*, *Phlox diffusa*, *Saussurea americana*, and *Xerophyllum tenax*. Burrowing mammals can increase the forb diversity. Early-successional stages may be dominated by *Achillea millefolium*, *Agastache urticifolia*, *Chamerion angustifolium*, *Urtica dioica*, and other forbs, and low cover of mesic grasses such as *Bromus carinatus* and *Deschampsia caespitosa*.

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup includes montane and subalpine mesic meadows from the Rocky Mountains west to the Sierra Nevada and eastern Cascade Range, and drier grasslands from the southern Rocky Mountains west in the high plateaus and ranges. Southern Rocky Mountain stands range from 2200 and 3000 m elevation extending up to 3350 m on warm aspects. Central Rocky Mountain stands typically occur above 2000 m in elevation in the southern extent and above 600 m in the north. Stands occupy a wide variety of environments where finely-textured soils, snow deposition, rocky substrates, or windswept dry conditions limit tree establishment. The grasslands occur on flat to rolling plains, in inter-montane parks and on dry sideslopes, especially with south and west aspects. They can also occur on gentle slopes with ample early-season seepage. Mesic meadow stands occur in swales that lose their snow cover relatively late in the season. Many occurrences are small-patch in spatial character, and are often found in mosaics with woodlands, more dense shrublands, or just below alpine communities. These upland communities occur on gentle to moderate-gradient slopes and relatively moist habitats. At montane elevations, this macrogroup occurs within *Pinus-Pseudotsuga* or mixed conifer-dominated forests. At subalpine and low alpine elevations, these meadows are found below treeline, usually within *Abies lasiocarpa-Picea*-dominated forests, or extend into the low alpine.

**Climate:** Approximately two-thirds of the region's precipitation occurs in just half the year (October to March), with the remaining third occurring in late spring to early summer. Generally, the east slopes of the Cascades east to the northern Rocky Mountains of Montana and Wyoming receive greater than 100 cm of precipitation annually. **Soil/substrate/hydrology:** Grassland soils are relatively high in organic matter, slightly acidic, and usually well-drained. Mesic meadow soils are typically seasonally moist to saturated during spring and early summer after snowmelt, but will dry out later in the growing season. Some occur on banks of high-gradient ephemeral streams that accumulate deep snowpacks, saturated rocky areas at the base of summer snowbanks, and seasonally saturated rocky areas. At montane elevations, soils are usually clays or silt loams with an A-horizon greater than 10 cm. Some sites may have inclusions of hydric soils in low, depressional areas within this macrogroup. At subalpine elevations, soils are derived from a variety of parent materials, and can be acidic or calcareous. The A-horizon is typically less than 10 cm, and soils are usually rocky or gravelly with good aeration and drainage, but with a well-developed organic layer. A third setting includes talus or scree slopes, or colluvial fields of rocks and small boulders, where subsurface moisture is provided by melting snow throughout much of the growing season. These rocky areas have soils composed of varied parent materials and are usually young and poorly developed.

**Dynamics:** This macrogroup is found in areas that inhibit the establishment of woody species, including areas with finely-textured soils, snow deposition, and/or windswept dry conditions. Mesic meadow stands are typically not affected by fire due to moist conditions and surrounding rocky terrain. Natural processes affecting stands include fluctuating summer snowbanks (drought sequences), snow avalanches, and rockfalls. Burrowing mammals in places will disrupt the soil and vegetation locally.

### DISTRIBUTION

**Geographic Range:** This macrogroup is widespread in the Rocky Mountain cordillera from New Mexico and Colorado north into Alberta and British Columbia, and west to high plateaus and mountains in the Colorado Plateau, higher mountain ranges of Nevada, Sierra Nevada into the eastern Cascades. It also occurs in the "island ranges" of central Montana.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

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

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313C:CP, 313D:CP, 315A:CC, 315H:CP, 321A:PP, 322A:??, 331B:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341E:CP, 341F:CP, 341G:CC, 342A:CC, 342B:CP, 342C:CC, 342D:CC, 342E:CC, 342F:CC,



342G:CC, 342H:CC, 342J:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CP

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate. As a macrogroup it combines two mesic meadow groups and one drier montane grassland from the southern Rocky Mountains. Grasslands are in separate group for it's more a question of clarifying exactly how it relates to drier predominantly grass-dominated groups, and also the relationship of specific associations to wet meadow groups.

**SYNONYMY**

- >< Idaho Fescue - Tufted Hairgrass (308) (Shiflet 1994)
- = Rocky Mountain Alpine and Subalpine Grassland, Bunchgrass Series - 141.41 (Brown et al. 1979)
- > Rocky Mountain Alpine and Subalpine Grassland, Bunchgrass Series, *Festuca arizonica* Association - 141.412 (Brown et al. 1979)
- > Rocky Mountain Alpine and Subalpine Grassland, Bunchgrass Series, *Festuca thurberi* Association - 141.411 (Brown et al. 1979)
- > Rocky Mountain Alpine and Subalpine Grassland, Bunchgrass Series, Mixed Grass-Forb Association - 141.413 (Brown et al. 1979)
- = Rocky Mountain Montane Grassland, Mixed Meadow Series - 142.41 (Brown et al. 1979)
- > Rocky Mountain Montane Grassland, Mixed Meadow Series, Mixed Forb-Grass Association - 142.411 (Brown et al. 1979)
- >< Tall Forb (409) (Shiflet 1994)
- >< Tufted Hairgrass - Sedge (313) (Shiflet 1994) [Forb-rich portions of this SRM type overlap with this group.]

**LOWER LEVEL UNITS**

**Groups:**

- G268 Southern Rocky Mountain Montane-Subalpine Grassland
- G271 Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow

**AUTHORSHIP**

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** K.A. Schulz and M. Jennings

**Acknowledgments:** We have incorporated significant descriptive information previously compiled by M.E. Hall, M.S. Reid and T. Luna.

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** KAS 10-14

**REFERENCES**

**References:** Barbour and Billings 2000, Barbour and Major 1988, Bowns and Bagley 1986, Brown 1982a, Brown et al. 1979, Buckner 1977, Comer et al. 2003, Eady 1971, Ellison 1954, Faber-Langendoen et al. 2015, Fritz 1981, Gregory 1983, Hall 1971, Hamet-Ahti 1978, Hess 1981, Hess and Wasser 1982, Holland and Keil 1995, Marr 1977a, Meidinger and Pojar 1991, Moir 1967, Passey et al. 1982, Polster 1979, Potkin and Munn 1989, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shepherd 1975, Shiflet 1994, Starr 1974, Stewart 1940, Turner 1975, Turner and Dortignac 1954

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2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

M168. Rocky Mountain & Vancouverian Subalpine-High Montane Mesic Meadow

**G268. Southern Rocky Mountain Montane-Subalpine Grassland**

**Type Concept Sentence:**

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**OVERVIEW**

**Scientific Name:** *Festuca arizonica* - *Festuca thurberi* - *Muhlenbergia montana* Grassland Group

**Common Name (Translated Scientific Name):** Arizona Fescue - Thurber's Fescue - Mountain Muhly Grassland Group

**Type Concept:** This Rocky Mountain grassland group typically occurs between 2200 and 3000 m elevation on flat to rolling plains and parks or on lower sideslopes that are dry, but it may extend up to 3350 m on warm aspects. Soils resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well-drained. Vegetation is characterized by an open to dense perennial graminoid layer. Larger occurrences usually consist of a mosaic of two or three plant associations with one

of the following dominant bunchgrasses: *Blepharoneuron tricholepis*, *Danthonia parryi*, *Festuca arizonica*, *Muhlenbergia montana*, or *Pseudoroegneria spicata* at lower elevation / warmer aspects, or *Danthonia intermedia*, *Festuca idahoensis*, *Festuca thurberi*, *Muhlenbergia filiculmis* at subalpine elevation / cooler aspects. The common subdominants include *Bouteloua gracilis*, *Hesperostipa comata*, or *Poa secunda*. *Bouteloua gracilis* often dominates sites with warm aspects and heavy grazing history. Forb species such as *Potentilla hippiana* may be present to codominant. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, ponderosa pine, and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus and inter-montane valleys. Small-patch representations of this group do occur at high elevations of the Trans-Pecos where they present as occurrences of *Festuca arizonica* - *Blepharoneuron tricholepis* Herbaceous Vegetation (CEGL004508). These occurrences often occupy sites adjacent to Eastern Madrean Chaparral Group (G280).

**Classification Comments:** Montane grasslands are very similar and intergrade with their montane and subalpine counterparts. The transition of this group to Central Rocky Mountain Montane Grassland Group (G267) probably occurs somewhere in central Colorado or southern Wyoming. This Southern Rockies grassland group may co-occur with patches of the more mesic Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow Group (G271), which is distinguished by dominance of mesic forb and grass species such as *Deschampsia caespitosa* and *Mertensia ciliata*.

**Internal Comments:** DFL 12-5-12: Canada added based on member assoc. mjr 1-11: NV added for GRBA.

**Other Comments:**

**Similar NVC Types:**

- G271 Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow
- G267 Central Rocky Mountain Montane Grassland

**Diagnostic Characteristics:** Vegetation is composed of an open to dense perennial graminoid layer that is generally less than 1 m tall. *Danthonia parryi*, *Festuca arizonica*, and *Muhlenbergia montana* are important species and typically dominate montane grasslands; *Danthonia intermedia* and *Festuca thurberi* are typical of subalpine grasslands in the southern Rocky Mountains. Other characteristic graminoid species that may be present to dominant include *Blepharoneuron tricholepis*, *Bouteloua gracilis*, *Festuca idahoensis*, *Hesperostipa comata*, *Muhlenbergia filiculmis*, and *Pseudoroegneria spicata*.

### VEGETATION

**Physiognomy and Structure:** Vegetation is composed of an open to dense perennial graminoid layer that is generally less than 1 m tall. Forb cover is variable and may be present to codominant.

**Floristics:** Vegetation in this group is characterized by an open to dense perennial graminoid layer. Larger occurrences usually consist of a mosaic of two or three plant associations with one of the following dominant bunchgrasses: *Blepharoneuron tricholepis*, *Danthonia parryi*, *Festuca arizonica*, *Muhlenbergia montana*, or *Pseudoroegneria spicata* at lower elevation / warmer aspects, or *Danthonia intermedia*, *Festuca idahoensis*, *Festuca thurberi*, or *Muhlenbergia filiculmis* at subalpine elevation / cooler aspects. The common subdominants include *Bouteloua gracilis*, *Hesperostipa comata*, or *Poa secunda*. *Bouteloua gracilis* often dominates sites with warm aspects and heavy grazing history. Forb species such as *Achillea millefolium*, *Castilleja* spp., *Erigeron simplex*, *Erigeron ursinus*, *Eriogonum umbellatum*, *Hymenoxys richardsonii*, *Penstemon secundiflorus*, *Potentilla hippiana*, *Solidago multiradiata*, and *Symphotrichum foliaceum* (= *Aster foliaceus*) may be present to codominant. In disturbed stands, species such as *Heterotheca villosa* may codominant. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, ponderosa pine, and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus and inter-montane valleys. Small-patch representations of this group do occur at high elevations of the Trans-Pecos where they present as occurrences of *Festuca arizonica* - *Blepharoneuron tricholepis* Herbaceous Vegetation (CEGL004508). These occurrences often occupy sites adjacent to Eastern Madrean Chaparral Group (G280).

G268 Southern Rocky Mountain Montane-Subalpine Grassland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Danthonia intermedia</i> Herbaceous Vegetation	G2G3/S2S3	CEGL001794

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This Rocky Mountain grassland group typically occurs between 2200 and 3000 m elevation on flat to rolling plains and inter-montane parks or on lower sideslopes that are dry, but it may extend up to 3350 m on warm aspects. Soils resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well-drained.

**Dynamics:**

**DISTRIBUTION**

**Geographic Range:** This grassland group occurs between 2200 and 3000 m elevation in the southern Rocky Mountains and extends west to high plateaus and mountains in the Colorado Plateau.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 11:C, 18:C, 19:C, 20:C, 21:C

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313C:CP, 313D:CP, 315A:CC, 315H:CP, 321A:PP, 322A:??, 331B:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341F:CP, 342A:CC, 342E:CC, 342F:CC, 342G:CC, 342J:CC, M313A:CC, M313B:CC, M331A:CP, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M341A:CC, M341B:CC, M341C:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Great Basin)

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

- = Rocky Mountain Alpine and Subalpine Grassland, Bunchgrass Series - 141.41 (Brown et al. 1979)
- > Rocky Mountain Alpine and Subalpine Grassland, Bunchgrass Series, *Festuca arizonica* Association - 141.412 (Brown et al. 1979)
- > Rocky Mountain Alpine and Subalpine Grassland, Bunchgrass Series, *Festuca thurberi* Association - 141.411 (Brown et al. 1979)
- > Rocky Mountain Alpine and Subalpine Grassland, Bunchgrass Series, Mixed Grass-Forb Association - 141.413 (Brown et al. 1979)
- = Rocky Mountain Montane Grassland, Mixed Meadow Series - 142.41 (Brown et al. 1979)
- > Rocky Mountain Montane Grassland, Mixed Meadow Series, Mixed Forb-Grass Association - 142.411 (Brown et al. 1979)

**LOWER LEVEL UNITS**

**Alliances:**

- A3953 *Festuca arizonica* - *Muhlenbergia montana* - *Poa fendleriana* Southern Rocky Mountain Montane Grassland Alliance
- A3954 *Festuca thurberi* - *Danthonia intermedia* - *Poa lettermanii* Southern Rocky Mountain Subalpine Grassland Alliance

**AUTHORSHIP**

**Primary Concept Source:** D.E. Brown, C.H. Lowe, and C.P. Pase (1979)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2010/03/22

**REFERENCES**

**References:** Bowns and Bagley 1986, Brown 1982a, Brown et al. 1979, Faber-Langendoen et al. 2015, Hess 1981, Hess and Wasser 1982, Moir 1967, Passey et al. 1982, Shepherd 1975, Stewart 1940, Turner 1975, Turner and Dortignac 1954

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2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

M168. Rocky Mountain & Vancouverian Subalpine-High Montane Mesic Meadow

**G271. Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow**

**Type Concept Sentence:**

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**OVERVIEW**

**Scientific Name:** *Festuca viridula* - *Deschampsia caespitosa* - *Ligusticum* spp. Rocky Mountain-Vancouverian Meadow Group

**Common Name (Translated Scientific Name):** Greenleaf Fescue - Tufted Hairgrass - Licorice-root species Rocky Mountain-Vancouverian Meadow Group

**Type Concept:** This Rocky Mountain, northern Vancouverian and Sierran group is restricted to sites from lower montane to subalpine where finely textured soils, snow deposition, rocky substrates, or windswept dry conditions limit tree establishment. Many occurrences are small-patch in spatial character, and are often found in mosaics with woodlands, more dense shrublands, or just below alpine communities. These are typically lush meadows dominated by a diversity of tall forbs, with grasses intermingled in many of them. The vegetation is typically forb-rich, with forbs often contributing more to overall herbaceous cover than graminoids. However, some stands are composed of dense grasslands, these often being taxa with relatively broad and soft blades, such as *Festuca viridula* but where the moist habitat promotes a rich forb component. Important taxa includes *Achillea millefolium*, *Balsamorhiza sagittata*, *Rudbeckia occidentalis*, *Thalictrum occidentale*, *Valeriana sitchensis*, *Xerophyllum tenax*, and numerous

species of Asteraceae, *Campanula*, *Erigeron*, *Ligusticum*, *Lomatium*, *Lupinus*, *Mertensia*, *Phlox*, *Penstemon*, *Solidago*, and *Wyethia*. Important graminoids include *Deschampsia caespitosa*, *Koeleria macrantha*, *Luzula glabrata*, perennial *Bromus* spp., and a number of *Carex* species. In the Cascades, this group includes *Festuca viridula* meadows. *Dasiphora fruticosa* ssp. *floribunda* and *Symphoricarpos* spp. are occasional but not abundant. In the Sierra Nevada *Calamagrostis breweri*, *Carex filifolia*, *Carex stramineiformis*, *Juncus drummondii*, *Oreostemma alpigenum*, *Solidago canadensis*, and *Trisetum spicatum* may dominate stands with diagnostics forbs *Oreostemma alpigenum*, and *Solidago canadensis*. Dwarf-shrubs such as *Vaccinium caespitosum* may have significant cover. Burrowing mammals can increase the forb diversity. This group is typically found above 2000 m in elevation in the southern part of its range and above 600 m in the northern part. These upland communities occur on gentle to moderate-gradient slopes and relatively moist habitats. The soils are typically seasonally moist to saturated in the spring but, if so, will dry out later in the growing season. These sites are not as wet as those found in Vancouverian & Rocky Mountain Subalpine & Alpine Snowbed, Wet Meadow & Dwarf-Shrubland Group (G520) and Vancouverian & Rocky Mountain Montane Wet Meadow & Marsh Group (G521), although some species are certainly shared with wet meadows, such as *Deschampsia*.

**Classification Comments:** The Rockies and Cascades support a number of forb types found on talus and rocky scree slopes, which are not sparsely vegetated, and which often have little to no grass component, though Carices may be abundant. These types often have heavy snow loading in winter, or are adjacent to snowfields, and subsurface moisture below the rocks/scree is significant throughout the growing season. These forb types are poorly documented; for now they are placed in this group, as many of the taxa are also found in mesic grassy meadows. Splitting them into a separate group would be hard to justify floristically.

**Internal Comments:** DFL 9-13: AK? added. mjr 10-12: CA? added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G267 Central Rocky Mountain Montane Grassland
- G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
- G268 Southern Rocky Mountain Montane-Subalpine Grassland
- G520 Vancouverian & Rocky Mountain Subalpine & Alpine Snowbed, Wet Meadow & Dwarf-Shrubland
- G320 North Pacific Alpine-Subalpine Turf & Herbaceous Meadow
- G317 North Pacific Alpine-Subalpine Dwarf-Shrubland & Heath
- G316 Rocky Mountain & Sierran Alpine Dwarf-Shrubland

**Diagnostic Characteristics:** Herbaceous communities found in the mountains of the Rockies and eastern Cascades, dominated by forbs and graminoids. These are relatively mesic or sometimes seasonally wet communities, and the combination of moisture and soil conditions results in forbs, often tall, being the predominant lifeform. Grasses and sedges are common, typically being taxa with broad and soft blades. Forb communities found on talus and scree slopes with subsurface moisture are included here, in particular when they are not sparsely vegetated.

## VEGETATION

**Physiognomy and Structure:** This group includes herbaceous communities found in the montane and subalpine throughout much of the Rockies, eastern Cascades and Sierra Nevada, dominated by flowering forbs, often tall (but still <1 m in height usually). Grasses with broad, soft blades are common, but these are more typically forb-rich meadows with grasses or other graminoids not the dominant lifeform. Cover is generally dense or can be patchy. Burrowing mammals in places will disrupt the soil.

**Floristics:** Species composition in this mesic meadow differs some between montane and subalpine elevations, but across its range, this is a very diverse group. Tall forb-dominated mesic meadows are typically composed of a wide diversity of genera and contribute more to overall herbaceous cover than graminoids. At montane elevations, important forbs include *Allium schoenoprasum*, *Angelica arguta*, *Arnica chamissonis*, *Athyrium filix-femina*, *Camassia quamash*, *Campanula rotundifolia*, *Chamerion angustifolium*, *Delphinium x occidentale*, *Erigeron speciosus*, *Eucephalus* spp., *Geum macrophyllum*, *Hackelia* spp., *Heracleum maximum*, *Ligusticum porteri*, *Ligusticum tenuifolium*, *Lupinus parviflorus*, *Mertensia* spp., *Osmorhiza occidentalis*, *Pteridium aquilinum*, *Senecio hydrophiloides*, *Senecio serra*, *Solidago canadensis*, *Symphotrichum* spp., *Thalictrum occidentale*, *Trollius laxus*, *Vicia americana* and *Zigadenus elegans*. Early-successional stages may be dominated by *Achillea millefolium*, *Agastache urticifolia*, *Chamerion angustifolium*, *Urtica dioica*, and small amounts of mesic grasses such as *Bromus carinatus* and *Deschampsia caespitosa*. At montane elevations, graminoids form a minor component and are usually taxa with relatively broad and soft blades such as *Bromus carinatus*, *Bromus sitchensis*, *Carex geyeri*, *Carex hoodii*, *Carex microptera*, *Carex raynoldsii*, *Deschampsia caespitosa*, *Elymus glaucus*, *Festuca rubra*, and *Melica spectabilis*. Broadleaf deciduous shrubs such as *Dasiphora fruticosa* ssp. *floribunda* and *Symphoricarpos* spp. are occasional, but not abundant.

At subalpine elevations, *Angelica* spp., *Arnica latifolia*, *Castilleja miniata*, *Erigeron peregrinus*, *Erythronium grandiflorum*, *Eucephalus ledophyllus*, *Ligusticum* spp., *Lupinus argenteus* var. *laxiflorus*, *Lupinus latifolius*, *Senecio triangularis*, *Valeriana* spp., and *Veratrum*

*viride* are commonly the dominant forbs. Other locally abundant forbs include *Hydrophyllum fendleri*, *Phacelia hastata*, *Phlox diffusa*, *Saussurea americana*, and *Xerophyllum tenax*. Burrowing mammals can increase the forb diversity. Graminoids are typically a minor component of the canopy, with typically less than 20% cover. Common species include *Agrostis variabilis*, *Carex microptera*, *Carex paysonis*, *Carex spectabilis*, *Deschampsia caespitosa*, *Elymus trachycaulus*, *Juncus drummondii*, *Luzula glabrata*, *Luzula parviflora*, *Phleum alpinum*, *Poa alpina*, and *Vahlodea atropurpurea*. However, this group also includes *Festuca viridula*-dominated meadows in the Cascades. In the Sierra Nevada *Calamagrostis breweri*, *Carex filifolia*, *Carex straminiformis*, *Juncus drummondii*, and *Trisetum spicatum* may dominate stands with diagnostic forbs *Oreostemma alpigenum*, and *Solidago canadensis*. Dwarf-shrubs such as *Vaccinium caespitosum* may have moderate cover in some stands. Early-successional stages may be dominated by *Achillea millefolium*, *Hypericum scouleri*, *Sibbaldia procumbens*, and other forbs, and small amounts of mesic graminoids such as *Carex* spp., *Deschampsia caespitosa*, *Phleum alpinum*, and *Poa alpina*.

G271 Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Chamerion angustifolium</i> Rocky Mountain Herbaceous Vegetation	G4G5/SNR	CEGL005856
<i>Festuca roemerii</i> - <i>Delphinium glareosum</i> Herbaceous Vegetation	G2/S2	CEGL001613
<i>Festuca roemerii</i> - <i>Phlox diffusa</i> ssp. <i>longistylis</i> Herbaceous Vegetation	G2/S2	CEGL001622
<i>Festuca rubra</i> Montane Herbaceous Vegetation	G2Q/S2?	CEGL001568
<i>Festuca viridula</i> - <i>Carex hoodii</i> Herbaceous Vegetation	G3/SNR	CEGL001596
<i>Festuca viridula</i> - <i>Eucephalus ledophyllus</i> Herbaceous Vegetation	G4/S4	CEGL001632
<i>Festuca viridula</i> - <i>Festuca idahoensis</i> Herbaceous Vegetation	G2?Q/SNR	CEGL001633
<i>Festuca viridula</i> - <i>Lupinus argenteus</i> var. <i>laxiflorus</i> Herbaceous Vegetation	G3Q/SNA	CEGL001634
<i>Festuca viridula</i> - <i>Lupinus latifolius</i> Herbaceous Vegetation	G4/S4	CEGL001635
<i>Valeriana sitchensis</i> - <i>Carex spectabilis</i> Herbaceous Vegetation	G4/S4	CEGL001996
<i>Valeriana sitchensis</i> - <i>Ligusticum grayi</i> Herbaceous Vegetation	G3G4Q/S3S4	CEGL001997
<i>Valeriana sitchensis</i> - <i>Veratrum viride</i> Herbaceous Vegetation	G4/S4	CEGL001998
<i>Xerophyllum tenax</i> Herbaceous Vegetation	GNR/SNR	CEGL005859

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** In the Rocky Mountains, these meadows occupy a wide variety of environments, including moderate to steep slopes and glacio-fluvial flats and swales that lose their snow cover relatively late in the season. Generally the group is restricted to sites from lower montane to subalpine where finely textured soils, snow deposition, rocky substrates, or windswept dry conditions limit tree establishment. Many occurrences are small-patch in spatial character, and are often found in mosaics with woodlands, more dense shrublands, or just below alpine communities. This group is typically found above 2000 m to 3700 m in elevation in the southern part of its range and above 600 m in the northern extent. These upland communities occur on gentle to moderate-gradient slopes and relatively moist habitats. The soils are typically seasonally moist to saturated in the spring but, if so, will dry out later in the growing season. At montane elevations, this group occurs within *Pinus-Pseudotsuga* or mixed conifer-dominated forests. At subalpine elevations, these meadows are found below treeline, usually within *Abies lasiocarpa*-*Picea* species-dominated forests.

**Climate:** Approximately two-thirds of the region's precipitation occurs in just half the year (October from March), with the remaining third occurring in late spring to early summer. Generally, the east slopes of the Cascades and Sierra Nevada ranges east to the northern Rocky Mountains of Montana and Wyoming receive greater than 100 cm of precipitation annually.

**Soil/substrate/hydrology:** Soils are typically seasonally moist to saturated during spring and early summer after snowmelt, but will dry out later in the growing season. At montane elevations, soils are usually clays or silt loams with an A horizon greater than 10 cm. Some sites may have inclusions of hydric soils in low, depressional areas within this group. At subalpine elevations, soils are derived from a variety of parent materials, and can be acidic or calcareous. The A horizon is typically less than 10 cm, and soils are usually rocky or gravelly with good aeration and drainage, but with a well-developed organic layer. A third setting includes talus or scree slopes, or colluvial fields of rocks and small boulders, where subsurface moisture is provided by melting snow throughout much of the growing season. Soils are developed from colluvium and more recently alluvium are often derived from limestone, sandstone, shale parent materials (Gregory 1983, Youngblood et al. 1985a), or weathered volcanic extrusives such as basalt, pumice and ash or loess deposits. Soil texture is variable and ranges from coarser-textured sandy loams to finer-textured silt loams, clay or clay loams with an average pH of 6.4 (Gregory 1983). Surface rock averages 46%, but varies from 1-90%. Bare ground cover is usually less than 15%.

**Dynamics:****DISTRIBUTION**

**Geographic Range:** This group is very widespread in the Rocky Mountain cordillera from New Mexico (where it is uncommon) and Colorado north into Canada, and west into the eastern Cascades and Sierra Nevada. It also occurs in the mountain ranges of Nevada, northern Utah and Wyoming, as well as the "island ranges" of central Montana.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 3:C, 4:C, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:P, 26:C, 68:C

**USFS Ecoregions (2007):** 341B:C?, 341E:CP, 341G:CC, 342B:CP, 342C:CC, 342D:CC, 342E:C?, 342H:CC, 342J:CC, M313A:PP, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CP

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Great Basin)

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate. This is a solid group in its core concept, it's more a question of clarifying exactly how it relates to drier predominantly grass-dominated groups, and also the relationship of specific associations to wet meadow groups.

**SYNONYMY**

- >< Idaho Fescue - Tufted Hairgrass (308) (Shiflet 1994)
- >< Tall Forb (409) (Shiflet 1994)
- >< Tufted Hairgrass - Sedge (313) (Shiflet 1994) [Forb-rich portions of this SRM type overlap with this group.]

**LOWER LEVEL UNITS****Alliances:**

- A3949 *Phleum alpinum* - *Elymus trachycaulus* - *Agrostis variabilis* Subalpine Mesic Meadow Alliance
- A3951 *Ligusticum* spp. - *Lupinus* spp. - *Delphinium* spp. Montane Mesic Meadow Alliance
- A3950 *Agastache urticifolia* - *Geranium viscosissimum* - *Pteridium aquilinum* Montane Mesic Meadow Alliance
- A4119 *Carex straminiformis* - *Solidago canadensis* Meadow Alliance
- A3364 *Calamagrostis breweri* Seasonally Wet Turf Alliance
- A3948 *Valeriana sitchensis* - *Luzula glabrata* var. *hitchcockii* - *Xerophyllum tenax* Subalpine Mesic Meadow Alliance
- A1257 *Festuca viridula* - *Carex hoodii* - *Lupinus* spp. Subalpine Mesic Meadow Alliance
- A1294 *Carex filifolia* Mesic Turf Alliance

**AUTHORSHIP**

**Primary Concept Source:** T.N. Shiflet (1994)

**Author of Description:** M.S. Reid and T. Luna, mod. K.A. Schulz

**Acknowledgments:**

**Version Date:** 2015/05/20

**REFERENCES**

**References:** Buckner 1977, Ellison 1954, Faber-Langendoen et al. 2015, Fritz 1981, Gregory 1983, Hall 1971, Marr 1977a, Meidinger and Pojar 1991, Potkin and Munn 1989, Shiflet 1994, Starr 1974, Youngblood et al. 1985a

2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

**M050. Southern Vancouverian Lowland Grassland & Shrubland**

**Type Concept Sentence:** This macrogroup consists of dry to mesic grasslands with patches of dwarf-shrublands found along the Pacific Coast on terraces and ridgeline balds at low elevations on the lee side of coastal mountains. Dominant species include *Festuca rubra*, *Festuca roemeri*, and/or *Danthonia californica*. Shrub and dwarf-shrub species may include *Arctostaphylos uva-ursi*, *Arctostaphylos columbiana*, *Arctostaphylos nevadensis*, *Baccharis pilularis*, *Gaultheria shallon*, *Juniperus communis*, *Rosa nutkana*, *Symphoricarpos albus*, and *Vaccinium ovatum*. It is found from Vancouver Island down the Pacific Coast to central California.

**OVERVIEW**

**Scientific Name:** Southern Vancouverian Lowland Grassland & Shrubland Macrogroup

**Common Name (Translated Scientific Name):** Southern Vancouverian Lowland Grassland & Shrubland Macrogroup

**Type Concept:** This macrogroup contains the vegetation of grasslands with some dwarf-shrubs. Dominant grasses include *Festuca rubra*, *Festuca roemerii*, or *Danthonia californica*. Dwarf-shrub species may include *Arctostaphylos uva-ursi*, *Arctostaphylos columbiana*, *Arctostaphylos nevadensis*, *Baccharis pilularis*, *Gaultheria shallon*, *Juniperus communis*, *Lupinus* spp., *Rubus* spp., *Rosa nutkana*, *Symphoricarpos albus*, and *Vaccinium ovatum*. It occurs along the Pacific Coast on terraces and ridgeline balds in the Coast Ranges, the Klamath Mountains and at low elevations on the lee side of the coastal mountains in the northern part of the range, from Vancouver Island down the coast to San Francisco. Fires, both lightning-ignited and those ignited by Native Americans, undoubtedly affected these sites. Because of this fire history, the extent of this macrogroup has declined locally through tree invasion, as areas formerly maintained as herbaceous by burning have filled in with trees.

**Classification Comments:** Stands with *Calamagrostis nutkaensis*, *Danthonia californica*, and *Deschampsia caespitosa* vary in moisture and habitat from dry to wet and slopes to swales, and associated species can vary. With overlapping floristics and ecology existing between this macrogroup (M050) and Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh Macrogroup (M073), further classification analysis and review are needed.

**Similar NVC Types:**

- M044 California Coastal Scrub
- M073 Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh

**Diagnostic Characteristics:** Grasslands in coastal balds dominated by native species such as bunchgrasses *Festuca rubra*, *Festuca roemerii*, or *Danthonia californica*. Shrubs and dwarf-shrubs may also occur as small patches intermixed in a matrix of herbaceous vegetation.

#### VEGETATION

**Physiognomy and Structure:** Low-statured (<1.5 m) grassy meadows and "balds," often openings in otherwise shrubby forested slopes. Shrub and dwarf-shrubs may be imbedded in the grassland.

**Floristics:** Grasslands are the most prevalent vegetation cover. Dwarf-shrubs occur commonly, especially in mountains or foothills, as very small patches for the most part, usually in a matrix of herbaceous vegetation, most often near edges. Bunchgrasses often dominate and include *Festuca rubra*, *Festuca roemerii*, or *Danthonia californica*. Other grasses that may be present include *Achnatherum lemmonii*, *Agrostis* spp., *Aira caryophylla*, *Bromus carinatus*, *Calamagrostis nutkaensis*, *Deschampsia caespitosa*, *Festuca idahoensis*, *Holcus lanatus*, *Koeleria macrantha*, or *Trisetum canescens*. Shrub and dwarf-shrub species imbedded in the herbaceous cover include *Arctostaphylos uva-ursi*, *Arctostaphylos columbiana*, *Arctostaphylos nevadensis*, *Baccharis pilularis*, *Gaultheria shallon*, *Juniperus communis*, *Rosa nutkana*, *Symphoricarpos albus*, and *Vaccinium ovatum*. Occasionally scattered stunted trees such as *Picea sitchensis*, *Pseudotsuga menziesii*, or *Quercus garryana* may be present. Perennial forbs may be present to abundant and include *Allium cernuum*, *Camassia quamash*, *Camassia leichtlinii*, *Grindelia hirsutula*, *Iris douglasiana*, *Lomatium martindalei*, *Mimulus guttatus* (in seeps), *Plectritis congesta*, *Phlox diffusa*, *Sisyrinchium bellum*, *Sanicula arctopoides*, and *Triteleia hyacinthina*. Significant portions of some balds, especially on rock outcrops, are dominated by bryophytes (mosses) such as *Racomitrium canescens* and to a lesser degree lichens (e.g., *Cladina portentosa*). The relative prevalence of grasslands versus shrublands increases from central to south range. To the north, conifers may occur more regularly. With fire suppression, *Baccharis pilularis*, *Rosa nutkana*, *Symphoricarpos albus*, and other shrubs may invade and can replace these grasslands with scrub-dominated systems. With increasing development activity, the invasive *Cytisus scoparius* may dominate the flora in the northern part of the range in British Columbia.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup exists on shallow soils and windy sites where wind and/or salt spray combine to limit tree growth, or on variably inundated swales and meadows. Steep slopes on coastal bluffs, headlands, or small islands are typical, though stands can be found on relatively level tops of headlands or islands. In British Columbia, many areas are interior and not coastal (C. Cadrin pers. comm. 2014). The climate is relatively dry to wet (50.8 cm to perhaps 254 cm [20-100 inches] annual precipitation), always with a distinct dry summer season. Soils can be shallow to bedrock or of glacial or marine sediment origin.

**Dynamics:** These sites are naturally non-forested due to shallow soils, steep slopes, sunny aspect, and/or upper slope position, rendering them too dry and marginal for tree establishment and growth except in microsites. In the northern part of the range, in British Columbia, the major limiting factor on shrub and tree cover is drought. In the central and southern range, shrub encroachment was also controlled by lightning-caused wildfires and intentional burns by Native Americans, which were historically frequent. More populated areas along the coastline probably burned more frequently than remote areas. A shift away from Native American to European practices and active fire suppression over the last 150 years has allowed shrubs to encroach sites in some

parts of the range, causing a decline in the south-central range of this macrogroup. In British Columbia, the major decline is due to human development. The introduced *Cytisus scoparius* is most problematic where it spreads from initial invasion along roaded areas, and into these dry non-wooded sites.

#### DISTRIBUTION

**Geographic Range:** This macrogroup is found from Vancouver Island, British Columbia, down the coast to central California. It occurs at mid to low elevations on the lee side of the Vancouver Island Ranges, in the Coast Ranges, Klamath Mountains, and at low elevations on the lee side of the coastal mountains in the central part of the range. Small patches have been documented as far south as Santa Barbara and San Luis Obispo counties, California.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

**States/Provinces:** BC, CA, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 242A:CC, 242B:C?, M242A:CC, M242B:CC, M242C:CP, M242D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- < Balds (Franklin and Dyrness 1973)
- < Coastal Prairie (214) (Shiflet 1994) [Most of the SRM Coastal Prairie type corresponds to this group.]

#### LOWER LEVEL UNITS

#### Groups:

- G488 Southern Vancouverian Shrub & Herbaceous Bald, Bluff & Prairie

#### AUTHORSHIP

**Primary Concept Source:** J.F. Franklin and C.T. Dyrness (1973)

**Author of Description:** G. Kittel and D. Meidinger

**Acknowledgments:** With acknowledgments for work from C. Chappell and J. Christy.

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 10-14

#### REFERENCES

**References:** Barbour and Billings 2000, Barbour and Major 1988, Cadrin et al. 2005, Cadrin pers. comm., Chappell and Christy 2004, Ecological Reserves Program 1983, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Holland and Keil 1995, Madrone Environmental Services 2008, McPhee et al. 2000, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Ward et al. 1998, Wildlife Inventory Section 1999, Wildlife Inventory Section 2000

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2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

M050. Southern Vancouverian Lowland Grassland & Shrubland

### G488. Southern Vancouverian Shrub & Herbaceous Bald, Bluff & Prairie

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Arctostaphylos* spp. / *Festuca roemerii* - *Danthonia californica* Shrub & Herbaceous Bald Group

**Common Name (Translated Scientific Name):** Manzanita species / Roemer's Fescue - California Oatgrass Shrub & Herbaceous Bald Group

**Type Concept:** This herbaceous to shrub-herbaceous group is found from Vancouver Island down the coast to San Francisco. It occurs along the coast on coastal terraces and ridgeline balds in the Coast Ranges, the Klamath Mountains and at low elevations on the lee side of the coastal mountains in the northern part of the range. Steep slopes on coastal bluffs and headlands are typical, though sometimes this group can be found on relatively level ridgelines. Due to shallow soils, steep slopes, sunny aspect, and/or upper slope position, these sites are dry and marginal for tree establishment and growth except in favorable microsites. The vegetation is grassland with some dwarf-shrubs which can occur as small patches but are usually in a matrix with the herbaceous vegetation. Bunch grasses often dominant include *Calamagrostis nutkaensis*, *Festuca rubra*, *Festuca roemerii*, or *Danthonia*



*californica*. Dwarf-shrub species imbedded in the herbaceous cover often include *Arctostaphylos uva-ursi*, *Arctostaphylos columbiana*, *Arctostaphylos nevadensis*, *Gaultheria shallon*, *Juniperus communis*, *Rubus spectabilis*, and *Vaccinium ovatum*. Occasionally scattered stunted trees, such as *Picea sitchensis*, *Pseudotsuga menziesii* or *Quercus garryana*, may be present. Fires, both lightning-ignited and those ignited by Native Americans, undoubtedly at least occasionally burn all these sites. Because of this fire history, the extent of this group has declined locally through tree invasion and growth, as areas formerly maintained as herbaceous by burning have filled in with trees.

**Classification Comments:** This group combines former groups North Pacific Hypermaritime Shrub & Herbaceous Headland Group (G278) and North Pacific Shrub & Herbaceous Bald & Bluff Group (G279), with California Northern Coastal Grassland (CES206.941). New (2009) associations from Mount Rainier National Park (aka Rex Crawford) nearly match Chris Chappell's description (2003) for the North Pacific bald and bluff system. Willamette Valley Upland Prairie and Savanna (CES204.858), a closely aligned system, shares similar dominant grass species (*Festuca roemerii* and *Danthonia californica*). Should we include it with this group?

**Internal Comments:** GK 3-10: Combined NP Shrub & Herbaceous Bald & Bluff, NP HyperMaritime Bald & Bluff and CA Northern Coastal Grassland into one Group. MSR 10-22-09: this seems too fine-scale for a Group level concept. Need to review further against northern CA coastal bluff/dune/grassland concepts, and also the North Pacific Shrub & herb bald and bluff Group. I think in practice these cannot be distinguished by good diagnostics.

**Other Comments:**

#### Similar NVC Types:

**Diagnostic Characteristics:** Grasslands are the most prevalent vegetation cover. Dwarf-shrubs occur commonly as small patches and usually in a matrix of herbaceous vegetation. Bunch grasses often dominant include *Calamagrostis nutkaensis*, *Festuca rubra*, *Festuca roemerii*, or *Danthonia californica*.

### VEGETATION

**Physiognomy and Structure:** Low-statured (<1.5 m) grassy area "balds," often openings in otherwise shrubby forested slopes. Dwarf-shrubs are often imbedded in the grass.

**Floristics:** Grasslands are the most prevalent vegetation cover. Dwarf-shrubs occur commonly, especially in mountains or foothills, as very small patches for the most part, usually in a matrix of herbaceous vegetation, most often near edges. Bunch grasses often dominant include *Calamagrostis nutkaensis*, *Festuca rubra*, *Festuca roemerii*, or *Danthonia californica*. Other grasses that may be present include *Achnatherum lemmonii*, *Koeleria macrantha*, *Agrostis* spp., *Bromus carinatus*, *Festuca idahoensis*, *Deschampsia caespitosa*, or *Trisetum canescens*. Dwarf-shrub species imbedded in the herbaceous cover include *Arctostaphylos uva-ursi*, *Arctostaphylos columbiana*, *Arctostaphylos nevadensis*, *Gaultheria shallon*, *Juniperus communis*, *Rubus spectabilis*, and *Vaccinium ovatum*. Occasionally scattered stunted trees such as *Picea sitchensis*, *Pseudotsuga menziesii* or *Quercus garryana* may be present. Perennial forbs may be present to abundant and include *Allium cernuum*, *Camassia quamash*, *Camassia leichtlinii*, *Grindelia hirsutula*, *Iris douglasiana*, *Lomatium martindalei*, *Mimulus guttatus* (in seeps), *Plectritis congesta*, *Phlox diffusa*, *Sisyrinchium bellum*, *Sanicula arctopoides*, or *Triteleia hyacinthina*. Significant portions of some balds, especially on rock outcrops, are dominated by bryophytes (mosses) and to a lesser degree lichens.

G488 Southern Vancouverian Shrub & Herbaceous Bald, Bluff & Prairie Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Achnatherum lemmonii</i> / <i>Racomitrium canescens</i> Herbaceous Vegetation	G1/S1	CEGL001800
<i>Allium cernuum</i> Herbaceous Vegetation	GNR?/S1	TBD (Chappell 2006)
<i>Arctostaphylos (nevadensis, uva-ursi)</i> - <i>Juniperus communis</i> Herbaceous Vegetation	GNR/S3S4	TBD (Chappell 2006)
<i>Arctostaphylos uva-ursi</i> - <i>Fragaria virginiana</i> - ( <i>Festuca roemerii</i> ) Herbaceous Vegetation	GNR/S3S4	TBD (Chappell 2006)
<i>Balsamorhiza deltoidea</i> Herbaceous Vegetation [Provisional]	GNR/S1Q	TBD (Chappell 2006)
<i>Calamagrostis howellii</i> Herbaceous Vegetation [Provisional]	GNR/S1Q	TBD (Chappell 2006)
<i>Calamagrostis nutkaensis</i> - <i>Vicia nigricans</i> ssp. <i>gigantea</i> - ( <i>Equisetum telmateia</i> ) Herbaceous Vegetation	GNR/S1	TBD (Chappell 2006)
<i>Carex inops</i> - <i>Eriophyllum lanatum</i> Herbaceous Vegetation	GNR/S2	TBD (Chappell 2006)
<i>Danthonia californica</i> - <i>Eriophyllum lanatum</i> Herbaceous Vegetation	GNR/S1	TBD (Chappell 2006)
<i>Danthonia californica</i> Valley Grassland Herbaceous Vegetation	G1Q/S1	CEGL001598

G488 Southern Vancouverian Shrub & Herbaceous Bald, Bluff & Prairie Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Festuca roemerii</i> – ( <i>Cerastium arvense</i> - <i>Koeleria macrantha</i> ) Herbaceous Vegetation	G2/S2	CEGL003349
<i>Festuca roemerii</i> – <i>Camassia leichtlinii</i> Herbaceous Vegetation	GNR/S1	TBD (Chappell 2006)
<i>Festuca roemerii</i> – <i>Camassia quamash</i> - <i>Cerastium arvense</i> Herbaceous Vegetation	GNR/SH	TBD (Chappell 2004; Rocchio et al. 2012)
<i>Festuca roemerii</i> - <i>Cerastium arvense</i> - <i>Koeleria macrantha</i> Herbaceous Vegetation	G1/S1	CEGL003349
<i>Festuca roemerii</i> - <i>Plectritis congesta</i> Herbaceous Vegetation	GNR/S1	TBD (Chappell 2006)
<i>Festuca roemerii</i> - <i>Sericocarpus rigidus</i> Herbaceous Vegetation	G1/S1	CEGL001608

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This group consists of mostly herbaceous-dominated areas located primarily on shallow soils and windy sites where wind and salt spray combine to limit tree growth. Steep slopes on coastal bluffs, headlands, or small islands are typical, though sometimes this group can be found on relatively level tops of headlands or islands. Due to shallow soils, steep slopes, sunny aspect, and/or upper slope position, these sites are dry and marginal for tree establishment and growth except in favorable microsites. Rock outcrops are a typical small-scale feature within balds and are considered part of this group. The climate is relatively dry to wet (50.8 cm to perhaps 254 cm [20-100 inches] annual precipitation), always with a distinct dry summer season when these sites usually become droughty enough to limit tree growth and establishment. The relative prevalence of grasslands versus shrublands increases to the south. Soils can be shallow to bedrock or of glacial or marine sediment origin. Seeps can be found in some balds that dry out by summer.

**Dynamics:** Fires, both lightning-ignited and those ignited by Native Americans, undoubtedly at least occasionally burn all these sites. Lower elevation sites in the Georgia Basin, Puget Trough, and Willamette Valley probably were burned somewhat more frequently and, in some cases, intentionally. Because of this fire history, the extent of this group has declined locally through tree invasion and growth, as areas formerly maintained as herbaceous by burning have filled in with trees. In recent centuries, these were fire-dominated systems, and there is a known history of Native American use of fire in these areas. While still present, annual grasses and forbs are not as prevalent in these grasslands as elsewhere in California. With fire suppression, *Baccharis pilularis* and other shrub components of north coastal scrub often invade and can replace these grasslands with scrub-dominated systems.

### DISTRIBUTION

**Geographic Range:** This herbaceous to shrub-herbaceous group is found from Vancouver Island down the coast to San Francisco. It occurs along the coast on coastal terraces and ridgeline balds in the Coast Ranges, Klamath Mountains, and at low elevations on the lee side of the coastal mountains in the northern part of the range. Small patches have been documented as far south as Santa Barbara and San Luis Obispo counties.

**Nations:** CA, US

**States/Provinces:** BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:P, 81:C

**USFS Ecoregions (2007):** 242A:CC, 242B:C?, M242A:CC, M242B:CC, M242C:CP, M242D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

### SYNONYMY

- < Balds (Franklin and Dyrness 1973)
- < Coastal Prairie (214) (Shiflet 1994) [Most of the SRM Coastal Prairie type corresponds to this group.]

### LOWER LEVEL UNITS

**Alliances:**

- A1647 *Lomatium martindalei* Herbaceous Alliance
- A3739 *Festuca rubra* - *Calamagrostis nutkaensis* Coastal Headland Herbaceous Alliance

### AUTHORSHIP

**Primary Concept Source:** J.F. Franklin and C.T. Dyrness (1973)

**Author of Description:** G. Kittel

**Acknowledgments:****Version Date:** 2010/03/22**REFERENCES**

**References:** Barbour and Billings 2000, Barbour and Major 1988, Chappell and Christy 2004, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994

2. Shrub &amp; Herb Vegetation

2.B.2.Na. Western North American Grassland &amp; Shrubland

**M493. Western North American Ruderal Grassland & Shrubland [Proposed]**

**Type Concept Sentence:** This upland macrogroup contains ruderal grasslands, meadows and shrublands found on human-disturbed sites, and dominated by non-native and generalist native species that occur in temperate areas throughout the western U.S. (Rockies westward) and southwestern Canada.

**OVERVIEW**

**Scientific Name:** *Bromus inermis* - *Centaurea* spp. - *Lepidium* spp. Western North American Ruderal Grassland & Shrubland Macrogroup

**Common Name (Translated Scientific Name):** Smooth Brome - Knapweed species - Pepperweed species Western North American Ruderal Grassland & Shrubland Macrogroup

**Type Concept:** This ruderal macrogroup occurs in temperate areas throughout the western North America and is composed of disturbed upland grasslands, meadows and shrublands dominated by non-native and generalist native species. It is abundant in waste areas and disturbed land in temperate areas throughout the western U.S. and southwestern Canada, including coastal areas, often as abandoned pastures, roadside margins or other weedy places. Sites are not mowed or otherwise maintained. Generally, these are areas that have been extremely disturbed by heavy equipment, such as old plowed fields, townsites, abandoned millsites, or livestock holding areas and other "waste" places that are now covered in invasive shrub or herbaceous species not native to western North America. Vegetation of the macrogroup can be a monoculture of a single non-native species, or a mix of several non-native forbs and graminoids, often associated with generalist natives species. Graminoids include *Agrostis gigantea*, *Agrostis stolonifera*, *Bromus inermis*, *Dactylis glomerata*, *Elymus repens*, and *Poa pratensis* (which may have been purposefully seeded for forage or to prevent soil erosion). Numerous other non-native herbaceous species may be present to dominant, including *Agrostis capillaris*, *Anthoxanthum odoratum*, *Bromus hordeaceus*, and *Holcus lanatus*. Native grasses and forbs may be present with low cover, or sometime abundant if they are generalists or ruderal species. Invasive non-native shrublands are less common, but some may be dominated by *Alhagi maurorum*, *Cytisus striatus*, *Cytisus scoparius*, or *Rubus armeniacus*.

**Classification Comments:** This macrogroup may be difficult to distinguish from native grasslands where native species are present. The test is that the non-native species, especially invasive species, far outweigh native species in abundance, such that a well-trained observer cannot tell what the native counterpart may have been or to do so is only speculation. This macrogroup can also include vegetation dominated by native ruderal species when caused by anthropomorphic disturbance such as old fields.

Restoration stands of planted or seeded native grasses such as *Festuca roemerii* (= *Festuca idahoensis* var. *roemerii*), *Festuca rubra*, or *Leymus mollis* are considered ruderal due to the fact that the planted species are the only native species present. If long-term restoration efforts succeed in re-establishing composition typical of native plant associations, then stands could be reclassified into that type.

Currently, this macrogroup is defined as occurring in the Rockies and westward, and thus is excluded from the Great Plains, where Great Plains Ruderal Grassland & Shrubland Macrogroup (M498) replaces it. But association ranges may need to be adjusted to reflect this pattern.

**Similar NVC Types:** Vegetation included in this macrogroup is similar to poor-condition natural temperate shrubland and grassland types that have been degraded by, but are not dominated by, invasive non-native species and can still be recognized as a native type.

- M046 California Ruderal Grassland & Meadow: is similar and characteristic differences need to be determined between Mediterranean and Temperate non-native grasslands & shrublands.
- M498 Great Plains Ruderal Grassland & Shrubland: may overlap where vegetation shares wide-ranging non-native species.
- M511 North Pacific Coastal Ruderal Grassland & Shrubland
- M301 Western North American Ruderal Wet Shrubland, Meadow & Marsh: may overlap in transition zones where upland species intermix with wetter forbs and graminoids.
- M512 North American Warm Desert Ruderal Scrub & Grassland: is similar but typically has more heat-tolerant or cold-sensitive species, such as *Bromus rubens* or *Eragrostis lehmanniana*, dominating the vegetation.
- M499 Western North American Cool Semi-Desert Ruderal Scrub & Grassland

**Diagnostic Characteristics:** This widespread upland shrubland and grassland macrogroup is dominated by invasive, non-native shrubs, grasses or forbs, often with generalist or "weedy" native species. Widespread dominant and diagnostic herbaceous species include naturalized forage species such as *Agrostis gigantea*, *Agrostis stolonifera*, *Anthoxanthum odoratum*, *Bromus inermis*, *Cynosurus echinatus*, *Dactylis glomerata*, *Holcus lanatus*, *Phalaris aquatica*, *Phleum pratense*, *Poa pratensis*, and numerous other non-native herbaceous species such as *Acroptilon repens*, *Cardaria draba*, *Carduus nutans*, *Centaurea* spp., *Cirsium arvense*, *Lepidium latifolium*, *Linum bienne*, and *Linaria* spp. There are relatively few non-native temperate upland shrublands, but *Alhagi maurorum*, *Cytisus scoparius*, *Genista* spp., and *Cytisus striatus* (or *Cytisus scoparius*) can form shrublands best in less xeric regions.

### VEGETATION

**Physiognomy and Structure:** This macrogroup includes ruderal vegetation with an open to dense shrub canopy and/or an herbaceous layer dominated by annual or perennial grasses or forbs.

**Floristics:** Vegetation of the macrogroup can be a monoculture of a single non-native species, or a mix of several non-native forbs and graminoids. Native grasses and forbs may be present with low cover, or sometime abundant if native species is acting as a ruderal species. Graminoids include *Aira caryophyllea*, *Aira praecox*, *Anthoxanthum odoratum*, *Agrostis gigantea*, *Agrostis stolonifera*, *Bromus inermis*, *Bromus rigidus*, *Bromus sterilis*, *Cynosurus echinatus*, *Dactylis glomerata*, *Elymus repens*, *Holcus lanatus*, *Lolium arundinaceum* (= *Schedonorus phoenix*), *Phalaris aquatica*, *Phleum pratense*, *Poa pratensis*, *Thinopyrum intermedium*, and many other species which may be purposefully seeded to prevent soil erosion or for livestock forage, but have naturalized. Highly invasive and wind- and animal-distributed non-native forb species include *Acroptilon repens*, *Agrostis capillaris*, *Aira caryophyllea*, *Aira praecox*, *Anthoxanthum odoratum*, *Cardaria draba*, *Carduus nutans*, *Centaurea* spp., *Cirsium arvense*, *Cirsium vulgare*, *Descurainia sophia*, *Halogeton glomeratus*, *Holcus lanatus*, *Hypericum perforatum*, *Lepidium latifolium*, *Linaria* spp., *Lolium arundinaceum* (= *Schedonorus phoenix*), *Sisymbrium altissimum*, *Trifolium pratense*, and *Verbascum thapsus*. Numerous other non-native herbaceous species may be present to dominant. Native forbs and ferns that can be increasers with disturbance may be present to abundant and include *Cerastium arvense*, *Galium aparine*, *Heracleum maximum*, *Marah oreganus*, and *Pteridium aquilinum*. Invasive non-native shrublands are less common, but some may be dominated by *Alhagi maurorum*, *Cytisus scoparius*, *Cytisus striatus*, *Cytisus scoparius*, or *Rubus armeniacus*. This macrogroup may grade into wetter areas and may have transition zones where mesic forbs intermix with wetter forbs and graminoids found in Western North American Ruderal Wet Shrubland, Meadow & Marsh Macrogroup (M301).

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This ruderal macrogroup is abundant in waste areas and disturbed land in temperate areas throughout the western U.S. and Canada, including coastal areas, often as abandoned pastures, roadside margins or other weedy places. Sites are not mowed or otherwise maintained. Most stands occur below approximately 1500 m (5000 feet) in elevation. Generally, these are areas that have been heavily disturbed by clearing, livestock, and heavy equipment, such as old plowed fields, townsites, abandoned millsites, livestock holding areas such as around stock tanks, old corrals or rabbit warrens and other "waste" places that are now covered in invasive shrub or herbaceous species not native to western North America. Substrates, aspects and landforms are variable, but do not include coastal sand dunes.

**Dynamics:** Vegetation included in this macrogroup is often the result of disturbance.

### DISTRIBUTION

**Geographic Range:** This ruderal grassland and shrubland macrogroup occurs in disturbed areas throughout temperate western North America (Rockies and westward in the U.S. and Canada).

**Spatial Scale & Pattern [optional]:**

**Nations:** CA, US

**States/Provinces:** BC, CA, CO, MT, NE, NV, OR, UT, WA, WY

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

### SYNONYMY

- > *Agrostis (gigantea, stolonifera) - Festuca arundinacea* (Bent grass - tall fescue meadows) Ruderal Stands (Sawyer et al. 2009) [45.106.00]
- > *Centaurea (solstitialis, meletensis)* (Yellow star-thistle fields) Ruderal Stands (Sawyer et al. 2009) [42.042.00]

WA groups

- > *Centaurea (virgata)* (Knapweed and purple-flowered star-thistle fields) Provisional Ruderal Stands (Sawyer et al. 2009) [42.043.00]
- > *Holcus lanatus - Anthoxanthum odoratum* (Common velvet grass - sweet vernal grass meadows) Ruderal Stands (Sawyer et al. 2009) [42.050.00]
- > *Lolium perenne* (Perennial rye grass fields) Ruderal Stands (Sawyer et al. 2009) [41.321.00]
- > *Poa pratensis* (Kentucky blue grass turf) Ruderal Stands (Sawyer et al. 2009) [42.060.00]

#### LOWER LEVEL UNITS

##### Groups:

- G624 Interior Western North American Ruderal Grassland & Shrubland
- G648 Southern Vancouverian Lowland Ruderal Grassland & Shrubland

#### AUTHORSHIP

**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2014)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** KAS 9-11, 10-14

#### REFERENCES

**References:** Esser 1993b, Faber-Langendoen et al. 2015, Howard 1996b, Sawyer et al. 2009, Uchytíl 1993

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2. Shrub & Herb Vegetation

2.B.2.Na. Western North American Grassland & Shrubland

M493. Western North American Ruderal Grassland & Shrubland

### **G648. Southern Vancouverian Lowland Ruderal Grassland & Shrubland [Proposed]**

**Type Concept Sentence:** This group is dominated by non-native invasive shrub or herbaceous species, such as *Agrostis capillaris*, *Anthoxanthum odoratum*, *Cytisus scoparius*, *Rubus armeniacus*, or many other introduced species, generally occurring on disturbed land throughout Pacific coastal areas below approximately 1500 m (5000 feet) in elevation.

#### OVERVIEW

**Scientific Name:** Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group

**Common Name (Translated Scientific Name):** Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group

**Type Concept:** This group is dominated by non-native species, such as introduced and invasive shrubs *Cytisus scoparius*, *Rubus armeniacus*, *Ulex europaeus*, and the introduced grasses *Agrostis capillaris*, *Anthoxanthum odoratum*, *Bromus hordeaceus*, *Holcus lanatus*, and/or *Poa pratensis*. It is abundant in waste areas and disturbed land throughout Pacific coastal areas either as abandoned pastures, roadside margins or other weedy places, below approximately 1500 m (5000 feet) in elevation. Sites are not mowed or otherwise maintained. Generally, these are areas that have been heavily disturbed by heavy equipment, such as old plowed fields, townsites, and abandoned millsites, livestock holding areas, and other once heavily used places that have been left as "waste" places.

**Classification Comments:** Restoration stands of planted or seeded native grasses such as *Festuca roemerii* (= *Festuca idahoensis* var. *roemerii*), *Festuca rubra*, or *Leymus mollis* are considered ruderal due to the fact that the planted species are the only native species present. If long-term restoration efforts succeed in reestablishing composition typical of a native plant associations, then stands could be reclassified into that type.

**Internal Comments:**

**Other Comments:**

##### Similar NVC Types:

- G647 North Pacific Maritime Coastal Ruderal Shrub & Grass Dune
- G677 North American Warm Desert Ruderal Scrub & Grassland
- G600 Great Basin & Intermountain Ruderal Dry Shrubland & Grassland

**Diagnostic Characteristics:**

#### VEGETATION

##### Physiognomy and Structure:

**Floristics:** Sites are dominated by non-native herbaceous species, or introduced shrubs such as *Cytisus scoparius*, *Rubus armeniacus*, *Ulex europaeus*, and *Lupinus arboreus*, or areas planted/seeded with native grasses undergoing restoration. In some areas, stands may be dominated by native herbaceous species; however, these cases occur on clearly disturbed ground. Non-native graminoids that can be abundant include *Agrostis avenacea*, *Agrostis capillaris*, *Agrostis stolonifera*, *Anthoxanthum odoratum*, *Arrhenatherum elatius*, *Bromus diandrus* (= *Bromus rigidus*), *Bromus hordeaceus*, *Bromus madritensis*, *Bromus sterilis*, *Cynosurus echinatus*, *Lolium arundinaceum* (= *Schedonorus phoenix*), *Lolium perenne*, and *Vulpia bromoides* (= *Festuca bromoides*). Other graminoids that are present to abundant include *Aira caryophylla*, *Aira praecox*, *Dactylis glomerata*, *Elymus repens*, *Holcus lanatus*, and *Poa pratensis*. Some areas are dominated by non-native forbs such as *Cirsium arvense*, *Hypochaeris radicata*, *Leucanthemum vulgare*, *Medicago lupulina*, *Rumex acetosella*, *Sisymbrium altissimum*, *Taraxacum officinale*, *Teesdalia nudicaulis*, and *Trifolium dubium*.

Of course, some waste areas are a mix of non-native grasses and forbs, or a mix of native and non-native species. Other non-native forbs that may be present include *Centaureum erythraea*, *Cirsium vulgare*, *Trifolium pratense*, *Vicia hirsuta*, and *Vicia sativa*. Native graminoids that may be present include *Carex inops*, *Bromus sitchensis*, *Elymus glaucus*, *Festuca rubra ssp. rubra*, and *Leymus mollis*. Stands of planted or seeded areas of native grasses (areas undergoing restoration) are included in this group until they mature into recognizable native plant associations. Native forbs and ferns that can be increasers with disturbance may be present and include *Cerastium arvense*, *Galium aparine*, *Heracleum maximum*, *Marah oreganus*, and *Pteridium aquilinum*. Some native shrubs may be scattered about with low abundance and include *Rubus ursinus*, *Symphoricarpos albus* and *Rosa nutkana*. Some areas have small to extensive patches of the introduced shrub *Rubus armeniacus* that is usually interspersed with the non-native grasses mentioned above.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This group is widespread throughout the coastal areas of the Pacific Northwest, but has been intensively studied in the Puget Sound specifically. Stands occur on soils that have been disturbed in the past from plowing, grazing or animal holding areas such as old corrals or rabbit warrens. Soils are mostly shallow and textures range from gravel, sand, sandy loam to loam. These areas are mostly flat or on low slopes and are usually well-drained. Hydrology ranges from very dry south-facing slopes to somewhat mesic north-facing protected sites. This group does not include sand dunes.

**Dynamics:** This group is generally a product of disturbance or abandonment of human or livestock activity, and once established is a quite permanent part of the landscape.

#### DISTRIBUTION

**Geographic Range:** This group occurs in the Pacific Northwest in disturbed sites and waste areas along the coast from California to Washington and possibly elsewhere.

**Nations:** CA?, US

**States/Provinces:** BC?, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 14:C, 15:C

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

#### LOWER LEVEL UNITS

**Alliances:**

- A2062 *Cytisus scoparius* - *Ulex europaeus* Coastal Ruderal Shrubland & Dwarf Tree Alliance
- A2063 *Anthoxanthum odoratum* - *Holcus lanatus* Ruderal Coastal Grassland Alliance

#### AUTHORSHIP

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2012)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2015/05/20

#### REFERENCES

**References:** Faber-Langendoen et al. 2015

## 2.B.2. Temperate Grassland & Shrubland

Temperate Grassland, Meadow & Shrubland is dominated by perennial grasses, forbs and shrubs typical of moderately dry to moist habitats, and is found in the mid-latitude regions of all continents (23° to 55°N and S), varying from large open grassland landscapes to droughty hillside meadows in forested landscapes.

### 2.B.2.Nd. Western North American Interior Sclerophyllous Chaparral

2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Sclerophyllous Chaparral

#### M094. Cool Interior Chaparral

**Type Concept Sentence:** These chaparral shrublands occur between low-elevation desert landscapes and higher subalpine woodlands of the Cascades, Sierra Nevada, and interior mountain ranges of the western U.S., generally among montane forests above 1500 m (4550 feet) elevation.

#### OVERVIEW

**Scientific Name:** *Arctostaphylos patula* - *Ceanothus velutinus* - *Quercus vacciniifolia* Montane Chaparral Macrogroup

**Common Name (Translated Scientific Name):** Greenleaf Manzanita - Snowbrush Ceanothus - Huckleberry Oak Montane Chaparral Macrogroup

**Type Concept:** These are chaparral shrublands found among montane forests of the Cascades south into Baja California, Mexico, and east in scattered locations on the eastern slope of the Sierra Nevada and Cascades and into the western Great Basin, Colorado Plateau, and Rocky Mountains. These hardy shrublands have open canopies with little undergrowth and are dominated by evergreen or winter-deciduous shrubs; some stands can have high densities of shrubs. Dominant and diagnostic shrubs include *Arctostaphylos glandulosa*, *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Ceanothus cordulatus*, *Ceanothus diversifolius*, *Ceanothus integerrimus*, *Ceanothus pinetorum*, *Ceanothus sanguineus* (in Oregon), *Ceanothus velutinus*, *Cercocarpus intricatus*, *Cercocarpus montanus* var. *glaber*, *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), *Eriogonum fasciculatum*, *Garrya flavescens*, *Holodiscus discolor* (= *Holodiscus microphyllus*), *Prunus emarginata*, *Prunus subcordata*, *Purshia stansburiana*, *Quercus garryana* var. *breweri*, *Quercus sadleriana*, *Quercus vacciniifolia*, and *Rhus trilobata*. This macrogroup occurs on sideslopes between low-elevation desert landscapes and higher pinyon-juniper woodlands of the western and central Great Basin on steep, exposed slopes with rocky and/or shallow soils, and among montane forests of the Rocky Mountains, Cascades and Sierra Nevada, above 1500 m (4550 feet) elevation where much of the annual precipitation occurs as snow. The shrubs are adapted to freezing temperatures and cold winters. Most of these chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. These may be short-duration chaparrals in previously forested areas that have experienced crown fires or recent logging. Occurrences likely shift across montane forested landscapes with catastrophic fire events.

**Classification Comments:** Sawyer et al. (2009) place shrublands dominated by *Ceanothus integerrimus*, *Prunus emarginata*, *Holodiscus discolor*, and *Quercus garryana* var. *breweri* into a Southern Vancouverian Montane Deciduous Scrub group or a Rock Outcrop group for the *Holodiscus* shrublands, but no such groups currently have been defined within existing macrogroups. While these taxa are deciduous rather than evergreen, they occur in the same areas as the chaparrals, and often have shared floristic characteristics as the *Arctostaphylos*, *Ceanothus*, *Chrysolepis* and evergreen oak shrublands. For now these types are placed in this cool montane chaparral macrogroup. *Ceanothus fendleri* associations might best fit here. A provisional association dominated by *Arctostaphylos columbiana* has been reported from Olympic National Park and is described as occurring south into the Cascades; while poorly known or described, it is included here for now. *Purshia stansburiana* is not a species commonly thought of as chaparral. However, on the Colorado Plateau and into the Grand Canyon region, it is often associated with *Arctostaphylos patula*. For now, associations dominated by *Purshia stansburiana* are included in this macrogroup, but perhaps better belong in some other. *Ceanothus velutinus* Shrubland (CEGL002167) was listed in this type but is being moved out, probably to Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macrogroup (M048). Linda Vance (pers. comm. 2014) considers this type to be very unlikely in Montana.

#### Similar NVC Types:

- M043 California Chaparral
- M049 Southern Rocky Mountain Montane Shrubland: also falls within Brown (1982a) Great Basin Montane Scrubland (132.1).
- M091 Warm Interior Chaparral: shares some floristics, but only in a few wide-ranging shrub taxa; each have diagnostic taxa that are not shared.

**Diagnostic Characteristics:** In the Great Basin, Cascades, and Rocky Mountains these are open-canopy broad-leaved evergreen shrublands dominated by *Arctostaphylos patula*, *Arctostaphylos nevadensis*, *Ceanothus martinii*, *Ceanothus velutinus*, and *Purshia stansburiana* (deciduous, but included here). In California, chaparral or open shrubland found among montane forests above 1500 m (4550 feet) elevation. Typical sclerophyllous chaparral shrubs include *Ceanothus cordulatus*, *Ceanothus diversifolius*, *Ceanothus pinetorum*, *Ceanothus integerrimus*, *Ceanothus velutinus*, *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), *Quercus sadleriana*, and *Quercus vacciniifolia*. Winter-deciduous shrubs may dominate, such as *Prunus emarginata*, *Prunus subcordata*, and *Ceanothus sanguineus* (in Oregon), *Holodiscus discolor* (= *Holodiscus microphyllus*), and *Quercus garryana* var. *breweri* (in California).

### VEGETATION

**Physiognomy and Structure:** Tall persistent or post fire shrublands 1-3 m tall, broad-leaved evergreen or winter deciduous, generally little to no undergrowth.

**Floristics:** In California and the Oregon Cascades, these shrublands are typically dominated by sclerophyllous shrubs. Characteristic shrub species include *Ceanothus cordulatus*, *Ceanothus diversifolius*, *Ceanothus integerrimus*, *Ceanothus velutinus*, *Ceanothus pinetorum*, *Chrysolepis sempervirens* (= *Castanopsis sempervirens*), *Lithocarpus densiflorus* var. *echinoides*, *Quercus sadleriana*, and *Quercus vacciniifolia*. Other evergreen species, such as *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Arctostaphylos manzanita*, and *Garrya fremontii*, are common in some stands. Characteristic winter-deciduous shrubs might dominate some stands, but are commonly present even where not dominant, such as *Prunus emarginata*, *Prunus subcordata*, and *Ceanothus sanguineus* (in Oregon), *Prunus virginiana*, *Holodiscus discolor* (= *Holodiscus microphyllus*), and *Quercus garryana* var. *breweri*. Other shrub species include *Amelanchier alnifolia*, *Symphoricarpos mollis*, *Chamaebatia foliolosa*, and *Cercocarpus* spp. Emergent *Abies concolor*, *Pinus lambertiana*, *Pinus jeffreyi*, *Pinus sabiniana*, *Pinus ponderosa*, *Pseudotsuga menziesii*, *Quercus chrysolepis*, *Quercus wislizeni*, and *Quercus kelloggii* trees may be present at sparse cover. The herbaceous layer is variable depending on cover of shrubs (dense shrublands have little understory) and substrate.

Further east, in the Great Basin, Colorado Plateau and Rocky Mountains, the diversity of shrubs tends to be less, but some species are shared with California montane chaparral. Characteristic shrubs include *Arctostaphylos patula*, *Arctostaphylos nevadensis*, *Ceanothus velutinus*, *Ceanothus martinii*, *Ceanothus prostratus*, and *Purshia stansburiana*. Other winter-deciduous shrubs are often present, including *Amelanchier alnifolia*, *Artemisia tridentata*, *Eriogonum* spp., *Prunus virginiana*, and *Symphoricarpos* spp. Emergent *Abies concolor*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus edulis*, *Pinus flexilis*, *Pinus monophylla*, *Pinus ponderosa*, *Pseudotsuga menziesii* trees may be present at sparse cover. The herbaceous layer is variable depending on cover of shrubs (dense shrublands have little understory) and substrate, but will include a variety of grass and forb taxa common to the Intermountain West and montane zones of the Rocky Mountains.

### ENVIRONMENT & DYNAMICS

**Environmental Description:** These are chaparral or open shrublands found at montane elevations throughout much of the western U.S., from the Sierra Nevada and Cascades and into the western Great Basin, Colorado Plateau, and Rocky Mountains. They occur in summer-dry habitats from 800 to 3000 m elevation. Can occur as low as 50 m in California, but mostly is found above 1500 m. Much of the precipitation comes as winter snow, and summer drought-stress is characteristic. These shrublands are mostly found on steep, usually south-facing or exposed slopes, where soils are rocky, shallow and well-drained, often glaciated. These are typically zonal disclimax or, occasionally, edaphic climax brushfields which occur in association with dry needle-leaved evergreen forests or woodlands. These shrublands are typically established after stand-replacing fires or clearcut logging in montane conifer forests or pinyon-juniper woodlands, and may be seral to forest after several decades. Excessively rocky or droughty, fire-prone sites in the forest may support relatively persistent stands of this macrogroup. These are in mosaics of woodlands and chaparral and may have conifer species invading if good seed source is available.

**Dynamics:** Two phases are recognized: first, early-seral and post-fire or post-logging shrub fields with few conifers; and second, edaphically controlled sites, with soils that are too dry or shallow-soiled for trees, hence sites where shrubs stay dominant (such as *Quercus vacciniifolia*, *Chrysolepis sempervirens*). Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Occurrences of this macrogroup likely shift across montane forested landscapes with catastrophic fire events. Clearcut logging can also trigger regeneration of some of the chaparral species.

### DISTRIBUTION

**Geographic Range:** Very widely distributed, but these are small or patchily distributed occurrences in many areas. Found from southern Cascades of Oregon to the Klamath Mountains and Peninsular Ranges of California into Baja California, Mexico, and east into the western and central Great Basin, east slopes of the Sierra Nevada and Cascades. It is also found in limited, small-patch occurrences throughout the montane zone of mountain ranges in the western U.S.

**Spatial Scale & Pattern [optional]:**

**Nations:** CA?, MX, US

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



**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 261B:CC, 263A:CC, 313A:??, 322A:??, 341A:CP, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342J:CP, M242B:??, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC, M341A:CC, M341D:CP

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

- > Bittercherry (419) (Shiflet 1994) [Sierran chaparral on east side includes *Prunus emarginata* shrublands.]
- >< Great Basin Montane Scrubland (132.1) (Brown 1982a) [Not equivalent, but Brown's (1982a) type includes the concept of this macrogroup. His type is under his Cold-temperate Scrublands.]
- > Montane Shrubland (209) (Shiflet 1994)
- > Snowbush (420) (Shiflet 1994)

**LOWER LEVEL UNITS**

**Groups:**

- G282 Western North American Montane Sclerophyll Scrub

**AUTHORSHIP**

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** M.S. Reid, G. Kittel, and K.A. Schulz

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** MSR/GK/KAS 10-14

**REFERENCES**

**References:** Barbour and Billings 2000, Barbour and Major 1988, Brown 1982a, Faber-Langendoen et al. 2015, Holland and Keil 1995, Keeler-Wolf et al. 2003a, Sawyer et al. 2009, Shiflet 1994, Vance pers. comm.

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2. Shrub & Herb Vegetation

2.B.2.Nd. Western North American Interior Sclerophyllous Chaparral

M094. Cool Interior Chaparral

**G282. Western North American Montane Sclerophyll Scrub [Proposed]**

**Type Concept Sentence:**

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**OVERVIEW**

**Scientific Name:** *Arctostaphylos patula* - *Arctostaphylos nevadensis* - *Ceanothus velutinus* Montane Sclerophyll Scrub Group

**Common Name (Translated Scientific Name):** Greenleaf Manzanita - Pinemat Manzanita - Snowbrush *Ceanothus* Montane Sclerophyll Scrub Group

**Type Concept:** This group consists of cool, mostly montane chaparral and sclerophyllous scrublands that occur in the western United States from the Sierra Nevada, Klamath-Siskiyou mountains and southern Cascade Range of California and southern Oregon east on the ranges of the Great Basin and plateaus of the Colorado Plateau into the Rocky Mountains extending out to the Black Hills. There are also occurrences extending as far west as the inner Coast Ranges in central California and the Peninsular and Transverse ranges. Stands are typically fairly open-canopied shrublands with open interspaces either bare or supporting patchy grasses and forbs.

*Arctostaphylos patula* and *Ceanothus velutinus* are the most widespread dominant/diagnostic species. Other dominant/diagnostic species include *Arctostaphylos mewukka*, *Arctostaphylos nevadensis*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus integerrimus*, *Ceanothus martinii*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus garryana* var. *breweri* (shrub form), *Quercus sadleriana*, and *Quercus vacciniifolia*. *Cercocarpus ledifolius* is generally absent. Most of the oaks and other chaparral species occur in the western extent. Understory varies with shrub density but is generally sparse. Occasional emergent conifers may be present. Higher elevation stands typically have higher species diversity. Stands in this group are typically montane shrublands found on the slopes of the Sierra Nevada and Cascades and into the western Great Basin, Colorado Plateau and the Black Hills of South Dakota in summer-dry habitats from 800 to 3000 m elevation. Stands in California are found at higher elevations than most other chaparral ranging from 300 to 3300 m elevation. They occur in the northern Coast Ranges, Klamath Mountains, Modoc Plateau, Sierra Nevada and foothills, and southern Cascades of California and southern Oregon. Climate is semi-arid to cool temperate. Yearly precipitation and temperature ranges are quite large. Much of the precipitation comes as winter snow at higher elevations, and summer drought-stress is characteristic. These shrublands occur on ridges and rocky slopes often with southerly

aspects. Substrates are thin, well-drained skeletal soils with coarser texture loamy or sandy soils. Parent materials are varied and range from limestone and sandstone to granitics, mafic, and ultramafic substrates. These shrub communities established after stand-replacing fires or clearcut logging in *Pinus ponderosa* or *Pseudotsuga menziesii* forests or pinyon-juniper woodlands, and are seral to forest after several decades. Excessively rocky or droughty, fire-prone sites in the forest may support relatively persistent stands of this group. In the Rocky Mountains, stands are found within a matrix of montane conifer forest and woodland in limited, small-patch occurrences forming post-fire shrublands in areas previously dominated by woodlands. Typical fire regime in this group varies with the amount of organic accumulation. All characteristic species are fire-adapted.

**Classification Comments:** This cool, mostly montane chaparral and sclerophyllous scrublands group occurs in the western United States and is frequently characterized by dominance of *Arctostaphylos patula* and *Ceanothus velutinus*. Other dominant/diagnostic species include *Arctostaphylos mewukka*, *Arctostaphylos nevadensis*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus integerrimus*, *Ceanothus martinii*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus garryana* var. *breweri* (shrub form), *Quercus sadleriana*, and *Quercus vaccinifolia*. *Cercocarpus ledifolius* is generally absent.

**Internal Comments:** MSR 9-13: AB?, BC?, NM, SD, WY added.

**Other Comments:**

**Similar NVC Types:**

- G261 California Mesic & Pre-montane Chaparral

**Diagnostic Characteristics:** Open-canopied broad-leaved evergreen shrublands dominated by diagnostic species *Arctostaphylos mewukka*, *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus integerrimus*, *Ceanothus martinii*, *Ceanothus velutinus*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus garryana* var. *breweri* (shrub form), *Quercus sadleriana*, and *Quercus vaccinifolia*. *Cercocarpus ledifolius* is generally absent and herbaceous layer is typically sparse.

## VEGETATION

**Physiognomy and Structure:** Broad-leaved evergreen shrubland with open canopy and little to no undergrowth. Shrubs are typically 1-3 m tall.

**Floristics:** Stands in this wide-ranging group are typically fairly open-canopied shrublands with open interspaces either bare or supporting patchy grasses and forbs. *Arctostaphylos patula* and *Ceanothus velutinus* are the most widespread dominant/diagnostic species. Other dominant/diagnostic species include *Arctostaphylos mewukka*, *Arctostaphylos nevadensis*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus integerrimus*, *Ceanothus martinii*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus garryana* var. *breweri* (shrub form), *Quercus sadleriana*, and *Quercus vaccinifolia*. *Cercocarpus ledifolius* is generally absent. Most of the oaks and other chaparral species occur in the western extent. Other shrubs may include *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Cercis canadensis* var. *texensis*, *Cercocarpus montanus*, *Garrya fremontii*, *Quercus berberidifolia*, *Prunus subcordata*, *Purshia stansburiana*, *Symphoricarpos* spp., and *Toxicodendron diversilobum*. Emergent conifers may be present, such as *Abies concolor*, *Pinus lambertiana*, *Pinus ponderosa*, *Pinus sabiniana*, *Pseudotsuga menziesii*, and tree oaks such as *Quercus chrysolepis*, *Quercus kelloggii*, or *Quercus wislizeni* may be present at sparse cover. Understory varies with shrub density but is generally sparse with *Elymus glaucus*, *Elymus elymoides*, *Eriogonum nudum*, *Festuca californica*, *Pyrola picta*, and *Stephanomeria lactucina* sometimes present in the herbaceous layer. Higher elevation stands typically have higher species diversity.

G282 Western North American Montane Sclerophyll Scrub	Global/ State Rank	NatureServe/ WANHP Code
<i>Arctostaphylos columbiana</i> Herbaceous Vegetation	GNR/S3	TBD (Crawford et al. 2009)
<i>Ceanothus velutinus</i> Shrubland	GNR/S3S5Q	CEGL002167

## ENVIRONMENT & DYNAMICS

**Environmental Description:** Stands in this group are typically montane shrublands found on the slopes of the Sierra Nevada and Cascades and into the western Great Basin, Colorado Plateau and Black Hills of South Dakota in summer-dry habitats from 800 to 3000 m elevation. Stands in California are found at higher elevations than most other chaparral ranging from 300 to 3300 m elevation. They occur in the northern Coast Ranges, Klamath Mountains, Modoc Plateau, Sierra Nevada and foothills, and southern Cascades of California and southern Oregon. Climate is semi-arid to cool temperate. Yearly precipitation and temperature ranges are quite large. The northern portion of the Sierra Nevada and Klamath-Siskiyou mountains can receive 200 cm of rain per year, while southern stands may receive only 40 cm per year. These sclerophyllous shrubs are adapted to freezing temperatures and cold winters. However, lower elevation stands may never see freezing temperatures, while northern, high-elevation and northern stands

may only have a 4-month growing season. Much of the precipitation comes as winter snow, and summer drought-stress is characteristic.

These shrublands occur on ridges and rocky slopes often with southerly aspects. Substrates are thin, well-drained skeletal soils with coarser texture loamy or sandy soils. Parent materials are varied and range from limestone and sandstone to granitics, mafic, and ultramafic substrates. These shrub communities are typically zonal disclimax or, occasionally, edaphic climax brushfields which occur in association with dry needle-leaved evergreen forests or woodlands. They typically established after stand-replacing fires or clear-cut logging in *Pinus ponderosa* or *Pseudotsuga menziesii* forests or pinyon-juniper woodlands, and are seral to forest after several decades. Excessively rocky or droughty, fire-prone sites in the forest may support relatively persistent stands of this group. In the Rocky Mountains, stands are found within a matrix of montane conifer forest and woodland in limited, small-patch occurrences forming post-fire shrublands in areas previously dominated by woodlands. Typical fire regime in this group varies with the amount of organic accumulation. All characteristic species are fire-adapted.

**Dynamics:** Stands commonly occur post disturbance after fire or logging along ridges and upper slopes.

#### DISTRIBUTION

**Geographic Range:** This chaparral group occurs across much of the western United States from the Sierra Nevada, Klamath-Siskiyou mountains and southern Cascade Range of California and southern Oregon east across the ranges of the Great Basin and plateaus of the Colorado Plateau into the Rocky Mountains extending out to the Black Hills. There are occurrences extending as far west as the inner Coast Ranges in central California, the northern Coast Ranges in southeastern Oregon and the Peninsular and Transverse ranges in southern California.

**Nations:** CA?, US

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

**TNC Ecoregions [optional]:** 3:C, 4:C, 7:P, 8:C, 9:C, 11:C, 12:C, 15:P, 18:C, 19:C, 20:P, 21:P

**USFS Ecoregions (2007):** 313A:??, 341A:CP, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342J:CP, M261E:CC, M341A:CC, M341D:CP

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed. This group is very uncertain as a type.

#### SYNONYMY

- >< Littleleaf Mountain-Mahogany (417) (Shiflet 1994)
- >< Snowbush (420) (Shiflet 1994)

#### LOWER LEVEL UNITS

##### Alliances:

- A4117 *Quercus sadleriana* - *Lithocarpus densiflorus* var. *echinoides* Shrubland Alliance
- A3918 *Prunus emarginata* - *Holodiscus discolor* Shrubland Alliance
- A3919 *Quercus garryana* var. *fruticosa* Shrubland Alliance
- A3916 *Quercus vacciniifolia* - *Chrysolepis sempervirens* Shrubland Alliance
- A3917 *Ceanothus cordulatus* - *Ceanothus integerrimus* Shrubland Alliance
- A0788 *Arctostaphylos patula* - *Arctostaphylos nevadensis* Shrubland Alliance
- A3936 *Ceanothus velutinus* Shrubland Alliance

#### AUTHORSHIP

**Primary Concept Source:** T.N. Shiflet (1994)

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

**Acknowledgments:**

**Version Date:** 2015/04/16

#### REFERENCES

**References:** Barbour and Major 1977, Brown 1982a, Faber-Langendoen et al. 2015, Sawyer et al. 2009, Shiflet 1994

## 2.B.4. Temperate to Polar Scrub & Herb Coastal Vegetation

Temperate to Polar Scrub & Herb Coastal Vegetation is found in temperate to polar coastal habitats, including beaches, bluffs and dunes, where wind and water are major drivers of the vegetation, across the mid to polar latitudes from 23° to 60-70°N and S latitude, dominated by prostrate perennials on the beach and foredune, and graminoids and scrub on backdunes and bluffs.

## 2.B.4.Nb. Pacific North American Coast Scrub & Herb Vegetation

### 2. Shrub & Herb Vegetation

#### 2.B.4.Nb. Pacific North American Coast Scrub & Herb Vegetation

### M058. Pacific Coastal Cliff & Bluff Vegetation

**Type Concept Sentence:** This macrogroup occurs on sea cliffs, scree slopes and rocky coastlines exposed to salt spray and ocean wave action. It occurs from the coast of the Aleutian Islands, south through California and possibly into Mexico.

#### OVERVIEW

**Scientific Name:** Pacific Coastal Cliff & Bluff Vegetation Macrogroup

**Common Name (Translated Scientific Name):** Pacific Coastal Cliff & Bluff Vegetation Macrogroup

**Type Concept:** This macrogroup occurs from the coast of the Aleutian Islands, south through California and possibly into Mexico. It consists of sparsely to moderately densely vegetated sea cliffs, scree slopes and rocky (but not cobble-on-sand) coastlines exposed to salt spray and ocean wave action. The vascular vegetation is typically composed of grasses and low shrubs, which are restricted to small cracks in rock, or slight, sheltered depressions. Lichen cover can be high. In the north, dominants include *Aruncus dioicus* var. *acuminatus*, *Campanula* spp., *Carex macrochaeta*, *Chamerion latifolium*, *Chamerion latifolium*, *Deschampsia* spp., *Fragaria chiloensis*, *Heuchera glabra*, *Lupinus nootkatensis*, *Phegopteris connectilis*, *Potentilla villosa*, *Prenanthes alata*, and *Rhodiola rosea*. On Haida Gwaii, *Festuca rubra* (native subspecies) is a common dominant of rocky headlands. Associated species include *Achillea millefolium*, *Conioselinum gmelinii*, *Fragaria chiloensis*, *Maianthemum dilatatum*, *Mimulus guttatus*, *Plantago maritima*, and *Potentilla villosa*. However, a wide range of other species may occur and may be dominant in some cases. *Picea sitchensis* tolerates salt spray and often occupies appropriate microsites on the rocky headlands. They are generally characterized by stunted growth, usually with branches from top to bottom of bole. Lichen cover can be high, but species are poorly described. Coastal bluffs further south, in the Georgia Strait and Puget Sound areas, also have *Festuca rubra* as a common dominant but associated species include *Bromus sitchensis*, *Grindelia integrifolia*, *Heuchera micrantha*, *Plectritis congesta*, *Sedum* spp., and *Zigadenus venenosus*, among others. Trees, if present, are stunted and/or windblown and may include *Arbutus menziesii*, *Quercus garryana*, or *Pseudotsuga menziesii*. *Juniperus maritima* may also occur. Shrubs are also infrequent and may include *Holodiscus discolor*, *Amelanchier alnifolia*, or *Mahonia aquifolium*. Mosses can be abundant, including species such as *Racomitrium canescens*, *Polytrichum piliferum*, or *Dicranum* spp. Introduced species are often found, e.g., *Aira* spp., *Cynosurus echinatus*, and *Cytisus scoparius*. Coastal bluff-scrub on the California coastal islands has *Artemisia californica*, *Coreopsis gigantea*, *Dudleya caespitosa*, *Dudleya greenei*, *Eriogonum arborescens*, *Eriogonum giganteum*, *Eriogonum grande* var. *rubescens*, *Isocoma menziesii*, *Malacothrix saxatilis* var. *implicata*, and many other species, including many endemic species. This type includes rocky headlands and sea cliffs. Frequent exposure to salt spray distinguishes this macrogroup from inland and alpine rock outcrops and cliffs. Substrates include glacial deposits along the Pacific Ocean. Exposure to waves, eroding and desiccating winds, slope failures, and sheet erosion create rocky substrates that are often unstable. Soils are thin and limited to fine materials blown into cracks and fissures in the bedrock substrate.

**Classification Comments:** Cobble-on-sand beach or coastal areas are included in North Pacific Maritime Coastal Scrub & Herb Beach & Dune Group (G498) in Pacific Coastal Beach & Dune Vegetation Macrogroup (M059).

#### Similar NVC Types:

- M044 California Coastal Scrub: has overlapping floristics such as *Coreopsis gigantea*, *Artemisia californica*, and *Isocoma menziesii*, though other succulent and herbaceous taxa are more diagnostic of M058.

**Diagnostic Characteristics:** Sparsely to densely vegetated sea cliffs, scree slopes and rocky (but not cobble-on-sand) coastlines exposed to salt spray and ocean wave action. The vascular vegetation is typically composed of grasses and low shrubs, which are restricted to small cracks in rock, or slight, sheltered depressions. Lichen cover can be high.

#### VEGETATION

**Physiognomy and Structure:** This macrogroup comprises sparse vascular vegetation of creeping forbs, succulents, low grasses, dwarf-shrubs, and stunted trees clinging to cliff faces, bluffs and balds exposed to salt spray of the ocean. Lichen or moss cover can be high.

**Floristics:** Forbs, grasses and shrubs establish on ledges and in cracks. On Amchitka Island, Shacklette et al. (1969) described several sea cliff communities, including *Eurhynchium-Puccinellia-Caloplaca*, *Potentilla-Draba-Saxifraga*, *Xanthoria-Ramalina*, and *Leymus-Ligusticum-Anemone*. On the Alaska Peninsula, dominance may shift to *Alnus viridis* ssp. *sinuata*, *Aruncus dioicus* var. *acuminatus*, *Campanula* spp., *Carex macrochaeta*, *Chamerion latifolium*, *Chamerion latifolium*, *Deschampsia* spp., *Fragaria*

*chiloensis*, *Heuchera glabra*, *Lupinus nootkatensis*, *Phegopteris connectilis*, *Potentilla villosa*, *Prenanthes alata*, and *Rhodiola rosea*. On Haida Gwaii, *Festuca rubra* (native subspecies) is a common dominant of rocky headlands. Associated species include *Achillea millefolium*, *Conioselinum gmelinii*, *Fragaria chiloensis*, *Maianthemum dilatatum*, *Mimulus guttatus*, *Plantago maritima*, and *Potentilla villosa*. However, a wide range of other species may occur and may be dominant in some cases. *Picea sitchensis* tolerates salt spray and often occupies appropriate microsites on the rocky headlands. They are generally characterized by stunted growth, usually with branches from top to bottom of bole. Lichen cover can be high, but species are poorly described. On Haida Gwaii, the lichen cover in elevational bands above the intertidal have been characterized (Brodo and Sloan 2004).

Coastal bluffs further south, in the Georgia Strait and Puget Sound areas, also have *Festuca rubra* as a common dominant but associated species include *Bromus sitchensis*, *Grindelia integrifolia*, *Heuchera micrantha*, *Plectritis congesta*, *Sedum* spp., and *Zigadenus venenosus*, among others. Trees, if present, are stunted and/or windblown and may include *Arbutus menziesii*, *Quercus garryana*, or *Pseudotsuga menziesii*. *Juniperus maritima* may also occur. Shrubs are also infrequent and may include *Holodiscus discolor*, *Amelanchier alnifolia*, or *Mahonia aquifolium*. Mosses can be abundant, including species such as *Racomitrium canescens*, *Polytrichum piliferum*, or *Dicranum* spp. Introduced species are often found, e.g., *Aira* spp., *Cynosurus echinatus*, and *Cytisus scoparius*.

Coastal bluff-scrub on the California coastal islands has *Artemisia californica*, *Coreopsis gigantea*, *Dudleya caespitosa*, *Dudleya greenei*, *Eriogonum arborescens*, *Eriogonum giganteum*, *Eriogonum grande* var. *rubescens*, *Isocoma menziesii*, *Malacothrix saxatilis* var. *implicata*, and many other species, including many endemic species (Junak et al. 2007).

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup includes rocky headlands and sea cliffs. Sea cliffs typically occur below 50 m elevation; however, on some extremely exposed cliffs, such as those on outer headlands, salt spray from winter storms may affect cliffs at 100-200 m elevation. Frequent exposure to salt spray distinguishes this macrogroup from inland and alpine rock outcrops and cliffs. Substrates include glacial deposits along the Pacific Ocean. Exposure to waves, eroding and desiccating winds, slope failures, and sheet erosion create rocky substrates that are often unstable. Soils are thin and limited to fine materials blown into cracks and fissures in the bedrock substrate.

**Dynamics:** Steep slopes, salt spray, wind and wave erosion, desiccation, and slope failures create a harsh growing environment.

#### DISTRIBUTION

**Geographic Range:** This macrogroup occurs from the coast of the Aleutian Islands, central and southern Alaska coast, British Columbia and Washington south to Mexico.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX, US

**States/Provinces:** AK, BC, CA, MXBC, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

- < III.B.1.a - Seral herbs (Viereck et al. 1992)
- < III.B.2.a - Mixed herbs (Viereck et al. 1992)
- < III.C.1.b - Dry bryophyte (Viereck et al. 1992)

#### LOWER LEVEL UNITS

#### Groups:

- G554 North Pacific Coastal Scrub & Herb Cliff & Bluff

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 10-14

## REFERENCES

**References:** Banner et al. 2004, Boggs et al. 2008b, Brodo and Sloan 2004, Faber-Langendoen et al. 2015, Junak et al. 2007, McPhee et al. 2000, Shacklette et al. 1969, Viereck et al. 1992, Ward et al. 1998

2. Shrub & Herb Vegetation

2.B.4.Nb. Pacific North American Coast Scrub & Herb Vegetation

M058. Pacific Coastal Cliff & Bluff Vegetation

### G554. North Pacific Coastal Scrub & Herb Cliff & Bluff

**Type Concept Sentence:**

#### OVERVIEW

**Scientific Name:** *Eurhynchium* sp. - *Saxifraga* sp. - *Xanthoria* sp. Sea Cliff & Bluff Vegetation Group

**Common Name (Translated Scientific Name):** Eurhynchium Moss species - Saxifrage species - Orange Wall Lichen species Sea Cliff & Bluff Vegetation Group

**Type Concept:** This group consists of sparsely vegetated sea cliffs, scree slopes and rocky (but not cobble-on-sand) coastlines exposed to salt spray and ocean wave action. It occurs from the coast of the Aleutian Islands, central and southern Alaska coast, British Columbia and Washington south to central Oregon. Frequent exposure to salt spray distinguishes this group from inland and alpine rock outcrops and cliffs. Elevation is usually within 15 m (50 feet), but some cliffs are much higher. Salt spray, wind and wave erosion, desiccation, and slope failures create a harsh growing environment. Vegetation is sparse and consists of grasses, lichens and low shrubs. Some cliff communities have been described from Alaska, including *Eurhynchium-Puccinellia-Caloplaca*, *Potentilla-Draba-Saxifraga*, *Xanthoria-Ramalina*, and *Leymus-Ligusticum-Anemone*. Other species include *Alnus viridis* ssp. *sinuata*, *Rubus spectabilis*, *Aruncus dioicus* var. *acuminatus*, *Heuchera glabra*, *Potentilla villosa*, *Phegopteris connectilis*, *Carex macrochaeta*, *Deschampsia* spp., *Lupinus nootkatensis*, *Campanula* spp., and *Chamerion latifolium*. Stunted *Picea sitchensis* may also occur.

**Classification Comments:** Cobble-on-sand beach or coastal areas are included in North Pacific Maritime Coastal Scrub & Herb Beach & Dune Group (G498).

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G498 North Pacific Maritime Coastal Scrub & Herb Beach & Dune

**Diagnostic Characteristics:** Sparsely vegetated sea cliffs, scree slopes and rocky (but not cobble-on-sand) coastlines exposed to salt spray and ocean wave action. Vegetation is often dominated by grasses, lichens and low shrubs.

#### VEGETATION

**Physiognomy and Structure:** This group comprises sparse vegetation of creeping forbs, low grasses, dwarf-shrubs, and stunted trees clinging to cliff faces, bluffs and balds exposed to salt spray of the ocean.

**Floristics:** Forbs, grasses and shrubs establish on ledges and in cracks. On Amchitka Island, Shacklette et al. (1969) described several sea cliff communities, including *Eurhynchium-Puccinellia-Caloplaca*, *Potentilla-Draba-Saxifraga*, *Xanthoria-Ramalina*, and (on less steep cliffs) *Leymus-Ligusticum-Anemone*. On the Alaska Peninsula, dominance may shift to *Alnus viridis* ssp. *sinuata*, *Rubus spectabilis*, *Aruncus dioicus* var. *acuminatus*, *Heuchera glabra*, *Potentilla villosa*, *Phegopteris connectilis*, *Carex macrochaeta*, *Deschampsia* spp., *Lupinus nootkatensis*, *Campanula* spp., *Chamerion latifolium*, *Prenanthes alata*, *Rhodiola rosea*, and *Chamerion latifolium*. *Picea sitchensis* may also occupy these rocky headlands and often does. They are characterized by somewhat stunted growth, usually with branches from top to bottom of bole. Epiphytic lichens are abundant in this group. Floristic information was summarized from the following sources: Shacklette et al. (1969), Viereck et al. (1992), and Boggs et al. (2008b).

G554 North Pacific Coastal Scrub & Herb Cliff & Bluff Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Calamagrostis nutkaensis</i> - <i>Elymus glaucus</i> Herbaceous Vegetation	G2/S2	CEGL001564
<i>Calamagrostis nutkaensis</i> / <i>Baccharis pilularis</i> Herbaceous Vegetation	G2/SNR	CEGL003377
<i>Festuca rubra</i> Coastal Headland Herbaceous Vegetation	G2/S1	CEGL001567
<i>Gaultheria shallon</i> - <i>Vaccinium ovatum</i> / <i>Pteridium aquilinum</i> Shrubland	G3/S2S3	CEGL000972

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** This group includes rocky headlands and sea cliffs. Sea cliffs typically occur below 50 m elevation; however, on some extremely exposed cliffs, such as those on outer headlands, salt spray from winter storms may affect cliffs at 100-200 m elevation. Vegetation cover is typically sparse to absent. Frequent exposure to salt spray distinguishes this group from inland and alpine rock outcrops and cliffs. In addition to salt spray, wind and wave erosion, desiccation, and slope failures create a harsh growing environment. Substrates include glacial deposits along the Pacific Ocean and associated marine and estuarine inlets. Exposure to waves, eroding and desiccating winds, slope failures, and sheet erosion create gravelly to rocky substrates that are often unstable. Soils are thin and limited to fine materials blown into cracks and fissures in the bedrock substrate. Environmental information was summarized from the following sources: Shacklette et al. (1969), Viereck et al. (1992), and Boggs et al. (2008b).

**Dynamics:** Steep slopes, salt spray, wind and wave erosion, desiccation, and slope failures create a harsh growing environment.

**DISTRIBUTION**

**Geographic Range:** It occurs from the coast of the Aleutian Islands, central and southern Alaska coast, British Columbia and Washington south to central Oregon.

**Nations:** CA, US

**States/Provinces:** AK, BC, OR, WA

**TNC Ecoregions [optional]:** 1:C, 69:C, 71:C, 72:C, 73:C

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Low.

**SYNONYMY**

- < III.B.1.a - Seral herbs (Viereck et al. 1992)
- < III.B.2.a - Mixed herbs (Viereck et al. 1992)
- < III.C.1.b - Dry bryophyte (Viereck et al. 1992)

**LOWER LEVEL UNITS**

**Alliances:**

- A3455 *Eurhynchium* sp. - *Saxifraga* sp. - *Xanthoria* sp. Herbaceous Vegetation Alliance

**AUTHORSHIP**

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2011/01/03

**REFERENCES**

**References:** Boggs et al. 2008b, Faber-Langendoen et al. 2015, Shacklette et al. 1969, Viereck et al. 1992

**M059. Pacific Coastal Beach & Dune Vegetation**

**Type Concept Sentence:** Coastal beach and active dunes along the Pacific Coast of North America.

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**OVERVIEW**

**Scientific Name:** Pacific Coastal Beach & Dune Vegetation Macrogroup

**Common Name (Translated Scientific Name):** Pacific Coastal Beach & Dune Vegetation Macrogroup

**Type Concept:** This macrogroup consists of herbaceous and shrubby vegetation on coastal sandy and cobble-on-sand beaches, beach dunes, and sand spits. Wetland dune swales are excluded. Herbaceous communities include salt-tolerant forb-dominated types with *Achillea millefolium* var. *borealis*, *Cochlearia groenlandica*, *Equisetum variegatum*, *Honckenya peploides*, *Lathyrus japonicus* var. *maritimus* (= *Lathyrus maritimus*), *Mertensia maritima*, and grasslands dominated by *Leymus mollis*, *Leymus arenarius* (= *Elymus arenarius*), and/or *Festuca rubra*. Dwarf-shrub are dominated by *Empetrum nigrum*, *Ericameria ericoides*, *Lupinus chamissonis*, *Lupinus arboreus*, *Gaultheria shallon*, *Vaccinium ovatum*, *Myrica gale*, or *Salix* spp. Herbaceous species intermixed with dwarf-shrubs include *Lathyrus japonicus* var. *maritimus*, *Conioselinum chinense*, *Cornus suecica*, and *Cnidium cnidiifolium*. This macrogroup occurs along the Pacific Coast from Mexico to Alaska, including the Aleutian Islands.

**Classification Comments:** The concept is suggested to extend only in the temperate zone, north of which occurs North American Arctic & Boreal Coast Vegetation Macrogroup (M402), but it is possible that this macrogroup should include the boreal coast, and M402 should be restricted to the Arctic?

Carmen Cadrin (pers. comm. 2014): I think the description presented in the macrogroup is too broad. Although some British Columbia sites have dune vegetation immediately adjacent to estuarine meadows, I'm not sure they should be lumped together in the same macrogroup. If it must stay as is, I suggest writing up the vegetation types by site characteristics as indicated in Environment and Dynamics sections. See also Review comments form for more details and Mackenzie (2012) for comparison of Terrestrial Realm/Beachland Class and Estuarine Realm.

According to Manuel Peinado (pers. comm. 2014), four macrogroups may need to be split within this macrogroup (in addition to removing the boreal and Arctic vegetation to M402): (1) North Pacific Temperate and Boreal Dune Vegetation (his *Honckenyo-Elymetea arenarii*). 469ff; (2) Californian Dune Vegetation (*Ambrosiotea chamissonis*). 472ff; (3) Bajo California - Mesoamerica Tropical Dune Vegetation (*Euphorbio-leucophyllae-Sporoboletia virginici*). 474ff; and (4) Pacific Tidal Beach (*Cakiletea maritima*). P. 472. Although *Cakile* is exotic in the west, your paper suggests other native components. But this is a challenging type for us, with respect to this macrogroup versus North Pacific Coastal Ruderal Grassland & Shrubland Macrogroup (M511).

Manuel Peinado (pers. comm. 2014): The author Pacific Coastal Beach & Dune Vegetation Macrogroup (M059) and Pacific Coastal Cliff & Bluff Vegetation Macrogroup (M058) has made a substantial synthesis effort, which is much appreciated. This effort is even more outstanding if we consider the extent of the coastal zone examined along with its vast diversity despite only including the vegetation of dunes and beaches. However, unfortunately, I feel that the final result of this great effort does not reflect the concept of the macrogroup as defined by the USNVC (2014):

"A vegetation classification unit of intermediate rank defined by combinations of moderate sets of diagnostic plant species and diagnostic growth forms that reflect biogeographic differences in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes."

As indicated in the publications I cite in this form, along North America's Pacific coast, including the coasts of Mexico (and even those of Mesoamerica), there exists an extensive biogeographic diversity recognized by several classification systems (Takhtajan, Thorne, Cronquist, etc.) that is clearly related to dune and beach vegetation. In addition, neither does the proposal put forward distinguish the clear differences in zoniomes and climates that arise from the Aleutian islands to the Mexican tropical coasts. Thus, on the continental scale, there are at least four macrobioclimates and a similar number of zoniomes: Boreal, Temperate, Mediterranean and Tropical. These show considerable regional differences reflected in the azonal communities of dunes, beaches and salt marshes. The proposal also lacks consideration of the ecological processes of zonation and succession, which are key to interpreting the vegetation of dunes and beaches and consequently fails to include very characteristic vegetation types such as debris-line communities, herbaceous rhizomatous vegetation on oligotrophic habitats, consolidated dune scrubs, stabilized dune forests, willow shrubs on dune swales and deflation plains, terrophytic sand communities and other specialized groups. These factors are reflected in intense changes in these sets of diagnostic plant species and diagnostic growth forms. If you consider it appropriate, I could make a different proposal based on my syntaxonomical scheme (cf. Peinado et al. 2011a).

#### Similar NVC Types:

- M044 California Coastal Scrub
- M402 North American Arctic & Boreal Coast Vegetation

**Diagnostic Characteristics:** This macrogroup is restricted to the immediate sandy coastline and open shrub-herb vegetation on dunes (typically within 2 km) from the coast. These coastal sandy beaches and dunes contain graminoid or broad-leaved herbaceous vegetation up to about 1 m in height, usually rhizomatous or stoloniferous. Total cover varies from very low on beaches and active dunes to moderately dense on stabilized dunes. Characteristic species include salt-tolerant forbs such as *Abronia latifolia*, *Abronia maritima*, *Achillea millefolium* var. *borealis*, *Artemisia pycnocephala*, *Calystegia macrostegia*, *Calystegia soldanella*, *Camissonia cheiranthifolia*, *Cochlearia groenlandica*, *Erigeron glaucus*, *Equisetum variegatum*, *Honckenya peploides*, *Lathyrus littoralis*, *Malacothrix incana*, and *Mertensia maritima*. Grasslands are dominated by *Leymus mollis*, *Leymus arenarius* (= *Elymus arenarius*), or *Festuca rubra* and may include *Poa douglasii*, *Poa eminens*, *Hordeum brachyantherum*, and *Deschampsia beringensis*, and forbs such as *Achillea millefolium* var. *borealis*, *Angelica genuflexa*, *Angelica lucida*, *Claytonia sibirica*, *Fragaria chiloensis*, *Heracleum maximum*, *Lathyrus japonicus* var. *maritimus*, *Ligusticum scoticum*, *Lupinus nootkatensis*, *Polygonum paronychia*, and *Senecio pseudoarnica*. Dwarf-shrub communities are dominated by *Empetrum nigrum*, *Ericameria ericoides*, *Lupinus chamissonis*, *Gaultheria shallon*, *Vaccinium ovatum*, *Myrica gale*, or *Salix* species. Herbaceous species intermixed with dwarf-shrubs include *Lathyrus japonicus* var. *maritimus* (= *Lathyrus maritimus*), *Conioselinum chinense*, *Cornus suecica*, and *Cnidium cniidiifolium*. *Lupinus arboreus* in native stands also are included.

## VEGETATION

**Physiognomy and Structure:** Vegetation is comprised of creeping to low-statured (up to about 1 m tall) perennial grasses, forbs and dwarf-shrubs. Plants are usually rhizomatous or stoloniferous. Total cover varies from very low on beaches and active dunes to moderately dense on stabilized dunes.



**Floristics:** This macrogroup consists of communities of salt-tolerant forbs such as *Abronia latifolia*, *Abronia maritima*, *Achillea millefolium* var. *borealis*, *Artemisia pycnocephala*, *Calystegia macrostegia*, *Calystegia soldanella*, *Camissonia cheiranthifolia*, *Cochlearia groenlandica*, *Erigeron glaucus*, *Equisetum variegatum*, *Honckenya peploides*, *Lathyrus littoralis*, *Malacothrix incana*, and *Mertensia maritima*. Grasslands are dominated by *Leymus mollis*, *Leymus arenarius* (= *Elymus arenarius*), or *Festuca rubra* and may include *Poa douglasii*, *Poa eminens*, *Hordeum brachyantherum*, and *Deschampsia beringensis*, and forbs such as *Achillea millefolium* var. *borealis*, *Angelica genuflexa*, *Angelica lucida*, *Claytonia sibirica*, *Fragaria chiloensis*, *Heracleum maximum*, *Lathyrus japonicus* var. *maritimus*, *Ligusticum scoticum*, *Lupinus nootkatensis*, *Polygonum paronychia*, and *Senecio pseudoarnica*. Dwarf-shrub communities are dominated by *Empetrum nigrum*, *Ericameria ericoides*, *Lupinus chamissonis*, *Gaultheria shallon*, *Vaccinium ovatum*, *Myrica gale*, or *Salix* species. Herbaceous species intermixed with dwarf-shrubs include *Lathyrus japonicus* var. *maritimus* (= *Lathyrus maritimus*), *Conioselinum chinense*, *Cornus suecica*, and *Cnidium cnidifolium*. *Lupinus arboreus* in native stands also are included.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup occurs on sandy beaches and dunes, with or without salt spray, typically within 2 km of the coast. Soils are usually sandy and well-drained; some areas may have a cobble layer on top of sand. Forb communities are salt-tolerant and tend to occur just above mean high tide, while the grasslands tend to occur on cobble beaches and on dunes that become higher and further away from the beach. On the California Channel Islands, communities can be further interior where sand has been moved >2 km inland from high winds. Dwarf-shrub communities occur on older dunes, usually behind grassland-dominated dunes.

**Dynamics:** Processes that define the macrogroup include sand deposition, salt spray, wind erosion, long-shore transport, dune formation, and water erosion such as overwash from storm surges. Herbaceous species stabilize the sand deposits (dunes, beaches), and the older deposits support dwarf-shrubs mixed with herbaceous species.

The beach and open (shrub-herb) dune vegetation is but one part of the vegetation on dunes, including debris-line communities, herbaceous rhizomatous vegetation on oligotrophic habitats, consolidated dune scrubs, stabilized dune forests, willow shrubs on dune swales and deflation plains, terophytic sand communities and other specialized groups. The zonal and successional relationships among these communities are complicated and non-linear.

#### DISTRIBUTION

**Geographic Range:** This macrogroup is restricted to the immediate sandy coastline and open shrub-herb vegetation on dunes (typically within 2 km) from the seven Aleutian Islands south through Alaska's central and southeastern coastline (including Kodiak and other islands), British Columbia, Washington, Oregon, California and possibly into Mexico.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX?, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 242A:CC, M242A:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

- < Beach and Dune (Barbour et al. 2007a)
- < III.A.1.a - *Elymus* (Vioreck et al. 1992)

#### LOWER LEVEL UNITS

#### Groups:

- G663 California Coastal Beach & Dune Scrub
- G498 North Pacific Maritime Coastal Scrub & Herb Beach & Dune
- G664 Warm Pacific Coastal Beach & Dune Vegetation

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 10-14

## REFERENCES

**References:** Barbour et al. 2007a, Boggs 2000, Boggs et al. 2003, Byrd 1984, Croll et al. 2005, DeVelice et al. 1999, Eyre 1980, Faber-Langendoen et al. 2015, Fleming and Spencer 2007, Mackenzie 2012, Page 1993, Peinado et al. 2005, Peinado et al. 2007, Peinado et al. 2008, Peinado et al. 2009a, Peinado et al. 2009b, Peinado et al. 2011a, Peinado et al. 2011b, Peinado et al. 2011c, Pickart and Barbour 2007, Shacklette et al. 1969, Shephard 1995, Stacey and Filatow 2009, Streveler et al. 1973, Talbot et al. 1984, Talbot et al. 2006, Viereck et al. 1992

## 2. Shrub &amp; Herb Vegetation

## 2.B.4.Nb. Pacific North American Coast Scrub &amp; Herb Vegetation

## M059. Pacific Coastal Beach &amp; Dune Vegetation

**G498. North Pacific Maritime Coastal Scrub & Herb Beach & Dune****Type Concept Sentence:**

## OVERVIEW

**Scientific Name:** *Leymus mollis* - *Leymus arenarius* - *Abronia latifolia* Dune Scrub & Herb Group

**Common Name (Translated Scientific Name):** American Dunegrass - Sand Ryegrass - Coastal Sand-verbena Dune Scrub & Herb Group

**Type Concept:** This group consists of herbaceous and shrubby vegetation on coastal sandy and cobble-on-sand beaches, beach dunes, and sand spits that occur along the Pacific Coast from Oregon to Alaska, including coastlines on the Gulf of Alaska, the Aleutian Islands and further north, encompassing the arctic coastlines along the Bering Sea of western Alaska. Processes that define the group include sand and salt deposition, wind and water erosion, and overwash from storm surges. Soils are usually sandy and well-drained, though dune slacks may be poorly drained. Beaches and dunes are dominated by a mosaic of barren sands, herbaceous and scrub vegetation. This group includes dunes that may occur as much as 2 km inland which may or may not experience salt spray or storm surges. Patch size is small to moderate and often linear. Vegetation within this group includes grasslands, salt-tolerant forb communities and dwarf-shrublands. Salt-tolerant forb communities occur just above mean high tide and are dominated or codominated by *Cochlearia groenlandica*, *Achillea millefolium* var. *borealis*, *Honckenya peploides*, *Mertensia maritima*, *Lathyrus japonicus* var. *maritimus* (= *Lathyrus maritimus*), or *Equisetum variegatum*. Grasslands communities occur on cobble beaches and on dunes that become higher and further away from beach and are dominated by *Leymus mollis*, *Leymus arenarius* (= *Elymus arenarius*), or *Festuca rubra* and may include other graminoids such as *Poa eminens*, *Hordeum brachyantherum*, and *Deschampsia beringensis*, and forbs such as *Abronia latifolia*, *Achillea millefolium* var. *borealis*, *Angelica genuflexa*, *Angelica lucida*, *Claytonia sibirica*, *Fragaria chiloensis*, *Heracleum maximum*, *Honckenya peploides*, *Lathyrus japonicus* var. *maritimus*, *Ligusticum scoticum*, *Lupinus nootkatensis*, *Potentilla villosa*, and *Senecio pseudoarnica*. Dwarf-shrub communities occur on older dunes, usually behind grassland-dominated dunes and are dominated by *Empetrum nigrum*, *Gaultheria shallon*, *Vaccinium ovatum*, *Myrica gale*, or *Salix* spp. Herbaceous species intermixed with dwarf-shrubs include *Lathyrus japonicus* var. *maritimus*, *Conioselinum chinense*, *Cornus suecica*, and *Cnidium cnidiifolium*.

**Classification Comments:** This group includes dry to moderately well-drained herbaceous and scrubby vegetation. Flat to gently sloping cobble-on-sand beaches are included. Interdune wetlands and forested dunes are not included in this group. Rocky shores of predominantly bedrock or cobble-on-rock belong to North Pacific Coastal Scrub & Herb Cliff & Bluff Group (G554).

At this time, no open inland dunes are known to exist in the region. Sites may exist in Oregon and Alaska [see North Pacific Active Inland Dune (CES204.861)], but they are not sufficiently documented to be tracked at this time

**Internal Comments:** MSR 11-14: this group should include the Cakile type from peinado which is really more a temperate type; need to add an alliance for it? mid Oregon north to S. Alaska. mjr 10-12: CA added based on member association distribution. DFL 7-24-12: Split into Alaskan versus Central Pacific?

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

- G554 North Pacific Coastal Scrub & Herb Cliff & Bluff: has denser vegetation and occurs on steep cliffs and bluffs that are also exposed to salt spray, but not on sand dune substrates.
- G517 Vancouverian Freshwater Wet Meadow & Marsh

**Diagnostic Characteristics:** Graminoid or broad-leaved herbaceous vegetation <1 m in height, usually rhizomatous or stoloniferous; occurs on beaches, sand dunes and cobble-on-sand coastlines along the immediate coast or no more than 2 km inland. Exposed to salt spray and storm surges. Vegetation is tolerant of salt spray. Total cover can be very low.

## VEGETATION

**Physiognomy and Structure:** Vegetation is comprised of creeping to low-statured (<1 m) perennial grass, forb and shrub on salt-spray exposed coastlines. Graminoid herbaceous and/or low shrubby vegetation is <1 m in height and usually rhizomatous or stoloniferous. It occurs on beaches, sand dunes and cobble-on-sand coastlines along the immediate coast or no more than 2 km inland. Stands are exposed to salt spray and storm surges. Vegetation is tolerant of salt spray. Total cover can be very low.

**Floristics:** Salt-tolerant forb communities occur just above mean high tide and are dominated or codominated by *Abronia latifolia*, *Cochlearia groenlandica*, *Achillea millefolium* var. *borealis*, *Honckenya peploides*, *Mertensia maritima*, *Lathyrus japonicus* var. *maritimus* (= *Lathyrus maritimus*), or *Equisetum variegatum*. Grasslands communities occur as dunes become higher and further away from beach and are dominated by *Leymus mollis*, *Leymus arenarius* (= *Elymus arenarius*), or *Festuca rubra* and may include other graminoids such as *Poa eminens*, *Hordeum brachyantherum*, and *Deschampsia beringensis*, and forbs such as *Achillea millefolium* var. *borealis*, *Angelica genuflexa*, *Angelica lucida*, *Claytonia sibirica*, *Fragaria chiloensis*, *Heracleum maximum*, *Lathyrus japonicus* var. *maritimus*, *Ligusticum scoticum*, *Lupinus nootkatensis*, and *Senecio pseudoarnica*. Dwarf-shrub communities occur on older dunes, usually behind grassland-dominated dunes and are dominated by *Empetrum nigrum*, *Gaultheria shallon*, *Vaccinium ovatum*, *Myrica gale*, or *Salix* species. Herbaceous species intermixed with dwarf-shrubs include *Lathyrus japonicus* var. *maritimus*, *Conioselinum chinense*, *Cornus suecica*, and *Cnidium cnidiifolium*. Floristic information is summarized from the following sources: Shacklette et al. (1969), Byrd (1984), Talbot et al. (1984, 2006), Viereck et al. (1992), Talbot and Talbot (1994), Shephard (1995), DeVelice et al. (1999), Boggs (2000), Boggs et al. (2003), Croll et al. (2005), and Fleming and Spencer (2007).

G498 North Pacific Maritime Coastal Scrub & Herb Beach & Dune Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Agrostis pallens</i> Herbaceous Vegetation	G1Q/S1	CEGL001600
<i>Artemisia campestris</i> - <i>Festuca rubra</i> / <i>Racomitrium canescens</i> Herbaceous Vegetation	G1/S1	CEGL003370
<i>Carex macrocephala</i> Herbaceous Vegetation	G1G2/S1	CEGL003368
<i>Festuca rubra</i> - <i>Ambrosia chamissonis</i> Herbaceous Vegetation	G1/S1	CEGL003290
<i>Festuca rubra</i> Stabilized Dune Herbaceous Vegetation	G1/S1	CEGL001774
<i>Leymus mollis</i> ssp. <i>mollis</i> - <i>Abronia latifolia</i> Herbaceous Vegetation	G2?/S2	CEGL001796
<i>Lupinus littoralis</i> Dune Herbaceous Vegetation	G3/S1	CEGL001974
<i>Poa macrantha</i> Herbaceous Vegetation	G1/S1	CWWA000184

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This group occurs on sandy beaches and dunes, with and without salt spray, within 2 km of the coast. Soils are usually sandy and well-drained; some areas may have a cobble layer on top of sand. Environmental information is summarized from the following sources: Shacklette et al. (1969), Byrd (1984), Talbot et al. (1984, 2006), Viereck et al. (1992), Talbot and Talbot (1994), Shephard (1995), DeVelice et al. (1999), Boggs (2000), Boggs et al. (2003), Croll et al. (2005), and Fleming and Spencer (2007).

**Dynamics:** Processes that define the group include sand deposition, salt spray, wind erosion, long-shore transport, dune formation, and water erosion such as overwash from storm surges. Herbaceous species stabilize the sand deposits (dunes, beaches), and the older deposits support dwarf-shrubs mixed with herbaceous species.

## DISTRIBUTION

**Geographic Range:** This group is restricted to the immediate sandy coastline (within 2 km) from the Alaskan western arctic coast and Aleutian Islands south through Alaska central and southeast coastline (including Kodiak and other islands), British Columbia, and Washington to the central Oregon coast (roughly Coos Bay).

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 69:P, 70:C, 72:C, 73:C, 74:C, 75:C, 79:C

**USFS Ecoregions (2007):** 242A:CC, M242A:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Low.

**SYNONYMY**

- < Beach and Dune (Barbour et al. 2007a)
- < III.A.1.a - Elymus (Viereck et al. 1992)

**LOWER LEVEL UNITS****Alliances:**

- A2066 *Poa macrantha* - *Leymus mollis* - *Festuca rubra* Sand Dune Herbaceous Alliance

**AUTHORSHIP**

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2011/01/03

**REFERENCES**

**References:** Barbour et al. 2007a, Boggs 2000, Boggs et al. 2003, Byrd 1984, Croll et al. 2005, DeVelice et al. 1999, Eyre 1980, Faber-Langendoen et al. 2015, Fleming and Spencer 2007, Pickart and Barbour 2007, Shacklette et al. 1969, Shephard 1995, Streveler et al. 1973, Talbot et al. 1984, Talbot et al. 2006, Viereck et al. 1992

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2. Shrub & Herb Vegetation

2.B.4.Nb. Pacific North American Coast Scrub & Herb Vegetation

**M511. North Pacific Coastal Ruderal Grassland & Shrubland [Proposed]**

**Type Concept Sentence:** This macrogroup includes coastal sand dunes dominated by non-native beachgrasses *Ammophila arenaria*, *Ammophila breviligulata*, forbs and succulents such as *Cakile edentula*, *Cakile maritima*, *Carpobrotus* spp., *Mesembryanthemum* spp., and/or introduced shrubs such as *Lupinus arboreus*. It occurs along the coast of California north into British Columbia.

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**OVERVIEW**

**Scientific Name:** North Pacific Coastal Ruderal Grassland & Shrubland Macrogroup

**Common Name (Translated Scientific Name):** North Pacific Coastal Ruderal Grassland & Shrubland Macrogroup

**Type Concept:** This macrogroup occurs on coastal dunes and other sandy areas at sea level from California into British Columbia. Substrates are eolian sands without horizon development or accumulated organic material. These areas are dominated by non-native beachgrasses *Ammophila arenaria*, *Ammophila breviligulata*, and/or forbs and succulents such as *Cakile edentula*, *Cakile maritima*, *Carpobrotus* spp., and *Mesembryanthemum* spp. Dunes may also have introduced shrubs such as *Lupinus arboreus*.

**Classification Comments:** *Cakile* spp. are more typical of beaches, and perhaps should not be included here. Pickart and Barbour (2007) state that naturalized (what we term ruderal) vegetation now exceeds native vegetation for most of California's dune systems.

**Similar NVC Types:**

- M493 Western North American Ruderal Grassland & Shrubland: including Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group (G648), includes coastal to inland broom species of *Cytisus scoparius*, *Genista* spp., *Ulex europaeus*, etc., and non-native meadow herbs such as *Holcus lanatus*.

**Diagnostic Characteristics:****VEGETATION**

**Physiognomy and Structure:** These areas can be dense shrublands totally comprised of one species or they can be more open mosaics of grassland and shrubland, or pure grassland.

**Floristics:** This macrogroup is dominated by non-native species such *Ammophila arenaria* or *Ammophila breviligulata*, *Cakile edentula*, *Cakile maritima*, *Carpobrotus chilensis*, *Carpobrotus edulis*, *Mesembryanthemum* spp., and/or *Lupinus arboreus*. Other non-native species may also be present, including *Bromus diandrus*, *Cirsium vulgare*, *Medicago polymorpha*, *Poa pratensis*, and *Rumex acetosella*. Native species may be scattered about but these are at very low cover.

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** This macrogroup occupies coastal dunes and other sandy areas at sea level. Substrates are entirely eolian sands without horizon development or accumulated organic material. These dunes tend to be higher and more stabilized and

therefore more abundant than historically due to the introduction of non-native dunegrass. A striking pair of photographs illustrate this point in Pickart and Barbour (2007, Figure 6.11).

**Dynamics:** According to Pickart and Barbour (2007, and references therein), "invasion by *Carpobrotus edulis* results in displacement of native herbaceous and even shrub species by direct overgrowth or indirectly by competition for resources...ecosystem impacts include changes to soil pH...the buildup of organic matter, and loss of sand movement...High *Carpobrotus edulis* cover is detrimental to burrowing dune insects...." They also note that *Ammophila arenaria*, which was introduced to stabilize the dunes, "has built a steep, continuous foredune over much of its range, replacing the original low, hummocky and mobile foredunes.

#### DISTRIBUTION

**Geographic Range:** This macrogroup ranges from California into British Columbia, Canada, and possibly southeastern Alaska. It may reach south into Mexico. No data or descriptive information are available from Mexico or Alaska.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX?, US

**States/Provinces:** AK?, BC, CA, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

#### LOWER LEVEL UNITS

#### Groups:

- G647 North Pacific Maritime Coastal Ruderal Shrub & Grass Dune

#### AUTHORSHIP

**Primary Concept Source:** M.G. Barbour and J. Major (1977)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 7-12

#### REFERENCES

**References:** Barbour and Major 1977, Faber-Langendoen et al. 2015, Pickart and Barbour 2007, Wiedemann 1966

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2. Shrub & Herb Vegetation

2.B.4.Nb. Pacific North American Coast Scrub & Herb Vegetation

M511. North Pacific Coastal Ruderal Grassland & Shrubland

### G647. North Pacific Maritime Coastal Ruderal Shrub & Grass Dune [Proposed]

**Type Concept Sentence:** This group consists of sand dunes and other sandy areas dominated by non-native beachgrasses *Ammophila arenaria* and *Ammophila breviligulata* or restoration areas of planted *Leymus mollis ssp. mollis* (the native dunegrass) from California into British Columbia.

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#### OVERVIEW

**Scientific Name:** North Pacific Maritime Coastal Ruderal Shrub & Grass Dune Group

**Common Name (Translated Scientific Name):** North Pacific Maritime Coastal Ruderal Shrub & Grass Dune Group

**Type Concept:** This group occurs on shifting sands of outer coastal dunes and other sandy areas at sea level from California to Washington and likely British Columbia. Substrates are entirely eolian sands without horizon development or accumulated organic material. These dunes systems are dominated by, and have been physically modified by, the introduction of non-native beachgrasses *Ammophila arenaria* and *Ammophila breviligulata* or restoration areas of planted *Leymus mollis ssp. mollis* (the native dunegrass). In addition, there are areas of introduced low shrubs such as *Mesembryanthemum* spp. and *Carpobrotus* spp. Several other non-native species may be dominant, but generally are limited to those that can invade and thrive in the shifting sand and salt-spray environment of the coastal sand dunes and sandsheets. With time the sand dunes become stabilize and vegetative cover

increases, at which point other invasive species may appear. Other non-native species may also be present, including *Bromus diandrus*, *Cirsium vulgare*, *Poa pratensis*, and *Rumex acetosella*.

**Classification Comments:** *Cytisus* and *Ulex* may be present on sand dunes but they are not limited to them. Do those stands belong to Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group (G648). *Lupinus arboreus* was listed; however, this is only introduced in Canada. More information is needed about this species in Canada.

**Internal Comments:** DFL 9-13: AK? added. DFL 11-20-12: Canada confirmed.

**Other Comments:** *Ammophila arenaria* is native to Europe and was introduced to stabilize dunes in the 1880s. It rapidly naturalized and became dominant over much of the northern Pacific Coast. Dense stands of *Ammophila* created steep foredunes, a landform which was rare in the region prior to 1930 (Weidemann 1966). Native foredune and strand communities are threatened by expansion of this vegetation (Barbour and Major 1977). This ruderal type is found in areas that have experienced recent soil disturbance, i.e., sandy soils that have been exposed to physical disturbances such as grazing (Roccio et al. 2011). Restoration projects that have planted the West Coast native dunegrass *Leymus mollis ssp. mollis* will remain in this group until they successfully mature into a recognizable native plant association.

*Cytisus scoparius* is native to Spain and is found in waste places throughout the Pacific Northwest and in California in areas below 1000 m in elevation. This group specifically refers to stands on sand dunes along the immediate coast. Other environments where *Cytisus* spp. stands are found belong to another ruderal group, Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group (G648).

**Similar NVC Types:**

- G648 Southern Vancouverian Lowland Ruderal Grassland & Shrubland: is also dominated by non-native species but these are not limited to sand dunes and strictly coastal environs.

**Diagnostic Characteristics:** Stands dominated by non-native, dune obligate species.

#### VEGETATION

**Physiognomy and Structure:** Shrub- or perennial herbaceous-dominated, generally <2 m in height, on sandy soils near the coast.

**Floristics:** These dunes are dominated by non-native beachgrasses *Ammophila arenaria* and *Ammophila breviligulata*, restoration areas of planted *Leymus mollis ssp. mollis* (the native dunegrass), or introduced shrubs such as *Carpobrotus* spp., *Mesembryanthemum* spp., and *Lupinus arboreus* (in Canada only). Often they can be a mosaic of patches of shrubs and grasses. Other non-natives present include *Bromus diandrus*, *Cirsium vulgare*, *Cytisus scoparius*, *Poa pratensis*, *Rumex acetosa*, and/or *Teesdalia nudicaulis*. Native herbaceous species that may be present but with very low abundance include *Abronia latifolia*, *Cakile* spp., *Galium aparine*, *Lathyrus littoralis*, *Poa macrantha*, and *Pteridium aquilinum*. Sparsely scattered native shrubs and trees may also occur, particularly near the landward edge, including *Arctostaphylos columbiana*, *Arctostaphylos uva-ursi*, *Gaultheria shallon*, *Ledum glandulosum*, *Lonicera involucrata*, *Pinus contorta*, *Rosa nutkana*, *Rubus ursinus*, and *Salix hookeriana*. These areas can be dense shrublands totally composed of one species or they can be more open mosaics of grassland and shrubland.

G647 North Pacific Maritime Coastal Sand Dune Ruderal Scrub & Herb Vegetation Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Ammophila arenaria</i> Ruderal Herbaceous Vegetation	n/a	CEGL003006
<i>Cytisus scoparius</i> Ruderal Shrubland [Placeholder]	n/a	CEGL003045

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This group occupies coastal dunes and other sandy areas at sea level. Substrates are entirely eolian sands without horizon development or accumulated organic material. These dunes tend to be higher and more stabilized and therefore more abundant than historically due to the introduction of non-native dunegrass.

**Dynamics:**

#### DISTRIBUTION

**Geographic Range:** This group occurs on shifting sands of outer coastal dunes and other sandy areas at sea level from California to Washington and likely British Columbia.

**Nations:** CA, MX?, US

**States/Provinces:** AK?, BC?, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 14:C

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Proposed.

**SYNONYMY**

**LOWER LEVEL UNITS**

**Alliances:**

- A2061 *Ammophila arenaria* Coastal Dunegrass Ruderal Grassland Alliance
- A1620 *Mesembryanthemum* spp. - *Carpobrotus* spp. Ruderal Herbaceous Alliance

**AUTHORSHIP**

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2012)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2015/05/20

**REFERENCES**

**References:** Barbour and Major 1977, Faber-Langendoen et al. 2015, Wiedemann 1966

## 2.C. Shrub & Herb Wetland

Shrub & Herb Wetland includes open bogs, fens, fresh and saltwater marshes, wet meadows and wet shrublands. The vegetation occurs from tropical to polar regions.

### 2.C.2. Temperate to Polar Bog & Fen

Temperate to Polar Bog & Fen includes temperate bogs and fens dominated by *Sphagnum* or brown mosses with ericaceous shrubs, graminoids, and low scrub tree growth forms, across the mid-latitudes of the Northern Hemisphere from 23° to 70°N, but is much less common in the southern mid-latitudes.

#### 2.C.2.Na. North American Bog & Fen

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2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

#### M876. North American Boreal & Sub-Boreal Acidic Bog & Fen

**Type Concept Sentence:** This boreal acidic bog and fen macrogroup extends across the boreal regions of North America, extending south into sub-boreal regions of the Pacific Maritimes and Rocky Mountains, the Great Lakes region and northeastern U.S. It is dominated by a continuous layer of *Sphagnum* mosses (sometimes submerged in bog pools), typically to depths exceeding 40 cm, as well as ericaceous dwarf-shrubs and thin-leaved graminoids. Scrub trees may be common, but trees are otherwise sparse.

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**OVERVIEW**

**Scientific Name:** *Chamaedaphne calyculata* - *Vaccinium oxycoccos* - *Carex oligosperma* Acidic Peatland Macrogroup

**Common Name (Translated Scientific Name):** Leatherleaf - Small Cranberry - Few-seed Sedge Acidic Peatland Macrogroup

**Type Concept:** This macrogroup extends across the boreal regions of North America, extending south into sub-boreal regions of the Pacific Maritime and Rocky Mountain divisions, Great Lakes region and northeastern U.S. It occurs where sufficiently cold climatic conditions allow the rate of peat accumulation to exceed its decomposition, resulting in ombrotrophic and acidic peatlands in which the bog surface is raised above the water table. Stands are dominated by a continuous layer of *Sphagnum* mosses (sometimes submerged in bog pools) and ericaceous dwarf-shrubs and thin-leaved graminoids. Scrub trees <2 m may be common, but trees >5 m are <10% cover. Dominant shrubs include *Andromeda polifolia*, *Betula nana*, *Chamaedaphne calyculata*, *Empetrum nigrum*, *Gaultheria hispidula*, *Kalmia polifolia*, *Ledum palustre* ssp. *decumbens*, *Ledum groenlandicum*, *Rubus chamaemorus*, *Vaccinium macrocarpon* (east), *Vaccinium oxycoccos*, *Vaccinium vitis-idaea*, and *Vaccinium uliginosum*. The herbaceous layer is typically graminoid-dominated. Species include *Carex livida*, *Carex membranacea*, *Carex microglochin*, *Carex oligosperma* (more eastern), *Carex pauciflora*, *Carex pluriflora*, *Carex rariflora* (more eastern), *Carex rotundata* (more eastern), *Carex stylosa*, *Eriophorum*

*angustifolium*, *Eriophorum brachyantherum*, and *Eriophorum virginicum*. Graminoids common to both poorer and richer fens include *Carex chordorrhiza*, *Carex lasiocarpa*, and *Carex limosa*. Insectivorous plants are common features of bogs and may include *Drosera intermedia*, *Drosera rotundifolia*, *Sarracenia purpurea*, and *Utricularia intermedia*. Trees include *Picea mariana*, *Picea glauca*, and *Larix laricina*.

Acidic peatlands range from strictly ombrotrophic bog (isolated from groundwater, precipitation-fed) to weakly minerotrophic poor fen. The surface morphology of a bog may be more-or-less level, domed, or eccentric, but typically is above the water table. As peat accumulates, ridges may form, which can be relatively dry compared to the flat areas. Secondary bog pools (schlenke) may be present in the raised portions of the peatlands. Peat deposits are composed primarily of partially decomposed *Sphagnum* mosses, and depth of peat exceeds 40 cm, separating this from similar wetlands that are non-peatlands. The water table is at or just above the surface, although the surface of some bogs is raised above the surrounding terrain.

In the eastern U.S., acidic peatlands extend southward through the Great Lakes and Northeast. Here *Sphagnum* and shrub peatlands occur in basins south through the Laurentian-Acadian region down to near the glacial boundary in the northeastern and north-central U.S. Unlike the true raised bogs of boreal regions, the vegetation is not raised above the groundwater level. The nutrient-poor substrate and the reduced throughflow of water create oligotrophic conditions fostering the development of *Sphagnum* peat and the growth of peatland vegetation. Although these peatlands are often called bogs, in most cases they are technically "poor fens," as the vegetation remains in contact with the weakly minerotrophic (nutrient-poor) groundwater.

In the Atlantic region, from Labrador to Downeast Maine, acidic peatlands take a somewhat different form. In basins, they develop raised plateaus with undulating sedge and dwarf-shrub vegetation. *Trichophorum caespitosum* may form sedge lawns on the raised plateau. The system may also occur as "blanket bogs" over a sloping rocky substrate in extreme maritime settings; here, dwarf-shrubs and *Sphagnum* are the dominant cover. Species characteristic of this maritime setting include *Empetrum nigrum* and *Rubus chamaemorus*. Typical bog heaths such as *Gaylussacia dumosa*, *Gaylussacia baccata*, *Kalmia angustifolia*, *Kalmia polifolia*, and *Ledum groenlandicum* are also present. Morphological characteristics and certain coastal species distinguish these from more inland acidic peatlands.

**Classification Comments:** North American arctic bog was moved under this macrogroup, based on the view from Alaskan ecologists that arctic bogs (which are uncommon) are not that different from boreal bogs. Strong diagnostic species that separate eastern from western acidic peatlands are not currently known. Clarification of the limits of this type with respect to Vancouverian (North Pacific) and Rocky Mountain acidic fens is also needed. Forested acidic bogs and fens (poor swamps) are not included here [see North American Boreal Poor - Intermediate Conifer Bog & Swamp Macrogroup (M299), but that concept is under review (as of May 2014)]. There is a shift in composition and physiognomy from north to south, including from evergreen conifers and shrubs to deciduous shrub and hardwood species.

Inclusion of "northern temperate" (sub-boreal) acidic peatlands and Atlantic maritime peatlands needs review; they may need to be separated out into distinct macrogroups (K. Baldwin pers. comm. 2014).

Both this macrogroup (M876) and North American Boreal & Sub-Boreal Alkaline Fen Macrogroup (M877) are organic wetlands or peatlands in the Canadian wetland classification system. The Canadian system separates bogs from fens based on the influence of nutrient-rich groundwater in fens, which is missing in bogs. However, here we include poor fens with bogs because both bogs and poor fens tend to be acidic, are similar in vascular species composition, and are dominated by *Sphagnum* spp. in the bryophyte layer.

#### Similar NVC Types:

- M299 North American Boreal Poor - Intermediate Conifer Bog & Swamp
- M063 North Pacific Bog & Fen
- M877 North American Boreal & Sub-Boreal Alkaline Fen
- M061 Eastern Cool Temperate Seep

**Diagnostic Characteristics:** This macrogroup contains a continuous (>80% cover) layer of *Sphagnum* peatmoss (sometimes submerged in bog pools), to depths exceeding 40 cm, with ericaceous dwarf-shrubs and thin-leaved graminoids >25% cover. Scrub trees <2 m may be common, but trees >5 m are <10% cover. Diagnostic species include low ericaceous shrubs, including *Andromeda polifolia*, *Betula nana*, *Chamaedaphne calyculata*, *Empetrum nigrum*, *Gaultheria hispidula*, *Kalmia angustifolia* (east), *Kalmia polifolia*, *Ledum palustre* ssp. *decumbens*, *Ledum groenlandicum*, *Rubus chamaemorus*, *Vaccinium macrocarpon* (east), *Vaccinium oxycoccos*, *Vaccinium vitis-idaea*, and *Vaccinium uliginosum*. Ericaceous shrubs are typically >75% of total shrub cover. Trees, if present, include *Picea mariana* and *Larix laricina*. Graminoids such as *Carex oligosperma* (more east), *Carex magellanica* ssp. *irrigua* (= *Carex paupercula*), *Carex pauciflora*, *Eriophorum vaginatum*, and *Eriophorum virginicum* are common in the herb layer, and together these graminoids have greater cover than medium to rich fen graminoid indicators (*Carex lasiocarpa*, *Carex livida*, *Carex interior*, *Carex limosa*, *Eriophorum viridicarinatum*, *Muhlenbergia glomerata*, *Trichophorum alpinum*). Species diversity is low.



## VEGETATION

**Physiognomy and Structure:** This macrogroup contains a continuous (>80% cover) layer of *Sphagnum* moss (sometimes submerged in bog pools). The vegetation is otherwise dominated by low ericaceous shrubs with patches of conifers, graminoids and bryophyte lawns. Stunted trees may form a partial to moderate cover over parts of the peatland, but the tree layer is <10% cover (Damman and French 1987). The overall topography of acidic peatlands is flat to gently undulating with microtopography characterized by hummocks and hollows (Heinselman 1963, Vitt and Slack 1975, Wheeler et al. 1983, Glaser et al. 1990). The pronounced microtopography in these systems leads to extreme and fine-scale gradients in soil moisture and pH (Bridgham et al. 1996).

The landscape morphology of acidic peatlands is often very striking. A variety of approaches has been taken to describe these forms: in Maine, see Davis and Anderson (2001); in Canada, see National Wetlands Working Group (1988); and in Minnesota see Glaser (1992a). In Canada, bog and fen peatlands each have their own set of forms. In Minnesota, Glaser treats bogs and fens together as part of larger patterned peatland complexes (mire complexes). Particularly distinctive are the ribbed bogs or fens in which a pattern of narrow (2- to 3-m wide), low (less than 1 m deep) ridges are oriented at right angles to the direction of the drainage (National Wetlands Working Group 1988). Wet pools or depressions occur between the ridges. These patterned peatlands may include string bog, Atlantic ribbed fen, or northern ribbed fen (National Wetlands Working Group 1988). They develop almost entirely north of 46°N latitude in east-central Canada and the adjacent U.S. They are minerotrophic peatlands in which the vegetation has developed into a pattern of strings (raised, usually linear features, and often more acidic) and flarks (wet depressions separating the strings, often less acidic). These patterned peatlands usually develop in open basins and flat plains, and the patterned portion may occupy only a fraction of the entire peatland. The edge of the basin may be shallow to deep peat over a sloping substrate, where seepage waters provide nutrients.

**Floristics:** In the western part of the range, the stunted and sparse tree layer includes *Picea mariana* and *Larix laricina* (*Picea glauca* is occasionally present). Dominant shrubs include *Andromeda polifolia*, *Betula nana*, *Chamaedaphne calyculata*, *Empetrum nigrum*, *Kalmia polifolia*, *Ledum groenlandicum*, *Ledum palustre* ssp. *decumbens*, *Rubus chamaemorus*, *Vaccinium oxycoccos*, *Vaccinium uliginosum*, and *Vaccinium vitis-idaea*. The herbaceous layer is typically graminoid-dominated. Species include *Carex chordorrhiza*, *Carex lasiocarpa*, *Carex limosa*, *Carex livida*, *Carex membranacea*, *Carex microglochis*, *Carex pauciflora*, *Carex pluriflora*, *Carex rariflora* (more eastern), *Carex rotundata* (more eastern), *Carex stylosa*, *Eriophorum brachyantherum*, and *Eriophorum angustifolium*. Dominant mosses include, among others, *Sphagnum fuscum* and *Sphagnum capillifolium* (= *Sphagnum nemoreum*) (Horton et al. 1979).

In the east, tree species include *Picea mariana*, *Picea glauca*, and *Larix laricina* (less commonly *Picea glauca*, *Abies balsamea* and *Thuja occidentalis*). Dwarf-shrubs include *Andromeda polifolia*, *Chamaedaphne calyculata*, *Kalmia polifolia*, *Ledum groenlandicum*, *Vaccinium macrocarpon*, *Vaccinium oxycoccos*, and occasionally *Gaultheria hispidula* or *Betula pumila*. Rarely, tall ericaceous shrubs such as *Vaccinium corymbosum* (northeast temperate peatlands) are dominant. Common sedges include *Carex magellanica* ssp. *irrigua* (= *Carex paupercula*) and *Carex oligosperma*. Graminoids common to both poorer and richer fens include *Carex chordorrhiza*, *Carex lasiocarpa*, and *Carex limosa*. Other herbs include *Eriophorum vaginatum*, *Eriophorum virginicum*, *Menyanthes trifoliata*, and *Scheuchzeria palustris*. Dominant mosses include *Sphagnum fuscum* and *Sphagnum magellanicum*, and less commonly *Sphagnum angustifolium*. *Pleurozium schreberi* can be common on raised mats (Harris et al. 1996, Minnesota DNR 2003). Insectivorous plants are common features of acidic peatlands and may include *Drosera rotundifolia*, *Drosera intermedia*, *Sarracenia purpurea*, and *Utricularia intermedia*. *Rhynchospora alba*, *Xyris montana*, and *Xyris torta* can be especially common on floating mats (Kost et al. 2007).

In the Atlantic region, from Labrador to Downeast Maine, acidic peatlands develop raised plateaus with undulating sedge and dwarf-shrub vegetation. *Trichophorum caespitosum* may form sedge lawns on the raised plateau. The system may also occur as "blanket bogs" over a sloping rocky substrate in extreme maritime settings; here, dwarf-shrubs and *Sphagnum* are the dominant cover. Species characteristic of this maritime setting include *Empetrum nigrum* and *Rubus chamaemorus*. Typical bog heaths such as *Gaylussacia dumosa*, *Gaylussacia baccata*, *Kalmia angustifolia*, *Kalmia polifolia*, and *Ledum groenlandicum* are also present. *Betula nana* (= *Betula michauxii*) may also be common. Morphological characteristics and certain coastal species distinguish these from more inland acidic peatlands.

Further south in the sub-boreal region, two major physiognomic types occur: first, the ericaceous dwarf-shrub bog, often dominated by *Chamaedaphne calyculata*, sometimes with distinctive southern and coastal elements such as *Gaylussacia dumosa*, *Ilex glabra*, and *Morella pensylvanica*, and with other constant and dominant species, including *Kalmia angustifolia* (east), *Kalmia polifolia* (north), and *Ledum groenlandicum* (north); and second, a tall-shrub peat thicket dominated by deciduous ericaceous shrubs, especially *Vaccinium corymbosum* (*Ilex verticillata* and *Cephalanthus occidentalis* can dominate on shallower peat and the moat along the bog border), and wet peatland margins. Graminoids such as *Carex oligosperma*, *Carex magellanica* ssp. *irrigua* (= *Carex paupercula*), *Eriophorum angustifolium* (north and midwest), *Eriophorum virginicum* (throughout and southward), and *Eriophorum vaginatum* are common in the herb layer. Some peatlands may have a sparse tree layer (<10% cover) or stunted (<2 m) stems of *Larix laricina*, *Picea mariana*, or *Acer rubrum*. Somewhat richer sites may include *Myrica gale* and *Dulichium arundinaceum* (Damman and French 1987). Distinctive southern shrubs present include *Alnus serrulata*, *Clethra alnifolia*, *Gaylussacia frondosa*, *Lyonia ligustrina*, *Rhododendron periclymenoides* (= *Rhododendron nudiflorum*), *Rhododendron viscosum*, and *Toxicodendron vernix* (= *Rhus vernix*). Diagnostic southern herbs include *Woodwardia virginica*. More northern (but not boreal) shrubs include *Alnus*

*incana ssp. rugosa* (= *Alnus rugosa*), *Alnus viridis* (along coast), *Nemopanthus mucronatus*, and *Viburnum nudum var. cassinoides* (Damman and French 1987).

## ENVIRONMENT & DYNAMICS

**Environmental Description:** Sites are generally hummocky with gently to more steeply (up to 8°) sloping terrain. Peatlands form where the rate of peat accumulation exceeds its decomposition, resulting in ombrotrophic and acidic peatlands in which the bog surface may be raised above the water table. Sites are found in depressions, on acidic seepage slopes, with either ombrotrophic or weakly minerotrophic groundwater. They occur in a variety of landforms, including peat bog-lake systems (lake-fill bogs, moat bogs, and pond border bogs), perched water-peatland systems in valleys and depressions, peat bog-stream systems, and ombrogenous peatland systems, including raised bogs (Damman and French 1987). Permafrost is only present in boreal Alaska and northern Canada, where it may form permafrost plateaus (Camill 1999). Where permafrost is present, thermokarst pools may result in roughly circular open pools with floating carpets of *Sphagnum riparium* and *Sphagnum jensenii*, with low *Sphagnum angustifolium* mounds in shallow spots (Horton et al. 1979, L. Allen pers. comm. 2014).

Acidic peatlands found in kettle depressions are associated with active or extinct glacial lakes. Within kettle depressions, the "kettle bogs" can occupy the entire basin or frequently occur as a mat (floating or grounded) on the margin of the remaining glacial lake. When bogs and poor fens occur along the edge of large bodies of water, they are found in sheltered bays or coves that are protected from wave and ice action, which can prevent the development of peat or erode existing peat mats. Those occurring on former glacial lakebeds and drainageways tend to be more extensive than kettle bogs, which are limited in area by the size of the glacial ice-block that formed the basin (Kost et al. 2007).

In the northeastern United States, true bogs may reach their core southern limit in Maine and extreme northern New Hampshire and Vermont (Damman and French 1987, figure 3), though isolated occurrences are possible southward, including in New York. Southward poor fens are found in areas where glacial stagnation left coarse deposits and glacial depressions (many are "kettleholes"). The basins are generally closed, i.e., without inlets or outlets of surface water, and typically small in area. The nutrient-poor substrate and the reduced throughflow of water create oligotrophic conditions fostering the development of *Sphagnum* peat and the growth of peatland vegetation. These acidic peatlands occur in a variety of landforms, including peat bog-lake systems (lake-fill bogs, moat bogs, and pond border bogs), perched water-peatland systems in valleys and depressions, and more rarely peat bog-stream systems.

**Dynamics:** In boreal wetlands the general successional trend is sometimes portrayed as proceeding from marsh to fen to treed bog. Although often true (Klinger and Short 1996), succession is not necessarily directional, and environmental conditions, such as nutrient content and abundance of groundwater, may prevent fens from developing into bogs (Zoltai et al. 1988). Succession can begin in shallow ponds or low-lying wetlands formed by processes such as glacial recession and floodplain dynamics (oxbows) or thermokarst. An organic root mat typically develops and is either anchored to the mineral soil or floating on water such as a pond's edge. Over time, peat-forming mosses and sedges may fill in the basin. As the peat layer develops, low and/or dwarf-shrubs become established. Dwarf-trees may establish on the well-developed peat and also around the margin of the peatland.

Many researchers have reported fire as a significant part of the disturbance regime of bogs (Dean and Coburn 1927, Gates 1942, Curtis 1959). The role of fire disturbance in acidic peatlands needs review.

Beaver, through their dam-building activities, can cause substantial hydrologic change to peatland systems, either causing flooding or the lowering of the water table, depending on the location of the peatland in relation to the dam (Gates 1942, Curtis 1959, Heinselman 1963, Jeglum 1975, Futyma and Miller 1986, cited in Kost et al. 2007).

## DISTRIBUTION

**Geographic Range:** This macrogroup extends across the western boreal regions of North America, extending south into sub-boreal regions of the Pacific Maritime and Rocky Mountain divisions. In the east, it extends across the boreal regions of central and eastern Canada and southward into adjacent sub-boreal and cold temperate regions of Canada and northeast and north-central United States. It is associated with the glacial terminus or stagnation zones, and interior from the Atlantic Coastal Plain. Maritime examples occur near the coast from eastern Maine (Mount Desert Island) eastward into the Canadian Maritimes and the coast of Labrador. Sub-boreal acidic peatlands are found in lower New England and southern New York, south to Pennsylvania, New Jersey and high montane regions of West Virginia, and westward to extreme southern Ontario, northern Ohio, northern Indiana and Illinois, Michigan and Wisconsin.

### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

**States/Provinces:** AB, AK, BC, CT, ID?, IL, IN, MA, MB, ME, MI, MN, MT, NB, NH, NJ, NS, NT, NY, OH, ON, OR?, PA, PE?, QC, RI, SK, VT, WA?, WI, WV, YT

### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 211A:CP, 211E:CC, 211F:CC, 211I:CC, 211J:CC, 212Ha:CCP, 212Hb:CCP, 212Hc:CCP, 212Hd:CCP, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCP, 212Hi:CCC, 212Hj:CCP, 212Hk:CCC, 212Hl:CCC, 212Hm:CCP, 212J:CC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212Q:CP, 212Ra:CCP, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 212S:CC, 212Tb:CCC, 212Te:CCP, 212X:CC,

WA groups

212Y:CC, 212Z:CC, 221A:CC, 221B:CC, 221D:CC, 221E:CC, 221Fa:CCC, 222H:CC, 222I:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222R:CC, 222Ua:CCP, 222Ud:CCC, 222Ue:CCC, M211A:CP, M211B:CP, M211C:CC, M242D:??

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- = Bog Wetland Class (National Wetlands Working Group 1988)
- = Bog and Poor Fen (Kost et al. 2007)
- = Bog and Poor Fen (Cohen et al. 2014)
- < Peatlands (Mitsch and Gosselink 2000)

#### LOWER LEVEL UNITS

**Groups:**

- G748 Eastern North American Boreal Acidic Bog & Fen
- G745 Eastern North American Sub-Boreal Acidic Bog & Fen
- G515 Rocky Mountain Acidic Fen
- G360 Western North American Boreal Acidic Bog & Fen

#### AUTHORSHIP

**Primary Concept Source:** National Wetlands Working Group (1988)

**Author of Description:** D. Faber-Langendoen, G. Kittel, M. Reid, M. Hall, K. Boggs, T. Boucher, S.C. Gawler

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** DFL 5-14

#### REFERENCES

**References:** Allen, L. pers. comm., Baldwin pers. comm., Bridgham et al. 1996, Camill 1999, Cohen et al. 2014, Curtis 1959, Damman and French 1987, Dansereau and Segadas-Vianna 1952, Davis and Anderson 2001, DeVelice et al. 1999, Dean and Coburn 1927, Faber-Langendoen et al. 2015, Futyma and Miller 1986, Gates 1942, Gawler and Cutko 2010, Glaser 1992a, Glaser and Janssens 1986, Glaser et al. 1990, Harris et al. 1996, Heinselman 1963, Horton et al. 1979, Jeglum 1975, Jorgenson et al. 2001a, Jorgenson et al. 2001b, Jorgenson et al. 2003, Klinger and Short 1996, Kost et al. 2007, Minnesota DNR 2003, Mitsch and Gosselink 2000, National Wetlands Working Group 1988, Viereck et al. 1992, Vitt and Slack 1975, Wheeler et al. 1983, Zoltai et al. 1988

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2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

M876. North American Boreal & Sub-Boreal Acidic Bog & Fen

### **G360. Western North American Boreal Acidic Bog & Fen [Proposed]**

**Note (Rocchio):** G360 is listed on usnvc.org as a '?' for WA. I don't think it occurs here unless *Betula nana/glandulosa* poor shrub fens (i.e. *Betula glandulosa* / *Carex utriculata*) and *Pinus contorta* var. *latifolia* and/or *Picea engelmannii* treed fens go here, then G360 would be in WA. As G360 and G515 are currently written, G360 seems to include treed, shrubland, and herbaceous types while G515 is only described as herbaceous types. So, I'm not sure if the primary difference between G515 and G360 is physiognomic or composition? If the former, we have it. If the latter, then I'm skeptical its included in the US as most of the dominants in G360 don't occur in, or at least aren't conspicuous component of, fens in Oregon, Idaho, and Montana (although MT may have some *P. glauca*). In summary, other than structural differences, as written the difference between G360 and G515 is unclear. There is a good overlap in species composition. If the boreal indicators are what separate them then I'd say G360 doesn't drop into the western US (it would follow then that G515 description should be updated to reflect treed/shrub components). Some of the species might (we have a few of the *Carices* as rare plants) but I don't think the Group would be down in the US. I'm basing that on the assumption that these are the boreal indicators: *Picea mariana*, *Picea glauca*, and *Larix laricina*, *Ledum palustre* ssp. *decumbens*, *Andromeda polifolia*, *Kalmia polifolia*, *Chamaedaphne calyculata*, *Empetrum nigrum*, *Rubus chamaemorus*, *Vaccinium vitis-idaea*, *Carex chordorrhiza*, *Carex pauciflora*, *Carex pluriflora*, *Carex rariflora* (more eastern), *Carex rotundata* (more eastern), *Carex stylosa*, )

**Type Concept Sentence:** This group extends across the western boreal regions of North America, extending south into the Pacific Maritime and Rocky Mountain divisions on wet organic soils (bogs) with tree- or shrub-dominated or dwarf-shrub/herbaceous vegetation.

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## OVERVIEW

**Scientific Name:** *Picea mariana* / *Ledum groenlandicum* / *Eriophorum brachyantherum* Boreal Acidic Bog & Fen Group

**Common Name (Translated Scientific Name):** Black Spruce / Bog Labrador-tea / Northland Cottonsedge Boreal Acidic Bog & Fen Group

**Type Concept:** This group extends across the western boreal regions of North America, extending south into sub-boreal regions of the Pacific Maritime and Rocky Mountain divisions. It occurs in wet depressions and old lake basins. Occurrences form where the rate of peat accumulation exceeds its decomposition, resulting in ombrotrophic and acidic peatlands in which the bog surface is raised above the water table. Patch size is small to large. These are primarily depressional wetlands, and secondary bog pools may also be present. This group may be tree- or shrub-dominated or dwarf-shrub/herbaceous. Trees may be stunted and dwarfed. Trees are dense or scattered, with common species including *Picea mariana*, *Picea glauca*, and *Larix laricina*. Dominant shrubs include *Betula nana*, *Ledum palustre* ssp. *decumbens*, *Ledum groenlandicum*, *Andromeda polifolia*, *Kalmia polifolia*, *Chamaedaphne calyculata*, *Empetrum nigrum*, *Rubus chamaemorus*, *Vaccinium oxycoccos*, *Vaccinium vitis-idaea*, and *Vaccinium uliginosum*. The herbaceous layer is typically graminoid-dominated. Species include *Carex chordorrhiza*, *Carex lasiocarpa*, *Carex limosa*, *Carex livida*, *Carex membranacea*, *Carex microglochin*, *Carex pauciflora*, *Carex pluriflora*, *Carex rariflora* (more eastern), *Carex rotundata* (more eastern), *Carex stylosa*, *Eriophorum brachyantherum*, and *Eriophorum angustifolium*.

**Classification Comments:** North American Arctic Bog & Fen was moved under this group, based on the opinion that arctic bogs (which are uncommon) are not that different from boreal bogs. Strong diagnostic species that separate eastern from western acidic peatlands are not currently known. Clarification of the limits of this type with respect to Vancouverian (North Pacific) and Rocky Mountain acidic fens is also needed.

**Internal Comments:** AK workshop 3-21-11: Not sure that Arctic bogs are separate from Boreal bogs. Lumped G372 with this. DFL 4-23-10: name changed from Western North American Boreal Acidic Peatland Group; lump G372 here. Primarily a shrub bog and fen. Schitzeria alliance belongs here. MSR 12-11-09: new; Need western N.A. diagnostics to make this work. Ledums?; poor fens up to Ph5; rich fens up to 5.5 to 8; discussion of whether treed bogs & fens could be split at the Group level and put together with treed swamps; Keith says it will be very hard to split out the acid peatlands from fens in AK; Viereck has some fen types which he calls "fens"

**Other Comments:**

### Similar NVC Types:

- G361 Western North American Boreal Alkaline Fen
- G748 Eastern North American Boreal Acidic Bog & Fen

**Diagnostic Characteristics:** This group represents tree, shrub or dwarf-shrub/herbaceous vegetation that occupies acidic peatlands in western North America. Strong diagnostic species that separate eastern from western acidic peatlands are not currently known. Stronger diagnostic species that are found across both eastern and western more northern boreal acidic peatlands, but are uncommon to absent further south, may include *Carex membranacea*, *Carex microglochin*, *Carex rotundata*, and *Eriophorum brachyantherum*. Two *Carex* species, *Carex rariflora* and *Carex rotundata*, may be absent from the western peatland.

## VEGETATION

**Physiognomy and Structure:** This group is defined by a mixed physiognomy which may be characterized by needle-leaved evergreen trees, broad-leaved deciduous shrubs or hydrophytic graminoids, particularly sedges. Trees, when present, are often dwarfed.

**Floristics:** This group may be tree- or shrub-dominated or dwarf-shrub/herbaceous. Trees may be stunted and dwarfed. Trees are dense or scattered, with common species including *Picea mariana*, *Picea glauca*, and *Larix laricina*. Dominant shrubs include *Betula nana*, *Ledum palustre* ssp. *decumbens*, *Ledum groenlandicum*, *Andromeda polifolia*, *Kalmia polifolia*, *Chamaedaphne calyculata*, *Empetrum nigrum*, *Rubus chamaemorus*, *Vaccinium oxycoccos*, *Vaccinium vitis-idaea*, and *Vaccinium uliginosum*. The herbaceous layer is typically graminoid-dominated. Species include *Carex chordorrhiza*, *Carex lasiocarpa*, *Carex limosa*, *Carex livida*, *Carex membranacea*, *Carex microglochin*, *Carex pauciflora*, *Carex pluriflora*, *Carex rariflora* (more eastern), *Carex rotundata* (more eastern), *Carex stylosa*, *Eriophorum brachyantherum*, and *Eriophorum angustifolium*.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This group extends across the western boreal regions of North America, extending south into sub-boreal regions of the Pacific Maritime and Rocky Mountain divisions. Sites are generally flat to gently sloping terrain, on slopes up to 8°. Occurrences form where the rate of peat accumulation exceeds its decomposition, resulting in ombrotrophic and acidic peatlands in which the bog surface is raised above the water table. Patch size is small to large. These are primarily depressional wetlands, and secondary bog pools may also be present. Soils are poorly-drained and acidic, often with a well-developed peat layer. Permafrost is

generally present and may form permafrost plateaus supporting the system in boreal Alaska but is generally absent in the boreal transition region.

**Dynamics:** In boreal wetlands the general successional trend is from marsh to fen to treed bog; however, succession is not necessarily directional, and environmental conditions, such as nutrient content and abundance of groundwater, may prevent fens from developing into bogs (Zoltai et al. 1988). Succession begins in shallow ponds or low-lying wetlands formed by processes such as glacial recession and floodplain dynamics (oxbows) or thermokarst. An organic root mat typically develops and is either anchored to the mineral soil or floating on water such as a pond's edge. Over time, peat-forming mosses and sedges may fill in the basin. As the peat layer develops, low and/or dwarf-shrubs become established. Dwarf-trees may establish on the well-developed peat and also around the margin of the peatland.

Many peatlands on the Kenai Lowland formed in kettles after remnant glacial ice melted. In this region there is a trend toward peatlands drying and ponds shrinking and filling in.

Permafrost degradation leading to collapse scars and thaw ponds is common in boreal Alaska, and studies from the Tanana Flats show areas of widespread degradation. Thaw ponds form when ice-rich permafrost degrades and collapses forming a basin. Aquatic plants rapidly colonize the pond. Over time, marsh plants and sphagnum moss invade creating peatland conditions. This trend is leading to widespread ecosystem conversion in the Tanana Flats (Jorgenson et al. 2001b). If a collapse scar is isolated, succession follows a bog development model, whereas in an open hydrologic setting, succession follows a fen development model. Pond systems may become connected as adjacent permafrost thaws.

#### DISTRIBUTION

**Geographic Range:** This group extends across the western boreal regions of North America, extending south into sub-boreal regions of the Pacific Maritime and Rocky Mountain divisions.

**Nations:** CA, US

**States/Provinces:** AB, AK, BC, ID, MT, NT, OR, SK, WA?, YT

**TNC Ecoregions [optional]:** 7:C, 74:C, 75:C, 79:C, 135:P, 136:P, 139:C, 140:C, 141:P, 144:P

**USFS Ecoregions (2007):** M242D:??, M333A:??, M333B:??

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

- > I.A.3.d - Black spruce (Viereck et al. 1992)
- > II.C.2.d - Shrub birch-ericaceous shrub bog (Viereck et al. 1992)

#### LOWER LEVEL UNITS

**Alliances:**

- A3448 *Vaccinium oxycoccos* - *Carex* spp. / *Sphagnum* spp. Western Boreal Acidic Bog & Fen Alliance

#### AUTHORSHIP

**Primary Concept Source:** G. Kittel, M. Reid, M. Hall, K. Boggs, T. Boucher, D. Faber-Langendoen, in Faber-Langendoen et al. (2011)

**Author of Description:** M.E. Hall and D. Faber-Langendoen

**Acknowledgments:**

**Version Date:** 2013/06/06

#### REFERENCES

**References:** Banner et al. 1993, Boggs and Sturdy 2005, Bursik and Moseley 1995, Comer et al. 2003, Crum 1992, DeLong 2003, DeLong et al. 1993, DeVelice et al. 1999, Eyre 1980, Faber-Langendoen et al. 2015, Gracz et al. 2005, Green and Klinka 1994, Jorgenson et al. 2001a, Jorgenson et al. 2001b, Jorgenson et al. 2003, Klein et al. 2005, Lawrence et al. 2005, MacKinnon et al. 1990, Meidinger et al. 1988, NCC 2002, Racine et al. 1998, Shiflet 1994, Smith et al. 2007, Steen and Coupé 1997, Stone et al. 2007, Viereck et al. 1992, Willoughby 2007, Willoughby et al. 2006, Zoltai et al. 1988

### G515. Rocky Mountain Acidic Fen

**Type Concept Sentence:** This group occurs infrequently throughout the Rocky Mountains from Colorado north into Canada. It is confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm.

#### OVERVIEW

**Scientific Name:** *Carex aquatilis* - *Carex lasiocarpa* - *Sphagnum* spp. Rocky Mountain Acidic Fen Group

**Common Name (Translated Scientific Name):** Water Sedge - Woolly-fruit Sedge - Peatmoss species Rocky Mountain Acidic Fen Group

**Type Concept:** This group occurs infrequently throughout the Rocky Mountains from Colorado north into Canada. It is confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm. Fens form at low points in the landscape or on slopes where groundwater intercepts the soil surface. Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Acidic fens are restricted to areas where bedrock is noncalcareous (e.g., sandstone, basalt, quartzite, granite). Constant high water levels and cold winter temperatures lead to accumulation of organic material. In addition to peat accumulation and perennially saturated soils, soil chemistry is acidic and nutrients are low. Iron fens are the exception where the pH is low (acidic) but nutrients are high. Fens usually occur as a mosaic of several plant associations dominated by *Carex aquatilis*, *Carex livida*, *Carex lasiocarpa*, *Carex limosa*, *Dulichium arundinaceum*, *Ledum glandulosum*, and *Trichophorum caespitosum*. The surrounding landscape may be ringed with other wetland systems, e.g., riparian shrublands, or a variety of upland systems from grasslands to forests.

**Classification Comments:** Nutrient-rich alkaline fens are not included here, they belong to Rocky Mountain Neutral-Alkaline Fen Group (G516).

**Internal Comments:** DFL 9-13: AK? added. mjr 10-12: CA added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G516 Rocky Mountain Neutral-Alkaline Fen: covers calcareous and other alkaline fens, with indicator species such as *Kobresia myosuroides* and *Kobresia simpliciuscula*.
- G285 North Pacific Neutral-Alkaline Fen: covers calcareous and other alkaline fens but with Pacific Northwest species such as *Myrica gale*.
- G284 North Pacific Bog & Acidic Fen: covers poor fens in the Pacific Northwest with species such as *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Picea sitchensis*, and *Tsuga heterophylla*.

**Diagnostic Characteristics:** Saturated year-round organic soils with >40 cm peat and dominated by wetland indicator plants *Carex aquatilis*, *Carex livida*, *Carex lasiocarpa*, *Dulichium arundinaceum*, *Ledum glandulosum*, and *Trichophorum caespitosum*. Ground cover is dominated by *Sphagnum* mosses.

### VEGETATION

**Physiognomy and Structure:** Wetlands dominated by bryophytes and low-statured graminoids. Woody cover, if present, is very sparse.

**Floristics:** Acidic fens associated with peatlands more closely resemble the vegetation of bogs, with *Sphagnum* mosses and ericaceous shrubs. Dominant species include *Carex aquatilis*, *Carex livida*, *Carex lasiocarpa*, *Dulichium arundinaceum*, *Ledum glandulosum*, and *Trichophorum caespitosum* (Cooper 1986b, Windell et al. 1986, Steen and Coupe 1997).

G515 Rocky Mountain Acidic Fen Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Carex limosa</i> / <i>Sphagnum</i> spp. Herbaceous Vegetation	GNR/SNR	CWWA000325
<i>Carex utriculata</i> / <i>Sphagnum</i> spp. Herbaceous Vegetation	GNR/SNR	CWWA000333
<i>Dulichium arundinaceum</i> Herbaceous Vegetation	G3/S2S3	CEGL001831
<i>Pinus contorta</i> / <i>Betula glandulosa</i> / <i>Carex utriculata</i> Woodland	GNR/SNR	CWWA000371
<i>Salix pedicellaris</i> / <i>Rhynchospora alba</i> / <i>Sphagnum</i> spp. Dwarf-shrubland	GNR/SNR	CWWA000400

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Soil/substrate/hydrology:* Fens are wetlands that develop where a relatively constant supply of groundwater maintains saturated conditions and the water chemistry reflects the mineralogy of the local soils and geological materials (Bedford and Godwin 2003). Organic soil of partially decomposed peat has a minimum depth of 40 cm (although some authors use 30-cm depth criteria). Acidic fens arise either because the groundwater accounts for only a small fraction of the annual water budget or because groundwater inputs move through materials with low solubility and are non-calcareous (e.g., basalt gneiss, granite) or low buffering capacity (e.g., sand, quartz) (Bedford and Godwin 2003).

**Dynamics:** Mountain fens act as natural filters cleaning ground and surface water. Fens also act as sponges by absorbing heavy precipitation, slowly releasing it downstream, minimizing erosion and recharging groundwater systems (Windell et al. 1986). The persistent groundwater and cold temperatures allow organic matter to accumulate (forming peat) which allows classification of wetlands within this group as fens. Fens produce peat that accumulates at the rate of 20 to 30 cm (8-11 inches) per 1000 years, making peatlands a repository of 10,000 years of post glacial history (Windell et al. 1986).

#### DISTRIBUTION

**Geographic Range:** This group occurs infrequently throughout the mountains of the interior west, the Sky Islands of Arizona and high mountains and plateaus of Nevada and Utah, and the Rocky Mountains of Utah, Colorado, Wyoming, Montana, Idaho, and north into interior Canada, where it is known from interior (non-coastal) British Columbia and Alberta.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 7:C, 8:P, 9:P, 11:P, 18:C, 19:P, 20:C, 21:P, 68:P

**USFS Ecoregions (2007):** 331J:CC, 331N:C?, M331A:CC, M331B:CC, M331D:CC, M331E:CP, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CP, M332B:CP, M332D:CC, M332E:CP, M332F:CP, M332G:CP, M333A:PP, M333B:PP, M333C:PP, M333D:PP

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

#### LOWER LEVEL UNITS

**Alliances:**

- A3437 *Carex lasiocarpa* - *Carex livida* - *Dulichium arundinaceum* Acidic Fen Herbaceous Alliance
- A3438 *Ledum glandulosum* Acidic Fen Shrubland Alliance

#### AUTHORSHIP

**Primary Concept Source:** J. Rocchio, D. Cooper, B. Bedford, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2013/05/22

#### REFERENCES

**References:** Bedford and Godwin 2003, Cooper 1986b, Faber-Langendoen et al. 2015, Rondeau 2001, Steen and Coupé 1997, Windell et al. 1986

2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

## M877. North American Boreal & Sub-Boreal Alkaline Fen

**Type Concept Sentence:** This alkaline fen macrogroup occurs on peatlands across the boreal regions of North America, extending south into sub-boreal regions of the Rocky Mountains, Great Lakes, and northeastern and north-central U.S. *Sphagnum* peatmoss and ericaceous shrubs are patchy to absent and brown mosses, broad-leaved non-ericaceous shrubs, and thin-leaved graminoids are common.

#### OVERVIEW

**Scientific Name:** *Dasiphora fruticosa* ssp. *floribunda* - *Carex lasiocarpa* / *Campylium stellatum* Alkaline Peatland Macrogroup

**Common Name (Translated Scientific Name):** Shrubby cinquefoil - Woolly-fruit Sedge / Star Campylium Moss Alkaline Peatland Macrogroup

**Type Concept:** This alkaline fen vegetation contains a mossy peat layer with depths typically exceeding 40 cm, and extends across the boreal regions of North America, extending south into sub-boreal regions of the Rocky Mountains, Great Lakes, and northeastern and north-central U.S. The vegetation may be graminoid-dominated, shrub-dominated, or a patchwork of the two, with broad-leaved non-ericaceous shrubs typically dominant. There is a discontinuous to absent layer of *Sphagnum* peatmoss, with brown mosses (*Calliergon*, *Campylium*, *Drepanocladus*, *Tomentypnum*, *Scorpidium scorpioides*) present to dominant. Broad-leaved non-ericaceous shrubs such as *Alnus incana*, *Betula glandulosa*, *Betula pumila*, *Dasiphora fruticosa* ssp. *floribunda*, *Myrica gale*, *Rhamnus alnifolia*, *Salix barclayi* (west), *Salix candida*, *Salix maccalliana* (west), and other *Salix* spp. exceed the cover of ericaceous shrubs, although some shore fens may be dominated by *Chamaedaphne calyculata*. Thin-leaved graminoids include especially *Carex*

*lasiocarpa*, as well as *Carex aquatilis* (on peat), *Carex diandra*, *Carex interior*, *Carex limosa*, *Carex livida*, *Eriophorum viridicarinarum*, *Muhlenbergia glomerata*, *Rhynchospora alba*, and *Trichophorum alpinum*. A wide diversity of herbs is found, especially *Equisetum fluviatile*, *Menyanthes trifoliata*, *Sarracenia purpurea*, *Solidago uliginosa* (east), *Triantha glutinosa* (= *Tofieldia glutinosa*), and *Triglochin maritima*. Other herbs include *Comarum palustre* and *Calla palustris*.

These fens develop in open basins where lateral groundwater flows through circumneutral to calcareous parent materials or causes calcareous upwellings, creating moderately to strongly alkaline conditions. They are found on level to gently sloping surfaces, or in closed wet depressions (sometimes as floating mats), and along wetland margins and lake- and rivershores. The shore fens are occasionally flooded, and so are included here because flooding tends to create moderately alkaline conditions. Peat deposits are composed primarily of partially decomposed brown mosses and sedges. Depth of peat exceeds 40 cm, separating this from similar wetlands that are non-peatlands. The water table is at or just above the surface.

In the sub-boreal regions of southeastern Canada and the northeastern United States, this macrogroup is typically found in glaciated settings, in pitted outwash or in kettle lakes associated with kettle-kame-moraine topography. The characteristic species include the shrubs *Cornus amomum*, *Cornus racemosa*, *Cornus sericea*, *Dasiphora fruticosa* ssp. *floribunda*, prairie grasses such as *Andropogon gerardii* and *Spartina pectinata*, sedges including *Carex flava*, *Carex sterilis*, *Carex prairea*, and other graminoids such as *Trichophorum alpinum*, and forbs such as *Packera aurea*, *Symplocarpus foetidus*, *Triantha glutinosa* (= *Tofieldia glutinosa*), and *Lobelia kalmii*. Less commonly, *Cladium mariscoides* may be a dominant.

**Classification Comments:** This macrogroup excludes "forested fens," which have trees >2 m and >10% cover, and are treated here as rich swamps [see North American Boreal Poor - Intermediate Conifer Bog & Swamp Macrogroup (M299). Both North American Boreal & Sub-Boreal Acidic Bog & Fen Macrogroup (M876) and this macrogroup (M877) are organic wetlands or peatlands in the Canadian wetland classification system. The Canadian system separates bogs from fens based on the influence of nutrient-rich groundwater in fens, which is missing in bogs. Here, we include poor fens with bogs, because they tend to be acidic and have a dominance of *Sphagnum* spp. in the bryophyte layer. M877 includes fens that have been classed as medium-rich to extremely rich as these have many species in common (Vitt and Chee 1990) and the bryophyte layer tends to lack the dominance of *Sphagnum* spp. found in bogs and poor fens.

#### Similar NVC Types:

- M299 North American Boreal Poor - Intermediate Conifer Bog & Swamp
- M876 North American Boreal & Sub-Boreal Acidic Bog & Fen
- M063 North Pacific Bog & Fen
- M061 Eastern Cool Temperate Seep

**Diagnostic Characteristics:** This type contains a peat layer of partially decomposed sedges and brown mosses with depths exceeding 40 cm. Dwarf-shrubs and thin-leaved graminoids are >25%, stunted (scrub) trees <2 m with variable cover; otherwise trees <10% cover. There is a discontinuous to absent layer of *Sphagnum* peatmoss (<80% cover), with brown mosses (*Aulacomnium palustre*, *Calliergon*, *Campylium*, *Drepanocladus*, *Tomentypnum*, *Scorpidium scorpioides*) present to dominant. Broad-leaved non-ericaceous shrubs (*Alnus incana*, *Betula glandulosa*, *Betula pumila*, *Dasiphora fruticosa* ssp. *floribunda*, *Myrica gale*, *Rhamnus alnifolia*, *Salix* spp.) exceed cover of ericaceous shrubs, although some shore fens may be dominated by *Chamaedaphne calyculata*. Thin-leaved graminoids include *Carex lasiocarpa*, *Carex limosa*, *Carex livida*, *Carex interior*, *Eriophorum viridicarinarum*, *Muhlenbergia glomerata*, *Trichophorum alpinum*, and together these graminoids exceed the cover of acidic peatland graminoids indicators (*Carex magellanica* ssp. *irrigua* (= *Carex paupercula*), *Carex oligosperma*, *Eriophorum vaginatum*, *Eriophorum virginicum*, *Scheuchzeria palustris*).

## VEGETATION

**Physiognomy and Structure:** This macrogroup contains a moss peat layer with depths exceeding 40 cm. Dwarf-shrubs and thin-leaved graminoids are >25%, stunted (scrub) trees <2 m with variable cover; otherwise trees <10%. There is a discontinuous to absent layer of *Sphagnum* peatmoss (<80% cover), with brown mosses present to dominant. Ericaceous dwarf-shrubs are typically minor, with broad-leaved shrubs dominant. Broad-leaved non-ericaceous shrubs exceed cover of ericaceous shrubs (>50%), although some shore fens may be more ericaceous-dominated. Thin-leaved graminoids are common. The tree layer is rare to absent (though some scrubby <2 m tall treed fens may fall within this type, with the tree layer usually dominated by *Larix laricina*).

The landscape morphology of alkaline peatlands is often very striking. A variety of approaches has been taken to describe these forms: in Maine, see Davis and Anderson (2001); in Canada, see National Wetlands Working Group (1988); and in Minnesota, see Glaser (1992a). In Canada, bog and fen peatlands each have their own set of forms. In Minnesota, Glaser treats bogs and fens together as part of larger patterned peatland complexes (mire complexes). Particularly distinctive are the ribbed bogs or fens in which a pattern of narrow (2- to 3-m wide), low (less than 1 m deep) ridges are oriented at right angles to the direction of the drainage (National Wetlands Working Group 1988). Wet pools or depressions occur between the ridges. These patterned peatlands may include string bog, Atlantic ribbed fen, or northern ribbed fen (National Wetlands Working Group 1988). They develop almost entirely north of 46°N latitude in east-central Canada and the adjacent U.S. They are minerotrophic peatlands in which the vegetation has developed into a pattern of strings (raised, usually linear features, and more acidic) and flarks (wet depressions



separating the strings, and less acidic). Bedrock or other substrate influences create circumneutral to calcareous conditions. In circumneutral areas, some of the more typical bog heaths may codominate with deciduous alkaline shrubs. Alkaline peatlands usually develop in open basins and flat plains, and the patterned portion may occupy only a fraction of the entire peatland. The edge of the basin may be shallow to deep peat over a sloping substrate, where seepage waters provide nutrients.

**Floristics:** Broad-leaved shrubs (*Alnus incana*, *Betula glandulosa*, *Betula nana* (= *Betula michauxii*), *Betula pumila*, *Dasiphora fruticosa* ssp. *floribunda*, *Myrica gale*, *Rhamnus alnifolia*, *Salix* spp.) are dominant to minor, and ericaceous dwarf-shrubs, such as *Andromeda polifolia*, *Vaccinium oxycoccos*, and *Kalmia polifolia* are minor, but *Chamaedaphne calyculata* is occasionally dominant. Thin-leaved graminoids include especially *Carex lasiocarpa*, but also *Carex aquatilis* (on peat) *Carex chordorrhiza*, *Carex interior*, *Carex limosa*, *Carex livida*, *Eriophorum viridicarinatum*, *Muhlenbergia glomerata*, *Rhynchospora alba*, and *Trichophorum alpinum*. A wide diversity of herbs is found, especially *Drosera rotundifolia*, *Equisetum fluviatile*, *Menyanthes trifoliata*, *Sarracenia purpurea*, *Triantha glutinosa* (= *Tofieldia glutinosa*), and *Triglochin maritima*. Species diversity is typically high (though shore fens may be low). Less commonly, *Calamagrostis canadensis* and *Equisetum fluviatile* may be present. Mosses include the brown mosses *Campylopus stellatum*, *Limprichtia revolvens* (= *Drepanocladus revolvens*), *Scorpidium scorpioides*, and *Tomentypnum nitens*. *Sphagnum* spp. are patchy to absent, and may include *Sphagnum russowii*, *Sphagnum squarrosum* and *Sphagnum warnstorffii*, among others (Gignac 1991, Vitt et al. 1995, Harris et al. 1996, Minnesota DNR 2003).

In the sub-boreal regions of southeastern Canada and the northeastern and north-central United States, characteristic species include the shrubs *Cornus amomum*, *Cornus racemosa*, *Cornus sericea*, *Dasiphora fruticosa* ssp. *floribunda*, prairie grasses such as *Andropogon gerardii* and *Spartina pectinata*, sedges including *Carex flava*, *Carex prairea*, *Carex sterilis*, and other graminoids such as *Trichophorum alpinum*, and forbs such as *Packera aurea*, *Triantha glutinosa* (= *Tofieldia glutinosa*), and *Lobelia kalmii*. In the western part of its range, *Carex lasiocarpa*, *Eriophorum angustifolium* ssp. *subarcticum* (= *Eriophorum polystachion*), *Parnassia glauca*, *Eleocharis compressa*, and *Symphytotrichum boreale* (= *Aster borealis*) may be common. Less commonly, *Cladium mariscoides* may be a dominant.

Trees are typically sparse in this macrogroup, though they may extend inward from natural wooded wetland borders. Common trees, even though stunted or scattered, include *Larix laricina* and (in the east) *Thuja occidentalis*.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Soil/substrate/hydrology:* These fens develop where lateral groundwater flows through circumneutral to calcareous parent materials or through calcareous upwellings that create moderately to strongly alkaline, saturated conditions. They are found on level to gently sloping surfaces, or in closed wet depressions (sometimes as floating mats), and along wetland margins and lake- and rivershores. The shore fens are occasionally flooded, and so are included here because flooding tends to create moderately alkaline conditions.

**Dynamics:** In boreal wetlands, the general successional trend is often suggested to go from marsh to fen to treed bog. Although often true (Klinger and Short 1996), succession is not necessarily directional, and environmental conditions such as nutrient content and abundance of groundwater may prevent fens from developing into bogs (Zoltai et al. 1988). Succession may begin in ponds or low-lying wetlands formed by processes such as glacial recession and floodplain dynamics (oxbows). An organic root mat typically develops and is either anchored to the mineral soil or floating on water such as a pond's edge. Over time, peat-forming mosses and sedges may fill in the basin. As the peat layer develops, low and/or dwarf-shrubs become established. Dwarf-trees may establish on the well-developed peat and also around the margin of the peatland (e.g., Klein et al. 2005).

In the sub-boreal regions, some fens are kept open by grazing, and succession to heavier shrub cover may occur in the absence of grazing. The role of fire disturbance in fens needs further review.

#### DISTRIBUTION

**Geographic Range:** This macrogroup is found in scattered locations from New England and adjacent Canada west to the Great Lakes and northern Minnesota and extends across the western boreal regions of North America, with occurrences in inland British Columbia, east into western Alberta, and north into Alaska and Yukon Territory.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

**States/Provinces:** AB, AK, BC, CT, IL, IN, MA, MB, ME, MI, MN, NB, NH, NJ, NS, NT, NY, OH, ON, PA, PE?, QC, RI, SK, VT, WA?, WI, WV, YT

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 211A:CP, 211E:CC, 211F:CC, 211I:CC, 211J:CC, 212Ha:CCP, 212Hb:CCP, 212Hc:CCP, 212Hd:CCP, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCP, 212Hi:CCC, 212Hj:CCP, 212Hk:CCC, 212Hl:CCC, 212Hm:CCP, 212J:CC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212Q:CP, 212Ra:CCP, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 212S:CC, 212Tb:CCC, 212Te:CCP, 212X:CC, 212Y:CC, 212Z:CC, 221A:CC, 221B:CC, 221D:CC, 221E:CC, 221Fa:CCC, 222H:CC, 222I:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222K:CC, 222M:CC, 222R:CC, 222Ua:CCP, 222Ud:CCC, 222Ue:CCC, 251B:CC, M211A:CP, M211B:CP, M211C:CC, M242D:??

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

- = Fen Wetland Class (National Wetlands Working Group 1988)
- < Peatlands (Mitsch and Gosselink 2000)

**LOWER LEVEL UNITS**

**Groups:**

- G185 Eastern North American Sub-Boreal Alkaline Fen
- G183 Midwest Prairie Alkaline Fen
- G516 Rocky Mountain Neutral-Alkaline Fen
- G361 Western North American Boreal Alkaline Fen
- G804 Eastern North American Boreal Alkaline Fen
- G805 Northeast & Midwest Prairie Alkaline Fen

**AUTHORSHIP**

**Primary Concept Source:** National Wetlands Working Group (1988)

**Author of Description:** D. Faber-Langendoen, G. Kittel, M. Reid, M. Hall, K. Boggs, T. Boucher, S.C. Gawler

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** DFL 5-14

**REFERENCES**

**References:** Crum 1992, Damman and French 1987, Davis and Anderson 2001, DeVelice et al. 1999, Faber-Langendoen et al. 2015, Gawler and Cutko 2010, Gignac et al. 1991, Glaser 1992a, Gracz et al. 2005, Harris et al. 1996, Jorgenson et al. 2001b, Klein et al. 2005, Klinger and Short 1996, Minnesota DNR 2003, Mitsch and Gosselink 2000, National Wetlands Working Group 1988, Smith et al. 2007, Viereck et al. 1992, Vitt and Chee 1990, Vitt et al. 1995, Zoltai et al. 1988

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2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

M877. North American Boreal & Sub-Boreal Alkaline Fen

**G516. Rocky Mountain Neutral-Alkaline Fen**

**Type Concept Sentence:** This group occurs infrequently throughout the Rocky Mountains from Colorado north into Canada. It is confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm.

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**OVERVIEW**

**Scientific Name:** *Kobresia myosuroides* - *Carex buxbaumii* Rocky Mountain Alkaline Fen Group

**Common Name (Translated Scientific Name):** Bellardi Bog Sedge - Buxbaum's Sedge Rocky Mountain Alkaline Fen Group

**Type Concept:** This group occurs infrequently throughout the Rocky Mountains from Colorado north into Canada. It is confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm. Fens form at low points in the landscape or on slopes where groundwater intercepts the soil surface. Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels and cold winter temperatures lead to accumulation of organic material. In addition to peat accumulation and perennially saturated soils, soil chemistry is alkaline to neutral with nutrients high in base cations. Nitrogen (N) and potassium (K) are usually still limiting plant growth in rich fens. Rich fens are strongly influenced by geology and occur where limestone, dolostone, marble or where glacially-derived materials are calcareous. Vegetation is dominated by graminoids and low shrubs and includes *Carex buxbaumii*, *Carex cusickii*, *Carex limosa*, *Carex saxatilis*, *Carex utriculata*, *Kobresia myosuroides*, and *Kobresia simpliciuscula*. Shrubs include *Betula glandulosa* and several *Salix* spp. The surrounding landscape may be ringed with other wetland systems, e.g., riparian shrublands, or a variety of upland systems from grasslands to forests.

**Classification Comments:** This group contains alkaline and neutral fens. Acidic and poor fens are classified in Rocky Mountain Acidic Fen Group (G515). Some associations occur across the pH gradient, making placement into either an acidic group or neutral-alkaline group problematic. It may prove more useful to have all fens in one group and use the alliance level to tease out poor versus rich fens.

**Internal Comments:** DFL 9-13: AK? added. GK 5-13: Additional associations reviewers suggest belong in this group (unfortunately, these associations have not necessarily been teased out as peatland associations, as many times they can occur on mineral soils): CEG001836 *Eleocharis quinqueflora* Herbaceous Vegetation; *Carex aquatilis*; *Carex aquatilis*-*Pedicularis groenlandica*; *Carex aquatilis*-*Carex utriculata*; *Carex illota*; *Carex nigricans* types; *Carex scopulorum* - *Caltha leptosepala*; *Carex simulata*; *Salix planifolia*/*Carex aquatilis*; *Salix planifolia*/*Carex scopulorum*; *Salix wolfii*/*Carex aquatilis* (can be mineral soils too, so the association would have to be spilt); *Betula glandulosa*/*Carex utriculata*; *Betula glandulosa*/ Mesic forbs - Mesic graminoids; Type with *Caltha leptosepala*; Types with *Menyanthes trifoliata*. mjr 10-12: CA added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G361 Western North American Boreal Alkaline Fen
- G285 North Pacific Neutral-Alkaline Fen: covers calcareous and other alkaline fens but with Pacific Northwest species such as *Myrica gale*.
- G284 North Pacific Bog & Acidic Fen: covers poor fens in the Pacific Northwest with species such as *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Picea sitchensis*, and *Tsuga heterophylla*.
- G515 Rocky Mountain Acidic Fen: includes wet peatlands that have deep peat and are therefore less influenced by groundwater, or occur in non-calcareous bedrock; mineral influences are much less and pH of soil water is more neutral than in the alkaline fens.

**Diagnostic Characteristics:** Saturated year-round organic soils with >40 cm peat, bathed in mineral-rich groundwater discharge and dominated by wetland indicator plants, and the ground cover is dominated by *Sphagnum* mosses.

**VEGETATION**

**Physiognomy and Structure:** Wet peatlands with heavy moss ground cover, low-statured graminoid species, short and dwarf-shrubs that often occur in a mosaic of these types all adjacent to each other.

**Floristics:** Vegetation is dominated by graminoids and low shrubs and includes *Carex buxbaumii*, *Carex cusickii*, *Carex limosa*, *Carex saxatilis*, *Carex utriculata*, *Kobresia myosuroides*, and *Kobresia simpliciuscula*. Shrubs include *Betula glandulosa* and several *Salix* spp. Rare plants found in calcareous fens include *Salix candida*, *Salix myrtilifolia*, *Salix serissima*, *Primula egaliksensis*, *Eriophorum altaicum* var. *neogaeum*, *Carex viridula*, *Carex tenuiflora*, *Carex leptalea*, *Trichophorum pumilum*, and *Sisyrinchium pallidum* (Cooper 1986b, Windell et al. 1986, Cooper and Sanderson 1997, Steen and Coupe 1997).

G516 Rocky Mountain Neutral - Alkaline Fen Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Betula glandulosa</i> / <i>Calamagrostis canadensis</i> Shrubland	GNR/SNR	CWWA000314
<i>Betula glandulosa</i> / <i>Carex lasiocarpa</i> Shrubland	G3/S1	CEGL002700
<i>Betula glandulosa</i> / <i>Carex utriculata</i> Shrubland	G4?/SNR	CEGL001079
<i>Carex aquatilis</i> var. <i>aquatilis</i> Herbaceous Fen Vegetation	GNR/SNR	CWWA000321
<i>Carex buxbaumii</i> Herbaceous Vegetation	G3/SNR	CEGL001806
<i>Carex canescens</i> Herbaceous Vegetation	GNR/SNR	CWWA000322
<i>Carex cusickii</i> Herbaceous Vegetation	G2/S2S3	CEGL000230
<i>Carex diandra</i> / <i>Hamatocaulis vernicosus</i> Herbaceous Fen Vegetation	GNR/SNR	CWWA000323
<i>Carex interior</i> - <i>Carex hystericina</i> Herbaceous Seep Vegetation	GNR/SNR	CWWA000291
<i>Carex lasiocarpa</i> Herbaceous Vegetation	G4?/S3?	CEGL001810
<i>Carex limosa</i> Herbaceous Vegetation	G2/S1	CEGL001811
<i>Carex luzulina</i> Rocky Mountain Herbaceous Vegetation	GNR/SNR	CWWA000424
<i>Carex pellita</i> - <i>Carex simulata</i> Herbaceous Vegetation	GNR/SNR	CWWA000328
<i>Carex rostrata</i> Herbaceous Vegetation	GNR/SNR	CWWA000330
<i>Carex saxatilis</i> Herbaceous Vegetation	G3/S1	CEGL001769
<i>Carex scopulorum</i> var. <i>prionophylla</i> Herbaceous Vegetation	GNR/SNR	CWWA000331
<i>Carex simulata</i> Herbaceous Vegetation	G4/SNA	CEGL001825
<i>Carex utriculata</i> Herbaceous Vegetation	G5/S5	CEGL001562

G516 Rocky Mountain Neutral - Alkaline Fen Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Deschampsia caespitosa</i> - ( <i>Symphotrichum spathulatum</i> ) Herbaceous Vegetation	GNR/SNR	CWWA000357
<i>Deschampsia caespitosa</i> - ( <i>Ligusticum grayi</i> ) Herbaceous Vegetation	GNR/SNR	CWWA000342
<i>Deschampsia caespitosa</i> - <i>Carex aquatilis</i> var. <i>aquatilis</i> Herbaceous Vegetation	GNR/SNR	CWWA000343
<i>Deschampsia caespitosa</i> Herbaceous Fen Vegetation	GNR/SNR	CWWA000346
<i>Eleocharis quinqueflora</i> Herbaceous Vegetation	G4/S3	CEGL001836
<i>Eleocharis rostellata</i> - <i>Epipactis gigantea</i> Herbaceous Seep Vegetation	GNR/SNR	CWWA000350
<i>Eleocharis rostellata</i> Herbaceous Fen Vegetation	GNR/SNR	CWWA000352
<i>Eriophorum angustifolium</i> ssp. <i>angustifolium</i> - <i>Eleocharis quinqueflora</i> / <i>Sphagnum</i> spp. Herbaceous Vegetation	GNR/SNR	CWWA000429
<i>Picea engelmannii</i> / <i>Betula glandulosa</i> / <i>Tomentypnum nitens</i> Woodland	GNR/SNR	CWWA000372
<i>Rhynchospora alba</i> / <i>Sphagnum</i> spp. Rocky Mountain Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000426
<i>Salix farriarum</i> / <i>Eleocharis quinqueflora</i> Saturated Shrubland	G2/S2	CEGL000229

### ENVIRONMENT & DYNAMICS

**Environmental Description:** It is confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm. Fens form at low points in the landscape or on slopes where groundwater intercepts the soil surface. Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels and cold winter temperatures lead to accumulation of organic material. In addition to peat accumulation and perennially saturated soils, soil chemistry is alkaline to neutral and nutrients high in base cations. Nitrogen (N) and potassium (K) are usually still limiting plant growth in rich fens. Rich fens are strongly influenced by geology and occur where limestone, dolostone, marble or where glacially-derived materials are calcareous (Cooper 1986b, Windell et al. 1986, Cooper and Sanderson 1997, Steen and Coupe 1997, Bedford and Godwin 2003).

**Dynamics:** Mountain fens act as natural filters cleaning ground and surface water. Fens also act as sponges by absorbing heavy precipitation, slowly releasing it downstream, minimizing erosion and recharging groundwater systems (Windell et al. 1986). The persistent groundwater and cold temperatures allow organic matter to accumulate (forming peat) which allows classification of wetlands within this group as fens. Fens produce peat that accumulates at the rate of 20 to 30 cm (8-11 inches) per 1000 years, making peatlands a repository of 10,000 years of post glacial history (Windell et al. 1986).

### DISTRIBUTION

**Geographic Range:** This group occurs infrequently throughout the mountains of the interior west, the Sky Islands of Arizona and high mountains and plateaus of Nevada and Utah, and the Rocky Mountains of Utah, Colorado, Wyoming, Montana, Idaho, and north into Canada.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

### SYNONYMY

### LOWER LEVEL UNITS

**Alliances:**

- A3435 *Carex limosa* - *Carex buxbaumii* - *Triglochin maritima* Alkaline Fen Herbaceous Alliance
- A3436 *Kobresia myosuroides* - *Kobresia simpliciuscula* Rich Fen Herbaceous Alliance
- A3434 *Betula nana* Alkaline Fen Shrubland Alliance

## AUTHORSHIP

**Primary Concept Source:** J. Rocchio, D. Cooper, B. Bedford, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2013/05/22

## REFERENCES

**References:** Bedford and Godwin 2003, Cooper 1986b, Cooper and Sanderson 1997, Faber-Langendoen et al. 2015, Rondeau 2001, Steen and Coupé 1997, Windell et al. 1986

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2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

## M063. North Pacific Bog & Fen

**Type Concept Sentence:** This macrogroup contains alkaline, acidic, or neutral peatlands (fens and bogs) that occur throughout southern Alaska (including the Aleutian Islands), maritime British Columbia, Washington, Oregon, and northern California. The vegetation is low-shrub or graminoid physiognomy, although stunted coastal Pacific tree species are possible, and nearly all have a moss-dominated ground layer.

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## OVERVIEW

**Scientific Name:** *Pinus contorta* var. *contorta* / *Ledum groenlandicum* / *Carex cusickii* North Pacific Bog & Fen Macrogroup

**Common Name (Translated Scientific Name):** Beach Pine / Bog Labrador-tea / Cusick's Sedge North Pacific Bog & Fen Macrogroup

**Type Concept:** This macrogroup contains acidic to alkaline peatlands (bogs and fens) with low-growing shrubs, stunted trees, or dense herbaceous structure, or a mosaic of physiognomic types; nearly all have a moss-dominated ground layer. Indicator shrub and herbaceous species include *Betula nana*, *Carex aquatilis*, *Carex cusickii*, *Carex limosa*, *Carex livida*, *Carex utriculata*, *Comarum palustre*, *Kalmia microphylla*, *Ledum* spp., *Menyanthes trifoliata*, *Myrica gale*, *Salix pulchra*, *Spiraea douglasii*, and many others. The ground layer is usually very thick with *Sphagnum* moss or "brown mosses" such as *Campylium*, *Drepanocladus*, *Scorpidium*, *Tomentypnum*, and *Warnstorfia*. Stunted tree species present may include *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Picea sitchensis*, *Thuja plicata*, and/or *Tsuga heterophylla*. This macrogroup occurs throughout southern Alaska (including the Aleutian Islands), maritime British Columbia, Washington, Oregon, and northern California. This includes lowlands such as the Puget Sound lowlands and higher montane and subalpine elevations in the coastal mountains, the Sierra Nevada, and the Klamath-Siskiyou mountains. The macrogroup is not limited to coastal/maritime areas. Elevations are mostly under 457 m (1500 feet). The macrogroup includes well-developed bogs, raised bogs, "poor" (aka acidic) and "rich" (aka alkaline), as well as neutral fens. Soils are deep (>40 cm) organic, and are usually saturated throughout the growing season. Sites include serpentine- and ultramafic-influenced peatlands in northern California. Water sources include mineral-rich groundwater (fens) to only that of precipitation (bogs).

**Classification Comments:** These peatlands are distinguished from boreal and interior continental bogs and fens by the presence of Pacific coastal species and a maritime-moderated climate. Its primary distinctiveness relative to boreal peatlands and Rocky Mountain peatlands appears to be from the distinctive tree composition of the scrub layer. Further review is needed. Its occurrence in western Nevada should be checked, as sites may be more similar to Rocky Mountain fens (J. Rocchio pers. comm. 2014). If this macrogroup is accepted as distinct from former Rocky Mountain Fen Macrogroup (M064) [subsequently split into North American Boreal & Sub-Boreal Acidic Bog & Fen Macrogroup (M876) and North American Boreal & Sub-Boreal Alkaline Fen Macrogroup (M877)], then it may need to be listed for northwestern Montana and parts of northern Idaho (L. Vance pers. comm. 2014).

Some ecologists would have liked to lump North Pacific Bog & Fen Macrogroup (M063) with former Rocky Mountain Fen Macrogroup (M064), as the species composition can be very similar. There are several reasons to keep them separate: (a) the bogs and fens of M063 have a warmer climate, with maritime influences in some areas, and therefore have higher rates of growth and decomposition, and M063 is a more dynamic macrogroup than this colder Rocky Mountain counterpart; (b) montane fens in the North Pacific may have more floristic overlap with M064, but the lowlands of M063 are floristically distinct due to maritime climate and occurrence of ombrotrophic bogs which are not found in M064; and (c) Sierra Nevada fens in California should be placed here in M064.

Within the macrogroup, there are three main types of fens by water chemistry: (1) alkaline or "rich" fens (pH >~6.5 or 7.0), generally associated with calcareous bedrock; (2) intermediate fens (pH 5.0-6.5), generally associated with granitic bedrock, which represent the majority of our fens; and (3) acidic fens (pH <~5.0). The acidic fens have sometimes been called poor fens, but that doesn't quite fit because they can have very high ionic concentrations. Our most acidic fens are associated with geologic sources of acid, either from iron pyrite (iron fens) or geothermal venting (geothermal fens). The fens that are most similar to classic "poor" fens

are best considered as the low pH end of the intermediate fen category and are most often basin fens in granite landscapes where there is little input of ions (J. Lemly pers. comm. 2014).

This is a reasonable macrogroup to be separated from boreal/sub-boreal and Vancouverian fens and bogs. However, the species of these fens can be wide-ranging, at least in the Pacific Northwest. It is true, as noted, that the coastal fens are under a milder climate--if you look at MacKenzie and Moran (2004), the Wf associations between coastal and interior areas are mostly a difference in *Carex aquatilis* var. *dives* (= *Carex sitchensis*) (Kartesz 1999) versus *Carex aquatilis*, which are combined by some. However, the acidic fens for the Pacific maritime areas include some of the British Columbia "bogs" and here there are additional species to characterize the Pacific area--and in the hypermaritime, the acidic fen-bogs are extensive, and can occur on quite steep slopes and in unusual slope positions (crests). They are unique in a global perspective and likely warrant recognition at a high level of the classification. As noted, the environmental drivers are also quite different between these extensive coastal bog-fens and fens of the interior (D. Meidinger pers. comm. 2014).

#### Similar NVC Types:

- M877 North American Boreal & Sub-Boreal Alkaline Fen: includes alkaline peatlands (circumneutral to alkaline fens) that occur in much colder climates of the north and interior, relative to members of M063, which have a more moderate maritime-influenced climate, but M877 currently includes Atlantic maritime climates.
- M876 North American Boreal & Sub-Boreal Acidic Bog & Fen: includes acidic peatlands (bogs and poor fens) that occur in much colder climates of the north and interior relative to members of M063, which have a more moderate maritime-influenced climate, but M876 currently includes Atlantic maritime climates.

**Diagnostic Characteristics:** Saturated organic soils >40 cm deep; ground layer dominated by *Sphagnum* spp., brown mosses or liverworts. Dominance by indicator species, including *Betula nana*, *Carex aquatilis*, *Carex cusickii*, *Carex limosa*, *Carex livida*, *Carex utriculata*, *Comarum palustre*, *Kalmia polifolia*, *Ledum* spp., *Menyanthes trifoliata*, *Myrica gale*, *Salix pulchra*, and *Spiraea douglasii*. The distinctive scrubby tree species present may include *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Picea sitchensis*, *Thuja plicata*, and/or *Tsuga heterophylla*.

## VEGETATION

**Physiognomy and Structure:** Vegetation is predominantly dwarf-shrubs or herbaceous (vascular or nonvascular) plants with a moss-dominated ground layer. Stunted trees may be present or a mosaic of patches of stunted trees amongst the mostly herbaceous area.

**Floristics:** Acidic fen herbaceous species include *Carex anthoxanthea*, *Carex aquatilis* var. *dives* (= *Carex sitchensis*), *Carex limosa*, *Carex pauciflora*, *Carex pluriflora*, *Comarum palustre*, *Cornus canadensis*, *Dodecatheon pulchellum*, *Drosera rotundifolia*, *Geum calthifolium*, *Nephrophyllidium crista-galli*, *Parnassia kotzebuei*, *Rubus chamaemorus*, and *Sanguisorba menziesii*. Moss species include *Sphagnum fuscum*, *Sphagnum austinii*, *Sphagnum henryense*, *Sphagnum pacificum*, *Sphagnum papillosum*, *Sphagnum rubellum*, *Sphagnum mendocinum*, and *Philonotis fontana* var. *americana*. Liverworts include species of *Nardia*, *Marsupella*, and *Scapania*. Shrub species include *Andromeda polifolia*, *Betula nana*, *Empetrum nigrum*, *Kalmia microphylla*, *Ledum groenlandicum*, *Ledum palustre* ssp. *decumbens*, *Myrica gale*, *Salix pulchra*, *Vaccinium caespitosum*, *Vaccinium oxycoccos*, and *Vaccinium uliginosum*. Stunted (<5 m) tree species, if present, include *Chamaecyparis nootkatensis* (= *Cupressus nootkatensis*), *Picea sitchensis*, *Pinus contorta* var. *contorta*, *Pinus monticola*, *Tsuga heterophylla*, or *Tsuga mertensiana*.

Neutral to alkaline fens may have brown mosses such as *Campylium*, *Drepanocladus*, *Scorpidium*, *Tomentypnum*, and *Warnstorfia*. Indicator species include *Betula nana*, *Carex aquatilis*, *Carex cusickii*, *Carex lasiocarpa*, *Carex livida*, *Carex utriculata*, *Comarum palustre*, *Menyanthes trifoliata*, *Myrica gale*, *Spiraea douglasii*. Trees may be present at the edges or on raised hummocks where soils are not anoxic and include *Tsuga heterophylla*, *Thuja plicata*, *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, and/or *Picea sitchensis*. Floristic information was summarized from the following sources: Shacklette et al. (1969), Knight et al. (1970), Thorne (1976), Sawyer et al. (1978), Slack (1979), Eyre (1980), Kruckeberg (1984), Banner et al. (1986, 1988, 1993), Keeler-Wolf (1986), Sawyer (1986), DeMeo et al. (1992), Viereck et al. (1992), Kunze (1994), Talbot and Talbot (1994), Jimerson et al. (1995), Martin et al. (1995), Shephard (1995), DeVelice et al. (1999), Boggs et al. (2003, 2008a, 2008b), Kagan et al. (2004), MacKenzie and Moran (2004), Talbot et al. (2006), and Fleming and Spencer (2007).

## ENVIRONMENT & DYNAMICS

**Environmental Description:** Soils are deep (>40 cm), organic, and are usually saturated throughout the growing season. Organic soil may overlay mineral soils and may be floating or submerged. Fens are alkaline, neutral and acidic. This macrogroup also includes bogs, deep peatlands that do not interact with groundwater. Peatland elevations are mostly under 457 m (1500 feet), and annual precipitation ranges from 890-3050 mm (35-120 inches); however, some types occur higher than 500 m (1650 feet). Within Washington, they are prominent within areas affected by continental and alpine glaciation, especially in the Puget Basin where glaciation has left kettle and glacial scours that currently support bogs and basin fens (J. Rocchio pers. comm. 2014). California fens have a more Mediterranean climate of hot summers and mild, cool winters. Some fens occur on serpentine and ultramafic soils. Fens occur in river valleys, in basins, around lakes and marshes, or on gentle to steep slopes. Environmental information was

summarized from the following sources: Shacklette et al. (1969), Knight et al. (1970), Thorne (1976), Sawyer et al. (1978), Slack (1979), Eyre (1980), Kruckeberg (1984), Banner et al. (1986, 1988, 1993), Keeler-Wolf (1986), Sawyer (1986), DeMeo et al. (1992), Viereck et al. (1992), Kunze (1994), Talbot and Talbot (1994), Jimerson et al. (1995), Martin et al. (1995), Shephard (1995), DeVelice et al. (1999), Boggs et al. (2003, 2008a, 2008b), Kagan et al. (2004), MacKenzie and Moran (2004), Cooper and Wolf (2006), Talbot et al. (2006), and Fleming and Spencer (2007).

**Dynamics:** Natural disturbance events along north coastal peatlands play an important role in slowing and reducing organic matter accumulation on specific types of sites. The main types of natural disturbance are landslides, windthrow, and fluvial activity (Banner et al. 2005). Peatlands on steep slopes experience landslides and windthrow events which tend to mix soil and slow the buildup of organic layers. On more gentle terrain, disturbance is less frequent, which allows for a deep accumulation of organic matter. Disturbance here is of small and localized scale. Large-scale disturbance such as major blowdown or severe fire are infrequent (>1000 years).

Fire, when it does occur, stimulates growth of mosses that prefer bare substrates, and starts the successional sequence of different mosses and vascular plants. Fires also increase nutrient availability and may temporarily create a carbon sink. Fire scars on stumps within herbaceous bogs and fens have been observed, pointing to a need for more study (Banner et al. 2005, J. Rocchio pers. comm. 2013). It has been documented that Native Americans burned herbaceous wetlands of the Olympic Peninsula annually to keep trees from invading wetland openings (Anderson 2009).

#### DISTRIBUTION

**Geographic Range:** This wetland type is relatively abundant in southeastern Alaska and maritime British Columbia but diminishes rapidly in size and number farther south. It includes peatlands along the Pacific Coast from the Aleutian Islands, Alaska Peninsula, Kodiak Islands, southern and southeastern coastal Alaska, coastal British Columbia south to northern California. It also includes peatlands found in the coastal mountains and montane to subalpine elevations of the Cascades and the Klamath-Siskiyou mountains.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 242A:CC, 242B:CP, 341D:PP, 342C:P?, 342H:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261B:C?, M261D:C?, M261E:CC, M332G:CC

#### Omernik Ecoregions:

#### Federal Lands [optional]:

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

- < Peatlands (Mitsch and Gosselink 2000) [Discusses only boreal peatlands, but concept is the same, on a smaller scale for Pacific coast lowlands and montane bogs and fens with floristics that are similar but also with regional differences.]
- < Peatlands (Barbour and Billings 2000) [Discusses only boreal peatlands, but concept is the same, on a smaller scale for Pacific coast lowlands and montane bogs and fens with floristics that are similar but also with regional differences.]

#### LOWER LEVEL UNITS

#### Groups:

- G285 North Pacific Neutral-Alkaline Fen
- G284 North Pacific Bog & Acidic Fen

#### AUTHORSHIP

**Primary Concept Source:** Kittel, M. Reid, K. Boggs, and T. Boucher, in Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel and D. Meidinger

**Acknowledgments:** We have incorporated significant descriptive information previously compiled by K. Boggs, T. Boucher, T. Keeler-Wolf.

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 4-11

#### REFERENCES

**References:** Anderson 2009, Banner et al. 1986, Banner et al. 1988, Banner et al. 1993, Banner et al. 2004, Banner et al. 2005, Barbour and Billings 2000, Barbour and Major 1988, Boggs et al. 2003, Boggs et al. 2008a, Boggs et al. 2008b, Boggs pers. comm., Boucher pers. comm., Cooper and Wolf 2006a, DeMeo et al. 1992, DeVelice et al. 1999, Eyre 1980, Faber-Langendoen et al. 2015,

Fleming and Spencer 2007, Holland and Keil 1995, Jimerson et al. 1995, Kagan et al. 2004a, Kartesz 1999, Keeler-Wolf 1986, Knight et al. 1970, Kruckeberg 1984, Kunze 1994, MacKenzie and Moran 2004, Martin et al. 1995, Meidinger pers. comm., Mitsch and Gosselink 2000, Rocchio pers. comm., Sawyer 1986, Sawyer and Keeler-Wolf 1995, Sawyer et al. 1978, Sawyer et al. 2009, Shacklette et al. 1969, Shephard 1995, Shiflet 1994, Slack 1979, Talbot and Talbot 1994, Talbot et al. 2006, Thorne 1976, Viereck et al. 1992, Warner and Rubec 1997

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## 2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

M063. North Pacific Bog & Fen

### G285. North Pacific Neutral-Alkaline Fen

#### Type Concept Sentence:

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#### OVERVIEW

**Scientific Name:** *Carex cusickii* - *Carex aquatilis* - *Myrica gale* North Pacific Neutral-Alkaline Fen Group

**Common Name (Translated Scientific Name):** Cusick's Sedge - Water Sedge - Sweetgale North Pacific Neutral-Alkaline Fen Group

**Type Concept:** This wetland group occurs in peatlands along the Pacific Coast from Alaska south to northern California, in and west of the coastal mountain summits but including the Puget Sound lowlands. Elevations range from under 457 m (1500 feet) to over 2100 m (7000 feet), and annual precipitation ranges from 890-3050 mm (35-120 inches). These wetlands are relatively abundant in Alaska and British Columbia but diminish rapidly in size and number farther south. They occur in river valleys, around lakes and marshes or on slopes. The organic soils can be characterized by an abundance of sodium cations from oceanic precipitation when they reside within the Hypermaritime zone. This group consists of neutral to alkaline fens (pH base-rich, neutral or alkaline); the extreme end is found often on calcareous substrates, but this is more the exception. Brown mosses such as *Campylopusium*, *Drepanocladus*, *Scorpidium*, *Tomentypnum*, and *Warnstorfia* and sedges (*Carex*) characterize rich fens (pH >5.5). Some sites may have high cover of minerotrophic non-hummock-forming *Sphagnum* species. Low shrub or graminoid physiognomy is typical. Groundwater input provides for the high mineral content, and soil saturation in general precludes tall vegetative growth. Shrubs are usually deciduous willows and birch, but evergreen dwarf-shrubs are not uncommon. Indicator species include *Carex cusickii*, *Menyanthes trifoliata*, *Carex aquatilis*, *Carex livida*, *Carex limosa*, *Carex utriculata*, *Myrica gale*, *Spiraea douglasii*, *Betula nana*, and *Comarum palustre*. Trees may be present at the edges or on raised hummocks where soils are not anoxic and include *Tsuga heterophylla*, *Thuja plicata*, *Chamaecyparis nootkatensis*, *Pinus contorta*, and/or *Picea sitchensis*.

**Classification Comments:** These herbaceous and dwarf-shrub bogs and fens are distinguished from North Pacific treed bogs and fens by having (if present) stunted trees <5 m in height. These peatlands are distinguished from boreal continental bogs and fens by the presence of Pacific coastal species, including *Gaultheria shallon*, *Spiraea douglasii*, *Carex aquatilis* var. *dives*, *Carex obnupta*, *Carex pluriflora*, *Darlingtonia californica*, *Sphagnum austinii*, *Sphagnum henryense*, *Sphagnum pacificum*, *Sphagnum papillosum*, *Sphagnum rubellum*, and *Sphagnum mendocinum*. Stunted tree species, if present, include *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Picea sitchensis*, *Tsuga heterophylla*, and *Thuja plicata*.

Pacific Northwest coastal peatlands occur across a gradient of pH depending on the amount of groundwater influence and the nutrient status (geology) of the water. The two ends of the spectrum are very acidic ("poor") fens and bogs to highly alkaline ("rich") fens. However, many wetlands occur in the mid-range of this gradient, and change overtime, such that it may prove difficult to keep "acidic" and "neutral-alkaline" separated at the group level. Indeed, many of the floristic dominants of described associations in British Columbia, Oregon and Washington occur across the pH gradient. These wetlands are not acidic and have plenty of contact with groundwater inflows.

**Internal Comments:** MSR 11-14: PROPOSED: move to M877; BUT Julie feels this needs Canadian and wider review/discussion before implementation. mjr 5-11: AK added.

**Other Comments:**

#### Similar NVC Types:

- G284 North Pacific Bog & Acidic Fen: are mostly acidic wetlands with less groundwater influence.
- G361 Western North American Boreal Alkaline Fen
- G516 Rocky Mountain Neutral-Alkaline Fen
- G515 Rocky Mountain Acidic Fen

**Diagnostic Characteristics:** Wetlands with deep organic soils (>40 cm) with strong groundwater influence that are >5.5 pH soil water.



## VEGETATION

**Physiognomy and Structure:** Brown mosses and sedges characterize alkaline and rich fens (pH >5.5). Some sites may have high cover of minerotrophic non-hummock-forming *Sphagnum* species. Low shrub or graminoid physiognomy is typical with some dwarf-shrubs.

**Floristics:** Brown mosses such as *Campylium*, *Drepanocladus*, *Scorpidium*, *Tomentypnum*, and *Warnstorfia* and sedges (*Carex*) characterize rich fens (pH >5.5). Some sites may have high cover of minerotrophic non-hummock-forming *Sphagnum* species. Low shrub or graminoid physiognomy is typical. Groundwater inputs provide for the high mineral content, and soil saturation in general precludes tall vegetative growth. Shrubs are usually deciduous willows and birch, but evergreen dwarf-shrubs are not uncommon. Indicator species include *Carex cusickii*, *Menyanthes trifoliata*, *Carex aquatilis*, *Carex utriculata*, *Myrica gale*, *Spiraea douglasii*, *Betula nana*, *Carex livida*, *Carex limosa*, and *Comarum palustre*. Trees may be present at the edges or on raised hummocks where soils are not anoxic and include *Tsuga heterophylla*, *Thuja plicata*, *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, and/or *Picea sitchensis*. Floristic information was summarized from the following sources: Shacklette et al. (1969), Eyre (1980), Banner et al. (1986, 1988, 1993), DeMeo et al. (1992), Viereck et al. (1992), Kunze (1994), Talbot and Talbot (1994), Martin et al. (1995), Shephard (1995), DeVelice et al. (1999), Boggs et al. (2003, 2008a, 2008b), MacKenzie and Moran (2004), Talbot et al. (2006), and Fleming and Spencer (2007).

G285 North Pacific Neutral - Alkaline Fen Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Betula glandulosa</i> / <i>Carex aquatilis</i> var. <i>dives</i> Shrubland	GNR/S1	CWWA000209
<i>Carex</i> ( <i>aquatilis</i> var. <i>dives</i> , <i>nigricans</i> , <i>utriculata</i> ) - <i>Caltha leptosepala</i> ssp. <i>howellii</i> Herbaceous Vegetation [Provisional]	G2G3Q/S1S2	CWWA000169
<i>Carex aquatilis</i> var. <i>dives</i> - ( <i>Eleocharis quinqueflora</i> ) Herbaceous Vegetation	GNR/S3	CWWA000211
<i>Carex aquatilis</i> var. <i>dives</i> - <i>Carex utriculata</i> Herbaceous Vegetation	G3G4/S2	CWWA000057
<i>Carex aquatilis</i> var. <i>dives</i> Herbaceous Vegetation	G4/S3S4	CEGL001826
<i>Carex cusickii</i> - ( <i>Menyanthes trifoliata</i> ) Herbaceous Vegetation	G2G3/S2	CEGL003332
<i>Carex interior</i> - <i>Hypericum anagalloides</i> Herbaceous Vegetation	G2?Q/S2?	CEGL001857
<i>Carex obnupta</i> - ( <i>Carex cusickii</i> ) Herbaceous Vegetation	GNR/SNR	CWWA000251
<i>Carex scopulorum</i> - <i>Eleocharis quinqueflora</i> Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000263
<i>Carex utriculata</i> Pacific Coast Herbaceous Vegetation	GNR/SNR	CWWA000428
<i>Dulichium arundinaceum</i> Rich Fen Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000266
<i>Equisetum arvense</i> Fen Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000267
<i>Eriophorum chamissonis</i> - <i>Carex interior</i> Herbaceous Vegetation	GNR/S1	CWWA000246
<i>Juncus balticus</i> - <i>Festuca rubra</i> - <i>Carex cusickii</i> Herbaceous Vegetation [Provisional]	GNR/S1	CWWA000220
<i>Ledum groenlandicum</i> / <i>Carex</i> ( <i>cusickii</i> , <i>interior</i> , <i>utriculata</i> ) - <i>Festuca rubra</i> Shrubland [Provisional]	GNR/S1	CWWA000227
<i>Ledum groenlandicum</i> / <i>Carex cusickii</i> Shrubland [Provisional]	GNR/S1Q	CWWA000228
<i>Spiraea douglasii</i> / <i>Carex obnupta</i> Shrubland [Provisional]	GNR/S1Q	CWWA000239
<i>Trichophorum caespitosum</i> - ( <i>Hypericum anagalloides</i> ) Herbaceous Vegetation	GNR/SNR	CEGL002679
<i>Vaccinium uliginosum</i> / <i>Dodecatheon jeffreyi</i> - <i>Caltha leptosepala</i> ssp. <i>howellii</i> Dwarf-shrubland	G3/SU	CWWA000244

## ENVIRONMENT & DYNAMICS

**Environmental Description:** Elevations are mostly under 457 m (1500 feet) but range up into the subalpine to 2100 m (7000 feet)), and annual precipitation ranges from 890-3050 mm (35-120 inches). These wetlands are relatively abundant in Alaska and British Columbia but diminish rapidly in size and number farther south. They occur in river valleys, around lakes and marshes, or on slopes. In Hypermaritime settings, the organic soils are characterized by an abundance of sodium cations from oceanic precipitation. This group consists of mostly circumneutral (ranging from slightly acidic to basic) fens. Some are found often on calcareous substrates, which represent the extreme alkaline range within the group. Environmental information was summarized from the following sources: Shacklette et al. (1969), Eyre (1980), Banner et al. (1986, 1988, 1993), DeMeo et al. (1992), Viereck et al. (1992), Kunze

(1994), Talbot and Talbot (1994), Martin et al. (1995), Shephard (1995), DeVelice et al. (1999), Boggs et al. (2003, 2008a, 2008b), MacKenzie and Moran (2004), Talbot et al. (2006), and Fleming and Spencer (2007).

**Dynamics:** Much literature documents the formation and succession of peatlands in Boreal, Temperate and Pacific Coastal settings (Banner et al. 1988, 2005, Mitsch and Gosselink 2000, and many others). These processes tend to take several hundreds to thousands of years, are well-documented and will not be repeated here. The purpose of this section is to discuss dynamics from disturbance. Natural disturbance events along north coast peatlands play an important role in slowing and reducing organic matter accumulation on specific types of sites. The main types of natural disturbance on the north Pacific coast are landslides, windthrow, and fluvial activity (Banner et al. 2005). Peatlands on steep slopes experience landslides and windthrow events which tend to mix soil and slow the buildup of organic layers. On more gentle terrain, disturbance is less frequent which allows for a deep accumulation of organic matter. Disturbance here is of small and localized scale. Large-scale disturbance such as major blowdown or severe fire are infrequent (>1000 years).

Fire, when it does occur, stimulates growth of mosses that prefer bare substrates, and "re-starts" a successional sequence of different mosses and vascular plants. Fires also increase nutrient availability and may temporarily create a carbon sink. Fire scars on stumps within herbaceous bogs and fens have been observed, pointing to a need for more study (Banner et al. 2005, J. Rocchio pers. comm. 2013). It has been documented that Native Americans burned herbaceous wetlands of the Olympic Peninsula annually to keep trees from invading wetland openings (Anderson 2009). Logging has also been shown to increase *Sphagnum* growth, through increased sunlight availability (Banner et al. 2005).

Landslides, fire and changes to water table depth and water source will alter the amount, composition and competition of peatland moss and higher vascular plant species. Fire can remove surface vegetation in dry seasons and stimulate the growth of *Sphagnum* spp. such that hummocks develop where once a depression occurred (Banner et al. 1988), shifting the small-scale local mosaic of swale and hummock within a peatland occurrences. Lowering the water table can allow trees such as *Pinus contorta*, *Tsuga heterophylla*, and *Betula papyrifera* to expand into peatland areas. Disturbance may bring the influx of mineral-rich waters from surrounding uplands (particularly along drainage channels), and flora characteristic of bogs is replaced by fen plants such as *Spiraea* spp., *Salix* spp., *Pyrus* spp., *Juncus* spp. and *Carex* spp. (Banner et al. 1988). Succession of mined peatlands depends on the degree of humification of the remaining substrate and hydrology. On unhumified peat moss *Sphagnum* spp., *Drosera rotundifolia*, *Rubus chamaemorus*, and *Ledum groenlandicum* can regenerate and new *Sphagnum* peat can accumulate in pits and pools after mining (Banner et al 1988).

In addition to disturbance, there are natural cycles and interplay between the advancement and retreat of peat levels (the buildup of peat that alters depth of rooting zone relative to groundwater, or decrease in in peat depth from an increase decomposition due to drought) and encroachment peat into surrounding uplands (paludification) or the reverse, surrounding upland species that may shade out moss species. Generally the greatest (annually measureable) change occurs on the edges of fens and bogs and at the tops of hummocks. These small-scale dynamics depend on the type of wetland and specific local site characteristics that cannot be generalized in a group description.

Monitoring peat wetlands is an important source of information as to whether observed changes are due to natural climatic or successional cycles or direct changes of water sources by human hands, or other indirect effects of human activity that may cause sedimentation, draining, flooding, or other changes to peatlands.

#### DISTRIBUTION

**Geographic Range:** This group is found along the Pacific Coast from central coast and southeastern Alaska, British Columbia, Washington, Oregon to northern California, in and west of the coastal mountain summits but including the Puget Sound lowlands.

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- >< II.C.2.e - Ericaceous shrub bog (Viereck et al. 1992)
- >< III.A.3.j - Subarctic lowland sedge bog meadow (Viereck et al. 1992)
- >< III.A.3.k - Subarctic lowland sedge-moss bog meadow (Viereck et al. 1992)
- >< III.C.1.a - Wet bryophyte (Viereck et al. 1992)
- >< Lodgepole Pine: 218 (Eyre 1980)
- >< Non-forested bog (Banner et al. 1993)
- >< Sitka Spruce: 223 (Eyre 1980)

## LOWER LEVEL UNITS

### Alliances:

- A3599 *Carex lasiocarpa* - *Kobresia myosuroides* - *Carex scirpoidea* Neutral-Highly Alkaline Herbaceous Fen Alliance
- A3432 *Myrica gale* - *Spiraea douglasii* Fen Shrubland Alliance
- A3433 *Carex aquatilis* - *Carex livida* - *Carex cusickii* Fen Herbaceous Alliance

### AUTHORSHIP

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:** D. Meidinger, J. Rocchio

**Version Date:** 2013/06/06

### REFERENCES

**References:** Banner et al. 1986, Banner et al. 1988, Banner et al. 1993, Banner et al. 2005, Boggs et al. 2003, Boggs et al. 2008a, Boggs et al. 2008b, DeMeo et al. 1992, DeVelice et al. 1999, Eyre 1980, Faber-Langendoen et al. 2015, Fleming and Spencer 2007, Kunze 1994, MacKenzie and Moran 2004, Martin et al. 1995, Mitsch and Gosselink 2000, Rocchio pers. comm., Shacklette et al. 1969, Shephard 1995, Talbot and Talbot 1994, Talbot et al. 2006, Viereck et al. 1992

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2. Shrub & Herb Vegetation

2.C.2.Na. North American Bog & Fen

M063. North Pacific Bog & Fen

## G284. North Pacific Bog & Acidic Fen

**Type Concept Sentence:**

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### OVERVIEW

**Scientific Name:** North Pacific Bog & Acidic Fen Group

**Common Name (Translated Scientific Name):** North Pacific Bog & Acidic Fen Group

**Type Concept:** This wetland group consists of acidic (pH <5.5) peatlands along the Pacific Coast from the Aleutian Islands, Alaska Peninsula, Kodiak Islands, southern and southeastern coastal Alaska, coastal British Columbia south to northern California, in and west of the coastal mountain summits but including the Puget Sound lowlands. Elevations are mostly under 457 m (1500 feet), and annual precipitation ranges from 890-3050 mm (35-120 inches); however, some types occur higher than 500 m (1650 feet). These wetlands are relatively abundant in Alaska and British Columbia but diminish rapidly in size and number farther south. They occur in river valleys, in basins, around lakes and marshes, or on gentle to steep slopes. The group includes well-developed bogs, raised bogs and poor fens. Soils are deep (>40 cm), organic, acidic (pH <5.5) and are usually saturated throughout the growing season. Mosses such as *Sphagnum* spp. or liverworts characterize the ground cover. Vegetation can be stunted conifer trees, dwarf-shrubs or herbaceous (vascular or nonvascular) plants or a mosaic; nearly all have a moss-dominated ground layer. Peatlands are often interspersed with small lakes and ponds and can be a mosaic with non-peat wetlands such as wet meadows. Shrubs include *Andromeda polifolia*, *Betula nana*, *Empetrum nigrum*, *Kalmia polifolia*, *Ledum* spp., *Myrica gale*, *Salix pulchra*, and *Vaccinium* spp. Herbaceous species include *Carex anthoxanthea*, *Carex aquatilis* var. *dives*, *Carex livida*, *Carex pauciflora*, *Carex pluriflora*, *Comarum palustre*, *Drosera rotundifolia*, *Equisetum fluviatile*, *Eriophorum angustifolium*, *Geum calthifolium*, *Nephrophyllidium crista-galli*, *Parnassia kotzebuei*, *Rubus chamaemorus*, *Sanguisorba menziesii*, and *Trichophorum caespitosum*. Mosses include *Sphagnum fuscum*, *Sphagnum* spp., and *Philonotis fontana* var. *americana*. Liverworts include *Nardia* spp., *Marsupella* spp., *Scapania* spp., and *Siphula* spp. Tree species include stunted *Chamaecyparis nootkatensis* (= *Cupressus nootkatensis*), *Picea sitchensis*, *Pinus contorta* var. *contorta*, or *Tsuga mertensiana*.

**Classification Comments:** Pacific Northwest coastal peatlands occur across a gradient of pH depending on the amount of groundwater influence and the nutrient status (geology) of the water. The two ends of the spectrum are very acidic ("poor") fens and bogs to highly alkaline ("rich") fens. However, many wetlands occur in the mid-range of this gradient, and change overtime, such that it may prove difficult to keep "acidic" and "neutral-alkaline" separated at the group level. Indeed, many of the floristic dominants of described associations in British Columbia, Oregon and Washington occur across the pH gradient. These herbaceous and dwarf-shrub bogs and fens are distinguished from North Pacific treed bogs and fens by having (if present) stunted trees <5 m in height. These peatlands are distinguished from boreal continental bogs and fens by the presence of Pacific coastal species, including *Gaultheria shallon*, *Spiraea douglasii*, *Carex aquatilis* var. *dives*, *Carex obnupta*, *Carex pluriflora*, *Darlingtonia californica*, *Sphagnum austinii*, *Sphagnum henryense*, *Sphagnum pacificum*, *Sphagnum papillosum*, *Sphagnum rubellum*, and *Sphagnum mendocinum*, and stunted tree species, including *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Picea sitchensis*, *Tsuga heterophylla*, *Ledum glandulosum*, and *Thuja plicata*.

**Internal Comments:** MSR 11-14: PROPOSED: move to M876, but Julie feels this needs Canadian and wider review/discussion before implementation. mjr 5-11: AK added.

**Other Comments:**

**Similar NVC Types:**

- G516 Rocky Mountain Neutral-Alkaline Fen
- G515 Rocky Mountain Acidic Fen: includes fens (organic soils >40 cm deep) with middle and southern Rocky Mountain species, not Pacific Northwest species, such as *Picea sitchensis*, *Pinus contorta* var. *contorta*, or *Tsuga mertensiana*.
- G285 North Pacific Neutral-Alkaline Fen: includes fens (organic soils >40 cm deep) with strong groundwater influence, bathed in minerotrophic water and pH >5.5.

**Diagnostic Characteristics:** Saturated organic soils >40 cm deep, *Sphagnum* spp. dominate ground layer. These peatlands are distinguished from boreal continental bogs and fens by the presence of Pacific coastal species, including *Ledum glandulosum*, *Gaultheria shallon*, *Spiraea douglasii*, *Carex aquatilis* var. *dives*, *Carex obnupta*, *Carex pluriflora*, *Darlingtonia californica*, *Sphagnum austinii*, *Sphagnum henryense*, *Sphagnum pacificum*, *Sphagnum papillosum*, *Sphagnum rubellum*, and *Sphagnum mendocinum*. Tree species if present are <5 m in height and include Pacific coastal species such as *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Picea sitchensis*, *Thuja plicata*, and *Tsuga heterophylla*.

**VEGETATION**

**Physiognomy and Structure:** Vegetation is predominantly dwarf-shrubs or herbaceous (vascular or nonvascular) plants with a moss-dominated ground layer. Stunted trees may be present or a mosaic of patches of stunted trees amongst the mostly herbaceous area.

**Floristics:** Herbaceous species include *Carex anthoxanthea*, *Carex aquatilis* var. *dives* (= *Carex sitchensis*), *Carex pauciflora*, *Carex pluriflora*, *Comarum palustre*, *Cornus canadensis*, *Dodecatheon pulchellum*, *Drosera rotundifolia*, *Equisetum fluviatile*, and *Eriophorum angustifolium*, *Geum calthifolium*, *Nephrophyllidium crista-galli*, *Parnassia kotzebuei*, *Rubus chamaemorus*, and *Sanguisorba menziesii*. Moss species include *Sphagnum fuscum*, *Sphagnum austinii*, *Sphagnum henryense*, *Sphagnum pacificum*, *Sphagnum papillosum*, *Sphagnum rubellum*, *Sphagnum mendocinum*, and *Philonotis fontana* var. *americana*. Liverworts include species of *Nardia*, *Marsupella*, *Scapania*, and *Siphula*. Shrub species include *Andromeda polifolia*, *Betula nana*, *Empetrum nigrum*, *Kalmia polifolia*, *Ledum groenlandicum*, *Ledum palustre* ssp. *decumbens*, *Myrica gale*, *Salix pulchra*, *Vaccinium caespitosum*, *Vaccinium oxycoccos*, and *Vaccinium uliginosum*. Stunted (<5 m) tree species, if present, include *Chamaecyparis nootkatensis* (= *Cupressus nootkatensis*), *Picea sitchensis*, *Pinus contorta* var. *contorta*, *Pinus monticola*, *Tsuga heterophylla*, or *Tsuga mertensiana*. Along the coast, *Pinus contorta* does not occur north of Juneau in southeastern Alaska; however, further inland it does occur much farther north in the Yukon Territory, where its presence in bogs and fens are part of Western North American Boreal Acidic Bog & Fen Group (G360). Floristic information summarized from the following sources: Shacklette et al. (1969), Eyre (1980), Banner et al. (1986, 1988, 1993), DeMeo et al. (1992), Viereck et al. (1992), Kunze (1994), Talbot and Talbot (1994), Martin et al. (1995), Shephard (1995), DeVelice et al. (1999), Boggs et al. (2003, 2008a, 2008b), MacKenzie and Moran (2004), Talbot et al. (2006), and Fleming and Spencer (2007).

G284 North Pacific Bog & Acidic Fen Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Carex (livida, utriculata) / Sphagnum</i> spp. Herbaceous Vegetation	G1G2/S1	CEGL003423
<i>Carex cusickii</i> - ( <i>Carex aquatilis</i> var. <i>dives</i> ) / <i>Sphagnum</i> spp. Herbaceous Vegetation	G2/S1	CWWA000061
<i>Carex echinata</i> ssp. <i>echinata</i> Herbaceous Vegetation [Provisional]	GNR/S1Q	CWWA000213
<i>Carex exsiccata</i> Poor Fen Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000259
<i>Carex lasiocarpa</i> / ( <i>Sphagnum</i> spp.) Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000261
<i>Carex luzulina</i> Pacific Coast Herbaceous Vegetation	G3/S1	CWWA000012
<i>Carex utriculata</i> - <i>Carex aquatilis</i> var. <i>dives</i> - <i>Sanguisorba officinalis</i> / <i>Sphagnum</i> spp. Herbaceous Vegetation	G3?/S2	CEGL003422
<i>Dulichium arundinaceum</i> Poor Fen Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000265
<i>Eriophorum angustifolium</i> ssp. <i>angustifolium</i> / <i>Sphagnum</i> spp. Herbaceous Vegetation	G4?/S2	CWWA000016
<i>Eriophorum chamissonis</i> / <i>Sphagnum</i> spp. Herbaceous Vegetation	G4/S1	CEGL003333
<i>Juncus balticus</i> - <i>Comarum palustre</i> / <i>Sphagnum</i> spp. Herbaceous Vegetation [Provisional]	GNR/S1Q	CWWA000247
<i>Juncus supiniformis</i> - ( <i>Carex livida</i> , <i>Rhynchospora alba</i> ) Herbaceous Vegetation	GNR/S1	CWWA000201

G284 North Pacific Bog & Acidic Fen Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Kalmia microphylla</i> - <i>Ledum groenlandicum</i> - <i>Gaultheria shallon</i> - <i>Pteridium aquilinum</i> / <i>Sphagnum</i> spp. Shrubland	GNR/S1Q	CWWA000221
<i>Kalmia microphylla</i> - <i>Ledum groenlandicum</i> / <i>Carex utriculata</i> / <i>Sphagnum</i> spp. Shrubland	GNR/S1Q	CWWA000222
<i>Kalmia microphylla</i> - <i>Ledum groenlandicum</i> / <i>Xerophyllum tenax</i> Shrubland	G1/S1	CEGL003359
<i>Kalmia microphylla</i> - <i>Vaccinium oxycoccos</i> / <i>Carex (livida, obnupta)</i> / <i>Sphagnum</i> spp. Dwarf-shrubland	GNR/S1Q	CWWA000223
<i>Kalmia microphylla</i> - <i>Vaccinium oxycoccos</i> / <i>Empetrum nigrum</i> / <i>Sphagnum</i> spp. Dwarf-shrubland	GNR/S1	CWWA000256
<i>Kalmia microphylla</i> - <i>Vaccinium oxycoccos</i> / <i>Sphagnum</i> spp. Dwarf-shrubland	GNR/S2	CWWA000224
<i>Kalmia microphylla</i> / <i>Carex</i> spp. - <i>Caltha leptosepala</i> ssp. <i>howellii</i> / <i>Sphagnum</i> spp. Dwarf-shrubland	GNR/S2	CWWA000225
<i>Ledum groenlandicum</i> - <i>Gaultheria shallon</i> / <i>Sphagnum</i> spp. Shrubland	GNR/SNR	CWWA000226
<i>Ledum groenlandicum</i> - <i>Kalmia microphylla</i> / <i>Sphagnum</i> spp. Shrubland	G4/S2	CEGL003414
<i>Ledum groenlandicum</i> - <i>Myrica gale</i> / <i>Sphagnum</i> spp. Shrubland	G2/S1	CEGL003335
<i>Ledum groenlandicum</i> / <i>Carex utriculata</i> / <i>Sphagnum</i> spp. Shrubland	GNR/S2	CWWA000229
<i>Ledum groenlandicum</i> / <i>Typha latifolia</i> / <i>Sphagnum</i> spp. Shrubland [Provisional]	GNR/S1Q	CWWA000231
<i>Myrica gale</i> - <i>Spiraea douglasii</i> / <i>Sphagnum</i> spp. Shrubland	G2?/S1	CEGL003420
<i>Myrica gale</i> / <i>Carex (aquatilis</i> var. <i>dives, utriculata)</i> Shrubland	G3/S2	CEGL003376
<i>Myrica gale</i> / <i>Sanguisorba officinalis</i> / <i>Sphagnum</i> spp. Shrubland	G1?/S1?	CEGL003419
<i>Rhynchospora alba</i> - ( <i>Vaccinium oxycoccos</i> ) / <i>Sphagnum</i> spp. Herbaceous Vegetation	G3/S2	CEGL003338
<i>Spiraea douglasii</i> / <i>Carex aquatilis</i> var. <i>dives</i> Shrubland	G4/S2	CEGL003415
<i>Spiraea douglasii</i> / <i>Sphagnum</i> spp. Shrubland	G3/S1	CEGL003416
<i>Vaccinium uliginosum</i> / ( <i>Carex aquatilis</i> var. <i>dives</i> ) Dwarf-shrubland	G4/S2	CEGL001249

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** Peatland elevations are mostly under 457 m (1500 feet), and annual precipitation ranges from 890-3050 mm (35-120 inches); however, some types occur higher than 500 m (1650 feet). They occur in river valleys, in basins, around lakes and marshes, or on gentle to steep slopes. The group includes well-developed bogs, raised bogs and poor (acidic, pH <5.5) fens, even on reasonable slopes in hypermaritime environments. High-elevation peatlands can occur on sloping terrain and may develop on fairly steep sideslopes in areas with very high rainfall and low permeability. Hypermaritime site organic soils are characterized by an abundance of sodium cations from oceanic spray. Soils are deep (>40 cm), organic, acidic (pH <5.5) and are usually saturated throughout the growing season. Organic soil may overlay mineral soils and may be floating or submerged. Alkaline and acidic fens can be intermixed with bogs. Environmental information was summarized from the following sources: Shacklette et al. (1969), Eyre (1980), Banner et al. (1986, 1988, 1993), DeMeo et al. (1992), Viereck et al. (1992), Kunze (1994), Talbot and Talbot (1994), Martin et al. (1995), Shephard (1995), DeVelice et al. (1999), Boggs et al. (2003, 2008a, 2008b), MacKenzie and Moran (2004), Talbot et al. (2006), and Fleming and Spencer (2007).

**Dynamics:** Much literature documents the formation and succession of peatlands in Boreal, Temperate and Pacific Coastal settings (Banner et al. 1988, 2005, Mitsch and Gosselink 2000, and many others). These processes tend to take several hundreds to thousands of years, are well-documented and will not be repeated here. The purpose of this section is to discuss dynamics from disturbance. Natural disturbance events along north coast peatlands play an important role in slowing and reducing organic matter accumulation on specific types of sites. The main types of natural disturbance on the north Pacific coast are landslides, windthrow, and fluvial activity (Banner et al. 2005). Peatlands on steep slopes experience landslides and windthrow events which tend to mix soil and slow the buildup of organic layers. On more gentle terrain, disturbance is less frequent, which allows for a deep accumulation of organic matter. Disturbance here is of small and localized scale. Large-scale disturbance such as major blowdown or severe fire are infrequent (>1000 years).

Fire, when it does occur, stimulates growth of mosses that prefer bare substrates, and "re-starts" a successional sequence of different mosses and vascular plants. Fires also increase nutrient availability and may temporarily create a carbon sink. Fire scars on stumps within herbaceous bogs and fens have been observed, pointing to a need for more study (Banner et al. 2005, J. Rocchio pers.

comm. 2013). It has been documented that Native Americans burned herbaceous wetlands of the Olympic Peninsula annually to keep trees from invading wetland openings (Anderson 2009). Logging has also been shown to increase *Sphagnum* growth, through increased sunlight availability (Banner et al. 2005).

Landslides, fire and changes to water table depth and water source will alter the amount, composition and competition of peatland moss and higher vascular plant species. Fire can remove surface vegetation in dry seasons and stimulate the growth of *Sphagnum* spp. such that hummocks develop where once a depression occurred (Banner et al. 1988), shifting the small-scale local mosaic of swale and hummock within peatland occurrences. Lowering the water table can allow trees such as *Pinus contorta*, *Tsuga heterophylla* and *Betula papyrifera* to expand into peatland areas. Disturbance may bring the influx of mineral-rich waters from surrounding uplands (particularly along drainage channels), and flora characteristic of bogs is replaced by fen plants such as *Spiraea* spp., *Salix* spp., *Pyrus* spp., *Juncus* spp. and *Carex* spp. (Banner et al. 1988). Succession of mined peatlands depends on the degree of humification of the remaining substrate and hydrology. On unhumified peatmoss *Sphagnum* spp., *Drosera rotundifolia*, *Rubus chamaemorus*, and *Ledum groenlandicum* can regenerate and new *Sphagnum* peat can accumulate in pits and pools after mining (Banner et al 1988).

In addition to disturbance, there are natural cycles and interplay between the advancement and retreat of peat levels (the buildup of peat that alters depth of rooting zone relative to groundwater, or decrease in peat depth from an increase decomposition due to drought) and encroachment peat into surrounding uplands (paludification) or the reverse, surrounding upland species that may shade out moss species. Generally the greatest (annually measurable) change generally occurs on the edges of fens and bogs and at the tops of hummocks. These small-scale dynamics depend on the type of wetland and specific local site characteristics that cannot be generalized in a group description. Some examples are given here. In Alaska, species that dominate the early stages of succession in newly formed ponded basins include *Equisetum variegatum*, *Equisetum fluviatile*, and *Comarum palustre*, while *Sphagnum* species invade the surface and help in forming peat. Acidic and nutrient-poor-tolerant vascular species eventually dominate such sites, such as *Myrica gale*, *Empetrum nigrum*, *Vaccinium uliginosum*, *Andromeda polifolia*, and *Vaccinium oxycoccos* (= *Oxycoccos microcarpus*). The late-successional stage of a peatland supports various community types, depending on the pH, waterflow, and nutrient status of a site, such as *Myrica gale* / *Empetrum nigrum* and *Picea sitchensis* / *Sphagnum* plant associations. Peat buildup, patterned ground, and changes in water table are recurrent aspects of peatland development rather than unidirectional successional events. For this reason it is unlikely that any of the late-seral peatland communities are stable in the sense of climax vegetation (K. Boggs and T. Boucher pers. comm. 2008). In Washington, some fens can be indefinitely maintained by groundwater discharge; sometimes succession from rich fen to poor fen/bog may occur in these situations but often is dependent on water chemistry and level of discharge and fire (J. Rocchio pers. comm. 2012).

Monitoring peat wetlands is an important source of information as to whether observed changes are due to natural climatic or successional cycles or direct changes of water sources by human hands, or other indirect effects of human activity that may cause sedimentation, draining, flooding, or other changes to peatlands.

#### DISTRIBUTION

**Geographic Range:** These wetlands are relatively abundant in Alaska and British Columbia but diminish rapidly in size and number farther south. This group includes acidic peatlands along the Pacific Coast from the Aleutian Islands, Alaska Peninsula, Kodiak Islands, southern and southeastern coastal Alaska, and coastal British Columbia south to northern California, in and west of the coastal mountain summits but including the Puget Sound lowlands.

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:C, 69:C, 70:C, 72:C, 73:C, 81:C

**USFS Ecoregions (2007):** 242A:CC, 242B:CP, 342C:P?, 342H:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M332G:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

- < I.A.3.a - Lodgepole pine (Viereck et al. 1992)
- >> II.A.2.b - Mountain hemlock (open) scrub (Viereck et al. 1992)
- >> II.C.2.e - Ericaceous shrub bog (Viereck et al. 1992)
- >> III.A.3.j - Subarctic lowland sedge bog meadow (Viereck et al. 1992)
- >> III.A.3.k - Subarctic lowland sedge-moss bog meadow (Viereck et al. 1992)
- >> III.C.1.a - Wet bryophyte (Viereck et al. 1992)
- >> Non-forested bog (Banner et al. 1993)
- >> Sitka Spruce: 223 (Eyre 1980)

**LOWER LEVEL UNITS****Alliances:**

- A3600 California Acidic Fen Shrubland Alliance
- A3598 California Acidic Herbaceous Fen Alliance
- A2514 *Ledum glandulosum* - *Ledum groenlandicum* Shrub Acidic Fen Alliance
- A3584 *Carex aquatilis* - *Sphagnum* spp. - *Rhynchospora* spp. Herbaceous Fen Alliance
- A3585 *Myrica gale* - *Spiraea douglasii* - *Vaccinium caespitosum* Fen Dwarf-shrubland Alliance

**AUTHORSHIP**

**Primary Concept Source:** Kittel, M. Reid, K. Boggs, and T. Boucher, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel, K. Boggs, T. Boucher, M. Reid

**Acknowledgments:** D. Meidinger, J. Rocchio

**Version Date:** 2013/06/06

**REFERENCES**

**References:** Anderson 2009, Banner et al. 1986, Banner et al. 1988, Banner et al. 1993, Banner et al. 2005, Boggs et al. 2003, Boggs et al. 2008a, Boggs et al. 2008b, Boggs pers. comm., Boucher pers. comm., DeMeo et al. 1992, DeVelice et al. 1999, Eyre 1980, Faber-Langendoen et al. 2015, Fleming and Spencer 2007, Kunze 1994, MacKenzie and Moran 2004, Martin et al. 1995, Mitsch and Gosselink 2000, Rocchio pers. comm., Shacklette et al. 1969, Shephard 1995, Talbot and Talbot 1994, Talbot et al. 2006, Viereck et al. 1992

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

Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland includes wet riparian and swamp shrublands, wet meadows, wet prairies, and shallow and deep emergent marshes. The vegetation comprises seasonal green emergent, hydrophytic shrubs and herbs with at least 10% cover, on mucky, inundated or saturated soils across the mid-latitudes of the Northern and Southern hemispheres from 23° to 70°.

**2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh**

Shrublands and herbaceous wet meadows, 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 boreal and temperate latitudes of western North America.

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2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

**M888. Arid West Interior Freshwater Emergent Marsh**

**Type Concept Sentence:**

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**OVERVIEW**

**Scientific Name:** Arid West Interior Freshwater Emergent Marsh Macrogroup

**Common Name (Translated Scientific Name):** Arid West Interior Freshwater Emergent Marsh Macrogroup

**Type Concept:**

**Classification Comments:**

**Similar NVC Types:**

**Diagnostic Characteristics:**

**VEGETATION**

**Physiognomy and Structure:**

**Floristics:**

## ENVIRONMENT &amp; DYNAMICS

**Environmental Description:****Dynamics:**

## DISTRIBUTION

**Geographic Range:****Spatial Scale & Pattern [optional]:****Nations:** CA, MX, US**States/Provinces:****TNC Ecoregions [optional]:****USFS Ecoregions (2007):****Omernik Ecoregions:****Federal Lands [optional]:**

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Unassigned.

## SYNONYMY

## LOWER LEVEL UNITS

**Groups:**

- G531 Arid West Interior Freshwater Emergent Marsh

## AUTHORSHIP

**Primary Concept Source:****Author of Description:****Acknowledgments:****Version Date:****Classif Resp Region:** West**Internal Author:** MSR 11-14

## REFERENCES

**References:** Faber-Langendoen et al. 2015

2. Shrub &amp; Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow &amp; Marsh

M888. Arid West Interior Freshwater Emergent Marsh

**G531. Arid West Interior Freshwater Emergent Marsh****Type Concept Sentence:**

## OVERVIEW

**Scientific Name:** *Schoenoplectus* spp. - *Typha* spp. Interior Emergent Marsh Vegetation Group**Common Name (Translated Scientific Name):** Clubrush species - Cattail species Interior Emergent Marsh Vegetation Group

**Type Concept:** Freshwater to brackish marshes are found at all elevations below timberline throughout the western interior basins and mountains of western North America. This group includes shallow freshwater to brackish waterbodies found in bottomlands along drainages, in river floodplain depressions, cienegas, oxbow lakes, below seeps, frequently flooded gravel bars, low-lying sidebars, in-fill side channels, small ponds, stockponds, ditches and slow-moving streams, perennial streams in valleys and mountain foothills, as well as in small depressions gouged into basalt by Pleistocene floods, channeled scablands of the Columbia Plateau and within dune fields in the intermountain western U.S. These wetlands are mostly small-patch, confined to limited areas in suitable floodplain or basin topography. They are mostly semipermanently flooded, but some marshes have seasonal hydrologic flooding. Water is on or above the surface for most of the growing season. A consistent source of freshwater is essential to the function of these communities. Soils are muck or mineral or muck over a mineral soil, and water is high-nutrient. It is often found along the borders of ponds, lakes or reservoirs that have more open water. Some occurrences are interdunal wetlands in wind deflation areas, where sands are scoured down to the water table. The water table may be perched over an impermeable layer of caliche or clay or, in the case of the Great Sand Dunes of Colorado, a geologic dike that creates a closed basin that traps water. Vegetation is characterized by a lush, dense herbaceous layer with low diversity occurring sometimes as a monoculture. Structure varies from emergent forbs which barely reach the water surface to tall graminoids that reach as tall as 4 m high. Dominant species include *Schoenoplectus pungens*, *Schoenoplectus americanus*, *Typha latifolia*, *Typha domingensis*, *Eleocharis palustris*, *Juncus balticus*,



*Paspalum distichum*, *Carex praegracilis*, *Carex pellita* (= *Carex lanuginosa*), and species of *Cyperus*, *Bidens*, *Cicuta*, *Mimulus*, and *Phalaris*.

**Classification Comments:** This group does not include oceanic saline-influenced tidal areas (coastal saline marshes and brackish marshes) which belong to Temperate Pacific Tidal Salt & Brackish Marsh Group (G499). Marshes in saline waters located at the edge of the Great Salt Lake are included in North American Desert Alkaline-Saline Herbaceous Wetland & Playa Group (G538).

**Internal Comments:** GK 9-13: AK, BC, ID, NV, OR, UT, WA, WY added. DFL 12-5-12: Canada & Mexico added based on member assocs. mjr 10-12: CA added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G521 Vancouverian & Rocky Mountain Montane Wet Meadow & Marsh
- G524 Western North American Ruderal Wet Shrubland, Meadow & Marsh
- G538 North American Desert Alkaline-Saline Herbaceous Wetland & Playa
- G544 Western North American Temperate Freshwater Aquatic Bed

**Diagnostic Characteristics:** Temperate continental, permanently saturated to seasonally flooded wetlands, often with standing water for much of the year, dominated by emergent graminoid herbaceous vegetation. Characteristic dominant species include *Typha* spp., *Schoenoplectus* spp., *Eleocharis palustris*, *Carex praegracilis*, *Carex pellita* (= *Carex lanuginosa*), and *Cyperus* spp.

**VEGETATION**

**Physiognomy and Structure:** Emergent herbaceous vegetation characterized by graminoids, annual or perennial forbs or a mixture of all three. Sites are permanently or seasonally inundated which prevents the establishment of woody species. Ponds typically have concentric rings or zones of vegetation.

**Floristics:** Vegetation is characterized by a lush, dense herbaceous layer with low diversity occurring sometimes as a monoculture. Structure varies from emergent forbs which barely reach the water surface to as tall as 4 m high. Interior marshes are dominated by emergent herbaceous species, mostly graminoids (*Carex*, *Scirpus* and/or *Schoenoplectus*, *Eleocharis*, *Juncus*, *Typha*,) but also some forbs. Dominant species include *Schoenoplectus pungens*, *Schoenoplectus americanus*, *Distichlis spicata*, *Flaveria chlorifolia*, *Helianthus paradoxus*, *Ranunculus aquatilis*, *Eleocharis palustris*, *Juncus balticus*, *Paspalum distichum*, *Carex praegracilis*, *Carex pellita* (= *Carex lanuginosa*), *Cyperus* spp., *Typha latifolia*, *Typha domingensis*, and species of *Bidens*, *Cicuta*, *Mimulus*, and *Phalaris*.

G531 Arid West Inland Freshwater Emergent Marsh Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Apocynum cannabinum</i> - <i>Artemisia (lindleyana, ludoviciana)</i> Herbaceous Vegetation	G3Q/S1	CWWA000172
<i>Artemisia ludoviciana</i> Herbaceous Vegetation	GNR/SNR	CWWA000312
<i>Bolboschoenus fluviatilis</i> Western Herbaceous Vegetation	GNR/SNR	CWWA000319
<i>Carex atherodes</i> Western Herbaceous Vegetation	GNR/SNR	CWWA000430
<i>Carex nebrascensis</i> - <i>Argentina anserina</i> Herbaceous Vegetation	GNR/SNR	CWWA000355
<i>Carex pellita</i> - <i>Argentina anserina</i> Herbaceous Vegetation	GNR/SNR	CWWA000327
<i>Carex pellita</i> - <i>Eleocharis palustris</i> Herbaceous Vegetation	GNR/SNR	CWWA000329
<i>Carex utriculata</i> - <i>Mimulus guttatus</i> Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000332
<i>Deschampsia caespitosa</i> - <i>Juncus balticus</i> Herbaceous Vegetation	GNR/SNR	CWWA000345
<i>Eleocharis palustris</i> Arid Marsh Herbaceous Vegetation	G3/S1?	CWWA000179
<i>Equisetum arvense</i> - <i>Juncus balticus</i> Herbaceous Vegetation	GNR/SNR	CWWA000353
<i>Hordeum brachyantherum</i> Herbaceous Vegetation	G2/SNR	CEGL003430
<i>Juncus balticus</i> - <i>Argentina anserina</i> Herbaceous Vegetation	GNR/SNR	CWWA000359
<i>Lomatium grayi</i> Herbaceous Vegetation	GNR	CWWA000364
<i>Phragmites australis</i> Western North America Temperate Native Herbaceous Vegetation	GNR/SNR	CWWA000369
<i>Schoenoplectus acutus</i> Herbaceous Vegetation	G5/S4	CEGL001840
<i>Schoenoplectus americanus</i> Western Herbaceous Vegetation	G3Q/S1	CEGL001841

<b>G531 Arid West Inland Freshwater Emergent Marsh Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Schoenoplectus maritimus</i> Herbaceous Vegetation	G4/S1?	CEGL001843
<i>Schoenoplectus tabernaemontani</i> Temperate Herbaceous Vegetation	G5/S3S4	CEGL002623
<i>Scirpus microcarpus</i> Herbaceous Vegetation	G4/S3S4	CEGL003322
<i>Typha latifolia</i> Western Herbaceous Vegetation	G5/S4	CEGL002010

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Temperate Continental climate. Environmental settings include bottomlands along drainages, in river floodplain depressions, cienegas, oxbow lakes, below seeps, frequently flooded gravel bars, low-lying sidebars, infilled side channels, small ponds, stockpools, ditches and slow-moving streams, perennial streams in valleys and mountain foothills. Elevations range from 890 to 1560 m (2930-5120 feet). *Soil/substrate/hydrology:* Substrates are variable but are generally fine-textured, alkaline, alluvial soil, coarse loam, sandy loam, sand, silt or peat. Hydrologic regimes vary from seasonal inundation followed by complete soil desiccation to year-round standing water. Water may be poorly oxygenated and nitrogen-rich. They are mostly semipermanently flooded, but some marshes have seasonal hydrologic flooding. Water is at or above the surface for most of the growing season. A consistent source of freshwater is essential to the function of these systems. Soils are muck or mineral or muck over a mineral soil, and water is high-nutrient. Environmental information compiled from Bowers (1982, 1984, 1986), Banner and Trowbridge (1986), Lloyd et al. (1990), MacKinnon et al. (1990), Cooper and Severn (1992), Viereck et al. (1992), Banner et al. (1993), Shiflet (1994), Holland and Keil (1995), Shephard (1995), Steen and Coupe (1997), Hammond (1998), Pineada et al. (1999), Boggs (2000), Pineda (2000), Rondeau (2001), Brand and Sanderson (2002), and Chappell and Christy (2004).

**Dynamics:** Sites are depressions, ponds, springs, and riparian areas that are heavily inundated for at least part of the growing season which impedes the establishment of woody species. Isolated marshes in dune systems are subject to changes in size and location of the wet swales as the sand dunes shift, due to active dune migration. Dune "blowouts" and subsequent stabilization through succession are characteristic processes of the active dunes which surround the interdunal swales.

### DISTRIBUTION

**Geographic Range:** This group is found throughout the temperate western North America interior (Columbia Basin, Great Basin, Colorado Plateau, and higher intermountain basins of western North America). It is also known to occur in dune fields across the intermountain western U.S., including the Great Sand Dunes in southern Colorado and the Pink Coral Dunes in Utah, and may also occur in dune fields in northeastern Arizona and the Great Basin, as well as in southwestern Wyoming in the Killpecker Dunes and Ferris Dunes, and southern Idaho.

**Nations:** CA, MX, US

**States/Provinces:** AK, AZ, BC, CA, CO, ID, NM, NV, OR, TX, UT, WA, WY

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:C, 4:C, 6:C, 10:C, 11:C, 12:C, 13:C, 14:C, 15:C, 16:C, 19:C, 20:C, 22:C, 23:C, 24:C, 28:C, 68:C, 69:C, 70:C, 81:C

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

### SYNONYMY

- < III.A.3.d - Fresh sedge marsh (Viereck et al. 1992)
- < III.B.3.a - Fresh herb marsh (Viereck et al. 1992)
- < Wetlands (217) (Shiflet 1994)

### LOWER LEVEL UNITS

**Alliances:**

- A4164 *Cladium californicum* Alkaline Seep Alliance
- A3894 *Paspalum distichum* Herbaceous Vegetation Alliance
- A3895 *Schoenoplectus americanus* - *Schoenoplectus acutus* - *Scirpus microcarpus* Herbaceous Emergent Alliance
- A3896 *Typha domingensis* - *Typha latifolia* - *Typha angustifolia* Western Herbaceous Emergent Alliance
- A3892 *Equisetum fluviatile* - *Equisetum x ferrissii* Herbaceous Alliance
- A3891 *Eleocharis palustris* - *Eleocharis macrostachya* Freshwater Shallow Marsh Alliance

## AUTHORSHIP

**Primary Concept Source:** C. Chappell, R. Crawford, K.A. Schulz, in D. Faber-Langendoen et al. (2011)

**Author of Description:** M.E. Hall, mod. G. Kittel and J. Christy

**Acknowledgments:** J. Christy

**Version Date:** 2013/09/09

## REFERENCES

**References:** Banner et al. 1986, Banner et al. 1993, Bezanson 2000, Boggs 2000, Bowers 1982, Bowers 1984, Bowers 1986, Brand and Sanderson 2002, Brown 1982a, Carr 1991, Carr 2004, Chappell and Christy 2004, Comer et al. 2003, Cooper and Severn 1992, Crowe et al. 2004, Dick-Peddie 1993, El-Hage and Moulton 1998, Faber-Langendoen et al. 2015, Hammond 1998, Hendrickson and Minckley 1984, Holland and Keil 1995, Jahrsdoerfer and Leslie 1988, Lloyd et al. 1990, MacKinnon et al. 1990, Muldavin et al. 1994b, Muldavin et al. 2000a, Muldavin et al. 2000b, Pineda 2000, Pineda et al. 1999, Rondeau 2001, Shephard 1995, Shiflet 1994, Steen and Coupé 1997, Szaro 1989, TPWD 1989d, Ungar 1965, Ungar 1972, Viereck et al. 1992

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2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

## M075. Western North American Montane-Subalpine Wet Shrubland & Wet Meadow

**Type Concept Sentence:** This macrogroup contains montane to subalpine and alpine wet meadows, marshes and wet shrublands throughout the Rocky Mountains of the U.S. and Canada, the Sierra Nevada, and Intermountain cordillera. Dominant species include graminoids such as *Calamagrostis canadensis*, *Carex scopulorum*, *Carex utriculata*, *Glyceria striata*, forbs such as *Caltha leptosepala*, *Dodecatheon jeffreyi*, *Sibbaldia procumbens*, and shrub species such as, but not limited to, *Alnus incana*, *Betula occidentalis*, *Betula glandulosa*, and many *Salix* species.

## OVERVIEW

**Scientific Name:** Western North American Montane to Alpine Wet Shrubland & Wet Meadow Macrogroup

**Common Name (Translated Scientific Name):** Western North American Montane to Alpine Wet Shrubland & Wet Meadow Macrogroup

**Type Concept:** This macrogroup contains montane to subalpine and alpine wet meadows, marshes and wet shrublands throughout the Cascade Range, Olympic Mountains, Rocky Mountains, Sierra Nevada, and the Basin and Range, at elevations ranging from 1000-3600 m (3300-12,000 feet). Wet meadows can be graminoid- or forb-dominated. Dominant graminoids include *Calamagrostis canadensis*, *Calamagrostis stricta*, *Carex aquatilis*, *Carex bolanderi*, *Carex exsiccata*, *Carex illota*, *Carex lachenalii*, *Carex lenticularis*, *Carex microptera*, *Carex nigricans*, *Carex scopulorum*, *Carex utriculata*, *Carex vernacula*, *Deschampsia caespitosa*, *Eleocharis quinqueflora*, *Eriophorum angustifolium*, *Glyceria striata* (= *Glyceria elata*), *Juncus drummondii*, and *Juncus nevadensis*. Dominant forb species include *Caltha leptosepala*, *Camassia quamash*, *Cardamine cordifolia*, *Dodecatheon jeffreyi*, *Phippsia algida*, *Rorippa alpina*, *Senecio triangularis*, *Sibbaldia procumbens*, *Trifolium parryi*, *Trollius laxus*, and *Veratrum californicum*. Wet shrublands are tall to dwarf in stature, forming open to closed canopies and include dominant species such as *Alnus incana*, *Alnus oblongifolia*, *Alnus viridis*, *Betula occidentalis*, *Betula glandulosa*, *Cornus sericea*, *Salix barclayi*, *Salix bebbiana*, *Salix boothii*, *Salix brachycarpa*, *Salix commutata*, *Salix drummondiana*, *Salix eriocephala*, *Salix farriae*, *Salix geyeriana*, *Salix monticola*, *Salix planifolia*, *Salix sitchensis*, and *Salix wolfii*. Sites are generally wet all season long but some dry out by summer's end, others remain saturated for much of the year. Montane marshes, from beaver dams and along shorelines, can be quite common, and are dominated by *Carex aquatilis*, *Carex atherodes*, *Carex lenticularis*, *Carex rostrata* (although rare), *Carex utriculata*, and *Schoenoplectus* spp.

**Classification Comments:** Some of the species included (*Alnus incana*, *Salix drummondiana*, etc.) can occur on high-gradient streams.

### Similar NVC Types:

- M168 Rocky Mountain & Vancouverian Subalpine-High Montane Mesic Meadow
- M073 Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh: occurs at lower elevations with a different to slightly overlapping suite of species.
- M101 Vancouverian Alpine Scrub, Forb Meadow & Grassland: is generally drier and not considered true wetlands.
- M099 Rocky Mountain & Sierran Alpine Scrub, Forb Meadow & Grassland: are alpine turf, fell-fields and dwarf-shrublands that are generally drier, and are not considered true wetlands.

**Diagnostic Characteristics:** Open to dense herbaceous wet meadows and open to closed-canopy wet shrublands of all statures (tall to dwarf) at montane and subalpine elevations (1000-3600 m [3300-12,000 feet]). These may occur at the edge of or finger into alpine elevations of western mountain ranges.

## VEGETATION

**Physiognomy and Structure:** This macrogroup is variable structurally and includes open to dense graminoid- and forb-dominated herbaceous stands as well as stands dominated by shrubs of all height classes, including dwarf-shrubs.

**Floristics:** This macrogroup consists of wet meadows (graminoid- or forb-dominated), marshes and wet shrublands. Dominant graminoids include *Calamagrostis canadensis*, *Calamagrostis stricta*, *Carex aquatilis*, *Carex bolanderi*, *Carex exsiccata*, *Carex illota*, *Carex lachenalii*, *Carex microptera*, *Carex nigricans*, *Carex scopulorum*, *Carex utriculata*, *Carex vernacula*, *Deschampsia caespitosa*, *Eleocharis quinqueflora*, *Eriophorum angustifolium*, *Glyceria striata* (= *Glyceria elata*), *Juncus drummondii*, and *Juncus nevadensis*. Dominant forb species include *Caltha leptosepala*, *Camassia quamash*, *Cardamine cordifolia*, *Dodecatheon jeffreyi*, *Phippsia algida*, *Rorippa alpina*, *Senecio triangularis*, *Sibbaldia procumbens*, *Trifolium parryi*, *Trollius laxus*, and *Veratrum californicum*. Dominant shrub species include *Alnus incana*, *Alnus oblongifolia*, *Alnus viridis*, *Betula occidentalis*, *Betula glandulosa*, *Cornus sericea*, *Dasiphora fruticosa* ssp. *floribunda*, *Salix barclayi*, *Salix bebbiana*, *Salix boothii*, *Salix brachycarpa*, *Salix commutata*, *Salix drummondiana*, *Salix eastwoodiae*, *Salix eriocephala*, *Salix geeyeriana*, *Salix monticola*, *Salix orestera*, *Salix planifolia*, *Salix sitchensis*, and *Salix wolfii*. Scattered to moderately dense heath shrubs may be present in wet meadows, especially *Kalmia microphylla*, *Vaccinium macrocarpon*, or *Vaccinium uliginosum*. Montane marshes, from beaver dams and along shorelines, can be quite common, and are dominated by *Carex aquatilis*, *Carex atherodes*, *Carex lenticularis*, *Carex rostrata* (although rare), *Carex utriculata*, and *Schoenoplectus* spp.

Floristic information was compiled from Willard (1963), Komarkova (1976, 1986), Padgett (1982), Nachlinger (1985), Cooper (1986b), Kovalchik (1987, 1993, 2001), Baker (1988, 1989a, 1989b, 1990), Barbour and Major (1988), Meidinger et al. (1988), Padgett et al. (1988a, 1988b), Reed (1988), Lloyd et al. (1990), Meidinger and Pojar (1991), Banner et al. (1993), DeLong et al. (1993), Kittel (1993, 1994), Shiflet (1994), Manning and Padgett (1995), Sawyer and Keeler-Wolf (1995), Kittel et al. (1996, 1999a, 1999b), Sanderson and Kettler (1996), Walford (1996), Zwinger and Willard (1996), Cooper et al. (1997), Crowe and Clausnitzer (1997), Steen and Coupe (1997), Muldavin et al. (2000a), and MacKenzie and Moran (2004).

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup predominantly occurs on wet sites with very low-gradient surface and subsurface flows, but shrublands can also form narrow bands along high-gradient streams. They occur at montane and subalpine elevations and may occur at the edges of or finger into alpine elevations. Elevation range is about 1000-3600 m in western mountain ranges. These communities occur as large meadows in subalpine valleys, as narrow bands lining sinuous streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains, as narrow rings around ponds and lakes, and as open meadows along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites, or adjacent to rocky streams with slopes up to 20%. In upper subalpine and alpine regions, sites typically are small depressions located below late-melting snow patches or on snowbeds. Soils of this macrogroup are mineral or with a thin (<40 cm) organic layer over mineral layers (that is, not a peatland). Salinity and alkalinity are generally low due to the frequent flushing of moisture through the meadow. These wetlands may form complexes with peatlands and forested swamps.

**Dynamics:** Seepage and subsurface irrigation are typical hydrological drivers of this system. Interannual variation in extent of winter precipitation and period of snowmelt may impact seasonal water levels influencing the mosaic or dominance of wet meadows and wet shrublands. Where beaver are present, their activity can modify successional dynamics, e.g., shrublands can be converted to open water and/or meadows by beaver activity, and abandoned habitat may revert to shrublands over time. Montane wetlands can be tolerant and resilient after moderate-intensity surface fires as well as late-season livestock grazing (Kovalchik 1987). Wetlands can also be negatively affected by intensive, continuous livestock grazing. Where this occurs, the result can be a shift in species composition, increased non-natives, xerification, compacted soils, increased soil erosion, and slope failures.

## DISTRIBUTION

**Geographic Range:** This macrogroup is found throughout the Rocky Mountain, Pacific Northwest and Intermountain West regions. Mountain ranges include the Rocky Mountain cordillera from New Mexico north into Montana, the Canadian Rockies of Alberta and British Columbia, the mountains and valleys of the Basin and Range and high areas of the Colorado Plateau, Olympic Mountains, Cascade Range and Sierra Nevada.

### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX?, US

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

### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 262A:PP, 263A:PP, 313A:CC, 313B:CC, 313D:CC, 315A:C?, 315B:C?, 315H:CC, 321A:PP, 322A:CC, 331A:CP, 331B:C?, 331H:CP, 331I:CP, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341F:CC, 341G:CP, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261B:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC,

M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:PP, M341A:CP, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

Federal Lands [optional]:

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

**LOWER LEVEL UNITS**

**Groups:**

- G526 Rocky Mountain & Great Basin Lowland & Foothill Riparian Shrubland
- G521 Vancouverian & Rocky Mountain Montane Wet Meadow & Marsh
- G520 Vancouverian & Rocky Mountain Subalpine & Alpine Snowbed, Wet Meadow & Dwarf-Shrubland
- G527 Western Montane-Subalpine Riparian & Seep Shrubland

**AUTHORSHIP**

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel, J. Triepke, K.A. Schulz, P. Comer

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK/KAS 10-14

**REFERENCES**

**References:** Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Banner et al. 1993, Barbour and Major 1988, Cooper 1986b, Cooper et al. 1997, Crowe and Clausnitzer 1997, DeLong 2003, DeLong et al. 1990, DeLong et al. 1993, Faber-Langendoen et al. 2015, Holland and Keil 1995, Kittel 1993, Kittel 1994, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Lloyd et al. 1990, MacKenzie and Moran 2004, MacKinnon et al. 1990, Manning and Padgett 1995, Meidinger and Pojar 1991, Meidinger et al. 1988, Muldavin et al. 2000a, Nachlinger 1985, Padgett 1982, Padgett et al. 1988a, Padgett et al. 1988b, Reed 1988, Sanderson and Kettler 1996, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Steen and Coupé 1997, Szaro 1989, Walford 1996, Willard 1963, Willoughby 2007, Zwinger and Willard 1996

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2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

M075. Western North American Montane-Subalpine Wet Shrubland & Wet Meadow

**G526. Rocky Mountain & Great Basin Lowland & Foothill Riparian Shrubland**

**Type Concept Sentence:**

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**OVERVIEW**

**Scientific Name:** *Salix exigua* - *Crataegus* spp. - *Forestiera pubescens* Rocky Mountain & Great Basin Riparian Shrubland Group

**Common Name (Translated Scientific Name):** Narrowleaf Willow - Hawthorn species - Stretchberry Rocky Mountain & Great Basin Riparian Shrubland Group

**Type Concept:** This group occurs throughout the Rocky Mountain and Colorado Plateau regions from approximately 900 to 1850 m (3000-6000 feet) in elevation, around the edges and between the mountain ranges of the Great Basin and along the lower eastern slope of the Sierra Nevada at about 1220 m (4000 feet) in elevation, at lowland and montane elevations in the Columbia Plateau, on the periphery of the mountains surrounding the Columbia River Basin, and along major tributaries and the main stem of the Columbia at relatively low elevations. It also occurs in the foothills of the northern Rocky Mountains and the east slopes of the Cascades in the lower montane and foothill zones. Climate is generally semi-arid. These shrublands occur along all streams at and below lower treeline, that is, not up in the mountains, but in the between-mountain valleys and lowlands of the interior west. Streams are permanent, intermittent and ephemeral. Stands occur in steep-sided canyons or in broad flat valleys. They can be large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. They also are typically found in backwater channels and other perennially wet but less scoured sites, such as floodplain swales and irrigation ditches, and they can occur in depressional wetlands and non-alkaline playas. Stands may also occur on upper benches away from active channel movement. Willow-dominated shrublands require flooding and bare gravels for reestablishment. Stands are maintained by annual flooding and hydric soils throughout the growing season. Sites are subject to temporary flooding during spring runoff. The water table is often just below the ground surface. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks and upper benches, and occasionally on hillslope springs.

Short to tall shrubs (0.5-5 m in height) characterize this group. Dominant shrubs include *Acer glabrum*, *Artemisia cana*, *Artemisia cana ssp. bolanderi*, *Artemisia cana ssp. viscidula*, *Artemisia tridentata ssp. tridentata*, *Cornus sericea*, *Crataegus douglasii*, *Crataegus rivularis*, *Dasiphora fruticosa ssp. floribunda*, *Forestiera pubescens*, *Oplopanax horridus*, *Philadelphus lewisii*, *Prunus virginiana*, *Rhus trilobata*, *Rosa nutkana*, *Rosa woodsii*, *Salix exigua*, *Salix irrorata*, *Salix melanopsis*, *Shepherdia argentea*, and *Symphoricarpos* spp. Herbaceous layers are often dominated by *Athyrium filix-femina*, *Carex flava* (= *Carex nevadensis*), *Carex* spp., *Elymus trachycaulus*, *Equisetum arvense*, *Deschampsia caespitosa*, *Festuca idahoensis*, *Galium triflorum*, *Glyceria striata*, *Gymnocarpium dryopteris*, *Heracleum maximum*, *Iris missouriensis*, *Juncus balticus*, *Juncus* spp., *Leymus cinereus*, *Maianthemum stellatum*, *Muhlenbergia filiformis*, *Muhlenbergia richardsonis*, *Pascopyrum smithii*, *Poa cusickii*, and *Poa secunda* (= *Poa nevadensis*). Introduced forage species such as *Agrostis stolonifera*, *Poa pratensis*, *Phleum pratense*, and the invasive annual *Bromus tectorum* are often present in disturbed stands.

**Classification Comments:** This group represents a range of short to tall shrubs (0.5-5 m in height). This group also represents lower elevation and foothill elevations shrublands. Higher elevation shrublands belong to Western Montane-Subalpine Riparian & Seep Shrubland Group (G527).

**Internal Comments:** GK 9-13: SD removed.

**Other Comments:**

**Similar NVC Types:**

- G322 Vancouverian Wet Shrubland
- G527 Western Montane-Subalpine Riparian & Seep Shrubland: includes riparian shrublands that occur at high elevations and are dominated by more montane species, for example *Salix monticola*.
- G545 Colorado Plateau Hanging Garden Seep
- G568 Great Plains Riverine Scour
- G337 Great Plains Shrub & Herb Riparian

**Diagnostic Characteristics:** Short to tall (0.5-5 m) riparian and wetland shrublands at foothill and lower elevations of the temperate interior West.

## VEGETATION

**Physiognomy and Structure:** Wetland and mesic shrublands dominated by short to tall shrubs (0.5-5 m).

**Floristics:** Dominant shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia cana ssp. bolanderi*, *Artemisia cana ssp. viscidula*, *Artemisia cana*, *Artemisia tridentata ssp. tridentata*, *Cornus sericea*, *Crataegus douglasii*, *Crataegus rivularis*, *Dasiphora fruticosa ssp. floribunda*, *Forestiera pubescens*, *Oplopanax horridus*, *Philadelphus lewisii*, *Prunus virginiana*, *Rhus trilobata*, *Rosa nutkana*, *Rosa woodsii*, *Salix exigua* (= *ssp. exigua*), *Salix irrorata*, *Salix melanopsis*, *Shepherdia argentea*, and *Symphoricarpos* spp. Herbaceous layers are often dominated by *Athyrium filix-femina*, *Carex flava* (= *Carex nevadensis*), *Carex* spp., *Elymus trachycaulus*, *Equisetum arvense*, *Deschampsia caespitosa*, *Festuca idahoensis*, *Galium triflorum*, *Glyceria striata*, *Gymnocarpium dryopteris*, *Heracleum maximum*, *Iris missouriensis*, *Juncus balticus*, *Juncus* spp., *Leymus cinereus*, *Maianthemum stellatum*, *Muhlenbergia filiformis*, *Muhlenbergia richardsonis*, *Pascopyrum smithii*, *Poa cusickii*, and *Poa secunda* (= *Poa nevadensis*). Introduced forage species such as *Agrostis stolonifera*, *Poa pratensis*, *Phleum pratense*, and the invasive annual *Bromus tectorum* are often present in disturbed stands. Floristic information was compiled from the following sources: Daubenmire (1952), Johnson and Simon (1985), Kovalchik (1987, 1992), Hansen et al. (1989), Manning and Padgett (1989, 1995), Padgett et al. (1989), Szaro (1989), MacKinnon et al. (1990), Banner et al. (1993), DeLong et al. (1993), Sawyer and Keeler-Wolf (1995), Walford (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), Walford et al. (1997, 2001), Kittel et al. (1999b), Muldavin et al. (2000a), DeLong (2003), MacKenzie and Moran (2004), and Sawyer et al. (2009).

G526 Rocky Mountain & Great Basin Lowland & Foothill Riparian Shrubland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>(Populus tremuloides) / Crataegus douglasii / Heracleum maximum</i> Shrubland	G1/S1	CEGL001094
<i>(Populus tremuloides) / Crataegus douglasii / Symphoricarpos albus</i> Shrubland	G3/S2?	CEGL001096
<i>Acer glabrum var. douglasii - (Symphoricarpos albus)</i> Shrubland	GNR/SNR	CWWA000282
<i>Amelanchier alnifolia - Philadelphus lewisii / Pseudoroegneria spicata</i> Shrubland	GNR/SNR	CWWA000309
<i>Amelanchier alnifolia / Toxicodendron rydbergii</i> Shrubland	GNR/SNR	CWWA000310
<i>Betula occidentalis - Celtis laevigata var. reticulata</i> Shrubland	G2/SNR	CEGL003450
<i>Betula occidentalis / Cornus sericea</i> Shrubland	G3/S1	CEGL001161
<i>Betula occidentalis / Crataegus douglasii</i> Shrubland	G1/S1	CEGL001081

G526 Rocky Mountain & Great Basin Lowland & Foothill Riparian Shrubland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Betula occidentalis</i> / <i>Equisetum arvense</i> Shrubland (Provisional)	GNR/SNR	CWWA000315
<i>Betula occidentalis</i> / <i>Maianthemum stellatum</i> Shrubland	G4?/S1	CEGL001162
<i>Betula occidentalis</i> / <i>Philadelphus lewisii</i> - <i>Symphoricarpos albus</i> Shrubland	G1G2/S1?	CEGL000489
<i>Betula occidentalis</i> / <i>Philadelphus lewisii</i> Shrubland	G2/SNR	CEGL002668
<i>Betula occidentalis</i> / <i>Rosa woodsii</i> Shrubland	GNR/SNR	CWWA000316
<i>Crataegus douglasii</i> / <i>Rosa woodsii</i> Shrubland	G2/S1	CEGL001095
<i>Philadelphus lewisii</i> / <i>Clematis ligusticifolia</i> Shrubland	GNR/SNR	CWWA000427
<i>Philadelphus lewisii</i> / <i>Symphoricarpos albus</i> Shrubland	G1G2/S1S2	CEGL000875
<i>Philadelphus lewisii</i> Intermittently Flooded Shrubland	G2/S1S2	CEGL001170
<i>Prunus virginiana</i> Temporarily Flooded Shrubland	G3?/S1?	CWWA000186
<i>Rhamnus alnifolia</i> Shrubland	G3/S1?	CEGL001132
<i>Salix (melanopsis, sitchensis)</i> Alluvial Bar Shrubland	GNR/SNR	CEGL002705
<i>Salix exigua</i> / Barren Shrubland	G5/S2	CEGL001200
<i>Salix exigua</i> / <i>Equisetum arvense</i> Shrubland	G3/S2S3	CEGL001201
<i>Salix exigua</i> / Mesic Graminoids Shrubland	G5/SNR	CEGL001203
<i>Salix exigua</i> Temporarily Flooded Shrubland	G5/S2	CEGL001197
<i>Salix lasiolepis</i> / Barren Ground Shrubland	G3?/SNR	CEGL001216
<i>Salix lucida ssp. caudata</i> Shrubland [Provisional]	G3Q/S1	CEGL001215
<i>Salix lutea</i> - <i>Salix exigua</i> Shrubland	GNR/SNR	CWWA000398
<i>Salix lutea</i> / <i>Cornus sericea</i> Shrubland	GNR/SNR	CWWA000399

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Climate is generally semi-arid continental with typically cold winters and hot summers. *Soil/substrate/hydrology:* These shrublands occur along all streams at and below lower treeline, that is, not up in the mountains, but in the between- mountain valleys and lowlands of the interior west. Streams are permanent, intermittent and ephemeral. Stands occur in steep-sided canyons or in broad flat valleys. They can be large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. They also are typically found in backwater channels and other perennially wet but less scoured sites, such as floodplain swales and irrigation ditches, and they can occur in depressional wetlands and non-alkaline playas, on hillside seeps and springs. These shrublands require flooding and bare gravels for reestablishment. Willow-dominated stands are maintained by annual flooding and hydric soils throughout the growing season. Sites are subject to temporary flooding during spring runoff. The water table is often just below the ground surface. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, immediate streambanks and upper benches. Soils are typically alluvial deposits of sand, clays, silts and cobbles that are highly stratified with depth due to flood scour and deposition. Highly stratified profiles consist of alternating layers of clay loam and organic material with coarser sand or thin layers of sandy loam over very coarse alluvium. Soils are fine-textured with organic material over coarser alluvium. Some soils are more developed due to a slightly more stable environment and greater input of organic matter. Environmental information was compiled from the following sources: Daubenmire (1952), Johnson and Simon (1985), Kovalchik (1987, 1992), Hansen et al. (1989), Manning and Padgett (1989, 1995), Padgett et al. (1989), Szaro (1989), MacKinnon et al. (1990), Banner et al. (1993), Delong et al. (1993), Sawyer and Keeler-Wolf (1995), Walford (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), Walford et al. (1997, 2001), Kittel et al. (1999b), Muldavin et al. (2000a), Delong (2003), MacKenzie and Moran (2004), and Sawyer et al. (2009).

**Dynamics:** Willow-dominated associations are disturbance-driven systems that require flooding, scour and deposition for germination and maintenance. Livestock grazing is a major influence in altering structure, composition, and function of the community (Baker 1988, 1989a, Padgett et al. 1989).

#### DISTRIBUTION

**Geographic Range:** This group is found throughout the Rocky Mountain and Colorado Plateau regions from approximately 900 to 1850 m (3000-6000 feet) in elevation, in the mountain ranges of the Great Basin and along the eastern slope of the Sierra Nevada from about 1220 m (4000 feet) in elevation, at lowland and montane elevations in the Columbia Plateau, on the periphery of the mountains surrounding the Columbia River Basin, and along major tributaries and the main stem of the Columbia at relatively low

elevations. It also occurs in the northern Rocky Mountains and the east slopes of the Cascades in the lower montane and foothill zones.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 6:C, 7:C, 8:C, 9:C, 11:C, 12:C, 18:C, 19:C, 20:C, 25:C, 26:C, 68:C

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- >< Other Sagebrush Types (408) (Shiflet 1994) [Artemisia cana ssp. viscidula shrublands are included.]
- < Riparian (422) (Shiflet 1994)

#### LOWER LEVEL UNITS

**Alliances:**

- A2557 *Artemisia cana* Mesic-Riparian Shrubland Alliance
- A3800 *Salix exigua* - *Salix irrorata* - *Salix melanopsis* Shrubland Alliance
- A3799 *Rhus trilobata* - *Crataegus rivularis* - *Forestiera pubescens* Shrubland Alliance

#### AUTHORSHIP

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:** J. Nachlinger, K. Schulz, J. Kagan, M.S. Reid

**Version Date:** 2013/09/06

#### REFERENCES

**References:** Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Banner et al. 1993, Barbour and Billings 1988, Carsey et al. 2003a, Crowe and Clausnitzer 1997, Daubenmire 1952, DeLong 2003, DeLong et al. 1993, Eyre 1980, Faber-Langendoen et al. 2015, Hansen et al. 1988b, Hansen et al. 1989, Johnson and Simon 1985, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, MacKenzie and Moran 2004, MacKinnon et al. 1990, Manning and Padgett 1989, Manning and Padgett 1995, Muldavin et al. 2000a, Padgett et al. 1989, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shiflet 1994, Steen and Coupé 1997, Szaro 1989, Walford 1996, Walford et al. 1997, Walford et al. 2001

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2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

M075. Western North American Montane-Subalpine Wet Shrubland & Wet Meadow

### G521. Vancouverian & Rocky Mountain Montane Wet Meadow & Marsh

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Carex* spp. - *Calamagrostis* spp. Montane Wet Meadow & Marsh Group

**Common Name (Translated Scientific Name):** Sedge species - Reedgrass species Montane Wet Meadow & Marsh Group

**Type Concept:** This group contains the wet meadows found in montane and subalpine elevations, occasionally reaching into the lower edges of the alpine elevations (about 1000-3600 m) from California's Transverse and Peninsular ranges north to British Columbia's coastal mountains and from throughout the Rocky Mountains of Canada and the U.S. (including the Black Hills of South Dakota) and mountain ranges of the intermountain interior west. Wet meadows occur in open wet depressions, basins and flats with low-velocity surface and subsurface flows. They can be large meadows in montane or subalpine valleys, or occur as narrow strips bordering ponds, lakes and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial



wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Wet meadows can be tightly associated with snowmelt and typically are not subjected to high velocity disturbance, but can be flooded by slow-moving waters. Soils are mostly mineral and show typical hydric soil characteristics such as low chroma and redoximorphic features; some areas may have high organic content as inclusions or pockets. Vegetation of this group can manifest as a mosaic of several plant associations, or be a monotypic stand of a single association which is dominated by graminoids or forbs. Varying dominant herbaceous species include graminoids *Calamagrostis canadensis*, *Calamagrostis stricta*, *Carex bolanderi*, *Carex exsiccata*, *Carex illota*, *Carex microptera*, *Carex scopulorum*, *Carex utriculata*, *Carex vernacula*, *Deschampsia caespitosa*, *Eleocharis quinqueflora*, *Glyceria striata* (= *Glyceria elata*), *Juncus drummondii*, *Juncus nevadensis*, and *Scirpus* and/or *Schoenoplectus* spp. Forb species include *Camassia quamash*, *Cardamine cordifolia*, *Dodecatheon jeffreyi*, *Phippsia algida*, *Rorippa alpina*, *Senecio triangularis*, *Trifolium parryi*, and *Veratrum californicum*. Common but sparse shrubs may include *Salix* spp., *Vaccinium uliginosum*, *Betula glandulosa*, and *Vaccinium macrocarpon*.

#### Classification Comments:

**Internal Comments:** MSR 11-14: proposed to rename: western montane ...FW Marsh. mjr 5-11: AK? added.

#### Other Comments:

#### Similar NVC Types:

- G520 Vancouverian & Rocky Mountain Subalpine & Alpine Snowbed, Wet Meadow & Dwarf-Shrubland: is more or less a strictly alpine group that occurs at higher elevations with different dominant species, and is restricted to alpine or upper subalpine environments; however, it may be adjacent to or even overlap with G521 in some areas.
- G517 Vancouverian Freshwater Wet Meadow & Marsh: occurs at lower elevations within 2 miles of coast.
- G524 Western North American Ruderal Wet Shrubland, Meadow & Marsh
- G531 Arid West Interior Freshwater Emergent Marsh
- G545 Colorado Plateau Hanging Garden Seep

**Diagnostic Characteristics:** Perennial herbaceous wet meadows found in the montane, subalpine and lower alpine elevations (about 1000-3600 m) of western mountain ranges. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles.

### VEGETATION

**Physiognomy and Structure:** Open wet meadows dominated by perennial cold-dormant graminoids or forbs, usually less than 1 m in height, often a pocket surrounded by forests. Wet meadows may be large and carpet an entire valley floor, or they can be very small patches or narrow linear strips. They can also occur in complex mosaics of meadows intermixed with patches of dwarf- or tall shrublands.

**Floristics:** Vegetation of this group can manifest as a mosaic of several plant associations, or be a monotypic stand of a single association which is dominated by graminoids or forbs. Varying dominant herbaceous species include graminoids *Calamagrostis canadensis*, *Calamagrostis stricta*, *Carex bolanderi*, *Carex utriculata*, *Carex illota*, *Carex exsiccata*, *Carex nigricans*, *Carex microptera*, *Carex scopulorum*, *Carex vernacula*, *Deschampsia caespitosa*, *Eleocharis quinqueflora*, *Glyceria striata* (= *Glyceria elata*), *Juncus drummondii*, *Juncus nevadensis*, and *Scirpus* and/or *Schoenoplectus* spp. Forb species may include *Camassia quamash*, *Cardamine cordifolia*, *Caltha leptosepala*, *Dodecatheon jeffreyi*, *Phippsia algida*, *Rorippa alpina*, *Senecio triangularis*, *Trifolium parryi*, *Trollius laxus*, and *Veratrum californicum*. Common but sparse shrubs may include *Salix* spp., *Vaccinium uliginosum*, *Betula glandulosa*, and *Vaccinium macrocarpon*. Floristic information compiled from Komarkova (1976, 1986), Nachlinger (1985), Kovalchik (1987, 1993), Barbour and Major (1988), Meidinger et al. (1988), Padgett et al. (1988a), Lloyd et al. (1990), Banner et al. (1993), DeLong et al. (1993), Manning and Padgett (1995), Sawyer and Keeler-Wolf (1995), Sanderson and Kettler (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), Kittel et al. (1999b), and MacKenzie and Moran (2004).

G521 Vancouverian & Rocky Mountain Montane Wet Meadow Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Adiantum pedatum</i> Rocky Mountain Herbaceous Vegetation	G4G5/S4	CWWA000285
<i>Athyrium filix-femina</i> - <i>Gymnocarpum dryopteris</i> Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000313
<i>Calamagrostis canadensis</i> Western Herbaceous Vegetation	G4/S3S4	CEGL001559
<i>Camassia quamash</i> Rocky Mountain Wet Meadow Herbaceous Vegetation	GNR/SNR	CWWA000320
<i>Carex amplifolia</i> Herbaceous Vegetation	G3/S1?	CEGL003427
<i>Carex aperta</i> Herbaceous Vegetation	GNR/SNR	CEGL001801

<b>G521 Vancouverian &amp; Rocky Mountain Montane Wet Meadow Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Carex aquatilis</i> var. <i>aquatilis</i> Herbaceous Vegetation	G5/S3	CEGL001802
<i>Carex exsiccata</i> Montane Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000260
<i>Carex illota</i> Herbaceous Vegetation	GUQ/SNR	CEGL001876
<i>Carex lacustris</i> Western Herbaceous Vegetation	GNR/SNR	CWWA000324
<i>Carex lenticularis</i> Herbaceous Vegetation	G3?/S2S3	CWWA000011
<i>Carex nebrascensis</i> Herbaceous Vegetation	G4/SNR	CEGL001813
<i>Carex nebrascensis</i> - <i>Carex pellita</i> - <i>Juncus balticus</i> Herbaceous Vegetation	GNR/SNR	CWWA000326
<i>Carex pellita</i> Herbaceous Vegetation	G3/S1	CEGL001809
<i>Carex praegracilis</i> Herbaceous Vegetation	G3G4/SNR	CEGL002660
<i>Carex scopulorum</i> var. <i>bracteosa</i> Herbaceous Vegetation	G4/S3S4	CEGL001822
<i>Carex spectabilis</i> - <i>Potentilla flabellifolia</i> Herbaceous Vegetation	G4Q/S4	CEGL001829
<i>Carex utriculata</i> Marsh Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000264
<i>Carex vesicaria</i> Herbaceous Vegetation	G4Q/S4	CEGL002661
<i>Cassiope mertensiana</i> - <i>Carex nigricans</i> Alpine Wet Dwarf-shrubland	GNR/SNR	CWWA000334
<i>Corydalis scouleri</i> Herbaceous Vegetation	G3?Q/S3?	CEGL001939
<i>Danthonia californica</i> - <i>Senecio hydrophiloides</i> Wet Meadow Herbaceous Vegetation	GNR/SNR	CWWA000338
<i>Danthonia intermedia</i> Wet Meadow Herbaceous Vegetation	GNR/SNR	CWWA000339
<i>Deschampsia caespitosa</i> - <i>Carex nebrascensis</i> Herbaceous Vegetation	G3?Q/SNR	CEGL001601
<i>Deschampsia caespitosa</i> - <i>Danthonia intermedia</i> Rocky Mountain Wet Meadow Herbaceous Vegetation	GNR/SNR	CWWA000344
<i>Deschampsia caespitosa</i> Herbaceous Vegetation	G4/S2?	CEGL001599
<i>Eleocharis acicularis</i> Herbaceous Vegetation	G4?/SNR	CEGL001832
<i>Eleocharis palustris</i> Herbaceous Vegetation	G5/S3?	CEGL001833
<i>Elymus hirsutus</i> - <i>Caltha leptosepala</i> ssp. <i>howellii</i> Herbaceous Vegetation	GNR/SNR	CEGL001566
<i>Equisetum arvense</i> Herbaceous Vegetation	G5/S5	CEGL003314
<i>Equisetum fluviatile</i> Herbaceous Vegetation	G4/S3?	CEGL002746
<i>Glyceria borealis</i> Herbaceous Vegetation	G4/S1	CEGL001569
<i>Glyceria elata</i> Herbaceous Vegetation	G3/S2	CWWA000017
<i>Glyceria grandis</i> Herbaceous Vegetation	G2?/S1S2	CEGL003429
<i>Glyceria striata</i> Herbaceous Vegetation	G3/S2	CEGL000219
<i>Heracleum maximum</i> Herbaceous Vegetation	G3G4/SNR	CEGL005857
<i>Juncus balticus</i> Herbaceous Vegetation	G5/S3S4	CEGL001838
<i>Lupinus latifolius</i> Herbaceous Vegetation	G4?/SNR	CEGL003491
<i>Lysichiton americanus</i> Herbaceous Vegetation	G4?/S3S4	CEGL003318
<i>Mimulus guttatus</i> - ( <i>Mimulus</i> spp.) Herbaceous Vegetation	GNR/SNR	CEGL005305
<i>Mimulus guttatus</i> Herbaceous Vegetation	G4/S4	CWWA000105
<i>Mimulus lewisii</i> Herbaceous Vegetation	GNR/SNR	CWWA000365
<i>Phyllodoce empetriformis</i> / <i>Vaccinium deliciosum</i> / <i>Carex nigricans</i> Dwarf-shrubland	GNR/SNR	CWWA000370
<i>Saussurea americana</i> - <i>Heracleum maximum</i> Herbaceous Vegetation	G3G4/S3S4	CEGL001945
<i>Senecio triangularis</i> Herbaceous Vegetation	G5?/S3	CEGL001987
<i>Torreyochloa pallida</i> var. <i>pauciflora</i> Herbaceous Vegetation	GNR/SNR	CWWA000413
<i>Trautvetteria caroliniensis</i> - ( <i>Senecio triangularis</i> ) Herbaceous Vegetation	GNR/S3?	CWWA000241
<i>Veronica americana</i> Herbaceous Vegetation	GNR/SNR	CWWA000193

<b>G521 Vancouverian &amp; Rocky Mountain Montane Wet Meadow Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Wyethia amplexicaulis</i> Wet Meadow	GNR/SNR	CWWA000416

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Soil/substrate/hydrology:* Wet meadows are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Wet meadows can be tightly associated with snowmelt and typically are not subjected to high velocity disturbance, but can be flooded by slow-moving waters. Moisture for these wet meadow community types is acquired from groundwater, stream discharge, overland flow, overbank flow, and on-site precipitation. Salinity and alkalinity are generally low due to the frequent flushing of moisture through the meadow. Depending on the slope, topography, hydrology, soils and substrate, intermittent, ephemeral, or permanent pools may be present.

These areas may support species more representative of purely aquatic environments. Standing water may be present during some or all of the growing season, with water tables typically remaining at or near the soil surface. Fluctuations of the water table throughout the growing season are not uncommon, however. On drier sites supporting the less mesic types, the late-season water table may be 1 m or more below the surface.

Soils are mostly mineral and show typical hydric soil characteristics such as low chroma and redoximorphic features; some areas may have high organic content as inclusions or pockets. Soils may have organic soils inclusions. The presence and amount of organic matter may vary considerably depending on the frequency and magnitude of alluvial deposition (Kittel et al. 1999b). Organic composition of the soil may include a thin layer near the soil surface or accumulations of highly sapric material of up to 120 cm thick. Soils may exhibit gleying and/or mottling throughout the profile. Wet meadows provide important water filtration, flow attenuation, and wildlife habitat functions. Environmental information compiled from Komarkova (1976, 1986), Nachlinger (1985), Kovalchik (1987, 1993), Barbour and Major (1988), Meidinger et al. (1988), Padgett et al. (1988a), Lloyd et al. (1990), Banner et al. (1993), DeLong et al. (1993), Manning and Padgett (1995), Sawyer and Keeler-Wolf (1995), Sanderson and Kettler (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), Kittel et al. (1999b), and MacKenzie and Moran (2004).

**Dynamics:** This group has soils that may be flooded or saturated throughout the growing season. It may also occur on areas with soils that are only saturated early in the growing season, or intermittently. Typically these associations are tolerant of moderate-intensity surface fires and late-season livestock grazing (Kovalchik 1987). Most appear to be relatively stable types, although in some areas these may be impacted by intensive livestock grazing.

### DISTRIBUTION

**Geographic Range:** This group occurs in the mountains in California's Transverse and Peninsular ranges north to British Columbia's coastal ranges and is found throughout the Rocky Mountains (including the Black Hills of South Dakota) of the U.S. and Canada as well as the intermountain ranges of the interior west, ranging in elevation from montane to alpine (1000-3600 m).

**Nations:** CA, MX?, US

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

**TNC Ecoregions [optional]:** 3:C, 4:C, 5:C, 7:C, 8:C, 9:C, 11:C, 12:C, 16:C, 18:C, 19:C, 20:C, 21:C, 22:P, 25:C, 68:C, 69:C, 81:C

**USFS Ecoregions (2007):** 262A:PP, 263A:PP, 313A:CP, 313B:CC, 313D:C?, 315A:C?, 315B:C?, 315H:CC, 321A:??, 322A:CC, 331A:CP, 331H:CP, 331I:CP, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341F:CP, 341G:CP, 342B:CC, 342C:CC, 342D:C?, 342E:CC, 342F:CP, 342G:CC, 342H:CC, 342I:CP, 342J:CP, M242A:CC, M242B:CC, M242C:CC, M242D:CP, M261A:CC, M261B:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:PP, M341A:CP, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Great Basin)

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

### SYNONYMY

- < Alpine Grassland (213) (Shiflet 1994) [SRM type 213 includes all alpine communities in Sierra, Klamath and California Cascades, both herbaceous and shrub-dominated, and wet meadows.]
- >> Alpine Rangeland (410) (Shiflet 1994) [Alpine wet meadows are included in this SRM type.]
- < Montane Meadows (216) (Shiflet 1994)
- >> Tall Forb (409) (Shiflet 1994) [Forb-dominated wet meadows are included in this group.]

- >< Tufted Hairgrass - Sedge (313) (Shiflet 1994) [Wetter portions of this SRM type overlap with this group.]

#### LOWER LEVEL UNITS

##### Alliances:

- A2584 *Carex amplifolia* - *Carex interior* - *Carex sheldonii* Herbaceous Alliance
- A2564 *Elymus glaucus* - *Carex pellita* - *Carex feta* Herbaceous Alliance
- A3815 *Calamagrostis canadensis* - *Calamagrostis stricta* - *Poa palustris* Herbaceous Alliance
- A3810 *Saxifraga odontoloma* - *Senecio triangularis* - *Mertensia ciliata* Wet Forb Alliance
- A3806 *Carex praegracilis* - *Carex scopulorum* - *Eleocharis quinqueflora* Herbaceous Alliance
- A3809 *Heracleum maximum* - *Veratrum californicum* - *Rorippa* spp. Tall Forb Alliance
- A3812 *Mimulus* spp. - *Primula parryi* - *Dodecatheon redolens* Wet Forb Alliance
- A3814 *Danthonia* spp. - *Camassia* spp. Wet Meadow Seep Alliance
- A3813 *Carex densa* Herbaceous Alliance
- A2642 *Argentina anserina* Low Forb Wet to Dry Meadow Alliance
- A3539 *Equisetum arvense* - *Equisetum hyemale* - *Equisetum variegatum* Herbaceous Alliance
- A3804 *Carex aquatilis* - *Carex utriculata* - *Deschampsia caespitosa* Herbaceous Alliance
- A1374 *Juncus balticus* - *Juncus mexicanus* Herbaceous Alliance
- A1361 *Poa glauca* Herbaceous Alliance
- A3805 *Carex nebrascensis* - *Carex vesicaria* - *Carex pellita* Herbaceous Alliance
- A3808 *Glyceria grandis* - *Glyceria striata* - *Glyceria borealis* Herbaceous Alliance
- A3807 *Eleocharis palustris* - *Eleocharis acicularis* Herbaceous Alliance

#### AUTHORSHIP

**Primary Concept Source:** P. Comer and G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** P. Comer, mod. G. Kittel and C. Chappell

**Acknowledgments:**

**Version Date:** 2010/12/21

#### REFERENCES

**References:** Banner et al. 1993, Barbour and Major 1988, Cooper 1986b, Crowe and Clausnitzer 1997, DeLong 2003, DeLong et al. 1990, DeLong et al. 1993, Faber-Langendoen et al. 2015, Holland and Keil 1995, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1987, Kovalchik 1993, Lloyd et al. 1990, MacKenzie and Moran 2004, MacKinnon et al. 1990, Manning and Padgett 1995, Meidinger and Pojar 1991, Meidinger et al. 1988, Nachlinger 1985, Padgett et al. 1988a, Reed 1988, Sanderson and Kettler 1996, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Steen and Coupé 1997, Stout et al. 2013

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2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

M075. Western North American Montane-Subalpine Wet Shrubland & Wet Meadow

## G520. Vancouverian & Rocky Mountain Subalpine & Alpine Snowbed, Wet Meadow & Dwarf-Shrubland

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Caltha leptosepala* - *Carex nigricans* - *Kalmia microphylla* Subalpine & Alpine Wet Meadow & Dwarf-Shrubland Group

**Common Name (Translated Scientific Name):** White Marsh-marigold - Black Alpine Sedge - Alpine Laurel Subalpine & Alpine Wet Meadow & Dwarf-Shrubland Group

**Type Concept:** These are high-elevation communities found throughout the Rocky Mountains, Pacific Northwest and Intermountain West regions, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. They range in elevation from upper subalpine to alpine (1500-3600 m) depending on latitude. These types occur as large meadows in subalpine valleys, as narrow strips bordering ponds, lakes and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches or on snowbeds. Soils of this group are mineral or with a thin (<40 cm) organic layer over mineral layers (aka not peatland). Soils show hydric soil characteristics, including high organic content and/or low chroma and redoximorphic features. This group often occurs as a mosaic of several plant associations, often dominated by graminoids such as *Carex illota*, *Carex lachenalii*, *Carex nigricans*, *Carex vernacula*, *Deschampsia caespitosa*, *Juncus drummondii*, and forbs *Caltha leptosepala*, *Trollius laxus*, *Phippsia algida*, *Rorippa alpina*, *Sibbaldia procumbens*, and *Trifolium parryi*. Often scattered to moderately dense dwarf-shrubs are present, especially *Dasiphora*, *Kalmia*, *Salix* or *Vaccinium*, which when present form alpine

dwarf-shrublands. Wet meadows are tightly associated with snowmelt and typically not subjected to high disturbance events such as flooding.

**Classification Comments:** This group includes sparsely vegetated alpine areas that nonetheless have lush wet meadows and dwarf-shrublands are included together in one group because the alpine mesic floristic composition is more diagnostic than vegetation structure. This might be confusing with Rocky Mountain & Sierran Alpine Dwarf-Shrubland Group (G316) because it includes mesic dwarf-shrublands; however, this group includes the true wetland associations.

**Internal Comments:** MSR 11-14: proposed to rename: western subalpine .... mjr 10-12: CA added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G271 Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow
- G521 Vancouverian & Rocky Mountain Montane Wet Meadow & Marsh: is lower in elevation (montane to subalpine) and may overlap slightly but has a different suite of dominant species than G520.
- G320 North Pacific Alpine-Subalpine Turf & Herbaceous Meadow: is similar in structure but does not contain wetland associations.
- G316 Rocky Mountain & Sierran Alpine Dwarf-Shrubland: is similar in structure but does not contain wetland associations.
- G317 North Pacific Alpine-Subalpine Dwarf-Shrubland & Heath: is similar in structure but does not contain wetland associations.

**Diagnostic Characteristics:** This group includes open to closed-canopy herbaceous stands dominated by Rocky Mountain alpine wetland species as well as open to closed dwarf-shrublands. Wetland graminoids may include *Carex illota*, *Carex lachenalii*, *Carex nigricans*, *Carex vernacula*, *Deschampsia caespitosa*, *Juncus drummondii*, and *Juncus mertensianus*; forbs include *Caltha leptosepala*, *Trollius laxus*, *Parnassia fimbriata*, *Phippsia algida*, *Polygonum bistortoides*, *Rorippa alpina*, *Sibbaldia procumbens*, and *Trifolium parryi*. Scattered to moderately dense dwarf-shrubs may also be present, especially *Dasiphora fruticosa ssp. floribunda* and *Kalmia microphylla*, which form alpine dwarf-shrublands.

## VEGETATION

**Physiognomy and Structure:** This group is variable structurally and includes open to closed-canopy, graminoid- and forb-dominated herbaceous stands as well as stands dominated by dwarf-shrublands. Sometimes rings of different plant communities form around a late-melting snowbed because of different soil moisture requirements (drier turf species on outside edges, wetland species near the middle and sometimes a sparsely vegetated center because of the extremely short growing season).

**Floristics:** This group often occurs as a mosaic of several plant associations, often dominated by graminoids, including *Carex illota*, *Carex lachenalii*, *Carex nigricans*, *Carex vernacula*, *Deschampsia caespitosa*, *Juncus drummondii*, *Juncus mertensianus*, and forbs *Caltha leptosepala*, *Trollius laxus*, *Parnassia fimbriata*, *Phippsia algida*, *Polygonum bistortoides*, *Rorippa alpina*, *Sibbaldia procumbens*, and *Trifolium parryi*. Often scattered to moderately dense dwarf-shrubs are present, especially *Dasiphora fruticosa ssp. floribunda*, *Kalmia microphylla*, or *Vaccinium uliginosum*, which form alpine dwarf-shrublands. Wet meadows are tightly associated with snowmelt and typically not subjected to high disturbance events such as flooding. Floristic information was compiled from Willard (1963), Komarkova (1976, 1986), Nachlinger (1985), Cooper (1986b), Kovalchik (1987, 1993), Padgett et al. (1988a), Reed (1988), Meidinger and Pojar (1991), Shiflet (1994), Manning and Padgett (1995), Sanderson and Kettler (1996), Zwinger and Willard (1996), Cooper et al. (1997), Crowe and Clausnitzer (1997), and Kittel et al. (1999b).

G520 Vancouverian & Rocky Mountain Subalpine Snowbed, Wet Meadow & Dwarf-Shrubland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Caltha leptosepala ssp. howellii</i> Herbaceous Vegetation	G4/S4	CEGL001954
<i>Carex nigricans</i> - ( <i>Petasites frigidus</i> var. <i>frigidus</i> ) / <i>Philonotis fontana</i> Herbaceous Vegetation [Provisional]	GNR/S3	CWWA000245
<i>Carex nigricans</i> Herbaceous Vegetation	G4/S4	CEGL001816
<i>Kalmia microphylla</i> / <i>Carex nigricans</i> Dwarf-shrubland	G3G4/S3	CEGL001402
<i>Marchantia polymorpha</i> - <i>Philonotis fontana</i> Bryophyte Vegetation	G3/SU	CWWA000103
<i>Polytrichum commune</i> Bryophyte Vegetation	G4/SU	CWWA000126
<i>Potentilla flabellifolia</i> - <i>Polygonum bistortoides</i> Herbaceous Vegetation	G4Q/S4	CEGL001981
<i>Saxifraga odontoloma</i> - <i>Senecio triangularis</i> Herbaceous Vegetation	G3G4/S3	CWWA000190

## ENVIRONMENT & DYNAMICS

**Environmental Description:** These are high-elevation communities found throughout the Rocky Mountains, Pacific Northwest and Intermountain West regions, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. They range in elevation from upper subalpine to alpine (1500-3600 m) depending on latitude. These types occur as large meadows in subalpine valleys, as narrow strips bordering ponds, lakes and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches or on snowbeds. Soils of this group are mineral or with a thin (<40 cm) organic layer over mineral layers (aka not peatland).

Moisture for these wet meadow community types is acquired from groundwater, stream discharge, overland flow, overbank flow, and on-site precipitation. Salinity and alkalinity are generally low due to the frequent flushing of moisture through the meadow. Depending on the slope, topography, hydrology, soils and substrate, intermittent, ephemeral or permanent pools may be present. These areas may support species more representative of purely aquatic environments. Standing water may be present during some or all of the growing season, with water tables typically remaining at or near the soil surface. Fluctuations of the water table throughout the growing season are not uncommon, however. On drier sites supporting the less mesic types, the late-season water table may be 1 m or more below the surface.

*Soil/substrate/hydrology:* Soils typically possess a high proportion of organic matter, but this may vary considerably depending on the frequency and magnitude of alluvial deposition (Kittel et. al. 1999b). Organic composition of the soil may include a thin layer near the soil surface or accumulations of highly sapric material up to 30 cm thick (aka not peatland). Soils may exhibit gleying and/or mottling throughout the profile. Wet meadow ecological systems provide important water filtration, flow attenuation, and wildlife habitat functions. Environmental information was compiled from Willard (1963), Komarkova (1976, 1986), Nachlinger (1985), Cooper (1986b), Kovalchik (1987, 1993), Padgett et al. (1988a), Reed (1988), Meidinger and Pojar (1991), Shiflet (1994), Manning and Padgett (1995), Sanderson and Kettler (1996), Zwinger and Willard (1996), Cooper et al. (1997), Crowe and Clausnitzer (1997), and Kittel et al. (1999b).

**Dynamics:** Associations in this group are adapted to soils that may be flooded or saturated throughout the growing season. They may also occur on areas with soils that are only saturated early in the growing season or intermittently. Typically these associations are tolerant of moderate-intensity surface fires and late-season livestock grazing (Kovalchik 1987). Most appear to be relatively stable types, although in some areas these may be impacted by intensive livestock grazing.

## DISTRIBUTION

**Geographic Range:** This group is found throughout the Rocky Mountains, Pacific Northwest and Intermountain West regions, ranging in elevation from upper subalpine to alpine (1500-3600 m) depending on latitude.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 22:P, 25:C, 68:C

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

## SYNONYMY

- >< Alpine Rangeland (410) (Shiflet 1994) [Alpine wet meadows are included in this SRM type.]
- >< Tall Forb (409) (Shiflet 1994) [Forb-dominated wet meadows are included in this group.]
- >< Tufted Hairgrass - Sedge (313) (Shiflet 1994) [Wetter portions of this SRM type overlap with this group.]

## LOWER LEVEL UNITS

**Alliances:**

- A3831 *Kalmia microphylla* - *Cassiope mertensiana* - *Dryas drummondii* Wet Dwarf-shrubland Alliance
- A3832 *Carex nigricans* - *Sibbaldia procumbens* - *Trollius laxis* Wet Meadow Alliance
- A1309 *Carex vernacula* - *Phippsia algida* - *Ptilagrostis kingii* Herbaceous Alliance
- A0958 *Dasiphora fruticosa* ssp. *floribunda* Wet Shrubland Alliance
- A1424 *Carex lachenalii* - *Carex capillaris* - *Carex illota* Seasonally Flooded Herbaceous Alliance
- A1698 *Caltha leptosepala* - *Rhodiola rhodantha* Herbaceous Alliance

**AUTHORSHIP**

**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2011)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2013/09/06

**REFERENCES**

**References:** Cooper 1986b, Cooper et al. 1997, Crowe and Clausnitzer 1997, Faber-Langendoen et al. 2015, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1987, Kovalchik 1993, Manning and Padgett 1995, Meidinger and Pojar 1991, Nachlinger 1985, Padgett et al. 1988a, Reed 1988, Sanderson and Kettler 1996, Shiflet 1994, Willard 1963, Zwinger and Willard 1996

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

M075. Western North American Montane-Subalpine Wet Shrubland & Wet Meadow

**G527. Western Montane-Subalpine Riparian & Seep Shrubland**

**Type Concept Sentence:**

**OVERVIEW**

**Scientific Name:** *Salix* spp. - *Alnus* spp. - *Betula occidentalis* Riparian & Seep Shrubland Group

**Common Name (Translated Scientific Name):** Willow species - Alder species - Water Birch Riparian & Seep Shrubland Group

**Type Concept:** This group is found throughout the Rocky Mountain cordillera from New Mexico north into Montana and northwestern Alberta, and also occurs in mountainous areas of the interior Intermountain West and on the Colorado Plateau. These are montane to subalpine riparian shrublands occurring as narrow bands or broad shrublands of short to tall (0.5-15 m) shrubs lining streambanks, benches and alluvial terraces in steep narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels, as well as steep moist avalanche chutes. Generally, the group is found at higher elevations, but can be found anywhere from 1500-3475 m, and may occur at even lower elevations in the Canadian Rockies. Occurrences can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. Many of the plant associations found within this group are associated with beaver activity. This group often occurs as part of a mosaic of multiple communities that are shrub- and herb-dominated and includes above-treeline, willow-dominated, snowmelt-fed basins that feed into streams. The shrub species that can be dominant reflect the large elevational gradient of this group and include *Alnus incana*, *Alnus oblongifolia*, *Alnus viridis*, *Betula occidentalis*, *Betula glandulosa*, *Betula occidentalis*, *Cornus sericea*, *Salix bebbiana*, *Salix boothii*, *Salix brachycarpa*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*, *Salix monticola*, *Salix planifolia*, and *Salix wolfii*. Generally the upland vegetation surrounding these wet shrublands is either conifer or aspen forest.

**Classification Comments:**

**Internal Comments:** GK 9-13: SD removed. mjr 10-12: CA added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G507 North Pacific Montane Riparian Woodland
- G322 Vancouverian Wet Shrubland: occurs at lower elevations along the Pacific Northwest coast.
- G526 Rocky Mountain & Great Basin Lowland & Foothill Riparian Shrubland: occurs at lower elevations and may overlap with G527.

**Diagnostic Characteristics:** Montane wet shrublands of the Rocky Mountains of Canada and the U.S., and mountain ranges in the Intermountain West. These shrublands line streams and valley bottoms and are often associated with beaver activity.

**VEGETATION**

**Physiognomy and Structure:** Montane wetlands dominated by short to tall (0.5-15 m) cold-deciduous shrubs with multiple stems, occurring as narrow bands of shrubs lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels.

**Floristics:** The dominant shrubs reflect the large elevational gradient and include *Alnus incana*, *Betula glandulosa*, *Betula occidentalis*, *Cornus sericea*, *Salix bebbiana*, *Salix boothii*, *Salix brachycarpa*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*, *Salix monticola*, *Salix planifolia*, and *Salix wolfii*. Generally the upland vegetation surrounding these riparian systems is either conifer or aspen forest. Floristic information was compiled from Padgett (1982), Kovalchik (1987, 1993, 2001), Baker (1988, 1989a, 1989b,

1990), Padgett et al. (1988a, 1988b), Kittel (1993, 1994), Manning and Padgett (1995), Kittel et al. (1996, 1999a, 1999b), Walford (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), and Muldavin et al. (2000a).

<b>G527 Western Montane-Subalpine Riparian &amp; Seep Shrubland</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Alnus incana</i> - <i>Betula occidentalis</i> Shrubland	G2G3/S1	CEGL001142
<i>Alnus incana</i> / <i>Carex utriculata</i> Shrubland	G4/S3S4	CWWA000004
<i>Alnus incana</i> / Alluvial Bar Shrubland	GNR/SNR	CWWA000288
<i>Alnus incana</i> / <i>Athyrium filix-femina</i> Shrubland	G3/S3?	CEGL002628
<i>Alnus incana</i> / <i>Calamagrostis canadensis</i> Shrubland	G3Q/S2	CEGL001143
<i>Alnus incana</i> / <i>Carex (bolanderi, infirminevia, leptopoda)</i> Shrubland	GNR/SNR	CWWA000289
<i>Alnus incana</i> / <i>Carex amplifolia</i> Shrubland	GNR/SNR	CWWA000286
<i>Alnus incana</i> / <i>Carex pellita</i> Shrubland	GNR/SNR	CWWA000290
<i>Alnus incana</i> / <i>Carex scopulorum</i> var. <i>prionophylla</i> Shrubland	GNR/SNR	CEGL000122
<i>Alnus incana</i> / <i>Carex utriculata</i> Shrubland	G4/S3S4	CWWA000004
<i>Alnus incana</i> / <i>Cornus sericea</i> Shrubland	G3G4/S3	CEGL001145
<i>Alnus incana</i> / <i>Equisetum arvense</i> Shrubland	G3/S3	CEGL001146
<i>Alnus incana</i> / <i>Glyceria striata</i> Shrubland	G3/S3	CEGL000228
<i>Alnus incana</i> / <i>Gymnocarpium dryopteris</i> Shrubland	GNR/SNR	CWWA000292
<i>Alnus incana</i> / <i>Lysichiton americanus</i> Shrubland	G3/S1S2	CEGL002629
<i>Alnus incana</i> / Mesic Forbs Shrubland	G3/SNR	CEGL001147
<i>Alnus incana</i> / <i>Ribes (inerme, hudsonianum, lacustre)</i> Shrubland	G3/S1	CEGL001151
<i>Alnus incana</i> / <i>Salix lutea</i> Shrubland	GNR/SNR	CWWA000294
<i>Alnus incana</i> / <i>Scirpus microcarpus</i> Shrubland	G2G3/S2	CEGL000481
<i>Alnus incana</i> / <i>Senecio triangularis</i> Shrubland	GNR/SNR	CWWA000295
<i>Alnus incana</i> / <i>Spiraea douglasii</i> Shrubland	G3/S3?	CEGL001152
<i>Alnus incana</i> / <i>Symphoricarpos albus</i> Shrubland	G3G4/S3	CEGL001153
<i>Alnus viridis</i> ssp. <i>sinuata</i> - <i>Cornus sericea</i> Shrubland	GNR/SNR	CWWA000305
<i>Alnus viridis</i> ssp. <i>sinuata</i> - <i>Ribes lacustre</i> Shrubland	GNR/SNR	CWWA000306
<i>Alnus viridis</i> ssp. <i>sinuata</i> / Alluvial Bar Shrubland	GNR/SNR	CWWA000307
<i>Alnus viridis</i> ssp. <i>sinuata</i> / <i>Athyrium filix-femina</i> - <i>Cinna latifolia</i> Shrubland	G4/S3	CEGL001156
<i>Alnus viridis</i> ssp. <i>sinuata</i> / Mesic Forbs Shrubland	G3G4/S3S4	CEGL002633
<i>Alnus viridis</i> ssp. <i>sinuata</i> Shrubland [Placeholder]	GNRQ/S4S5	CEGL001154
<i>Cornus sericea</i> / <i>Athyrium filix-femina</i> Shrubland	GNR/SNR	CWWA000336
<i>Cornus sericea</i> / <i>Equisetum arvense</i> Shrubland	GNR/SNR	CWWA000335
<i>Cornus sericea</i> / <i>Heracleum maximum</i> Shrubland	G3/SNR	CEGL001167
<i>Cornus sericea</i> / <i>Saxifraga odontoloma</i> Shrubland	G4Q/S2S4	CWWA000356
<i>Cornus sericea</i> / <i>Symphoricarpos albus</i> Shrubland	G4?/S3S4	CWWA000177
<i>Cornus sericea</i> Rocky Mountain Shrubland	G4Q/S2S4	CEGL001165
<i>Crataegus douglasii</i> / <i>Spiraea douglasii</i> Shrubland	GNR/SNR	CWWA000337
<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> / <i>Deschampsia caespitosa</i> Shrubland	G4/SNR	CEGL001107
<i>Rhododendron albiflorum</i> Shrubland [Provisional]	GNR/SNR	CWWA000393
<i>Ribes lacustre</i> / <i>Cinna latifolia</i> Shrubland	G2?/S2	CWWA000023
<i>Salix (boothii, geyeriana)</i> / <i>Carex aquatilis</i> Shrubland	G3/S1?	CEGL001176
<i>Salix (farriar, planifolia)</i> / <i>Carex utriculata</i> Shrubland	G3G4/S2?	CEGL001228
<i>Salix bebbiana</i> / Mesic Graminoids Shrubland	G3?/SNR	CEGL001174
<i>Salix boothii</i> / Mesic Forbs Shrubland	G3/SNR	CEGL001180



<b>G527 Western Montane-Subalpine Riparian &amp; Seep Shrubland</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Salix commutata</i> / <i>Carex scopulorum</i> Shrubland	G3/SNR	CEGL001189
<i>Salix commutata</i> / <i>Senecio triangularis</i> Shrubland	GNR/SNR	CWWA000397
<i>Salix drummondiana</i> / <i>Calamagrostis canadensis</i> Shrubland	G3/S2?	CEGL002667
<i>Salix drummondiana</i> / <i>Carex scopulorum</i> var. <i>prionophylla</i> Shrubland	G2G3/S2?	CEGL001584
<i>Salix drummondiana</i> / <i>Carex utriculata</i> Shrubland	G4/S3	CEGL002631
<i>Salix planifolia</i> / <i>Carex scopulorum</i> Shrubland	G3G4/S2?	CEGL001229
<i>Salix scouleriana</i> / <i>Elymus glaucus</i> Shrubland	GNR/SNR	CWWA000401
<i>Salix scouleriana</i> / <i>Paxistima myrsinites</i> Shrubland	GNR/SNR	CWWA000402
<i>Salix sitchensis</i> - ( <i>Alnus incana</i> ) / <i>Angelica arguta</i> Shrubland	GNR/SNR	CWWA000403
<i>Salix sitchensis</i> / <i>Glyceria elata</i> Shrubland	GNR/SNR	CWWA000404
<i>Spiraea douglasii</i> - ( <i>Salix sitchensis</i> , <i>drummondiana</i> ) Shrubland	GNR/SNR	CWWA000405
<i>Spiraea douglasii</i> / <i>Calamagrostis canadensis</i> Shrubland	GNR/SNR	CWWA000406
<i>Vaccinium caespitosum</i> - ( <i>Salix farriae</i> ) / <i>Danthonia intermedia</i> Dwarf-shrubland	G1G2/S1S2	CEGL000484

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Soil/substrate/hydrology:* These are montane to subalpine riparian shrublands occurring as narrow bands lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels. Generally, the group is found at higher elevations, but can be found anywhere from 1500-3475 m, and may occur at even lower elevations in the Canadian Rockies. Occurrences can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. Environmental information was compiled from Padgett (1982), Kovalchik (1987, 1993, 2001), Baker (1988, 1989a, 1989b, 1990), Padgett et al. (1988a, 1988b), Kittel (1993, 1994), Manning and Padgett (1995), Kittel et al. (1996, 1999a, 1999b), Walford (1996), Crowe and Clausnitzer (1997), Steen and Coupe (1997), and Muldavin et al. (2000a).

#### Dynamics:

### DISTRIBUTION

**Geographic Range:** This group is found throughout the Rocky Mountain cordillera from New Mexico north into Montana and the Canadian Rockies of Alberta and British Columbia (including the isolated "island" mountain ranges of central and eastern Montana), and in mountainous areas of the Intermountain West and on the Colorado Plateau.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 6:P, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C, 68:C

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

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Great Basin)

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

### SYNONYMY

- < Riparian (422) (Shiflet 1994)

### LOWER LEVEL UNITS

#### Alliances:

- A0977 *Salix lasiolepis* Shrubland Alliance
- A3974 *Crataegus douglasii* / *Symphoricarpos albus* - *Rosa woodsii* Valley Bottom Mesic Shrubland Alliance
- A1003 *Salix commutata* Shrubland Alliance
- A3774 *Salix eastwoodiae* - *Salix lemmonii* Shrubland Alliance

- A3973 *Celtis laevigata* var. *reticulata* / *Philadelphus lewisii* Valley Bottom Mesic Scrub Alliance
- A0981 *Salix monticola* Shrubland Alliance
- A3770 *Salix wolfii* - *Salix brachycarpa* - *Betula glandulosa* Shrubland Alliance
- A2563 *Salix orestera* Shrubland Alliance
- A3771 *Alnus incana* - *Alnus viridis* Shrubland Alliance
- A3773 *Cornus sericea* - *Dasiphora fruticosa* ssp. *floribunda* - *Ribes* spp. Shrubland Alliance
- A3769 *Salix boothii* - *Salix geyeriana* - *Salix lutea* Montane Shrubland Alliance
- A3772 *Betula occidentalis* Shrubland Alliance

#### AUTHORSHIP

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2013/09/06

#### REFERENCES

**References:** Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Crowe and Clausnitzer 1997, Faber-Langendoen et al. 2015, Kittel 1993, Kittel 1994, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Manning and Padgett 1995, Muldavin et al. 2000a, Padgett 1982, Padgett et al. 1988a, Padgett et al. 1988b, Shiflet 1994, Steen and Coupé 1997, Szaro 1989, Walford 1996, Willoughby 2007

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2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

## M074. Western North American Vernal Pool

**Type Concept Sentence:** This macrogroup includes herbaceous communities with high diversity and high endemism that form distinct zones or concentric rings within shallow ephemeral pools on hardpan soils with an indurated clay or cemented layer or on shallow soils over unfractured bedrock. It is found throughout intermountain valleys of British Columbia, Oregon, Washington, California and Mexico

#### OVERVIEW

**Scientific Name:** *Callitriche marginata* - *Downingia elegans* - *Eryngium aristulatum* Western North American Vernal Pool Macrogroup

**Common Name (Translated Scientific Name):** Winged Water-starwort - Elegant Calicoflower - California Eryngo Western North American Vernal Pool Macrogroup

**Type Concept:** This macrogroup includes herbaceous communities that form distinct zones or concentric rings around shallow ephemeral pools from sea level to 2600 m (7800 feet) elevation. The number of species is high and changes from north to south, so there are no particularly characteristic species, although there are characteristic plant genera that can be described at the macrogroup level. These include species of *Callitriche*, *Downingia*, *Eryngium*, *Hemizonia*, *Lasthenia*, *Navarretia*, *Orcuttia*, *Plagiobothrys*, *Pogogyne*, *Psilocarphus*, *Sedella*, *Spergularia*, and *Trichostema*. Pools occur on shallow soils over volcanic bedrock, in scablands, on hardpan soils with an indurated clay or cemented layer that retains water throughout some portion of the spring, and that typically dry down completely into early summer months. These occur in British Columbia, Oregon, Washington, California and Mexico.

**Classification Comments:** How are alkaline vernal pools different from playas or alkaline depressions? For example, why don't halophytes occur in the alkaline vernal pools? Some specific discussion addressing that potential confusion would be worthwhile. The discussion under the Dynamics section hints at this.

#### Similar NVC Types:

- M073 Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh: contains wet meadows and marshes that are generally dominated by graminoid species and do not form communities of concentric rings around small, ephemeral shallow pools.
- M301 Western North American Ruderal Wet Shrubland, Meadow & Marsh: includes wet meadows and marshes dominated by non-native herbaceous species. These may have replaced the native vegetation surrounding vernal pools to the point that the native herbaceous community is no longer recognizable.
- M076 Warm Desert Lowland Freshwater Shrubland, Meadow & Marsh: contains wet meadows and marshes in warm desert climates that are generally dominated by graminoid species and do not form communities of concentric rings around small, ephemeral shallow pools.

**Diagnostic Characteristics:** Herbaceous, forb-dominated communities found within depressional wetlands that are seasonally wet and dry, forming concentric rings or zones within pools of shallow open water or within ponds of low emergent vegetation that often contain many endemic and rare plant and invertebrate species.

## VEGETATION

**Physiognomy and Structure:** Annual and perennial herbaceous species that are mostly forbs, with low stature, generally <1 m in height.

**Floristics:** Many endemic plant species are found in vernal pools. Characteristic species are predominantly annual and diverse. Northern scabland vernal pools share about a third of the species found in northern California vernal pools, but they do not share many of the more common dominant species. Vernal pool communities tend to be forb-dominated with many rare and endemic plant species (Barbour et al. 2007a, 2007b, Fristrom and Game 2011) and animals (Belk 1998, Fugate 1998), many of which are documented to occur only in vernal pools.

In British Columbia, Washington and Oregon, pools have characteristic species that include *Callitriche marginata*, *Callitriche* spp., *Camissonia tanacetifolia*, *Deschampsia danthonioides*, *Downingia elegans*, *Elatine* spp., *Eleocharis* spp., *Epilobium densiflorum* (= *Boisduvalia densiflora*), *Eryngium petiolatum*, *Eryngium vaseyi*, *Grindelia nana*, *Isoetes orcuttii*, *Juncus uncialis*, *Myosurus minimus* (= *Myosurus X clavicaulis*), *Navarretia leucocephala* ssp. *diffusa*, *Pilularia americana*, *Plagiobothrys* spp., *Plagiobothrys figuratus*, *Plagiobothrys scouleri*, *Polyctenium williamsiae*, *Polygonum polygaloides* ssp. *confertiflorum*, *Polygonum polygaloides* ssp. *polygaloides*, *Psilocarphus brevissimus*, *Psilocarphus elatior*, *Psilocarphus oregonus*, *Trifolium cyathiferum*, *Triteleia hyacinthina*, and *Veronica peregrina* (Bjork 1997, Chappell and Christy 2004).

In northern Nevada, most of the species by biomass are perennials and include *Juncus balticus*, *Carex douglasii*, *Muhlenbergia richardsonis*, and species of *Eleocharis*, *Polygonum*, *Rumex*, and *Polyctenium* (J. Morefield pers. comm. 2010).

Characteristic plant species in northern California and the southern Cascades include *Artemisia cana* ssp. *bolanderi*, *Blennosperma nanum*, *Callitriche marginata*, *Cicendia quadrangularis*, *Cressa truxillensis*, *Downingia bella*, *Downingia insignis*, *Epilobium densiflorum* (= *Boisduvalia densiflora*), *Eryngium aristulatum*, *Eryngium mathiasiae*, *Eryngium vaseyi*, *Lasthenia ferriisae*, *Lasthenia glaberrima*, *Mimulus* spp., *Plagiobothrys leptocladus* (= *Allocarya leptoclada*), *Pogogyne douglasii*, *Pogogyne* spp., *Psilocarphus brevissimus*, *Sedella pumila* (= *Parvisedum pumilum*), *Spergularia salina* (= *Spergularia marina*), and *Veronica peregrina* (Barbour et al. 2007a, 2007b, Sawyer et al. 2009).

In the Great Valley of central California where short inundation periods are characteristic, *Alopecurus saccatus*, *Callitriche marginata*, *Crassula aquatica*, *Deschampsia danthonioides*, *Downingia bicornuta*, *Elatine californica*, *Eleocharis acicularis*, *Eryngium vaseyi*, *Isoetes orcuttii*, *Juncus bufonius*, *Lasthenia californica*, *Navarretia leucocephala*, *Pilularia americana*, *Plagiobothrys stipitatus*, *Pogogyne ziziphoroides*, *Psilocarphus brevissimus*, and *Veronica peregrina* ssp. *xalapensis* are often present and diagnostic. Where longer inundation periods are characteristic, *Lasthenia glaberrima* and *Eleocharis macrostachya* may be found (Barbour et al. 2005, 2007a, 2007b, Sawyer et al. 2009).

In southern California, characteristic plant species include *Eryngium aristulatum*, *Hemizonia parryi* ssp. *australis*, *Lasthenia glabrata* ssp. *coulteri*, *Navarretia fossalis*, *Orcuttia californica*, *Pogogyne abramsii*, *Pogogyne nudiuscula*, and *Trichostema austromontanum* (Barbour et al. 2007, Sawyer et al. 2009). Given their relative isolation in upland-dominated landscapes, many endemic plant species are common in vernal pools (Witham et al. 1998, Barbour et al. 2007a, 2007b).

## ENVIRONMENT & DYNAMICS

**Environmental Description:** Vernal pools of this macrogroup are found in areas with a Mediterranean climate of mild winters and dry summers. The ground often has a hummocky micro-relief over bedrock or soil underlain by a clay pan or hardpan which restricts water drainage. Drainage is prevented by a cemented layer of indurated clay or cemented Si or Fe, or unfractured bedrock. These wetlands tend to be acidic to circumneutral to alkaline and slightly saline. Depressions tend to be relatively small closed basins that fill annually during winter and spring through rainfall and/or snowmelt. Some pools remain dry for several years, while in wetter regions, pools can remain inundated for two years in a row.

**Dynamics:** Depressions are seasonally filled by winter and spring rain, followed by nine months of no rain such that they dry with a slowly decreasing pond depth. This inundation and slow drying period is an important aspect that differentiates vernal pools from other types of wetlands, and is one reason for the highly unique flora and fauna found there. Some pools fill annually, others only once in several years. Some years pools dry up quickly, in other years they may remain inundated for 2 years.

## DISTRIBUTION

**Geographic Range:** This macrogroup is found throughout intermountain valleys of British Columbia, Oregon, Washington, California and Mexico, from sea level to 2600 m (7800 feet) elevation. It is found on the Gulf and San Juan islands of Washington; in the northern Columbia Basin and perhaps the Okanagan Valley in British Columbia; the western portion of the Great Basin in Nevada; in the Lassen, Klamath, and upper Pit river drainages, and the Devils Garden area, the northern Central Valley, in the foothills of the southern Cascades and Sierra Nevada of northern California; and in southern California where they range from Baja Norte, Mexico, north through Santa Barbara County, California (Bjork 1997, Chappell and Christy 2004, Barbour et al. 2007a).

**Spatial Scale & Pattern [optional]:**

**Nations:** CA, MX, US

**States/Provinces:** BC, CA, MXBC, NV, OR, WA

**TNC Ecoregions [optional]:** 2:C, 4:C, 5:C, 6:C, 12:C, 13:C, 14:C, 16:C, 68:C

**USFS Ecoregions (2007):** 261B:CC, 262A:CC, 342B:PP, M242C:??, M261C:C?, M261D:CP, M261E:CP, M261F:C?, M261G:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** High. Some floristic overlap between groups may warrant combining some groups together.

**SYNONYMY**

- > California Vernal Pool (Barbour and Billings 2000) [Describes California variation of vernal pools. Does not cover Oregon and Washington vernal pools.]

**LOWER LEVEL UNITS**

**Groups:**

- G530 California Vernal Pool
- G529 Oregon-Washington-British Columbia Vernal Pool

**AUTHORSHIP**

**Primary Concept Source:** C.W. Witham et al. (1998)

**Author of Description:** G. Kittel, C. Chappell, R. Crawford, J. Morefield, P. Comer, T. Keeler-Wolf

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 4-11

**REFERENCES**

**References:** Barbour and Billings 2000, Barbour and Major 1988, Barbour et al. 2005, Barbour et al. 2007a, Barbour et al. 2007b, Belk 1998, Bjork 1997, Bjork and Dunwiddie 2004, Chappell and Christy 2004, Comer et al. 2003, Faber-Langendoen et al. 2015, Fristrom and Game 2011, Fugate 1998, Holland and Keil 1995, Morefield pers. comm., Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shiflet 1994, Stout et al. 2013, Witham et al. 1998

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2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

M074. Western North American Vernal Pool

## **G529. Oregon-Washington-British Columbia Vernal Pool**

**Type Concept Sentence:**

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**OVERVIEW**

**Scientific Name:** *Downingia* spp. - *Callitriche* spp. - *Eryngium* spp. North Pacific Vernal Pool Group

**Common Name (Translated Scientific Name):** Calicoflower species - Water-starwort species - Eryngo species North Pacific Vernal Pool Group

**Type Concept:** This group includes herbaceous wetlands that surround and occur within shallow ephemeral water bodies found in depressions among grasslands, shrub-steppe and open woodlands throughout intermountain valleys of Oregon, the San Juan and Gulf islands of Washington and British Columbia, and exposed volcanic scablands of the Columbia Plateau in Washington, Oregon, and northern Nevada. Hardpan vernal pools occur on soils with an indurated clay or cemented (Si or Fe) layer that retains water inputs throughout some portion of the spring, and that typically dry down completely into early summer months. In the San Juan and Gulf islands, they are created in small depressions in bedrock. Thus this group only occurs where there is hummocky micro-relief. These wetlands tend to be acidic wetlands. On the Columbia Plateau many pools are located on massive basalt flows, andesite or rhyodacite caprock. Inundation is highly irregular, sometimes not occurring for several years. Depressions usually (but not always) fill with water during winter and spring. They are generally dry again within nine months, though in exceptional times they can remain inundated for two years in a row. Water is from rainfall and snowmelt in relatively small closed basins, on average probably no more than 5-15 times the area of the ponds themselves. Pools are depressions with no outflows. Soils when present are typically silty clay, sometimes with sandy margins. Ponds are very small (3 square m) to large depressions (1600 square m). Due to drawdown characteristics, vernal pools typically form concentric rings of similar vegetation. Given their relative isolation in upland-dominated

landscapes, many endemic plant species are found in vernal pools. Characteristic species are predominantly annual and diverse. Northern scabland vernal pools share about a third of the species found in northern California vernal pools, but they don't share many of the more common dominant species. Currently very little quantitative plot data have been made available. *Eryngium petiolatum* and *Plagiobothrys figuratus* are known dominants that do not occur in California; however, it is assumed many more species could be used to differentiate between these similar groups. Characteristic species include *Callitriche marginata*, *Callitriche* spp., *Camissonia tanacetifolia*, *Deschampsia danthonioides*, *Downingia elegans*, *Elatine* spp., *Eleocharis* spp., *Epilobium densiflorum* (= *Boisduvalia densiflora*), *Eryngium petiolatum*, *Eryngium vaseyi*, *Grindelia nana*, *Isoetes orcuttii*, *Juncus uncialis*, *Myosurus minimus* (= *Myosurus x clavicaulis*), *Navarretia leucocephala* ssp. *diffusa*, *Pilularia americana*, *Plagiobothrys* spp., *Plagiobothrys figuratus*, *Plagiobothrys scouleri*, *Polyctenium williamsiae*, *Polygonum polygaloides* ssp. *confertiflorum*, *Polygonum polygaloides* ssp. *polygaloides*, *Psilocarphus brevissimus*, *Psilocarphus elatior*, *Psilocarphus oregonus*, *Trifolium cyathiferum*, *Triteleia hyacinthina*, and *Veronica peregrina*. In northern Nevada, most of the species by biomass are perennials and include *Juncus balticus*, *Carex douglasii*, *Muhlenbergia richardsonis*, and species of *Eleocharis*, *Polygonum*, *Rumex*, and *Polyctenium*.

**Classification Comments:** The associations that occur "throughout intermountain valleys of California" are not included here but are in California Vernal Pool Group (G530). Plot data are needed to better differentiate Oregon, Washington, and British Columbian vernal pools from California pools.

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G530 California Vernal Pool
- G803 Granitic Outcrop Pool

**Diagnostic Characteristics:** Single strata, herbaceous, seasonal dry, seasonal wet wetlands.

### VEGETATION

**Physiognomy and Structure:** Annual and perennial herbaceous.

**Floristics:** Given their relative isolation in upland-dominated landscapes, many endemic plant species are found in vernal pools. Characteristic species are predominantly annual and diverse. Northern scabland vernal pools share about a third of the species found in northern California vernal pools, but they don't share many of the more common dominant species. Currently very little quantitative plot data have been made available. *Eryngium petiolatum* and *Plagiobothrys figuratus* are known dominants that do not occur in California; however, it is assumed many more species could be used to differentiate between these similar groups. Characteristic species include *Callitriche marginata*, *Callitriche* spp., *Camissonia tanacetifolia*, *Deschampsia danthonioides*, *Downingia elegans*, *Elatine* spp., *Eleocharis* spp., *Epilobium densiflorum* (= *Boisduvalia densiflora*), *Eryngium petiolatum*, *Eryngium vaseyi*, *Grindelia nana*, *Isoetes orcuttii*, *Juncus uncialis*, *Myosurus minimus* (= *Myosurus x clavicaulis*), *Navarretia leucocephala* ssp. *diffusa*, *Pilularia americana*, *Plagiobothrys* spp., *Plagiobothrys figuratus*, *Plagiobothrys scouleri*, *Polyctenium williamsiae*, *Polygonum polygaloides* ssp. *confertiflorum*, *Polygonum polygaloides* ssp. *polygaloides*, *Psilocarphus brevissimus*, *Psilocarphus elatior*, *Psilocarphus oregonus*, *Trifolium cyathiferum*, *Triteleia hyacinthina*, and *Veronica peregrina*. In northern Nevada, most of the species by biomass are perennials and include *Juncus balticus*, *Carex douglasii*, *Muhlenbergia richardsonis*, and species of *Eleocharis*, *Polygonum*, *Rumex*, and *Polyctenium*.

G529 North Pacific Vernal Pool Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Danthonia unispicata</i> - <i>Poa secunda</i> Herbaceous Vegetation	G3/SNA	CEGL001783
<i>Deschampsia danthonioides</i> - <i>Grindelia squarrosa</i> Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000340
<i>Deschampsia danthonioides</i> - <i>Juncus bufonius</i> Grassland [Provisional]	GNR/SNR	CWWA000341
<i>Deschampsia danthonioides</i> Grassland [Provisional]	G2/S1	CWWA000178
<i>Eleocharis macrostachya</i> - ( <i>Eleocharis acicularis</i> , <i>Carex douglasii</i> ) Herbaceous Vegetation	GNR/SNR	CWWA000348
<i>Eleocharis palustris</i> Vernal Pool Vegetation	GNR/SNR	CWWA000349
<i>Navarretia leucocephala</i> - <i>Plagiobothrys leptocladus</i> - ( <i>Downingia</i> spp.) Herbaceous Vegetation	GNR/SNR	CWWA000367
<i>Plagiobothrys scouleri</i> - <i>Plantago bigelovii</i> Herbaceous Vegetation	G2/S1?	CEGL003459
<i>Polygonum polygaloides</i> Vernal Pool Vegetation	GNR/SNR	CWWA000384

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Mediterranean climate with mild winters and dry summers; interior Washington vernal pools have colder winters. *Soil/substrate/hydrology:* Vernal pools form in areas with a hummocky micro-relief, within bedrock or soil underlain by a hardpan restricting water drainage. Hardpan vernal pools can have an indurated clay or cemented (Si or Fe) hardpan that retains water inputs throughout some portion of the spring, and typically the depression dries down entirely into early summer months. In the Sand Juan and Gulf islands, they are created in small depressions in bedrock. These wetlands tend to be acidic. In the interior of Washington and Oregon, many pools are located on massive basalt flows, andesite or rhyodacite caprock. Inundation is highly irregular, sometimes not occurring for several years. Depressions usually (but not always) fill with water during winter and spring. They are generally dry again within nine months, though in exceptional times they can remain inundated for two years in a row. Water is from rainfall and snowmelt in relatively small closed basins, on average probably no more than 5-15 times the area of the ponds themselves. Soils are silty clay, sometimes with sandy margins. Environmental information compiled from Chappell and Christy (1994), Bjork (1997), and Bjork and Dunwiddie (2004).

**Dynamics:** Pools fill up during winter and spring rains and dry completely by fall.

### DISTRIBUTION

**Geographic Range:** Vernal pools occur in grasslands and open woodlands throughout intermountain valleys of Oregon and the Gulf and San Juan islands of Washington, and in the northern Columbia Basin and perhaps the Okanagan Valley in British Columbia, and to the western portion of the Great Basin in Nevada.

**Nations:** CA, US

**States/Provinces:** BC, NV, OR, WA

**TNC Ecoregions [optional]:** 2:C, 4:C, 5:C, 6:C, 14:C, 68:C

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Low. Some floristic overlap with northern California vernal pools (California Vernal Pool Group (G530)). It has been suggested to combine the Modoc and Columbia Plateau vernal pools into their own group, as they have distinct floristics and broader range in minimum and maximum annual temperatures than the vernal pools on the coastal side of the Cascade Range.

### SYNONYMY

### LOWER LEVEL UNITS

**Alliances:**

- A2627 *Plagiobothrys figuratus* - *Plagiobothrys scouleri* Herbaceous Alliance
- A2625 *Eryngium petiolatum* Herbaceous Alliance

### AUTHORSHIP

**Primary Concept Source:** C. Chappell and R. Crawford, in Faber-Langendoen et al. (2011)

**Author of Description:** C. Chappell, R. Crawford, J. Morefield, G. Kittel

**Acknowledgments:**

**Version Date:** 2015/05/11

### REFERENCES

**References:** Bjork 1997, Bjork and Dunwiddie 2004, Chappell and Christy 2004, Faber-Langendoen et al. 2015, Holland and Keil 1995

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

## M073. Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh

**Type Concept Sentence:** This macrogroup includes freshwater shrublands, meadows, marshes and mudflat wetlands, with mostly mineral soils that are that are poorly to well-drained and seasonally wet to saturated, occurring at low elevations from the Pacific coast inland to the Rocky Mountains.

### OVERVIEW

**Scientific Name:** Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh Macrogroup

**Common Name (Translated Scientific Name):** Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh Macrogroup

**Type Concept:** This macrogroup includes freshwater shrublands, meadows, marshes and mudflat wetlands. Stands include riparian shrublands, herbaceous meadows, emergent marshes and sparse mudflats dominated by low forbs. Dominant shrubs include *Acer glabrum*, *Alnus incana* ssp. *tenuifolia*, *Alnus viridis* ssp. *crispa*, *Alnus viridis* ssp. *sinuata*, *Artemisia cana*, *Cornus sericea*, *Crataegus douglasii*, *Crataegus rivularis*, *Dasiphora fruticosa* ssp. *floribunda*, *Malus fusca*, *Philadelphus lewisii*, *Prunus virginiana*, *Rhus trilobata*, *Rosa nutkana*, *Rosa woodsii*, *Rubus spectabilis*, many *Salix* spp., *Shepherdia argentea*, *Spiraea douglasii*, and *Symphoricarpos* spp. Herbaceous species are quite varied and include graminoids *Calamagrostis canadensis*, *Carex aquatilis* var. *dives* (= *Carex sitchensis*), *Carex flava* (= *Carex nevadensis*), *Carex lyngbyei*, *Carex mackenziei*, *Carex obnupta*, *Carex pellita* (= *Carex lanuginosa*), *Carex praegracilis*, *Carex utriculata*, *Cyperus* spp., *Deschampsia beringensis*, *Deschampsia caespitosa*, *Eleocharis obtusa*, *Eleocharis palustris*, *Elymus trachycaulus*, *Eragrostis hypnoides*, *Glyceria striata*, *Juncus balticus*, *Juncus lesueurii*, *Juncus nevadensis*, *Leymus cinereus*, *Leymus mollis*, *Muhlenbergia filiformis*, *Muhlenbergia richardsonis*, *Pascopyrum smithii*, *Paspalum distichum*, *Phalaris* spp., *Poa cusickii*, *Poa secunda* (= *Poa nevadensis*), *Schoenoplectus americanus*, *Schoenoplectus pungens*, *Typha domingensis*, and *Typha latifolia*; forbs *Achillea millefolium* var. *borealis* (= *Achillea borealis*), *Angelica lucida*, *Argentina anserina* (= *Potentilla anserina*), *Argentina egedii*, *Bidens* spp., *Castilleja* spp., *Cicuta* spp., *Crassula aquatica*, *Euthamia occidentalis*, *Galium triflorum*, *Gnaphalium palustre*, *Heracleum maximum*, *Hydrocotyle umbellata*, *Iris missouriensis*, *Lathyrus japonicus* var. *maritimus*, *Lilaeopsis occidentalis*, *Limosella aquatica*, *Ludwigia palustris*, *Lupinus nootkatensis*, *Lysichiton americanus*, *Maianthemum stellatum*, *Mimulus* spp., and *Parnassia palustris*; ferns and fern allies *Athyrium filix-femina*, *Equisetum arvense*, *Equisetum fluviatile*, *Equisetum variegatum*, and *Gymnocarpium dryopteris*; and mosses *Sphagnum* spp. These species are associated with wetlands that occur on poorly drained or well-drained seasonally wet to saturated soils that may dry out completely during the growing season, and are mostly on mineral or shallow (<30 cm) organic or muck soils over mineral substrates. This type ranges from southern Alaska to northern New Mexico, and includes only freshwater, non-saline wetlands that occur in lowland elevations, from sea level to about 1830 m (6000 feet) (generally below the transition from montane forests to lowland grasslands and shrublands).

**Classification Comments:** Is the floristic variability here greater than it is for peatlands or forested wetlands? For peatlands the macrogroups are more finely divided among floristic regions (North Pacific, Vancouverian) and the forested are split biogeographically at the division level! However, here all western shrublands, wet meadows and marshes are only split out at the group level. Are there data justifying that the floristics of this macrogroup (M073) are much more homogenous than those of other wetland types? If they show as much variability as those other groups, then some consistency is needed in how the macrogroups are defined: Vancouverian, Rocky Mountain, Intermountain Basin. Or, to keep logic consistency, those other macrogroup should be lumped (i.e., M063 and M064 = Western North American Bog & Fen (J. Rocchio pers. comm. 2014). Should swamp versus riparian be more consistently applied within the groups of this macrogroup? Great Plains wetland. Possible split: (1) Within 2.B.6 Nb, split M073 into two macrogroups for Vancouverian/Temperate Pacific (G322+G517+G525) and Western North American Interior (G526+G531) bioregions. (2) Consider a physiognomic-based macrogroup within M073--although might that make more sense at division scale?

**Similar NVC Types:** Communities dominated by *Eleocharis palustris* can occur in Western North American Vernal Pool Macrogroup (M074) but usually have vernal pool associate species as well, though not always.

- M172 Northern Vancouverian Lowland-Montane Grassland & Shrubland
- M050 Southern Vancouverian Lowland Grassland & Shrubland
- M074 Western North American Vernal Pool
- M075 Western North American Montane-Subalpine Wet Shrubland & Wet Meadow: overlaps in floristics and ecology, including Vancouverian & Rocky Mountain Montane Wet Meadow & Marsh Group (G521) and Western Montane-Subalpine Riparian & Seep Shrubland Group (G527).
- M301 Western North American Ruderal Wet Shrubland, Meadow & Marsh
- M076 Warm Desert Lowland Freshwater Shrubland, Meadow & Marsh
- M071 Great Plains Wet Meadow, Marsh & Playa: extends west to the Rocky Mountain foothills.
- M109 Western North American Freshwater Aquatic Vegetation

**Diagnostic Characteristics:** This macrogroup includes a broad range of species associated with freshwater shrublands, meadows, marshes and mudflat wetlands. Stands include riparian shrublands, herbaceous meadows, emergent marshes and sparse mudflats dominated by low forbs. See the floristics section for details.

## VEGETATION

**Physiognomy and Structure:** Deciduous broadleaf shrublands, short to tall (0.5-5 m) and low-statured herbaceous wetlands dominated by perennial graminoids, annual plants or emergent vegetation.

**Floristics:** Dominant shrubs include *Acer glabrum*, *Alnus incana* ssp. *tenuifolia*, *Alnus viridis* ssp. *sinuata*, *Artemisia cana*, *Cornus sericea*, *Crataegus douglasii*, *Crataegus rivularis*, *Dasiphora fruticosa* ssp. *floribunda*, *Malus fusca*, *Philadelphus lewisii*, *Prunus*

*virginiana*, *Rhus trilobata*, *Rosa nutkana*, many *Salix* spp., *Shepherdia argentea*, *Spiraea douglasii*, and *Symphoricarpos* spp. Herbaceous species are quite varied and include graminoids *Calamagrostis canadensis*, *Carex aquatilis* var. *dives* (= *Carex sitchensis*), *Carex flava* (= *Carex nevadensis*), *Carex lyngbyei*, *Carex mackenziei*, *Carex obnupta*, *Carex pellita* (= *Carex lanuginosa*), *Carex praegracilis*, *Carex utriculata*, *Cyperus* spp., *Deschampsia beringensis*, *Deschampsia caespitosa*, *Eleocharis obtusa*, *Eleocharis palustris*, *Elymus trachycaulus*, *Eragrostis hypnoides*, *Glyceria striata*, *Juncus balticus*, *Juncus lesueurii*, *Leymus cinereus*, *Leymus mollis*, *Muhlenbergia richardsonis*, *Pascopyrum smithii*, *Paspalum distichum*, *Phalaris* spp., *Poa cusickii*, *Poa secunda* (= *Poa nevadensis*), *Schoenoplectus americanus*, *Schoenoplectus pungens*, *Typha domingensis*, and *Typha latifolia*; forbs *Achillea millefolium* var. *borealis* (= *Achillea borealis*), *Angelica lucida*, *Argentina anserina* (= *Potentilla anserina*), *Argentina egedii*, *Bidens* spp., *Castilleja* spp., *Cicuta* spp., *Crassula aquatica*, *Euthamia occidentalis*, *Galium triflorum*, *Gnaphalium palustre*, *Heracleum maximum*, *Hydrocotyle umbellata*, *Iris missouriensis*, *Lathyrus japonicus* var. *maritimus*, *Lilaeopsis occidentalis*, *Limosella aquatica*, *Ludwigia palustris*, *Lupinus nootkatensis*, *Lysichiton americanus*, *Maianthemum stellatum*, *Mimulus* spp., and *Parnassia palustris*; ferns and fern allies *Athyrium filix-femina*, *Equisetum arvense*, *Equisetum fluviatile*, *Equisetum variegatum*, and *Gymnocarpium dryopteris*; and mosses *Sphagnum* spp.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** Environmental settings include bottomlands along drainages, river floodplain depressions, glacial or other depressions, cienegas, oxbow lakes, seeps and springs, frequently flooded gravel bars, low-lying sidebars, infilled side channels, small ponds, ditches, small interdunal depressions to extensive deflation plains behind stabilized foredunes, slow-moving streams, perennial streams in valleys and mountain foothills, and lakeshore mudflats. Elevations range from sea level to 1830 m (0-6000 feet). *Soil/substrate/hydrology:* Substrates are variable but are generally fine-textured, alluvial soil, coarse loam, sandy loam, sand, and silt. Hydrologic regimes vary from seasonal inundation followed by complete soil desiccation to year-round standing water. Water may be poorly oxygenated or nitrogen-rich and at or above the ground surface for most of the growing season. A consistent source of freshwater is essential to the function of these systems. Rarely, water is brackish.

**Dynamics:** These wetlands are subject to flooding, groundwater discharge, or surface inundation, resulting from proximity to waterbodies, including tidal pulses of freshwater, or subsurface water due to high water table. Flooding may be accompanied by burial by sand and other coarse material. A fluctuating water table may expose some areas to scour by wind. They may be heavily inundated for at least part of the growing season, impeding the establishment of tree species. Isolated wetlands in dune systems are subject to changes in the size and location of the wet swales as the sand dunes shift with active dune migration.

#### DISTRIBUTION

**Geographic Range:** This macrogroup is found from the northernmost Aleutian Islands to Cook Inlet Basin and Prince William Sound, Alaska, south along the Pacific Coast to California, into the temperate western North American interior (interior British Columbia, Columbia Basin, Great Basin, Colorado Plateau, and higher intermountain basins) and in dune wetlands across the intermountain western U.S.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX?, US

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

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 242A:CC, 242B:CC, 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 322A:CC, 331A:CC, 331B:CC, 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 331K:C?, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

#### Omernik Ecoregions:

#### Federal Lands [optional]:

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate. Geographic range is really wide.

#### SYNONYMY

- < Wetlands (217) (Shiflet 1994)

#### LOWER LEVEL UNITS

#### Groups:

- G525 Temperate Pacific Freshwater Wet Mudflat
- G517 Vancouverian Freshwater Wet Meadow & Marsh
- G322 Vancouverian Wet Shrubland



**AUTHORSHIP****Primary Concept Source:** Faber-Langendoen et al. (2014)**Author of Description:** G. Kittel, K. Boggs, C. Chappell, P. Comer, M.S. Reid, M.E. Hall, J. Christy**Acknowledgments:****Version Date:** 10/15/2014**Classif Resp Region:** West**Internal Author:** GK 10-14**REFERENCES**

**References:** Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Banner et al. 1986, Banner et al. 1993, Barbour and Billings 1988, Barbour and Major 1988, Bezanson 2000, Boggs 2000, Boggs 2002, Boggs et al. 2008b, Bowers 1982, Bowers 1984, Bowers 1986, Brand and Sanderson 2002, Brown 1982a, Carr 1991, Carr 2004, Carsey et al. 2003a, Chappell and Christy 2004, Christy 2004, Comer et al. 2003, Comer et al. 2013a, Cooper and Severn 1992, Crowe and Clausnitzer 1997, Crowe et al. 2004, Daubenmire 1952, DeLong 2003, DeLong et al. 1993, DeLong et al. 1994, DeVelice et al. 1999, Dick-Peddie 1993, Ecosystems Working Group 1998, El-Hage and Moulton 1998, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Hammond 1998, Hansen et al. 1988b, Hansen et al. 1989, Hendrickson and Minckley 1984, Holland and Keil 1995, Jahrsdoerfer and Leslie 1988, Johnson and Simon 1985, Johnson, J. pers. comm., Kittel et al. 1999b, Kittel et al. 2012b, Kovalchik 1987, Kovalchik 1993, Kunze 1994, Lloyd et al. 1990, MacKenzie and Moran 2004, MacKinnon et al. 1990, Manning and Padgett 1989, Manning and Padgett 1995, Meidinger et al. 1988, Muldavin et al. 1994b, Muldavin et al. 2000a, Muldavin et al. 2000b, PRBO Conservation Science 2011, Padgett et al. 1989, Pineda 2000, Pineda et al. 1999, Rondeau 2001, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, Shephard 1995, Shiflet 1994, Sparks et al. 1977, Steen and Coupé 1997, Stone 1993, Szaro 1989, TPWD 1989d, Ungar 1965, Ungar 1972, Viereck et al. 1992, Walford 1996, Walford et al. 1997, Walford et al. 2001

2. Shrub &amp; Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow &amp; Marsh

M073. Vancouverian Lowland Wet Shrubland, Wet Meadow &amp; Marsh

**G525. Temperate Pacific Freshwater Wet Mudflat****Type Concept Sentence:****OVERVIEW****Scientific Name:** *Eleocharis obtusa* - *Eragrostis hypnoides* - *Ludwigia palustris* Temperate Pacific Freshwater Wet Mudflat Group**Common Name (Translated Scientific Name):** Blunt Spikerush - Teal Lovegrass - Marsh Seedbox Temperate Pacific Freshwater Wet Mudflat Group

**Type Concept:** This group consists of associations that occur on freshwater mudflats that are found scattered throughout the temperate regions of the Pacific Coast of North America. In the Pacific Northwest, they occur primarily in seasonally or tidally flooded shallow lakebeds and on floodplains, especially along the lower Columbia River. During any one year, they may be absent because of year-to-year variation in river water levels. Mudflats must be exposed before the vegetation develops from the seedbank. They are dominated mainly by low-statured annual plants. They range in physiognomy from sparsely vegetated mud to extensive sods of herbaceous vegetation. The predominant species include *Eleocharis obtusa*, *Lilaeopsis occidentalis*, *Crassula aquatica*, *Limosella aquatica*, *Gnaphalium palustre*, *Eragrostis hypnoides*, and *Ludwigia palustris*.

**Classification Comments:****Internal Comments:** DFL 11-20-12: Canada added. mjr 5-11: AK added from AK workshop.**Other Comments:****Similar NVC Types:**

- G385 North American Pacific Intertidal Algal Flat

**Diagnostic Characteristics:** Extensive tidally or seasonally drained shallow lakebeds or floodplains exposing mudflats that may develop low-statured herbaceous annual vegetation.

**VEGETATION**

**Physiognomy and Structure:** Low-statured annual plants from sparsely vegetated mud to extensive sods of herbaceous vegetation.

**Floristics:** The predominant species include *Cyperus squarrosus*, *Eleocharis obtusa*, *Lilaeopsis occidentalis*, *Crassula aquatica*, *Limosella aquatica*, *Gnaphalium palustre*, *Eragrostis hypnoides*, *Rorippa curvisiliqua*, and *Ludwigia palustris*.

G525 Temperate Pacific Freshwater Wet Mudflat Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Eleocharis obtusa</i> Herbaceous Vegetation	G4/SU	CEGL003326
<i>Eleocharis ovata</i> - <i>Ludwigia palustris</i> Herbaceous Vegetation	G2/S2	CWWA000217
<i>Eragrostis hypnoides</i> - <i>Gnaphalium palustre</i> Herbaceous Vegetation [Provisional]	G2/SU	CEGL003327
<i>Lilaeopsis occidentalis</i> Herbaceous Vegetation	G3/S2	CEGL003329

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Temperate. *Soil/substrate/hydrology:* Seasonally flooded shallow lakebeds and on floodplains.

**Dynamics:** May be absent because of year-to-year variation in river water levels. Mudflats must be exposed before the vegetation develops from the seedbank.

#### DISTRIBUTION

**Geographic Range:** This group is found throughout the temperate regions of the Pacific Coast of North America.

**Nations:** CA, US

**States/Provinces:** AK, CA, OR, WA

**TNC Ecoregions [optional]:** 2:C, 14:C, 15:C, 16:C

**USFS Ecoregions (2007):** 242A:CC, 242B:CC, M242A:CC, M242C:CP, M242D:CP

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

#### LOWER LEVEL UNITS

#### Alliances:

- A3901 *Lilaeopsis occidentalis* Freshwater Tidal Herbaceous Alliance
- A3850 *Bidens cernua* - *Euthamia occidentalis* - *Ludwigia palustris* Herbaceous Forb Mudflat Alliance
- A3851 *Eleocharis obtusa* - *Eragrostis hypnoides* Herbaceous Graminoid Mudflat Alliance

#### AUTHORSHIP

**Primary Concept Source:** C. Chappell, in Faber-Langendoen et al. (2011)

**Author of Description:** C. Chappell and G. Kittel

**Acknowledgments:**

**Version Date:** 2013/09/06

#### REFERENCES

**References:** Chappell and Christy 2004, Christy 2004, Faber-Langendoen et al. 2015, Holland and Keil 1995

2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

M073. Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh

### G517. Vancouverian Freshwater Wet Meadow & Marsh

**Type Concept Sentence:**

#### OVERVIEW

**Scientific Name:** *Deschampsia beringensis* - *Argentina egedii* - *Carex obnupta* Vancouverian Freshwater Coastal Marsh & Meadow Group

**Common Name (Translated Scientific Name):** Bering's Tufted Hairgrass - Pacific Silverweed - Slough Sedge Vancouverian Freshwater Coastal Marsh & Meadow Group

**Type Concept:** These coastal freshwater wetlands range from south of San Luis Obispo County, California, north through Coos Bay, Oregon, and continue north along the coast to the northern Aleutian Islands. Coastal freshwater wetlands are found in interdunal

areas, on delta deposits, uplifted marshes, or beach deposits. They occur inland of tidal marshes and are common along sloughs and levees. Within dune areas, freshwater wetlands are often part of larger active and stabilized coastal barrier islands, spits, and coastal dunes, where they can be referred to as "slack dune ponds" when associated with larger and deeper water or "coastal dune swales" when water is shallow. They typically occur behind active foredunes, especially where the base of the dunes are at or near groundwater levels. In Alaska, slacks between dunes are colonized by *Equisetum variegatum* and other herbaceous species. Shrubs such as *Salix commutata*, *Salix sitchensis*, and *Myrica gale* can invade as sites become less wet due to isostatic rebound or burial by sand deposits. Organic mats may be present. Wet meadows are dominated by a wide variety of graminoids and forbs, including *Deschampsia beringensis*, *Festuca rubra*, *Argentina egedii* (= *Potentilla egedii*), *Lathyrus japonicus* var. *maritimus*, *Castilleja* spp., *Heracleum maximum*, *Parnassia palustris*, *Lupinus nootkatensis*, *Achillea millefolium* var. *borealis* (= *Achillea borealis*), *Angelica lucida*, and *Carex mackenziei*. *Leymus mollis* and *Lupinus nootkatensis* are common on levees, and *Carex lyngbyei* often dominates in sloughs and wet depressions. Dune slacks in Oregon and Washington are colonized by *Carex obnupta*, *Argentina egedii*, *Juncus lesueurii*, *Juncus nevadensis*, *Salix hookeriana*, and various other emergent species. In the south from southern Oregon to San Luis Obispo County, California, common plant species include *Argentina anserina* (= *Potentilla anserina*), *Hydrocotyle umbellata*, *Euthamia occidentalis*, *Juncus* spp., *Carex obnupta*, and *Sparganium* spp.

#### Classification Comments:

**Internal Comments:** DFL 11-20-12: Canada added.

**Other Comments:**

#### Similar NVC Types:

- G498 North Pacific Maritime Coastal Scrub & Herb Beach & Dune: differs in being composed of upland vegetation that can have more woody vegetation.
- G521 Vancouverian & Rocky Mountain Montane Wet Meadow & Marsh
- G524 Western North American Ruderal Wet Shrubland, Meadow & Marsh
- G499 Temperate Pacific Tidal Salt & Brackish Marsh: differs in being a saltwater or brackish water wetland.

**Diagnostic Characteristics:** Freshwater herbaceous or shrubby wetlands in dune complexes, behind deltas and coastal upper marshes, influenced by tides and inland freshwater pulses.

### VEGETATION

**Physiognomy and Structure:** Low-statured herbaceous wetlands dominated by graminoid with some low shrubs, usually fringing or surrounding small freshwater ponds within sand dunes.

**Floristics:** The floristics of this group have a gradual overlapping gradation from south to north, resulting in complete species replacement. *Carex obnupta* and *Argentina anserina* occur in California and overlap with Oregon and Washington and southern British Columbia stands. Before these species drop out, *Argentina egedii*, *Leymus mollis*, and *Carex lyngbyei* begin to overlap and continue through the northern extent of the range. In Alaska, slacks between dunes are colonized by *Equisetum variegatum* and other herbaceous species. Shrubs such as *Salix commutata*, *Salix sitchensis*, and *Myrica gale* can invade as sites become less wet due to isostatic rebound or burial by sand deposits. Organic mats may be present. Wet meadows are dominated by a wide variety of graminoids and forbs, including *Deschampsia beringensis*, *Festuca rubra*, *Argentina egedii* (= *Potentilla egedii*), *Lathyrus japonicus* var. *maritimus*, *Castilleja* spp., *Heracleum maximum*, *Parnassia palustris*, *Lupinus nootkatensis*, *Achillea millefolium* var. *borealis* (= *Achillea borealis*), *Angelica lucida*, and *Carex mackenziei*. *Leymus mollis* and *Lupinus nootkatensis* are common on levees, and *Carex lyngbyei* often dominates in sloughs and wet depressions. Dune slacks in Oregon and Washington are colonized by *Carex obnupta*, *Argentina egedii*, *Juncus lesueurii*, *Juncus nevadensis*, *Salix hookeriana*, and various other emergent species. In the south from southern Oregon to San Luis Obispo County, California, common plant species include *Argentina anserina* (= *Potentilla anserina*), *Hydrocotyle umbellata*, *Euthamia occidentalis*, *Juncus* spp., *Carex obnupta*, and *Sparganium* spp. Floristic information compiled from Sparks et al. (1977), Barbour and Major (1988), Viereck et al. (1992), Stone (1993), Shiflet (1994), Holland and Keil (1995), Sawyer and Keeler-Wolf (1995), and Boggs (2000).

G517 Vancouverian Freshwater Wet Meadow & Marsh Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Adiantum pedatum</i> Pacific Coast Herbaceous Vegetation [Provisional]	G4G5/S3	CWWA000027
<i>Athyrium filix-femina</i> Coastal Herbaceous Vegetation	G4?/S2	CWWA000048
<i>Bidens cernua</i> Herbaceous Vegetation [Provisional]	G3/S2S3	CEGL003324
<i>Bidens frondosa</i> Herbaceous Vegetation	G4/S1	CTWA003325
<i>Caltha palustris</i> - <i>Lysichiton americanus</i> Herbaceous Vegetation	G3/S2	CWWA000055

<b>G517 Vancouverian Freshwater Wet Meadow &amp; Marsh Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Camassia quamash</i> - <i>Triteleia hyacinthina</i> Herbaceous Vegetation	GNR/S1S2	CWWA000210
<i>Camassia quamash</i> Wet Prairie Herbaceous Vegetation	G3/S1S2	CEGL003341
<i>Carex aperta</i> Herbaceous Vegetation	G1?/S1	CEGL001801
<i>Carex aquatilis</i> var. <i>dives</i> - <i>Comarum palustre</i> Herbaceous Vegetation	G2/S2	CEGL003433
<i>Carex densa</i> - <i>Deschampsia cespitosa</i> Herbaceous Vegetation [Provisional]	G2/S1	CEGL003455
<i>Carex densa</i> - <i>Eleocharis palustris</i> Herbaceous Vegetation [Provisional]	G4/SU	CEGL003456
<i>Carex deweyana</i> ssp. <i>leptopoda</i> Herbaceous Vegetation [Provisional]	GNR/SU	CWWA000212
<i>Carex exsiccata</i> Herbaceous Vegetation	G2G3/S2S3	CEGL003312
<i>Carex feta</i> Herbaceous Vegetation [Provisional]	GNR/SU	CWWA000214
<i>Carex interrupta</i> Herbaceous Vegetation	G3G4/S3?	CWWA000176
<i>Carex lyngbyei</i> Herbaceous Vegetation	G4/S2	CEGL003369
<i>Carex obnupta</i> - ( <i>Carex aquatilis</i> var. <i>dives</i> , <i>utriculata</i> ) Herbaceous Vegetation	GNR/SNR	CWWA000250
<i>Carex obnupta</i> - <i>Argentina egedii</i> ssp. <i>egedii</i> Herbaceous Vegetation	G4/S2?	CEGL001820
<i>Carex obnupta</i> Herbaceous Vegetation	G4/S4	CEGL003313
<i>Carex pachystachya</i> Herbaceous Vegetation	GNR/SU	CWWA000215
<i>Carex pellita</i> Wet Prairie Herbaceous Vegetation	GNR/SNR	CWWA000269
<i>Carex unilateralis</i> - <i>Hordeum brachyantherum</i> Herbaceous Vegetation	G2/S1	CEGL001830
<i>Deschampsia caespitosa</i> - <i>Artemisia lindleyana</i> Herbaceous Vegetation	G1/S1	CEGL003425
<i>Deschampsia caespitosa</i> - <i>Danthonia californica</i> Herbaceous Vegetation	G2/S1	CEGL001604
<i>Eleocharis obtusa</i> Herbaceous Vegetation [Provisional]	G4/SU	CEGL003326
<i>Eleocharis ovata</i> - <i>Ludwigia palustris</i> Herbaceous Vegetation	G2/S2	CWWA000217
<i>Eleocharis palustris</i> - <i>Carex unilateralis</i> Herbaceous Vegetation	G2/S1	CEGL003411
<i>Eleocharis palustris</i> Pacific Coast Herbaceous Vegetation	GNR/SNR	CWWA000431
<i>Eleocharis rostellata</i> Herbaceous Vegetation	G3/S1	CEGL003428
<i>Equisetum arvense</i> Herbaceous Vegetation	G5/S5	CEGL003314
<i>Equisetum fluviatile</i> Pacific Coast Herbaceous Vegetation	GNR/SNR	CWWA000354
<i>Equisetum telmateia</i> Herbaceous Vegetation	GNR/S4Q	CWWA000218
<i>Euthamia occidentalis</i> Herbaceous Vegetation	G3/S3	CEGL003328
<i>Glyceria striata</i> Pacific Coast Herbaceous Vegetation	GNR/SNR	CWWA000422
<i>Isoetes nuttallii</i> Herbaceous Vegetation	G3/S1	CEGL003343
<i>Juncus articulatus</i> Herbaceous Vegetation	GNR/SUQ	CWWA000219
<i>Juncus balticus</i> Pacific Coast Herbaceous Vegetation	GNR/S3	CWWA000248
<i>Juncus bufonius</i> Herbaceous Vegetation	G5/S5	CTWA003316
<i>Juncus effusus</i> Pacific Coast Herbaceous Vegetation	G5/S5	CEGL003317
<i>Juncus falcatus</i> - <i>Juncus (lesueurii, nevadensis)</i> Herbaceous Vegetation	G3/S1?	CWWA000093
<i>Lilaeopsis occidentalis</i> Herbaceous Vegetation [Provisional]	G3/S2	CEGL003329
<i>Ludwigia palustris</i> - <i>Polygonum hydropiperoides</i> Herbaceous Vegetation	G2/S1S2	CEGL003330
<i>Mimulus guttatus</i> - <i>Bryum miniatum</i> Herbaceous Vegetation	G4/S3S4	CTWA003373
<i>Mimulus guttatus</i> Seep Herbaceous Vegetation [Provisional]	GNR/SNR	CWWA000268
<i>Oenanthe sarmentosa</i> Herbaceous Vegetation	G4/S3S4	CEGL003319
<i>Paspalum distichum</i> Herbaceous Vegetation	G3/S2	CEGL003320
<i>Petasites frigidus</i> Herbaceous Vegetation	G5/S5	CWWA000116
<i>Ranunculus flammula</i> - <i>Juncus nevadensis</i> - <i>Carex lenticularis</i> Herbaceous Vegetation	G1/S1	CEGL003426
<i>Rosa nutkana</i> / <i>Deschampsia cespitosa</i> Shrubland [Provisional]	G2/SU	CEGL003344

<b>G517 Vancouverian Freshwater Wet Meadow &amp; Marsh Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Sagittaria latifolia</i> Herbaceous Vegetation	G2/S1	CEGL003321
<i>Schoenoplectus (acutus, tabernaemontani)</i> Pacific Coast Herbaceous Vegetation	GNR/SNR	CWWA000432
<i>Scirpus atrocinctus</i> Herbaceous Vegetation [Provisional]	GNR/SUQ	CWWA000238
<i>Scirpus microcarpus</i> Pacific Coast Herbaceous Vegetation	GNR/SNR	CWWA000420
<i>Stachys ciliata</i> Herbaceous Vegetation	G4/S4	CWWA000156
<i>Triteleia hyacinthina</i> Herbaceous Vegetation	GNR/S2	CWWA000243
<i>Typha latifolia</i> Pacific Coast Herbaceous Vegetation	G5/S5	CEGL002010

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Winter precipitation elevates the water table and inundates some communities to a depth of 1 m (3 feet). *Soil/substrate/hydrology:* In Oregon and Washington, habitat ranges from small interdunal depressions to extensive deflation plains behind stabilized foredunes. The seasonal rise in water table also causes vernal pools to form in forested sites on old deflation plains. These pools are teeming with invertebrates and are temporary sources of food and breeding grounds for amphibians and waterfowl. Some wetlands are perched on an iron-cemented duripan, and groundwater may be charged with iron. pH ranges from 5.0-6.3 (6.9), with low conductivity. Moist and wet meadows associated with delta deposits, uplifted marshes, or beach deposits occur inland of tidal marshes and are also common along sloughs and levees. Environmental information compiled from Sparks et al. (1977), Barbour and Major (1988), Viereck et al. (1992), Stone (1993), Shiflet (1994), Holland and Keil (1995), Sawyer and Keeler-Wolf (1995), and Boggs (2000).

**Dynamics:** This group is subject to flooding, burial by sand, scour by wind, and tidal pluses of freshwater.

#### DISTRIBUTION

**Geographic Range:** This group occurs along the coast from San Luis Obispo County, California, north through Oregon, Washington, British Columbia, and Alaska, including Kodiak Island, and continues to the northernmost Aleutian Islands.

**Nations:** CA, US

**States/Provinces:** AK, CA, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- < III.A.1.e - Hair-grass (Viereck et al. 1992)
- < III.B.2.a - Mixed herbs (Viereck et al. 1992)
- < Wetlands (217) (Shiflet 1994)

#### LOWER LEVEL UNITS

**Alliances:**

- A3820 *Danthonia californica* - *Carex lenticularis* - *Deschampsia caespitosa* Coastal & Lowland Herbaceous Alliance
- A1468 *Carex aperta* Herbaceous Alliance
- A3821 *Camassia quamash* - *Isoetes nuttallii* - *Carex unilateralis* Lowland Wet Prairie Herbaceous Alliance
- A1660 *Corydalis scouleri* Herbaceous Vegetation Alliance
- A3822 *Carex obnupta* Herbaceous Alliance
- A4080 *Oenanthe sarmentosa* Herbaceous Alliance

#### AUTHORSHIP

**Primary Concept Source:** K. Boggs, J. Christy, T. Keeler-Wolf, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:** K. Boggs, T. Boucher, J. Christy, P. Comer, T. Keeler-Wolf

**Version Date:** 2010/12/20

## REFERENCES

**References:** Barbour and Major 1988, Boggs 2000, Faber-Langendoen et al. 2015, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Sparks et al. 1977, Stone 1993, Viereck et al. 1992

## 2. Shrub &amp; Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

M073. Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh

**G322. Vancouverian Wet Shrubland****Type Concept Sentence:**

## OVERVIEW

**Scientific Name:** *Alnus* spp. - *Salix* spp. - *Spiraea* spp. Lowland Riparian & Wet Slope Shrubland Group

**Common Name (Translated Scientific Name):** Alder species - Willow species - Meadowsweet species Lowland Riparian & Wet Slope Shrubland Group

**Type Concept:** This group includes shrublands that occur on poorly drained or well-drained seasonally wet to saturated soils that may dry out completely during the growing season, mostly on mineral or shallow (<30 cm) organic or muck soils over mineral substrates. This includes wet shrublands throughout the Pacific Northwest Coast, from Cook Inlet and Prince William Sound, Alaska, to the southern coast of Oregon. These are deciduous broadleaf tall shrublands that are located in depressions, around lakes or ponds, or river terraces where water tables fluctuate seasonally (mostly seasonally flooded regime), in areas that receive nutrient-rich waters. These depressions are poorly drained with fine-textured organic, muck or mineral soils and standing water common throughout the growing season. *Alnus viridis* ssp. *sinuata* often dominates the shrub layer, but many *Salix* species may also occur. The shrub layer can have many dead stems. However, various species of *Salix*, *Spiraea douglasii*, *Malus fusca*, *Cornus sericea*, *Alnus incana* ssp. *tenuifolia* (= *Alnus tenuifolia*), *Alnus viridis* ssp. *crispa* (= *Alnus crispa*), and/or *Alnus viridis* ssp. *sinuata* (= *Alnus sinuata*) can be the major dominants. They may occur in mosaics with marshes or forested swamps, being on average more wet than forested swamps and more dry than marshes. However, it is also frequent for them to dominate entire wetland systems. Wetland species, including *Carex aquatilis* var. *dives* (= *Carex sitchensis*), *Carex utriculata*, *Equisetum fluviatile*, and *Lysichiton americanus*, dominate the understory. On some sites, *Sphagnum* spp. are common in the understory.

**Classification Comments:**

**Internal Comments:** MSR 11-14: desc needs to include *Morella californica*. mjr 10-12: CA added based on member association distribution.

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

- G254 North Pacific Lowland Riparian Forest & Woodland
- G354 Vancouverian Alder - Salmonberry - Willow Shrubland
- G527 Western Montane-Subalpine Riparian & Seep Shrubland
- G526 Rocky Mountain & Great Basin Lowland & Foothill Riparian Shrubland: has similar physiognomy and wetland hydrology but is comprised of Rocky Mountain and other inland species.

**Diagnostic Characteristics:** Shrublands that occur on poorly drained or well-drained seasonally wet to saturated soils that may dry out completely during the growing season, mostly on mineral or shallow (<30 cm) organic or muck soils over mineral substrates.

## VEGETATION

**Physiognomy and Structure:** These are deciduous broadleaf tall shrublands that are located in depressions, around lakes or ponds, or river terraces where water tables fluctuate seasonally (mostly seasonally flooded regime), in areas that receive nutrient-rich waters. They occur as linear bands or stringers, and can form small patches around springs and seeps.

**Floristics:** *Alnus viridis* ssp. *sinuata* often dominates the shrub layer, but many *Salix* species may also occur. The shrub layer can have many dead stems. However, *Salix* spp., *Spiraea douglasii*, *Malus fusca*, *Cornus sericea*, *Alnus incana* ssp. *tenuifolia* (= *Alnus tenuifolia*), *Alnus viridis* ssp. *crispa* (= *Alnus crispa*), and/or *Alnus viridis* ssp. *sinuata* (= *Alnus sinuata*) can be the major dominants. Wetland species, including *Carex aquatilis* var. *dives* (= *Carex sitchensis*), *Carex utriculata*, *Equisetum fluviatile*, and *Lysichiton americanus*, dominate the understory. On some sites, *Sphagnum* spp. are common in the understory. Floristic information was compiled from Franklin and Dyrness (1973), Eyre (1980), Meidinger et al. (1988), Lloyd et al. (1990), MacKinnon et al. (1990), Viereck et al. (1992), Banner et al. (1993), DeLong et al. (1993, 1994), Steen and Coupe (1997), Ecosystems Working Group (1998), DeVelice et al. (1999), Boggs (2002), DeLong (2003), Chappell and Christy (2004), and Boggs et al. (2008b).

<b>G322 Vancouverian Wet Shrubland Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>(Rubus spectabilis) / Athyrium filix-femina</i> Shrubland	G5/S5	CWWA000417
<i>Acer circinatum - Alnus incana</i> Shrubland	G4G5/S4S5	CWWA000028
<i>Acer circinatum - Rubus parviflorus</i> Shrubland	GNR/SNR	CEGLPGW06
<i>Acer circinatum / Athyrium filix-femina - Tolmiea menziesii</i> Shrubland	G5/S4	CEGL003291
<i>Acer circinatum</i> Shrubland	G4/S4	CWWA000204
<i>Alnus (incana, viridis ssp. sinuata) / Lysichiton americanus - Oenanthe sarmentosa</i> Shrubland	G1/S1	CEGL003293
<i>Alnus incana / Carex (aquatilis, deweyana, lenticularis, luzulina, pellita)</i> Shrubland	G3/S1	CEGL001144
<i>Alnus viridis ssp. sinuata / Acer circinatum</i> Shrubland	G4G5/S4S5	CEGL001155
<i>Alnus viridis ssp. sinuata / Mesic Forbs</i> Shrubland	G3G4/S3S4	CEGL002633
<i>Alnus viridis ssp. sinuata / Oplopanax horridus</i> Shrubland	G4G5/S4	CEGL001157
<i>Alnus viridis ssp. sinuata / Rubus spectabilis / Athyrium filix-femina</i> Shrubland	G4G5/S4	CWWA000045
<i>Alnus viridis ssp. sinuata</i> Shrubland [Placeholder]	GNRQ/S4S5	CEGL001154
<i>Cupressus nootkatensis / Oplopanax horridus - (Alnus viridis ssp. sinuata)</i> Forest	G3/S3?	CEGL000349
<i>Cornus sericea - Salix (hookeriana, sitchensis)</i> Shrubland	G3/S1	CEGL003292
<i>Cornus sericea - Salix spp. - Spiraea douglasii</i> Shrubland	GNR/S2	CWWA000249
<i>Cornus sericea</i> Pacific Coast Shrubland [Provisional]	GNR/SU	CWWA000216
<i>Malus fusca - (Salix hookeriana) / Carex obnupta</i> Shrubland	G3/S2	CEGL003294
<i>Malus fusca / Boykinia major / Carex obnupta</i> Shrubland	GNR/SUQ	CWWA000254
<i>Malus fusca</i> Shrubland	G3/S2S3	CEGL003385
<i>Myrica gale / Boykinia intermedia - Carex obnupta</i> Shrubland	G1/S1	CEGL003336
<i>Myrica gale / Boykinia intermedia - Deschampsia cespitosa</i> Shrubland	GNR/SNR	CWWA000255
<i>Myrica gale / Lysichiton americanus</i> Shrubland	G1/S1	CWWA000109
<i>Oplopanax horridus</i> Interior Shrubland	GNR/SNR	CWWA000368
<i>Oplopanax horridus</i> Pacific Coast Shrubland	G4/S4	CWWA000114
<i>Physocarpus capitatus</i> Shrubland	GNR/SUQ	CWWA000232
<i>Ribes bracteosum / Athyrium filix-femina</i> Shrubland	G5/S5	CWWA000394
<i>Ribes bracteosum - Rubus spectabilis</i> Shrubland	G5/S5	CWWA000135
<i>Rubus spectabilis - Ribes hudsonianum</i> Shrubland	G5/S5	CWWA000419
<i>Rubus spectabilis</i> Wet Shrubland	G4/SU	CEGL003472
<i>Salix (hookeriana, lucida ssp. lasiandra, sitchensis)</i> Shrubland [Provisional]	G3Q/S3	CWWA000167
<i>Salix commutata</i> Shrubland	GNR/S2	CWWA000236
<i>Salix geyeriana - Salix hookeriana</i> Shrubland	G1/S1	CEGL003295
<i>Salix hookeriana - (Salix sitchensis)</i> Shrubland	G2/S2	CEGL003387
<i>Salix hookeriana - Spiraea douglasii</i> Shrubland	GNR/S1	CWWA000237
<i>Salix hookeriana / Carex obnupta - (Argentina egedii ssp. egedii)</i> Shrubland	G4/S1?	CWWA000140
<i>Salix sitchensis / Equisetum arvense - Petasites frigidus</i> Shrubland	G4?/S4?	CEGL003296
<i>Salix sitchensis</i> Shrubland	G4/S3?	CEGL002896
<i>Salix spp. - Spiraea douglasii / Carex (aquatilis var. dives, obnupta, utriculata)</i> Shrubland	G3G4/S2Q	CWWA000199
<i>Spiraea douglasii</i> Inland Maritime Shrubland	GNR/SNR	CWWA000407
<i>Spiraea douglasii</i> Shrubland	G5/S5	CEGL001129

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** Stands that belong to this group are located in depressions, around lakes or ponds, or river terraces where water tables fluctuate seasonally (mostly seasonally flooded regime), in areas that receive nutrient-rich waters. These depressions are poorly drained with fine-textured organic, muck or mineral soils and standing water common throughout the growing season. Environmental information was compiled from Franklin and Dyrness (1973), Eyre (1980), Meidinger et al. (1988), Lloyd et al. (1990), MacKinnon et al. (1990), Viereck et al. (1992), Banner et al. (1993), DeLong et al. (1993, 1994), Steen and Coupe (1997), Ecosystems Working Group (1998), DeVelice et al. (1999), Boggs (2002), DeLong (2003), Chappell and Christy (2004), and Boggs et al. (2008b).

**Dynamics:****DISTRIBUTION**

**Geographic Range:** This group occurs throughout the Pacific Northwest Coast, from Cook Inlet Basin and Prince William Sound, Alaska, to the southern coast of Oregon.

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:C, 4:C, 69:C, 70:C, 81:C

**USFS Ecoregions (2007):** 242A:CC, 242B:C?, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CP, M261G:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

- < Avalanche track (MHmm2/51) (Banner et al. 1993)
- < II.B.1.f - Shrub swamp (closed) (Viereck et al. 1992)
- < II.B.2.f - Shrub swamp (open) (Viereck et al. 1992)

**LOWER LEVEL UNITS****Alliances:**

- A2577 *Malus fusca* Shrubland Alliance
- A3833 *Alnus viridis ssp. sinuata* - *Alnus viridis ssp. fruticosa* - *Acer circinatum* Wet Shrubland Alliance
- A1123 *Vaccinium uliginosum* - *Vaccinium caespitosum* Wet Shrubland Alliance
- A2609 *Rubus spectabilis* Wet Shrubland Alliance
- A3834 *Cornus sericea* Pacific Slope Shrubland Alliance
- A3835 *Salix hookeriana* - *Salix sitchensis* - *Spiraea douglasii* Flooded Shrubland Alliance

**AUTHORSHIP**

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel, K. Boggs, C. Chappell, P. Comer, M.S. Reid

**Acknowledgments:**

**Version Date:** 2010/12/20

**REFERENCES**

**References:** Banner et al. 1993, Boggs 2002, Boggs et al. 2008b, Chappell and Christy 2004, DeLong 2003, DeLong et al. 1993, DeLong et al. 1994, DeVelice et al. 1999, Ecosystems Working Group 1998, Eyre 1980, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Holland and Keil 1995, Lloyd et al. 1990, MacKinnon et al. 1990, Meidinger et al. 1988, Steen and Coupé 1997, Viereck et al. 1992

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2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

**M301. Western North American Ruderal Wet Shrubland, Meadow & Marsh**

**Type Concept Sentence:** This macrogroup includes disturbed natural wetland habitats of temperate western North America that are now strongly dominated by non-native and sometimes weedy or generalist native species.

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**OVERVIEW**

**Scientific Name:** Western North American Ruderal Wet Shrubland, Meadow & Marsh Macrogroup

**Common Name (Translated Scientific Name):** Western North American Ruderal Wet Shrubland, Meadow & Marsh Macrogroup



**Type Concept:** This macrogroup contains disturbed natural habitats such as wet meadows, emergent marshes, coastal backwater dunes, and sloughs as well as waste areas that were once wetlands and are now dominated by non-native species. Dominant non-native species include *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, *Arundo donax*, *Cirsium arvense*, *Conyza canadensis*, *Lolium arundinaceum* (= *Festuca arundinacea*; = *Schedonorus arundinaceus*), *Lactuca serriola*, *Phalaris arundinacea*, *Phragmites australis*, *Poa palustris*, *Poa pratensis*, and *Sonchus* spp. Native species may be present but are so low in abundance that they are insufficient to identify the native macrogroup or lower units. This macrogroup occurs from sea level up to the subalpine throughout the western U.S. Due to disturbance, soils may be compacted, missing upper horizons, or unnaturally enriched or depleted. Disturbance can be from activities such as severe continuous heavy grazing, abandoned building sites, industry, and road beds, areas that have been logged, or chained and cleared that occur where wetlands once stood.

**Classification Comments:** This macrogroup does not include actively managed irrigated hay meadows that have been historically seeded, whether with native or exotic grasses. These belong under 7. Agricultural & Developed Vegetation Cultural Class (CCL01). If management (frequent mowing, seeding, fertilizing) is stopped (was abandoned) and they take on a more spontaneous composition and structure, they may be placed here in M301. Some native plant communities in other macrogroups may be converted to this macrogroup (M301) through disturbances, such as altered soil moisture or soil profile disturbance, introduction of exotics sometimes as a feedback mechanism stemming from the introduced vegetation itself. As long as those communities contain sufficient diagnostic species of the macrogroup, they may be considered as altered phases of that macrogroup, but they are placed here (M301) when the non-native or weedy natives component is overwhelmingly dominant. The decision should be based on the combination of both biotic and abiotic (site) factors, not just site factors. For example, if a site has 99% cover of *Phragmites* and has such high site disturbance that it is hard to know whether it was once a native woody-dominated swamp or was always a native, herbaceous-dominated marsh, then it is clearly in this macrogroup. But if a site with 98% *Phragmites* and 2% cover of a native shrub that seems to indicate that the site is a native *Salix* swamp that was disturbed, and that disturbance has now ended (was abandoned), and can still be identified as a native plant association (albeit very poor condition), then that may belong to the native swamp macrogroup (adapted from D. Meidinger pers. comm. 2014).

**Similar NVC Types:**

- M493 Western North American Ruderal Grassland & Shrubland
- M074 Western North American Vernal Pool
- M073 Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh: is dominated by natives, or if communities have abundance of exotics present, there are still enough native species present to key to a native type.
- M499 Western North American Cool Semi-Desert Ruderal Scrub & Grassland

**Diagnostic Characteristics:** Strongly dominated by non-native and weedy or generalist native species that are primarily facultative wetland taxa in wet graminoid, forb or shrub meadow or marsh settings. These include grasses and forbs such as *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, *Cirsium arvense*, *Conyza canadensis*, *Lolium arundinaceum* (= *Festuca arundinacea*; = *Schedonorus arundinaceus*), *Iris pseudacorus*, *Lepidium latifolium*, *Lactuca serriola*, *Phalaris arundinacea*, *Phragmites australis* (non-native strains), *Poa palustris*, *Poa pratensis*, *Rubus armeniacus*, *Rubus discolor*, *Sonchus* spp., and *Typha angustifolia*, among others.

## VEGETATION

**Physiognomy and Structure:** Herbaceous stratum of perennial or annual graminoid and forbs, or shrubs.

**Floristics:** Vegetation of this macrogroup is dominated by non-native and weedy generalist species. Grasses and forbs include *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, *Arundo donax*, *Cirsium arvense*, *Conyza canadensis*, *Lolium arundinaceum* (= *Festuca arundinacea*; = *Schedonorus arundinaceus*), *Lactuca serriola*, *Lythrum salicaria*, *Iris pseudacorus*, *Phalaris arundinacea*, *Phragmites australis*, *Poa palustris*, *Poa pratensis*, *Poa trivialis*, *Rubus armeniacus*, *Scirpus cyperinus*, and *Sonchus* spp. Wet non-native shrub species need to be documented. Native diagnostic species may be present but are so low in abundance that the original native plant association is impossible to determine.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup occupies wet (seasonal, temporary or permanently flooded) depressions, floodplains, or groundwater discharge sites. Soils may be mineral or organic. Sites can be seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Due to disturbance, soils may be compacted. Other sites are semipermanently to permanently flooded. Some sites once had active agricultural management regimes of seasonal sheet irrigation for grazing or haying purposes, but now lay abandoned and dominated by the original non-native hay grasses. Thus they are no longer agricultural pastures in a strict sense, nor do they bear any resemblance to the native historical meadow that occupied the site prior to the conversion to an irrigated hay meadow. These wetlands can also occur in areas

that were historically uplands, but have become wetlands over time through the repeated application of irrigation water or from seepage off water conveyance and water storage infrastructures (ditches, stock ponds, reservoirs, etc.).

**Dynamics:** This macrogroup includes areas that are a product of disturbance such as continuous severe heavy grazing by domestic livestock, soil disturbance/compactions from heavy equipment, or areas that have undergone a significant reduction in the amount or length of time water remains on site.

#### DISTRIBUTION

**Geographic Range:** This macrogroup is found throughout the entire western U.S. and Canada.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

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

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

#### LOWER LEVEL UNITS

#### Groups:

- G524 Western North American Ruderal Wet Shrubland, Meadow & Marsh

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel and J. Triepke

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 10-14

#### REFERENCES

**References:** Buck-Diaz et al. 2012, Faber-Langendoen et al. 2008a, Faber-Langendoen et al. 2015, Hansen et al. 1995, Meidinger pers. comm., Rondeau 2001, Sawyer et al. 2009, Sueltenfuss et al. 2013, Whitson et al. 2000

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2. Shrub & Herb Vegetation

2.C.4.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh

M301. Western North American Ruderal Wet Shrubland, Meadow & Marsh

### G524. Western North American Ruderal Wet Shrubland, Meadow & Marsh

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Poa pratensis* - *Conyza canadensis* - *Cirsium arvense* Ruderal Wet Meadow & Marsh Group

**Common Name (Translated Scientific Name):** Kentucky Bluegrass - Canadian Horseweed - Canada Thistle Ruderal Wet Meadow & Marsh Group

**Type Concept:** This group contains disturbed wet meadows found in lowland, montane and subalpine elevations, occasionally reaching into the lower edges of the alpine elevations (sea level to 3600 m) throughout the western U.S. and Canada. These are wet meadows that occur in open wet depressions, basins and flats with low-velocity surface and subsurface flows. They can be large meadows in montane or subalpine valleys, or occur as narrow strips bordering ponds, lakes, and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Soils are mostly mineral and show typical hydric soil characteristics such as low chroma and redoximorphic features; some areas may have high organic content as inclusions or pockets. Due to disturbance, soils may be compacted. Vegetation of this group is dominated by non-native species such as *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, *Conyza canadensis*, *Cirsium arvense*, *Sonchus* spp., *Lactuca serriola*, *Phalaris arundinacea*, *Phragmites australis*, *Poa*

*palustris*, and *Poa pratensis*. Native species may be present but are so low in abundance that the original native plant association is impossible to determine. These can be wet meadows, wet emergent marshes, coastal backwater dunes, and sloughs.

**Classification Comments:** This group may be difficult to tease apart from its native counterpart. The test is that the non-native species far outweigh native species in abundance and richness, such that a well-trained observer cannot tell what the native counterpart may have been or to do so is only speculation. This group does not include actively managed irrigated hay meadows that have been historically seeded. Those belong under Class 7 Agricultural, Pasture/Hay Formation.

**Internal Comments:** mjr 5-11: AK added.

**Other Comments:**

**Similar NVC Types:**

- G517 Vancouverian Freshwater Wet Meadow & Marsh: is dominated by native species.
- G521 Vancouverian & Rocky Mountain Montane Wet Meadow & Marsh: is dominated by native species.
- G531 Arid West Interior Freshwater Emergent Marsh
- G677 North American Warm Desert Ruderal Scrub & Grassland
- G600 Great Basin & Intermountain Ruderal Dry Shrubland & Grassland

**Diagnostic Characteristics:** Wet graminoid meadow or marsh dominated by non-native species.

**VEGETATION**

**Physiognomy and Structure:** Herbaceous wet meadow dominated by perennial herbs introduced to North America.

**Floristics:** Vegetation of this group is dominated by non-native species such as *Agrostis gigantea*, *Agrostis stolonifera*, *Alopecurus pratensis*, *Conyza canadensis*, *Lactuca serriola*, *Cirsium arvense*, *Iris pseudacorus*, *Phalaris arundinacea*, *Phragmites australis*, *Poa palustris*, *Poa pratensis*, *Poa trivialis*, and *Scirpus cyperinus*. Native species may be present but are so low in abundance that the original native plant association is impossible to determine. Floristic information was compiled from Whitson et al. (1996), Rondeau (2001), Faber-Langendoen et al. (2008), and Sawyer et al. (2009).

G524 Western North American Ruderal Wet Shrubland, Meadow & Marsh Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Agrostis (gigantea, stolonifera)</i> Ruderal Herbaceous Vegetation	n/a	CEGL001558
<i>Alnus incana / Phalaris arundinacea</i> Ruderal Shrubland	n/a	CWWA000293
<i>Alopecurus geniculatus</i> Ruderal Wet Meadow	n/a	CWWA000308
<i>Amorpha fruticosa</i> Shrubland	n/a	CWWA000311
<i>Carex leporina</i> Ruderal Wet Meadow Herbaceous Vegetation	n/a	not tracked
<i>Crataegus monogyna / Mixed Forbs &amp; Graminoids</i> Ruderal Wet Shrubland	n/a	not tracked
<i>Elymus repens</i> Ruderal Herbaceous Vegetation	n/a	CWWA000358
<i>Equisteum arvense</i> - Mixed Graminoid Ruderal Wet Meadow Herbaceous Vegetation	n/a	not tracked
<i>Juncus gerardii var. gerardii</i> Ruderal Brackish Wet Meadow	n/a	not tracked
<i>Lepidium latifolium</i> Ruderal Vegetation	n/a	not tracked
<i>Leymus cinereus - Bromus tectorum</i> Ruderal Wet Meadow	n/a	CWWA000362
<i>Nasturtium officinale</i> Herbaceous Vegetation	n/a	CWWA000366
<i>Phalaris arundinacea</i> Western Herbaceous Ruderal Vegetation	n/a	CEGL001474
<i>Phragmites australis</i> Western North America Temperate Ruderal Herbaceous Vegetation	n/a	CEGL001475
<i>Poa pratensis</i> Seasonally Flooded Ruderal Herbaceous Vegetation	n/a	CEGL003081
<i>Rosa (woodsii, nutkana)</i> Ruderal Wet Shrubland	n/a	CWWA000395
<i>Schedonorus pratensis</i> Ruderal Wet Meadow Herbaceous Vegetation	n/a	not tracked
<i>Typha angustifolia</i> Ruderal Herbaceous Vegetation	n/a	CWWA000415

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** *Soil/substrate/hydrology:* These wet meadows occur in open wet depressions, basins and flats with low-velocity surface and subsurface flows. They can be large meadows in montane or subalpine valleys, or occur as narrow strips bordering ponds, lakes, and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on subirrigated sites with slopes up to 10%. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. Some sites occur under an agricultural management regime of seasonal sheet irrigation for grazing or haying purposes, and may bear no resemblance to historical types of the area. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Soils are mostly mineral and show typical hydric soil characteristics such as low chroma and redoximorphic features; some areas may have high organic content as inclusions or pockets. Due to disturbance, soils may be compacted.

This group occurs in the same environmental settings as Vancouverian & Rocky Mountain Montane Wet Meadow & Marsh Group (G521), Vancouverian Freshwater Wet Meadow & Marsh Group (G517), and Arid West Interior Freshwater Emergent Marsh Group (G531).

**Dynamics:** This group is a product of disturbance such as continuous heavy grazing by domestic livestock, soil disturbance/compactions, significant change in hydrologic regime, and infestation by invasive plants.

**DISTRIBUTION**

**Geographic Range:** This group is found throughout the entire western U.S. and Canada.

**Nations:** CA, US

**States/Provinces:** AB, AK, BC, CA, CO, ID, MT, NM, NV, OR, SD, WA, WY

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Low.

**SYNONYMY****LOWER LEVEL UNITS****Alliances:**

- A3848 *Poa pratensis* - *Agrostis gigantea* - *Agrostis stolonifera* Ruderal Herbaceous Alliance
- A3847 *Phragmites australis* - *Arundo donax* - *Alopecurus pratensis* Native & Semi-native Flooded Herbaceous Alliance
- A3849 *Conyza canadensis* - *Cirsium arvense* - *Lactuca serriola* Ruderal Herbaceous Alliance
- A3846 *Phalaris arundinacea* Native & Semi-native Herbaceous Alliance

**AUTHORSHIP**

**Primary Concept Source:** D. Faber-Langendoen, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:** Associate Editor: F.J. Triepke

Peer review by J. Rocchio

**Version Date:** 2013/09/06

**REFERENCES**

**References:** Buck-Diaz et al. 2012, Faber-Langendoen et al. 2008a, Faber-Langendoen et al. 2015, Rondeau 2001, Sawyer et al. 2009, Whitson et al. 2000

**2.C.4.Nd. Eastern North American Wet Meadow, Marsh & Shrubland**


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2. Shrub & Herb Vegetation

2.C.4.Nd. Eastern North American Wet Meadow, Marsh & Shrubland

**M071. Great Plains Wet Meadow, Marsh & Playa**

**Type Concept Sentence:** This wetland macrogroup is found throughout the Great Plains in riparian and non-riparian settings, dominated by a wide variety of herb or shrub obligate or facultative wetland species.

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## OVERVIEW

**Scientific Name:** *Spartina pectinata* - *Typha* spp. - *Schoenoplectus* spp. Great Plains Wet Meadow, Marsh & Playa Macrogroup

**Common Name (Translated Scientific Name):** Prairie Cordgrass - Cattail species - Bulrush species Great Plains Wet Meadow, Marsh & Playa Macrogroup

**Type Concept:** This herbaceous- or shrub-dominated wetland is found throughout the Great Plains. Sites can be dominated by emergent wetland-obligate species or by herbaceous or shrub species tolerant of seasonal flooding in riparian and non-riparian settings. Abundant species vary widely in this wide-ranging and environmentally diverse macrogroup. Common species in wetter sites include *Sagittaria* spp., *Schoenoplectus* spp., *Sparganium* spp., and *Typha* spp. In wet meadows and wet prairies, *Calamagrostis canadensis*, *Calamagrostis stricta*, *Carex* spp. (including *Carex atherodes*, *Carex pellita*, *Carex nebrascensis*), *Eleocharis palustris*, *Glyceria* spp., *Juncus* spp., *Lycopus americanus*, *Panicum virgatum*, *Spartina pectinata*, and *Triglochin maritima* are common. *Pascopyrum smithii* often occurs on the drier edges of stands in the western parts of its range and in temporarily flooded basins in the southern Great Plains along with *Panicum obtusum* and *Buchloe dactyloides*. In more saline areas, common species can include *Carex sartwellii*, *Carex praegracilis*, *Hordeum jubatum*, *Plantago eriopoda*, and *Schoenoplectus pungens*. Shrubs are less common range-wide but dominate some sites. Typical species are *Amorpha fruticosa*, *Artemisia cana* ssp. *cana* and *Artemisia tridentata* (in the northwest portion of the range), *Cornus drummondii*, *Cornus sericea*, *Prunus virginiana*, *Salix* spp. (especially *Salix interior*), *Symphoricarpos occidentalis*, and the exotic *Elaeagnus angustifolia*. Seedlings of riparian trees, especially *Populus deltoides*, can be found in some stands. This macrogroup occurs in basins and along rivers and streams throughout the semi-arid to dry-temperate Great Plains. The hydrologic regime varies from sites flooded for only a few weeks each growing season to those flooded for years at a time. The water source for these sites can be snowmelt (either local or from the Rocky Mountains), rain, or groundwater. Sites with limited watersheds and little or no groundwater connection tend to be wet for short periods of time, while those with larger watersheds or more reliable water sources can be saturated or flooded for most or all of the growing season. Water varies from fresh to moderately saline. Many sites are on fine-textured, poorly drained soils either on the surface or forming an impermeable subsurface layer that prevents rapid water drainage. Some sites have coarse, often alluvial soils. Soils are nearly always mineral, but muck can accumulate on some sites, and this macrogroup includes fens where marl or peat can form.

**Classification Comments:** Criteria for separating this macrogroup (M071) from Eastern North American Wet Meadow & Marsh Macrogroup (M069) need to be better defined.

### Similar NVC Types:

- M073 Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh
- M069 Eastern North American Wet Meadow & Marsh: has substantial overlap in species composition but vegetation of the Great Plains can be differentiated by marsh and wet meadow species that do not occur or are rare in the East, such as *Beckmannia syzigachne*, *Calamagrostis stricta*, *Carex nebrascensis*, *Pascopyrum smithii*, *Scolochloa festucacea*, *Sporobolus airoides*, and others.
- M303 Eastern North American Ruderal Wet Meadow & Marsh
- M067 Atlantic & Gulf Coastal Plain Wet Prairie & Marsh
- M077 Great Plains Brackish Marsh & Saline Wet Meadow: less-saline stands can be similar but species such as *Hordeum jubatum* and *Distichlis spicata* are more common in this macrogroup.
- M108 Eastern North American Freshwater Aquatic Vegetation

**Diagnostic Characteristics:** This macrogroup has a range of hydrologic regimes in both riparian and non-riparian settings, but all sites are flooded for at least a few weeks during the growing season. Sites are dominated by herbaceous or shrub species that are tolerant of this inundation or are annual species that germinate after sites dry. These wetlands occur in a largely prairie landscape.

## VEGETATION

**Physiognomy and Structure:** Most examples of this macrogroup are dominated by perennial herbaceous species. This includes emergent species up to 2 m tall in shallower, semipermanently flooded wetlands, and graminoids and forbs in seasonally flooded or saturated sites. Shrubs 1-3 m tall are present in some examples and can be dominant, particularly in riparian settings.

**Floristics:** Abundant species vary widely in this wide-ranging and environmentally diverse macrogroup. Common species in wetter sites include *Sagittaria* spp., *Schoenoplectus acutus*, *Schoenoplectus americanus*, *Schoenoplectus fluviatilis*, *Schoenoplectus maritimus*, *Schoenoplectus tabernaemontani*, *Sparganium* spp., *Typha angustifolia*, *Typha domingensis* (in the south), and *Typha latifolia*. In wet meadows and wet prairies, *Calamagrostis canadensis*, *Calamagrostis stricta*, *Carex* spp. (including *Carex atherodes*, *Carex pellita*, *Carex nebrascensis*), *Glyceria* spp., *Eleocharis palustris*, *Juncus* spp., *Lycopus americanus*, *Panicum virgatum*, *Spartina pectinata*, and *Triglochin maritima* are common. *Pascopyrum smithii* often occurs on the drier edges of stands in the western parts of its range and in temporarily flooded basins in the southern Great Plains along with *Panicum obtusum* and *Buchloe dactyloides*. Fens contain species rarely found elsewhere in this macrogroup. These include *Carex prairea*, *Dulichium arundinaceum*, *Lobelia kalmii*, *Onoclea sensibilis*, and *Rhynchospora capillacea*. In more saline areas, common species can include *Carex sartwellii*, *Carex*

*praegracilis*, *Hordeum jubatum*, *Plantago eriopoda*, and *Schoenoplectus pungens*. Shrubs are less common range-wide but dominate some sites. Typical species are *Amorpha fruticosa*, *Artemisia cana ssp. cana* and *Artemisia tridentata* (in the northwest portion of the range), *Cornus drummondii*, *Cornus sericea*, *Prunus virginiana*, *Salix* spp. (especially *Salix interior*), and *Symphoricarpos occidentalis*, and the exotic *Elaeagnus angustifolia*. Seedlings of riparian trees, especially *Populus deltoides*, can be found in some stands.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup occurs in basins and along rivers and streams throughout the semi-arid to dry-temperate Great Plains. The hydrologic regime varies from sites flooded for only a few weeks each growing season to those under water for years at a time. Water depth rarely exceeds 1 m for extended periods. The water source for these sites can be snowmelt (either local or from the Rocky Mountains), rain, or groundwater. Sites with limited watersheds and little or no groundwater connection tend to be wet for short periods of time while those with larger watersheds or more reliable water sources can be saturated or flooded for most or all of the growing season. Water varies from fresh to moderately saline. Many sites are on fine-textured, poorly drained soils either on the surface or forming an impermeable subsurface layer that prevents rapid water drainage. Some sites have coarse, often alluvial soils. Soils are nearly always mineral, but muck can accumulate on some sites, and this macrogroup includes fens where marl or peat can form.

**Dynamics:** These wetlands occur in a semi-arid to dry-temperate climate and so are very susceptible to seasonal and inter-annual changes in precipitation within their watersheds. With the high evaporation rates in the climatic zone, reductions in water input (through reduced rain, snowmelt, or groundwater discharge) are quickly translated to reductions in water levels. Many examples of this macrogroup are shaped by seasonal or temporary fluctuations in available water with plants able to take advantage of the higher water in the spring or after heavy rains and then tolerant of the relatively drier conditions between flooding events. Other sites have more consistent sources of water and have species that require near permanent flooding or saturation to flourish, but even these sites can be affected by inter-annual changes in precipitation levels. Many wetlands in the Great Plains change greatly in size and composition over a period of several years as precipitation levels rise and fall. Changes in water depth of over a meter are possible over several years (Stewart and Kantrud 1971). These multi-year changes promote floristic diversity by creating shifting environments and vegetation at any one place on the landscape. During the wetter seasonal or multi-year periods, temporary connections may be formed between otherwise discontinuous wetlands, allowing the spread of species and possibly affecting water chemistry through flushing of salts or other dissolved chemicals into or out of basins (Leibowitz and Vining 2003). Fire in adjacent uplands can spread into drier examples of this macrogroup, removing litter and reducing dense vegetation.

#### DISTRIBUTION

**Geographic Range:** This macrogroup is found throughout the Great Plains from the southern Canadian Prairie Provinces to northern Texas and from the High Plains below the Rocky Mountains to the Tallgrass Prairies in the central United States.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX?, US

**States/Provinces:** AB, CO, IA, KS, MB, MN, MO, MT, ND, NE, NM, OK, SD, SK, TX, WY

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 251A:CC, 251B:CC, 251C:CC, 251F:CC, 251H:CC, 315D:CC, 315F:CP, 331B:CC, 331C:CC, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 331J:CC, 331K:CC, 331L:CC, 331M:CC, 331N:CC, 332A:CC, 332B:CC, 332C:CC, 332D:CC, 332E:CC, 332F:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- < Prairie Potholes (Richardson 2000)

#### LOWER LEVEL UNITS

#### Groups:

- G325 Great Plains Freshwater Marsh
- G336 Great Plains Wet Prairie, Wet Meadow & Seepage Fen
- G337 Great Plains Shrub & Herb Riparian
- G568 Great Plains Riverine Scour
- G136 Great Plains Playa & Rainwater Basin Wetland

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** J. Drake

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** Midwest

**Internal Author:** JD 10-14

## REFERENCES

**References:** Faber-Langendoen et al. 2015, Friedman et al. 1996, Hoagland 2000, Lauver et al. 1999, Leibowitz and Vining 2003, Richardson 2000, Steinauer and Rolfsmeier 2000, Stewart and Kantrud 1971, Thompson and Hansen 2002

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2. Shrub & Herb Vegetation

2.C.4.Nd. Eastern North American Wet Meadow, Marsh & Shrubland

M071. Great Plains Wet Meadow, Marsh & Playa

### **G336. Great Plains Wet Prairie, Wet Meadow & Seepage Fen [Proposed]**

**Note (Rocchio):** I spoke to Gwen Kittell about this one... we do have *Spartina pectinata* patches along riparian areas in SE and NE WA, which is why I'm guessing its included but it seems that including a type in a Great Plains Group as occurring in WA is a bit odd from a biogeographic standpoint? Maybe, G531 instead? Gwen will work on getting a more appropriate Association named.

**Type Concept Sentence:** This group of seasonally flooded herbaceous wetlands is found in the northern and central Great Plains, usually in basins but sometimes on the margins of floodplains; most sites have abundant *Calamagrostis stricta*, *Carex* spp., and *Spartina pectinata*.

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## OVERVIEW

**Scientific Name:** *Spartina pectinata* - *Calamagrostis stricta* - *Carex* spp. Great Plains Wet Prairie & Wet Meadow Group

**Common Name (Translated Scientific Name):** Prairie Cordgrass - Slimstem Reedgrass - Sedge species Great Plains Wet Prairie & Wet Meadow Group

**Type Concept:** This group includes herbaceous wetlands and fens in the eastern and central Great Plains. Examples occur in basins or along slow-moving streams or rivers. Sites are flooded or saturated for part of the growing season but often dry out in late summer. These wet meadows and wet prairies typically have moderate to dense cover of herbaceous vegetation 1-2 m tall. *Calamagrostis stricta*, *Carex* spp., and *Spartina pectinata* are common dominants, though several other species are common locally or in some parts of the range. Soils are fine-textured and may be mineral or mucky in most sites. In fens, soils are muck or peat.

**Classification Comments:** This group is similar in concept to Midwest Wet Prairie & Wet Meadow Group (G770), which occurs further east, but there is substantial overlap in species composition and physiognomic and environmental characteristics. *Carex nebrascensis* might help distinguish from it Eastern North American Wet Meadow Group (it occurs in the western U.S. but not east of Great Plains).

**Internal Comments:** JD 5-15: TX removed.

**Other Comments:**

### **Similar NVC Types:**

- G325 Great Plains Freshwater Marsh: is similar but wetter and has more species tolerant of long-term flooding such as *Typha* spp.
- G337 Great Plains Shrub & Herb Riparian
- G136 Great Plains Playa & Rainwater Basin Wetland
- G556 Northern & Central Ruderal Wet Meadow & Marsh
- G770 Midwest Wet Prairie & Wet Meadow
- G324 Great Plains Depressional Saline & Brackish Wetland

**Diagnostic Characteristics:** Shallow, seasonally flooded or sometimes saturated herbaceous wetlands that are found in the Great Plains. Woody species are rare or absent. Some sites have moderate levels of salinity.

## VEGETATION

**Physiognomy and Structure:** These wet meadows and wet prairies are dominated by herbaceous plants, usually graminoids. Vegetation cover is typically moderate to dense and between 1 and 2 m tall.

**Floristics:** This group is dominated by medium to tall herbaceous species. Abundant species include *Spartina pectinata*, *Calamagrostis stricta*, *Calamagrostis canadensis*, *Carex* spp. (including *Carex atherodes*, *Carex pellita*, *Carex nebrascensis*), *Glyceria* spp., *Juncus* spp., *Lycopus americanus*, *Panicum virgatum*, *Schoenoplectus tabernaemontani*, and *Triglochin maritima*. *Pascopyrum smithii* often occurs on the drier edges of this group in the western parts of its range. Fens in the Great Plains are included in this group. In those sites, some species rarely found elsewhere in this group occur. These include *Rhynchospora capillacea*, *Lobelia*

*kalmii*, *Dulichium arundinaceum*, *Carex prairea*, and *Onoclea sensibilis*. In more saline areas, common species can include *Carex sartwellii*, *Carex praeagrabilis*, *Plantago eriopoda*, and *Schoenoplectus pungens*.

G336 Great Plains Wet Prairie, Wet Meadow & Seepage Fen Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Spartina pectinata</i> Western Herbaceous Vegetation	G3?/S1	CEGL001476

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This group occurs on poorly drained nearly level sites with few exceptions. Most sites are in basins or along slow-moving streams or rivers and have seasonally flooded fine-textured soils. Some sites can be moderately saline: these are more common in the western parts of the distribution of this group. Fens in the Great Plains are included in this group. The fens occur where minerotrophic groundwater emerges at the surface, typically on the lower slopes of a hill or cliff or in floodplains. Marl or peat can form in these fens.

**Dynamics:** Hydrologic changes (flooding and drought) affect sites in this group significantly. In drier years, sites can be invaded by species from adjacent prairies, while in wetter years, species typical of more permanently flooded marshes do well. Also, fire spreading from adjacent upland prairies can sweep through examples of this group. Many sites have been affected by agricultural practices and either converted to row crops or affected by grazing and trampling by livestock.

#### DISTRIBUTION

**Geographic Range:** This group is found throughout the eastern and central Great Plains from the southern Prairie Provinces of Canada to Oklahoma. It probably does not extend west into the shortgrass prairie beyond eastern Montana, eastern Wyoming, and western Kansas or east beyond western Minnesota, central Iowa, and northwestern Missouri.

**Nations:** CA, US

**States/Provinces:** IA, KS, MB, MN, MO, MT, ND, NE, OK, SD, SK, WY

**TNC Ecoregions [optional]:** 25:C, 26:C, 27:?, 33:C, 34:C, 35:C, 36:C, 66:C, 67:C

**USFS Ecoregions (2007):** 251A:CC, 251B:CC, 251C:CC, 331B:CC, 331C:CC, 331D:CC, 331E:CC, 331F:CC, 331H:C?, 332A:CC, 332B:CC, 332C:CC, 332D:CC, 332E:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

- < Prairie Potholes (Richardson 2000)

#### LOWER LEVEL UNITS

##### Alliances:

- A3495 *Carex* spp. - *Triglochin maritima* - *Eleocharis quinqueflora* Marl Fen Herbaceous Alliance
- A3493 *Spartina pectinata* Great Plains Herbaceous Alliance
- A3492 *Panicum virgatum* - *Pascopyrum smithii* Herbaceous Alliance

#### AUTHORSHIP

**Primary Concept Source:** C.J. Richardson, in Barbour and Billings (2000)

**Author of Description:** J. Drake

**Acknowledgments:**

**Version Date:** 2015/05/08

#### REFERENCES

**References:** Faber-Langendoen et al. 2015, Lauver et al. 1999, Richardson 2000, Steinauer and Rolfsmeier 2000, Stewart and Kantrud 1971

## 2.C.5. Salt Marsh

Salt Marsh is a wetland that has shallow water and levels that usually fluctuate due primarily to tides along the coast or changes in water depth in depressions. Coastal salt marshes are primarily intertidal; that is, they are found in areas at least occasionally inundated by high tide but not flooded during low tide, including estuaries, lagoons, and the lee side of barrier islands. The



vegetation comprises emergent shrubs and herbs with at least 10% cover, especially saline or halophytic species. They occur at all latitudes around the globe, but are concentrated in the temperate mid-latitudes (23-70°N and S).

## 2.C.5.Nc. Temperate & Boreal Pacific Coastal Salt Marsh

Intertidal salt marshes and adjacent brackish marshes dominated by salt-tolerant graminoid and succulent stem vegetation found on the coast of the Pacific Rim in temperate, boreal and arctic latitudes of western North America and eastern Asia.

### 2. Shrub & Herb Vegetation

#### 2.C.5.Nc. Temperate & Boreal Pacific Coastal Salt Marsh

## M081. North American Pacific Coastal Salt Marsh

**Type Concept Sentence:** This macrogroup consists of coastal intertidal salt marshes dominated by *Allenrolfea occidentalis*, *Batis maritima*, *Carex lyngbyei*, *Glaux maritima*, *Jaumea carnosa*, *Suaeda* spp., and/or *Salicornia virginica*, among many other species along the Pacific Coast of North America, spanning boreal salt marshes from Alaska to Baja California in Mexico.

### OVERVIEW

**Scientific Name:** North American Pacific Coastal Salt Marsh Macrogroup

**Common Name (Translated Scientific Name):** North American Pacific Coastal Salt Marsh Macrogroup

**Type Concept:** This macrogroup consists of the intertidal salt marshes and brackish marshes found throughout the North American Pacific Coast. Vegetation ranges from very dense thickets to open and sparse. Dominant plant species include *Batis maritima*, *Carex lyngbyei*, *Carex ramenskii*, *Distichlis spicata*, *Eleocharis palustris*, *Glaux maritima*, *Hippuris tetraphylla*, *Honckenya peploides*, *Hordeum brachyantherum*, *Jaumea carnosa*, *Juncus balticus*, *Limonium californicum*, *Monanthochloe littoralis*, *Plantago macrocarpa*, *Puccinellia pumila*, *Salicornia virginica*, *Salicornia* spp., *Spergularia canadensis*, *Suaeda* spp., *Triglochin maritima*, and/or *Triglochin* spp. These marshes occur in bays, behind sand spits or other locations protected from wave action. In the Mediterranean region, the salt marshes are dominated by low shrubs, including *Sarcocornia pacifica*.

**Classification Comments:** According to M. Peinado (pers. comm. 2014), the concepts for North American Pacific Coastal Salt Marsh Macrogroup (M081) and Temperate Pacific Tidal Salt & Brackish Marsh Group (G499) are too broad and do not distinguish floristic, ecological and zonal realities (including plant communities) of the salt marshes of the North American Pacific. From the coast of southeast temperate Alaska to southern California, salt marshes show three types of floristic and ecological zonation: Boreal, Temperate and Mediterranean.

### Similar NVC Types:

- M082 Warm & Cool Desert Alkali-Saline Wetland

**Diagnostic Characteristics:** In temperate and boreal salt marshes, the coastal herbaceous intertidal salt marshes and brackish marshes are primarily associated with estuaries or coastal lagoons; salt marshes are limited to bays, behind sand spits or other locations protected from wave action. In the Mediterranean region, the salt marshes are dominated by low shrubs (*Sarcocornia pacifica*).

### VEGETATION

**Physiognomy and Structure:** Graminoid-dominated herbaceous wetlands flooded daily by saltwater tidal influx. May contain low scattered shrubs.

**Floristics:** Dominant plant species change from north to south, but communities have many species in common which include *Carex lyngbyei*, *Distichlis spicata*, *Jaumea carnosa*, *Sarcocornia pacifica* (= *Salicornia virginica*), and *Salicornia* spp. High salt marsh and other short-inundation and regularly drying salt marsh or marsh-like settings can be dominated by *Allenrolfea occidentalis*, *Arthrocnemum subterminale*, *Cressa truxillensis*, *Distichlis spicata*, *Frankenia salina*, and/or *Glaux maritima*. Low marshes are located in areas that flood every day and are dominated by a variety of low-growing forbs and low to medium-height graminoids, especially *Carex lyngbyei*, *Carex ramenskii*, *Glaux maritima*, *Hippuris tetraphylla*, *Honckenya peploides*, *Puccinellia pumila*, *Salicornia virginica*, *Schoenoplectus americanus*, *Schoenoplectus maritimus*, *Spergularia canadensis*, and *Triglochin maritima*. High marshes are located in areas that flood infrequently and are dominated by medium-tall graminoids and low forbs, especially *Argentina egedii*, *Deschampsia caespitosa*, *Festuca rubra*, *Hordeum brachyantherum*, *Juncus balticus*, *Plantago macrocarpa*, *Poa eminens*, and *Symphotrichum subspicatum* (= *Aster subspicatus*). Transition zone (slightly brackish) marshes are often dominated by *Atriplex prostrata* (= *Atriplex triangularis*), *Cordylanthus* spp., *Juncus mexicanus*, *Lilaeopsis masonii*, *Phragmites* spp., *Schoenoplectus acutus*,

and *Typha* spp. The invasive species *Lepidium latifolium* is a problem in many of these marshes. Rare plant species include *Cordylanthus maritimus ssp. maritimus*.

In the cool wet climates of northern British Columbia, marshes can be dominated by *Plantago maritima* and *Puccinellia pumila*. In the warm summer-dry climates of central California to Baja California and the Sonoran coast, marshes can be sparsely vegetated and are composed of halophytic species such as *Allenrolfea occidentalis*, *Arthrocnemum subterminale*, *Atriplex* spp., *Distichlis spicata*, *Frankenia* spp., *Limonium californicum*, *Monanthochloe littoralis*, *Pluchea* spp., *Salicornia* spp., *Sarcocornia pacifica*, and *Suaeda* spp. Floristic data were compiled from Shreve and Wiggins (1964), Sparks et al. (1977), Brown (1982a), Barbour and Major (1988), National Wetlands Working Group (1988), Viereck et al. (1992), Holland and Keil (1995), Sawyer and T. Keeler-Wolf (1995), and Boggs (2000).

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Ranges from temperate to Mediterranean to warm desert. *Soil/substrate/hydrology:* The frequency of tidal flooding and salinity vary widely. Soils are usually fine-textured and saturated. Primarily associated with estuaries or coastal lagoons, salt marshes are limited to bays, behind sand spits or other locations protected from wave action. These marshes form when there is a freshwater source that mixes with coastal ocean saltwater. Summer-dry periods result in decreased freshwater inputs from inland. Hypersaline environments within salt marshes occur in "salt pans" where tidal water collects and evaporates, and the vegetation can be sparse. Substrates are typically fine-textured and saline alluvium. Vegetation ranges from very dense thickets to open and sparse. Sharp gradients and abrupt shifts in species composition across complex moisture and salinity gradients make for fine-scale patches or bands of vegetation.

Gradients in elevation influence gradients in moisture and in salinity, with highest portions being drier and having higher surface concentrations of salt. Tidal fluctuation is very important and maintains constant moderate salinity and moisture conditions. Low marshes are located in areas that flood every day, while high marshes may only have water during periodic high tides. Environmental data were compiled from Shreve and Wiggins (1964), Sparks et al. (1977), Brown (1982), Barbour and Major (1988), National Wetlands Working Group (1988), Viereck et al. (1992), Holland and Keil (1995), Sawyer and T. Keeler-Wolf (1995), and Boggs (2000).

#### Dynamics:

#### DISTRIBUTION

**Geographic Range:** This macrogroup occurs from Kodiak Island and south-central Alaska, south along the Pacific Coast throughout British Columbia, Washington, Oregon, California, Baja California and the Sonoran coast along the Gulf of California, including coastal marshes along the Colorado River delta and other river deltas such as the Rio Yaqui.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX, US

**States/Provinces:** AK, BC, CA, MXBC, MXBS, MXSO, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 242A:CC, 261B:CC, 263A:CC, M242A:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

- < Wetlands (217) (Shiflet 1994)

#### LOWER LEVEL UNITS

#### Groups:

- G499 Temperate Pacific Tidal Salt & Brackish Marsh

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel, K. Boggs, C. Chappell

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 10-14

#### REFERENCES

**References:** Barbour and Major 1988, Boggs 2000, Brown 1982a, Faber-Langendoen et al. 2015, Holland and Keil 1995, MacDonald 1988, MacDonald and Barbour 1974, MacKenzie and Moran 2004, Macdonald 1977, National Wetlands Working Group 1988,

Peinado et al. 1994b, Peinado et al. 1994d, Peinado et al. 1995b, Peinado et al. 2007, Peinado et al. 2009a, Peinado et al. 2011a, Peinado pers. comm., Pickart 2006, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Shreve and Wiggins 1964, Sparks et al. 1977, Viereck et al. 1992

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## 2. Shrub & Herb Vegetation

2.C.5.Nc. Temperate & Boreal Pacific Coastal Salt Marsh

M081. North American Pacific Coastal Salt Marsh

### G499. Temperate Pacific Tidal Salt & Brackish Marsh

#### Type Concept Sentence:

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#### OVERVIEW

**Scientific Name:** *Carex lyngbyei* - *Schoenoplectus maritimus* - *Glaux maritima* Temperate Pacific Tidal Salt & Brackish Marsh Group

**Common Name (Translated Scientific Name):** Lyngbye's Sedge - Cosmopolitan Bulrush - Sea-milkwort Temperate Pacific Tidal Salt & Brackish Marsh Group

**Type Concept:** This group consists of the intertidal salt marshes and brackish marshes found throughout the North American Pacific Coast, from Kodiak Island and south-central Alaska, south along the coast throughout British Columbia, Washington, Oregon, California, Baja California and the Sonoran coast along the Gulf of California, including coastal marshes along the Colorado River Delta and other river deltas such as the Rio Yaqui. Primarily associated with estuaries or coastal lagoons, salt marshes are limited to bays, behind sand spits or other locations protected from wave action. Vegetation ranges from very dense thickets to open and sparse. Dominant plant species change from north to south, but communities have many species in common which include *Batis maritima*, *Carex lyngbyei*, *Carex ramenskii*, *Distichlis spicata*, *Eleocharis palustris*, *Glaux maritima*, *Jaumea carnosa*, *Limonium californicum*, *Monanthochloe littoralis*, *Hippuris tetraphylla*, *Honckenya peploides*, *Puccinellia* spp., *Salicornia virginica*, *Salicornia* spp., *Spergularia canadensis*, *Suaeda* spp., *Triglochin maritima*, and/or *Triglochin* spp.

**Classification Comments:** This type has a very extensive distribution, from cold temperate Alaska to subtropical Mexico. It also spans the low to high marsh.

#### Internal Comments:

#### Other Comments:

#### Similar NVC Types:

- G517 Vancouverian Freshwater Wet Meadow & Marsh: upper parts of salt marsh have some similarities to freshwater marshes.
- G535 North American Low Arctic Coastal Salt Marsh: occurs further north along the Aleutian Islands and in the arctic and boreal climes.

**Diagnostic Characteristics:** Coastal herbaceous intertidal salt marshes and brackish marshes primarily associated with estuaries or coastal lagoons, salt marshes are limited to bays, behind sand spits or other locations protected from wave action.

#### VEGETATION

**Physiognomy and Structure:** Graminoid-dominated herbaceous wetlands flooded daily by saltwater tidal influx. May contain low scattered shrubs.

**Floristics:** Dominant plant species change from north to south, but communities have many species in common which include *Jaumea carnosa*, *Carex lyngbyei*, *Distichlis spicata*, *Sarcocornia pacifica* (= *Salicornia virginica*), and *Salicornia* spp. High salt marsh and other short-inundation and regularly drying salt marsh or marsh-like settings have much in common with each other. For example, *Distichlis spicata*, *Allenrolfea occidentalis*, *Frankenia salina*, *Arthrocnemum subterminale*, *Cressa truxillensis*, *Glaux maritima*, and many other "high marsh" species in California may also be found in the interior saline and alkaline basins and moist bottomlands far from the coast.

A study at Humboldt Bay (northwestern California) by Pickart (2006) suggests that there are different alliances based on saline, brackish, and fresh to slightly brackish marsh. The only types that would be considered saline marsh are *Distichlis spicata*, *Schoenoplectus maritimus* (= *Scirpus maritimus*), *Atriplex prostrata*, *Salicornia*, and *Spergularia*. Many species considered as salt marsh indicators or differential types in this treatment such as *Deschampsia caespitosa*, *Argentina anserina* (= *Potentilla anserina*), and *Eleocharis* occur in brackish conditions. Another suite of species, including *Juncus arcticus*, *Hydrocotyle ranunculoides*, *Typha latifolia*, and *Oenanthe sarmentosa*, are only slightly to moderately brackish in Na-based and electrical conductivity salinity classes.

Low marshes are located in areas that flood every day and are dominated by a variety of low-growing forbs and low to medium-height graminoids, especially *Carex lyngbyei*, *Carex ramenskii*, *Glaux maritima*, *Hippuris tetraphylla*, *Honckenya peploides*, *Puccinellia* spp., *Salicornia virginica*, *Schoenoplectus americanus*, *Schoenoplectus maritimus*, *Spergularia canadensis*, and *Triglochin*

*maritima*. High marshes are located in areas that flood infrequently and are dominated by medium-tall graminoids and low forbs, especially *Argentina egedii*, *Deschampsia caespitosa*, *Festuca rubra*, *Juncus balticus*, *Poa eminens* and *Symphotrichum subspicatum* (= *Aster subspicatus*). Transition zone (slightly brackish) marshes are often dominated by *Atriplex prostrata* (= *Atriplex triangularis*), *Cordylanthus* spp., *Juncus mexicanus*, *Lilaeopsis masonii*, *Phragmites* spp., *Schoenoplectus acutus*, and *Typha* spp. The invasive species *Lepidium latifolium* is a problem in many of these marshes. Rare plant species include *Cordylanthus maritimus* ssp. *maritimus*.

In the warm summer-dry climates of central California to Baja California and the Sonoran coast, marshes can be sparsely vegetated and are composed of halophytic species such as *Allenrolfea occidentalis*, *Arthrocnemum subterminale*, *Atriplex* spp., *Monanthochloe littoralis*, *Distichlis spicata*, *Frankenia* spp., *Limonium californicum*, *Pluchea* spp., *Salicornia* spp., and *Suaeda* spp. Floristic data were compiled from Shreve and Wiggins (1964), Sparks et al. (1977), Brown (1982), Barbour and Major (1988), National Wetlands Working Group (1988), Viereck et al. (1992), Holland and Keil (1995), Sawyer and T. Keeler-Wolf (1995), and Boggs (2000).

G499 Temperate Pacific Tidal Salt & Brackish Marsh Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Argentina egedii</i> - <i>Juncus balticus</i> Herbaceous Vegetation	G3G4/S2	CEGL003382
<i>Argentina egedii</i> - <i>Symphotrichum subspicatum</i> Herbaceous Vegetation	G3G4/S1	CEGL003288
<i>Calamagrostis nutkaensis</i> - <i>Argentina egedii</i> - <i>Juncus balticus</i> Herbaceous Vegetation	G1/S1	CEGL003421
<i>Carex lyngbyei</i> - ( <i>Distichlis spicata</i> , <i>Triglochin maritima</i> ) Herbaceous Vegetation	G4/S2	CEGL003285
<i>Carex lyngbyei</i> - <i>Argentina egedii</i> Herbaceous Vegetation	G4/S1?	CEGL003289
<i>Deschampsia caespitosa</i> - ( <i>Carex lyngbyei</i> , <i>Distichlis spicata</i> ) Herbaceous Vegetation	G3G4/S2	CEGL003357
<i>Deschampsia caespitosa</i> - <i>Argentina egedii</i> Herbaceous Vegetation	G3G4/S2	CEGL003383
<i>Deschampsia caespitosa</i> - <i>Sidalcea hendersonii</i> Herbaceous Vegetation	G2/SNA	CEGL003384
<i>Distichlis spicata</i> - ( <i>Salicornia virginica</i> ) Herbaceous Vegetation	G4/S2	CEGL003356
<i>Festuca rubra</i> - ( <i>Argentina egedii</i> ) Herbaceous Vegetation	G1/S1	CEGL003424
<i>Festuca rubra</i> - <i>Juncus lesueurii</i> Herbaceous Vegetation	G3/S1	CWWA000180
<i>Glaux maritima</i> Herbaceous Vegetation [Provisional]	G3/S1?	CEGL003286
<i>Ruppia maritima</i> Estuarine Herbaceous Vegetation	G5/SU	CWWA000187
<i>Salicornia (bigelovii, virginica)</i> Tidal Herbaceous Vegetation	GNRQ/SNA	CEGL003123
<i>Salicornia virginica</i> - <i>Distichlis spicata</i> - <i>Triglochin maritima</i> - ( <i>Jaumea carnosa</i> ) Herbaceous Vegetation	G3/S2	CEGL003366
<i>Schoenoplectus (acutus, tabernaemontani)</i> Pacific Coast Herbaceous Vegetation	GNR/SNR	CWWA000432
<i>Schoenoplectus (americanus, pungens)</i> Tidal Herbaceous Vegetation [Provisional]	G3/S2	CEGL003367
<i>Schoenoplectus maritimus</i> Tidal Herbaceous Vegetation [Provisional]	G3/S1	CEGL003287
<i>Triglochin maritima</i> - ( <i>Salicornia virginica</i> ) Herbaceous Vegetation	G4/S2	CEGL003381

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Ranges from temperate to Mediterranean to warm desert. *Soil/substrate/hydrology:* The frequency of tidal flooding and salinity vary widely. Soils are usually fine-textured and saturated. Primarily associated with estuaries or coastal lagoons, salt marshes are limited to bays, behind sand spits or other locations protected from wave action. These marshes form when there is a freshwater source that mixes with coastal ocean saltwater. Occurrences can be small or large patch, and individual associations are confined to specific environments defined by ranges of salinity, tidal inundation regime, and soil texture. Summer-dry periods result in decreased freshwater inputs from inland. Hypersaline environments within salt marshes occur in "salt pans" where tidal water collects and evaporates, and the vegetation can be sparse. Substrates are typically fine-textured and saline alluvium. Vegetation ranges from very dense thickets to open and sparse. Sharp gradients and abrupt shifts in species composition across complex moisture and salinity gradients make for fine-scale patches or bands of vegetation.

Most cool temperate and warm temperate coastal salt marshes are influenced by daily tides and also by seasonal or unpredictable inundations at highest elevation levels of the marsh. Gradients in elevation influence gradients in moisture and in salinity, with highest portions being drier and having higher surface concentrations of salt. High marshes in the warm temperate to subtropical zones have more in common with interior saline and alkaline systems such as playa margins, alkali seeps, and springs.

"High" salt marshes in cooler areas with higher summer precipitation (e.g., the Pacific Northwest) tend to have more in common with brackish or even freshwater meadows, while high marshes in warm temperate Mediterranean or subtropical dry

coasts tend to have more in common with desert alkaline or saline settings. Tidal fluctuation is very important and maintains constant moderate salinity and moisture conditions. The species that are indicative of this tidal salt marsh environment are the core of this group. They tend to sort based on moisture and water depth and not on salinity gradients.

Low marshes are located in areas that flood every day and are dominated by a variety of low-growing forbs and low to medium-height graminoids.

In the warm summer-dry climates of central California to Baja California and the Sonoran coast, marshes can be sparsely vegetated and are composed of halophytic species.

Environmental data was compiled from Shreve and Wiggins (1964), Sparks et al. (1977), Brown (1982), Barbour and Major (1988), National Wetlands Working Group (1988), Viereck et al. (1992), Holland and Keil (1995), Sawyer and T. Keeler-Wolf (1995), and Boggs (2000).

The following grouping of associations corresponds to the major environmental zones. These should be compared with the alliances. **Low Tidal Marsh- Regularly Flooded Daily** - CEGLO02882, CEGLO02920, CEGLO02923, CEGLO03123, CEGLO03286, CEGLO03287, CEGLO03329, CEGLO03366, CEGLO03380, CEGLO03381, CEGLO03462, CEGLO03466, CEGLO03471. **Hypersaline High Marsh** - CEGLO03356, CEGLO03120, CEGLO02885. **Brackish High Marsh** - CEGLO03285, CEGLO03288, CEGLO03289, CEGLO03357, CEGLO03367, CEGLO03369, CEGLO03382, CEGLO03383, CEGLO03384, CEGLO03421, CEGLO03424, CEGLO03469.

## Dynamics:

### DISTRIBUTION

**Geographic Range:** This group is found throughout the Pacific Coast, from Kodiak Island and south-central Alaska, south along the coast throughout British Columbia, Washington, Oregon, California, Baja California and the Sonoran coast along the Gulf of California, including coastal marshes along the Colorado River Delta and other river deltas such as the Rio Yaqui. Tidal marshes have a limited distribution along the Gulf of Alaska and British Columbia coastline due to the topography and geomorphology of the coast, which features steep slopes and deep fjords and offers limited protection from wave action (National Wetlands Working Group 1988).

**Nations:** CA, MX, US

**States/Provinces:** AK, BC, CA, MXBC, MXBS, MXSO, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:C, 14:C, 15:C, 16:C, 23:C, 69:C, 70:C, 71:C

**USFS Ecoregions (2007):** 242A:CC, 261B:CC, 263A:CC, M242A:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Low.

### SYNONYMY

- < Wetlands (217) (Shiflet 1994)

### LOWER LEVEL UNITS

#### Alliances:

- A2622 *Carex lyngbyei* Brackish Tidal Herbaceous Alliance
- A3903 *Schoenoplectus maritimus* - *Schoenoplectus californicus* Tidal Herbaceous Alliance
- A3898 *Argentina egedii* - *Calamagrostis nutkaensis* - *Juncus balticus* Tidal Herbaceous Alliance
- A3902 *Sarcocornia pacifica* - *Spartina foliosa* - *Glaux maritima* Tidal Herbaceous Alliance
- A3899 *Deschampsia caespitosa* - *Festuca rubra* Brackish Tidal Herbaceous Alliance
- A3900 *Distichlis spicata* Tidal Herbaceous Alliance

### AUTHORSHIP

**Primary Concept Source:** K. Boggs, C. Chappell, G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:** K. Boggs, C. Chappell, G. Kittel, T. Keeler-Wolf, M.S. Reid

**Version Date:** 2013/10/09

### REFERENCES

**References:** Barbour and Major 1988, Boggs 2000, Brown 1982a, Faber-Langendoen et al. 2015, Holland and Keil 1995, National Wetlands Working Group 1988, Pickart 2006, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Shreve and Wiggins 1964, Sparks et al. 1977, Viereck et al. 1992

## 2.C.5.Nd. North American Western Interior Brackish Marsh

Interior saline-alkaline wetlands of North American interior west, including salt flats, marshes and seeps, whose species composition is driven by water chemistry and duration and seasonality of wetness. Stands range from sparse cover of shrubs and/or herbs to productive marshes dominated by tall emergent graminoids.

### 2. Shrub & Herb Vegetation

#### 2.C.5.Nd. North American Western Interior Brackish Marsh

## M082. Warm & Cool Desert Alkali-Saline Wetland

**Type Concept Sentence:** This macrogroup consists of alkaline and saline wetlands with salt-tolerant plant growth where dominant and characteristic plant species include *Atriplex* spp., *Distichlis spicata*, *Salicornia* spp., *Sarcobatus vermiculatus*, *Sesuvium verrucosum*, *Sporobolus* spp., *Suaeda moquinii*, and *Triglochin maritima*. These are located in playas, washes, mudflats and depressional wetlands where evaporation far exceeds precipitation and/or where bedrock and soil properties contribute to alkaline/saline conditions. Sites are found throughout the western U.S. and southwestern Canada.

### OVERVIEW

**Scientific Name:** Warm & Cool Desert Alkali-Saline Wetland Macrogroup

**Common Name (Translated Scientific Name):** Warm & Cool Desert Alkali-Saline Wetland Macrogroup

**Type Concept:** This macrogroup consists of alkaline and saline wetlands dominated by salt-tolerant shrubs or herbs (or both) such as *Allenrolfea occidentalis*, *Artemisia tridentata*, *Atriplex* spp., *Distichlis spicata*, *Eleocharis* spp., *Juncus* spp., *Isocoma acradenia*, *Grayia spinosa*, *Krascheninnikovia lanata*, *Leymus cinereus*, *Leymus triticoides* (= *Elymus triticoides*), *Salicornia* spp., *Sarcobatus vermiculatus*, *Sesuvium verrucosum*, *Sporobolus airoides*, *Suaeda moquinii* (= *Suaeda nigra*), *Suaeda moquinii*, and/or *Triglochin maritima*. These wetlands occur near drainages, on stream terraces or flats and may form rings around drying ponds or playas. Soils are alkaline to saline that varies greatly with soil moisture and greatly affects species composition. Sites also experience intermittent, seasonal or semipermanent flooding and/or raised water tables. Sites may retain water into the growing season and dry completely only in drought years, while others dry out for the growing season. Some sites have seasonal drying that exposes mudflats which are colonized by annual wetland vegetation. Sites are found throughout the western U.S. and southwestern Canada.

**Classification Comments:** All interior alkaline/saline wetlands are together in one macrogroup. *Andropogon glomeratus*, *Distichlis spicata*, *Eleocharis rostellata*, *Muhlenbergia utilis*, *Schoenus nigricans*, *Solidago spectabilis* var. *confinis* (= *Solidago confinis*), and *Solidago spectabilis* var. *spectabilis* (= *Solidago spectabilis*) along with a variety of other forbs occur in sites with alkaline springs in eastern California (Evens et al. 2014). These stands are placed in this macrogroup until further data compilation and analysis occur.

### Similar NVC Types:

- M077 Great Plains Brackish Marsh & Saline Wet Meadow
- M081 North American Pacific Coastal Salt Marsh

**Diagnostic Characteristics:** Salt-tolerant shrublands or herbaceous vegetation with a shallow water table.

### VEGETATION

**Physiognomy and Structure:** Open shrub and/or herbaceous vegetation.

**Floristics:** Shrublands are dominated by *Allenrolfea occidentalis*, *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex gardneri*, *Atriplex parryi*, *Grayia spinosa*, *Isocoma acradenia*, *Krascheninnikovia lanata*, *Sarcobatus vermiculatus*, and/or *Suaeda moquinii*. Herbaceous stands may be dominated by *Calamovilfa longifolia*, *Distichlis spicata* (= *Distichlis stricta*), *Eleocharis palustris*, *Leymus cinereus*, *Leymus triticoides* (= *Elymus triticoides*), *Eleocharis palustris*, *Juncus cooperi*, *Juncus mexicanus*, *Muhlenbergia* spp., *Poa secunda*, *Puccinellia lemmonii*, *Puccinellia nuttalliana*, *Sarcocornia utahensis*, *Sporobolus airoides*, and/or *Triglochin maritima* (West 1983b, Knight 1994). During exceptionally wet years, increased precipitation can dilute soil salt concentrations which may allow less salt-tolerant species to become established or more abundant.

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Cold or warm basins and desert. *Soil/substrate/hydrology:* Sites typically have saline/alkaline soils, a shallow water table and flood or high water table intermittently, seasonally to semipermanently. Sites may remain dry for most growing seasons, or remain wet due to poor drainage. The water table generally remains high enough to maintain vegetation, despite salt accumulations (West 1983b, Knight 1994). Some stands occur on floodplains, along the margins of perennial lakes, and in alkaline closed basins, with extremely low-gradient shorelines, and slopes with alkaline springs. Environmental information compiled from individual associations and Knight (1994).

**Dynamics:** During exceptionally wet years, the salt concentration drops, allowing less salt-tolerant species to appear, such as cattails (*Typha* spp.) or bulrushes (*Scirpus* and/or *Schoenoplectus* spp.) (Knight 1994). Water evaporation leaves high salt concentrations in the soils. Some areas only flood during wet years, sometimes only once or twice in a decade. Others will have standing water every spring, except in the driest of years.

#### DISTRIBUTION

**Geographic Range:** This macrogroup is found throughout much of the western U.S. in intermountain basins and in southwestern Canada.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX, US

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

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:??, 322A:CC, 331B:CC, 331C:CP, 331D:CP, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 331K:CP, 331L:C?, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CP, 342F:CC, 342G:CC, 342H:CC, 342I:C?, 342J:CC, M242C:CC, M261D:CC, M261E:CP, M261G:CC, M313A:CC, M313B:CC, M331A:C?, M331B:CP, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CP, M331J:C?, M332A:C?, M332D:CP, M332E:C?, M332G:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

#### Omernik Ecoregions:

#### Federal Lands [optional]:

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

- < Salt Desert Shrub (414) (Shiflet 1994)
- >< Saltbush - Greasewood (501) (Shiflet 1994)

#### LOWER LEVEL UNITS

#### Groups:

- G538 North American Desert Alkaline-Saline Herbaceous Wetland & Playa
- G537 North American Desert Alkaline-Saline Shrub Wetland

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel

#### Acknowledgments:

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 10-14

#### REFERENCES

**References:** Billings 1945, Billings 1949, Comer et al. 2003, Evens et al. 2014, Faber-Langendoen et al. 2015, Fautin 1946, Knight 1994, Peinado et al. 2013, Sawyer et al. 2009, Shiflet 1994, Stout et al. 2013, Thomas et al. 2004, West 1983b

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2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh

M082. Warm & Cool Desert Alkali-Saline Wetland

### G538. North American Desert Alkaline-Saline Herbaceous Wetland & Playa

#### Type Concept Sentence:

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#### OVERVIEW

**Scientific Name:** *Distichlis spicata* - *Puccinellia lemmonii* - *Salicornia* spp. Alkaline-Saline Herbaceous Wetland & Playa Group

**Common Name (Translated Scientific Name):** Saltgrass - Lemmon's Alkali Grass - Saltwort species Alkaline-Saline Herbaceous Wetland & Playa Group

**Type Concept:** This group is found in the intermountain western U.S. Associations are composed of densely vegetated seasonal wetlands, salt-water emergent marshes to barren and sparsely vegetated playas (generally <10% plant cover). Soils and standing water (if present) are alkaline. Salt crusts are common where there are actively drying ponds, that can have saltgrass beds in depressions and sparse shrubs around the margins. Playa flats are intermittently, seasonally to semipermanently flooded, usually

retaining water into the growing season and drying completely only in drought years. Many are associated with hot and cold springs, located in basins with internal drainage. Soils are alkaline to saline clays with hardpans. Seasonal drying exposes mudflats colonized by annual wetland vegetation. Water is prevented from percolating through the soil by an impermeable soil subhorizon and is left to evaporate. Soil salinity varies greatly with soil moisture and greatly affects species composition. During exceptionally wet years, increased precipitation can dilute soil salt concentrations which may allow less salt-tolerant species to become established or more abundant. Some stands occur on floodplains, along the margins of perennial lakes, and in alkaline closed basins, with extremely low-gradient shorelines. Characteristic species may include *Allenrolfea occidentalis*, *Atriplex* spp., *Distichlis spicata*, *Grayia spinosa*, *Leymus cinereus*, *Leymus triticoides* (= *Elymus triticoides*), *Muhlenbergia* spp., *Poa secunda*, *Puccinellia lemmonii*, *Salicornia* spp., *Sarcobatus vermiculatus*, and *Triglochin maritima*.

#### Classification Comments:

**Internal Comments:** DFL 12-5-12: Canada & Mexico added based on member assoc.

**Other Comments:**

#### Similar NVC Types:

- G531 Arid West Interior Freshwater Emergent Marsh
- G324 Great Plains Depressional Saline & Brackish Wetland: also includes salt-tolerant herbaceous wetlands, but occurs east of the Continental Divide on the Great Plains.
- G537 North American Desert Alkaline-Saline Shrub Wetland: also occurs in cold desert regions but is dominated by shrub species.

**Diagnostic Characteristics:** Salt-tolerant herbs that are seasonally or intermittently wet on barren to sparsely vegetated playas, lake margins, closed basins, and low-gradient shorelines.

### VEGETATION

**Physiognomy and Structure:** Open shrub and/or herb vegetation.

**Floristics:** Characteristic species may include *Allenrolfea occidentalis*, *Atriplex* spp., *Distichlis spicata*, *Grayia spinosa*, *Leymus cinereus*, *Leymus triticoides* (= *Elymus triticoides*), *Muhlenbergia* spp., *Poa secunda*, *Puccinellia lemmonii*, *Salicornia* spp., *Schoenoplectus americanus*, *Schoenoplectus maritimus*, and *Triglochin maritima*.

G538 North American Desert Alkaline-Saline Herbaceous Wetland & Playa Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Distichlis spicata</i> - ( <i>Scirpus nevadensis</i> ) Herbaceous Vegetation	G4/SNA	CEGL001773
<i>Distichlis spicata</i> / <i>Carex (praegracilis, douglasii)</i> Herbaceous Vegetation	GNR/SNR	CWWA000347
<i>Distichlis spicata</i> Herbaceous Vegetation	G5/S1?	CEGL001770
<i>Eleocharis rostellata</i> Alkaline Herbaceous Vegetation	GNR/SNR	CWWA000351
<i>Hordeum jubatum</i> Great Basin Herbaceous Vegetation	G4/SNR	CEGL005285
<i>Leymus cinereus</i> - <i>Carex praegracilis</i> Herbaceous Vegetation	GNR/SNR	CWWA000363
<i>Leymus cinereus</i> - <i>Distichlis spicata</i> Herbaceous Vegetation	G3/S1	CEGL001481
<i>Leymus cinereus</i> Herbaceous Vegetation	G2G3Q/S1	CEGL001479
<i>Puccinellia nuttalliana</i> Herbaceous Vegetation	G3?/SNR	CEGL001799
<i>Salicornia rubra</i> Herbaceous Vegetation	G2G3/SNR	CEGL001999
<i>Spartina gracilis</i> Herbaceous Vegetation	GU/S2?	CEGL001588
<i>Sporobolus airoides</i> Northern Intermountain Herbaceous Vegetation	GNR/SNR	CWWA000408
<i>Suaeda (calceoliformis, moquinii)</i> Herbaceous Vegetation	GNR/SNR	CWWA000421

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Cold desert. *Soil/substrate/hydrology:* This group is found on barren and sparsely vegetated playas (generally <10% plant cover). Salt crusts are common throughout, with small saltgrass beds in depressions and sparse shrubs around the margins. The flats are intermittently, seasonally to semipermanently flooded, usually retaining water into the growing season and drying completely only in drought years. Many are associated with hot and cold springs, located in basins with internal drainage. Soils are alkaline to saline clays with hardpans. Seasonal drying exposes mudflats colonized by annual wetland vegetation. Water is prevented from percolating through the soil by an impermeable soil subhorizon and is left to evaporate. Soil salinity varies greatly with soil moisture and greatly affects species composition. During exceptionally wet years, increased precipitation can dilute



soil salt concentrations which may allow less salt-tolerant species to become established or more abundant. Some stands occur on floodplains, along the margins of perennial lakes, and in alkaline closed basins, with extremely low-gradient shorelines. Environmental information compiled from individual associations and Knight (1994).

**Dynamics:** Playas are shallow, seasonal wetlands that lie in the lowest point of a closed watershed. Their basins are lined with clay soils, which collect and hold water from rainfall and runoff events. Water evaporates, leaving high salt concentrations in the soils. Some playas will only flood with water during years with high precipitation, sometimes only once or twice in a decade. Others will have standing water every spring, except in the driest of years. During flooded years, some salt-tolerant marsh plant species may grow, such as cattails (*Typha* spp.) or bulrush (*Scirpus* and/or *Schoenoplectus* spp.) (Knight 1994).

#### DISTRIBUTION

**Geographic Range:** This group is found throughout the intermountain western U.S.

**Nations:** CA, MX, US

**States/Provinces:** CA, CO, ID, NM, NV, OR, UT, WA?, WY

**TNC Ecoregions [optional]:** 6:C, 10:C, 11:C, 19:C

**USFS Ecoregions (2007):** 313A:CP, 313B:CP, 313D:CC, 322A:??, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CP, 342F:CC, 342G:CC, 342H:CC, 342I:C?, 342J:CC, M242C:CC, M261D:P?, M261G:PP, M313A:CC, M331D:??, M331E:??, M332G:CC, M341A:CC, M341B:C?, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

#### LOWER LEVEL UNITS

#### Alliances:

- A3930 *Eleocharis palustris* - *Eleocharis rostellata* Alkaline-Saline Herbaceous Alliance
- A3932 *Hordeum jubatum* Alkaline Herbaceous Alliance
- A1332 *Distichlis spicata* Alkaline Wet Meadow Alliance
- A1334 *Muhlenbergia asperifolia* - *Spartina gracilis* - *Sporobolus airoides* Alkaline Herbaceous Alliance
- A1329 *Leymus cinereus* - *Leymus triticooides* Herbaceous Alliance
- A4165 *Poa secunda* - *Muhlenbergia richardsonis* - *Carex douglasii* Semi-alkaline Herbaceous Alliance

#### AUTHORSHIP

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al.

**Author of Description:** G. Kittel

**Acknowledgments:** J. Kagan and P. Comer

**Version Date:** 2013/09/09

#### REFERENCES

**References:** Faber-Langendoen et al. 2015, Knight 1994, Shiflet 1994, Stout et al. 2013

2. Shrub & Herb Vegetation

2.C.5.Nd. North American Western Interior Brackish Marsh

M082. Warm & Cool Desert Alkali-Saline Wetland

### G537. North American Desert Alkaline-Saline Shrub Wetland

**Type Concept Sentence:**

#### OVERVIEW

**Scientific Name:** *Sarcobatus vermiculatus* - *Atriplex* spp. Alkaline-Saline Shrub Wetland Group

**Common Name (Translated Scientific Name):** Greasewood - Saltbush species Alkaline-Saline Shrub Wetland Group

**Type Concept:** This group occurs throughout much of the western U.S. in intermountain basins. Stands typically occur near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This group consists of open to moderately dense shrublands dominated by *Atriplex lentiformis*, *Atriplex parryi*, *Atriplex polycarpa*, *Atriplex spinifera*, *Allenrolfea occidentalis*, *Salicornia rubra*, *Sarcobatus vermiculatus*, *Sesuvium verrucosum*, and/or *Suaeda moquinii*. Stands may be monotypic or have lesser abundance of other shrubs such as *Atriplex*

*canescens*, *Atriplex confertifolia*, *Atriplex gardneri*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tridentata* ssp. *tridentata*, *Artemisia cana* ssp. *cana*, *Baccharis* spp., *Krascheninnikovia lanata*, and others. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of *Calamovilfa longifolia*, *Distichlis spicata* (where water remains ponded the longest), *Eleocharis palustris*, *Pascopyrum smithii*, *Poa pratensis*, *Puccinellia nuttalliana*, or *Sporobolus airoides* herbaceous types.

#### Classification Comments:

**Internal Comments:** MSR 11-14: this is now to include the coastal high marsh alkaline taxa from California classif extending into Baja; including *Atriplex polycarpa*, *A. lentiformis*. DFL 12-5-12: Canada? added based on member assoc.

#### Other Comments:

#### Similar NVC Types:

- G534 Western Great Plains Saline Depression Wetland: occurs in the northern and western Great Plains and is also dominated by *Sarcobatus vermiculatus* with more Great Plains herbaceous species.
- G538 North American Desert Alkaline-Saline Herbaceous Wetland & Playa: includes salt communities in the cold desert that are dominated by herbaceous species.

**Diagnostic Characteristics:** Salt-tolerant shrublands with a shallow water table.

### VEGETATION

**Physiognomy and Structure:** Shrubland.

**Floristics:** These shrublands are dominated by *Atriplex lentiformis*, *Atriplex parryi*, *Atriplex polycarpa*, *Atriplex spinifera*, *Allenrolfea occidentalis*, *Salicornia rubra*, *Sarcobatus vermiculatus*, *Sesuvium verrucosum*, and/or *Suaeda moquinii*. Codominant shrubs include *Ambrosia dumosa*, *Artemisia californica*, *Atriplex canescens*, *Baccharis pilularis*, *Baccharis salicifolia*, *Encelia californica*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Hymenoclea salsola*, *Kochia americana*, *Larrea tridentata*, *Malosma laurina*, *Myoporum laetum*, *Pluchea sericea*, *Prosopis glandulosa*, *Rhus integrifolia*, and/or *Suaeda taxifolia* plus several others. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of *Calamovilfa longifolia*, *Distichlis spicata* (where water remains ponded the longest), *Eleocharis palustris*, *Pascopyrum smithii*, *Poa pratensis*, *Puccinellia nuttalliana*, or *Sporobolus airoides* herbaceous types (West 1983b, Knight 1994).

G537 North American Desert Alkaline-Saline Shrub Wetland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Sarcobatus vermiculatus</i> / <i>Distichlis spicata</i> Shrubland	G4/S2?	CEGL001363
<i>Sarcobatus vermiculatus</i> / <i>Leymus cinereus</i> Shrubland	G3/S1	CEGL001366

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Cold interior desert. *Soil/substrate/hydrology:* Sites are generally flat to gently sloping and moderately saline, but some sites do occur on rolling to hilly fans and slopes. Sites typically have saline soils, a shallow water table and flood intermittently, on margins of intermittently flooded desert playas, and usually remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations, often with fine soils such as clays (West 1983b, Knight 1994).

#### Dynamics:

### DISTRIBUTION

**Geographic Range:** This group occurs throughout much of the western U.S. in intermountain basins.

**Nations:** CA?, US

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

**TNC Ecoregions [optional]:** 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:??, 322A:CC, 331B:CC, 331C:CP, 331D:CP, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 331K:CP, 331L:C?, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342H:CC, 342I:C?, 342J:CC, M242C:??, M261D:CC, M261E:CP, M261G:CC, M313A:CC, M313B:CC, M331A:C?, M331B:CP, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CP, M331J:C?, M332A:C?, M332D:CP, M332E:C?, M332G:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

- < Salt Desert Shrub (414) (Shiflet 1994)
- >< Saltbush - Greasewood (501) (Shiflet 1994)

**LOWER LEVEL UNITS****Alliances:**

- A0798 *Pluchea sericea* Shrubland Alliance
- A3173 *Atriplex lentiformis* Shrubland Alliance
- A1046 *Sarcobatus vermiculatus* Intermountain Shrub Alliance
- A0866 *Allenrolfea occidentalis* - *Isocoma acradenia* Shrubland Alliance
- A3880 *Suaeda moquinii* - *Salicornia rubra* Alkaline Scrub Alliance
- A2507 *Atriplex parryi* Shrubland Alliance
- A0865 *Atriplex spinifera* Shrubland Alliance
- A3879 *Sesuvium verrucosum* - *Allenrolfea occidentalis* Saline Wet Flats Desert Scrub Alliance

**AUTHORSHIP**

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 2015/05/11

**REFERENCES**

**References:** Comer et al. 2003, Faber-Langendoen et al. 2015, Knight 1994, Shiflet 1994, West 1983b

## 3. DESERT & SEMI-DESERT

Cool and warm semi-deserts dominated by xeromorphic growth forms, including *succulent* (e.g., cacti, euphorbias) and *small-leaved shrubs* and *trees*, desert grasses and other xeromorphic growth forms, with an irregular horizontal canopy spacing that is often open to very sparse (1%) cover.

### 3.B. Cool Semi-Desert Scrub & Grassland

Cool Semi-Desert Scrub & Grassland occurs in dry, cool-temperate climates, at mid-latitudes (35° to 50°N), typically in the interior of continents, and varies from low shrublands to very open grassland and shrub-steppe, including open rocky or sandy semi-desert vegetation.

Type Concept:

#### 3.B.1. Cool Semi-Desert Scrub & Grassland

Cool Semi-Desert Scrub & Grassland occurs in dry, cool-temperate climates, at mid-latitudes (35° to 50°N), typically in the interior of continents.

#### 3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

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3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

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

**Type Concept Sentence:** This diverse semi-arid macrogroup is found throughout the Intermountain West, including mid-elevation sites in eastern and central Mojave Desert, the Great Basin, Colorado Plateau, Columbia Plateau, and lower elevation sites in the central Rocky Mountains extending east across Wyoming Basins into the western Great Plains. It can occur as open shrubland, dwarf-shrub, shrub herbaceous, or grassland communities. Characteristic species include shrubs *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ephedra* spp., *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, and dry grasses such as *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, *Leymus salinus* ssp. *salinus*, *Muhlenbergia pungens*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus cryptandrus*, and *Sporobolus airoides*.

### OVERVIEW

**Scientific Name:** *Chrysothamnus viscidiflorus* - *Coleogyne ramosissima* / *Achnatherum hymenoides* Great Basin & Intermountain Dry Shrubland & Grassland Macrogroup

**Common Name (Translated Scientific Name):** Yellow Rabbitbrush - Blackbrush / Indian Ricegrass Great Basin & Intermountain Dry Shrubland & Grassland Macrogroup

**Type Concept:** This macrogroup is found throughout the Intermountain West, including mid-elevation sites in eastern and central Mojave Desert, the Great Basin, Colorado Plateau, Columbia Plateau, and lower elevation sites in the central Rocky Mountains extending east across Wyoming Basins into the western Great Plains. Stands can occur as open shrubland, dwarf-shrub, shrub herbaceous or grassland communities. Characteristic shrubs include *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ephedra torreyana*, *Ephedra viridis*, *Ericameria nauseosa*, *Ericameria parryi*, *Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. Less frequent diagnostic shrubs include *Artemisia filifolia*, *Chrysothamnus albidus*, *Ephedra cutleri*, *Ericameria teretifolia*, *Glossopetalon spinescens* var. *aridum*, *Opuntia* spp., *Parryella filifolia*, *Poliomntha incana*, *Psoralea fremontii*, *Purshia stansburiana*, *Quercus havardii* var. *tuckeri*, *Tetradymia canescens*, *Tetradymia tetrameres*, and *Vanclevea stylosa*. In cooler canyon and foothill sites, deciduous shrubs such as *Holodiscus discolor*, *Physocarpus malvaceus*, *Rhus glabra*, *Ribes* spp., and *Symphoricarpos* spp. maybe present. Additional shrubs characteristic of mid-elevation Mojave Desert sites are *Eriogonum fasciculatum*, *Ephedra californica*, *Ephedra nevadensis*, *Eriogonum corymbosum*, *Grayia spinosa*, *Lycium andersonii*, *Menodora spinescens*, *Nolina bigelovii*, *Nolina microcarpa*, *Nolina parryi*, *Opuntia acanthocarpa*, *Purshia glandulosa*, *Purshia stansburiana*, *Salazaria mexicana*, *Thamnosma montana*, *Yucca brevifolia*, or *Yucca schidigera*. Wide-ranging shrubs *Atriplex canescens*, *Artemisia tridentata*, and *Sarcobatus vermiculatus* may be present, but do not dominate, as they are diagnostic of other macrogroups. The herbaceous layer is sparse to moderately dense and is characterized by perennial graminoids *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, *Leymus salinus* ssp. *salinus*, *Muhlenbergia pungens*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. Forb cover is sparse but can be relatively diverse. These communities occur on a variety of landforms. Shrublands are common on windswept mesas, canyons, benchlands, colluvial slopes, alluvial fans and flats, broad basins and sandy plains. Grassland and steppe occur in both lowland and upland areas and may occupy swales, playas, mesatops, plateau parks, canyon bottoms and slopes, foothills, alluvial terraces, and plains. Sites range from gentle to steep slopes on all aspects. Soils are variable but are generally shallow, calcareous, and range from sandy to finer-textured (clays to silt-loams) that are often derived from limestone, sandstone or shale.

**Classification Comments:** This macrogroup encompasses a somewhat broad range of semi-desert shrublands in the Intermountain West. Many of these communities are somewhat disturbance-maintained, early-seral types. Additional data and analysis are needed to clarify the associations that should be placed here. Shrub communities occurring over talus included in this macrogroup are part of a continuum and can be highly variable, and some dwarf-shrub communities can technically be defined as herbaceous types. It's possible that Colorado Plateau Blackbrush - Mormon-tea Shrubland Group (G312) could be merged in this macrogroup with Mojave Mid-Elevation Mixed Desert Scrub Group (G296), as they both are found in higher elevations that are wetter and cooler and they overlap significantly in floristics.

### Similar NVC Types:

- M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland: is a similar western macrogroup that includes higher elevation, more relatively mesic grasslands and shrublands. There is some species overlap in foothill zones.
- M088 Mojave-Sonoran Semi-Desert Scrub
- M118 Intermountain Basins Cliff, Scree & Badland Sparse Vegetation
- M093 Great Basin Saltbush Scrub

**Diagnostic Characteristics:** This diverse semi-arid macrogroup occurs as open shrub, dwarf-shrub, shrub herbaceous, grassland, or sparse vegetation communities (on sand deposits). Stands typically range from 5-50% total vegetation cover. Rock outcrop, shale badlands and deep sand sites are typically sparse. If present, the shrub layer is characterized by wide-ranging diagnostic shrubs *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ephedra torreyana*, *Ephedra viridis*, *Ericameria nauseosa*, *Ericameria parryi*,

*Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. Less frequent diagnostic shrubs include *Chrysothamnus albidus*, *Ericameria teretifolia*, *Glossopetalon spinescens* var. *aridum*, *Opuntia* spp., *Purshia stansburiana*, and *Tetradymia canescens*. Additional diagnostic shrubs characteristic of sand deposits are *Artemisia filifolia*, *Ephedra cutleri*, *Eriogonum leptocladon*, *Parryella filifolia*, *Poliomintha incana*, *Psorothamnus fremontii*, *Quercus havardii* var. *tuckeri*, *Tetradymia tetrameres*, or *Vanceleva stylosa*. Other shrubs characteristic of mid-elevation Mojave Desert sites are *Eriogonum fasciculatum*, *Ephedra californica*, *Ephedra nevadensis*, *Eriogonum corymbosum*, *Grayia spinosa*, *Lycium andersonii*, *Menodora spinescens*, *Nolina bigelovii*, *Nolina microcarpa*, *Nolina parryi*, *Opuntia acanthocarpa*, *Purshia glandulosa*, *Purshia stansburiana*, *Salazaria mexicana*, *Thamnosma montana*, *Yucca brevifolia*, or *Yucca schidigera*. The herbaceous layer is sparse to moderately dense and is characterized by perennial graminoids *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, *Leymus salinus* ssp. *salinus*, *Muhlenbergia pungens*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. Forb cover is sparse but can be relatively diverse.

## VEGETATION

**Physiognomy and Structure:** This macrogroup is variable, being composed of grasslands, shrublands and steppe. The shrub layer, if present, is open to moderately dense and composed of evergreen, microphyllous semi-desert scrubs and/or cold-deciduous, broad-leaved shrubs with succulents and dwarf-shrubs. Herbaceous species may form a sparse to moderately dense layer composed of perennial graminoids. Forb cover is sparse but can be relatively diverse.

**Floristics:** Vegetation in this semi-arid macrogroup is highly variable, ranging from open to dense shrublands, grasslands and steppe, including sparse vegetation on sand deposits. High-frequency dominant shrubs that characterize this macrogroup are *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ephedra torreyana*, *Ephedra viridis*, *Ericameria nauseosa*, *Ericameria parryi*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, and *Poliomintha incana*. Less frequent but sometimes dominant shrubs include *Chrysothamnus albidus*, *Ericameria teretifolia*, *Glossopetalon spinescens* var. *aridum*, *Opuntia fragilis*, *Opuntia polyacantha*, *Opuntia phaeacantha*, *Purshia stansburiana*, and *Tetradymia canescens*. Sand communities are characterized by *Artemisia filifolia*, *Ephedra cutleri*, *Ephedra torreyana*, *Ephedra viridis*, *Eriogonum leptocladon*, *Parryella filifolia*, *Poliomintha incana*, *Psorothamnus fremontii*, *Quercus havardii* var. *tuckeri*, *Tetradymia tetrameres*, or *Vanceleva stylosa*. In cooler canyon and foothill sites, deciduous shrubs such as *Holodiscus discolor*, *Physocarpus malvaceus*, *Rhus glabra*, *Ribes* spp., and *Symphoricarpos* spp. maybe present. Shrubs diagnostic of other macrogroups such as *Atriplex canescens*, *Artemisia tridentata*, shrubby *Juniperus osteosperma*, and *Sarcobatus vermiculatus* may be present to codominant. In the southern Great Basin and mid-elevation sites in the Mojave Desert, *Yucca brevifolia* and several other desert shrubs, such as *Eriogonum fasciculatum*, *Ephedra californica*, *Ephedra nevadensis*, *Eriogonum corymbosum*, *Grayia spinosa*, *Lycium andersonii*, *Menodora spinescens*, *Nolina bigelovii*, *Nolina microcarpa*, *Nolina parryi*, *Opuntia acanthocarpa*, *Purshia glandulosa*, *Purshia stansburiana*, *Salazaria mexicana*, *Thamnosma montana*, or *Yucca schidigera*, may also be present. Other associated shrubs include *Eriogonum* spp., *Fallugia paradoxa*, *Grayia spinosa*, *Isocoma drummondii*, and *Lycium pallidum*. The herbaceous layer is sparse to moderately dense and composed of drought-resistant perennial graminoids such as *Achnatherum lettermanii*, *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, *Leymus salinus* ssp. *salinus*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, and *Sporobolus airoides*. On sandy sites *Achnatherum hymenoides*, *Leymus flavescens*, *Muhlenbergia pungens*, *Psoralidium lanceolatum* and *Sporobolus cryptandrus* are prominent. *Festuca idahoensis* may codominate in cooler canyon slopes and higher elevation stands. Forb cover is sparse but can be relatively diverse. Associated forbs include *Astragalus purshii*, *Balsamorhiza sagittata*, *Calochortus macrocarpus*, *Chamaesyce* spp., *Erigeron* spp., *Hymenopappus filifolius*, *Lupinus pusillus*, *Machaeranthera canescens*, *Phlox hoodii*, *Sphaeralcea coccinea*, *Sphaeralcea munroana*, *Vicia americana*, and species of *Antennaria*, *Astragalus*, *Cryptantha*, *Eriogonum*, *Gilia*, and *Lappula*. Annuals may be seasonally present to abundant depending on precipitation and disturbance. Cryptogams are important in some stands with up to 40% ground cover on sites in the Colorado Plateau. Exotic species such as *Bassia scoparia* (= *Kochia scoparia*), *Bromus tectorum*, *Draba verna*, *Lactuca serriola*, *Poa pratensis*, *Salsola tragus*, *Sisymbrium altissimum*, and *Tragopogon dubius* are present in many of these stands.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup is found throughout the Intermountain West from mid-elevation sites in eastern and central Mojave Desert, the Great Basin and Colorado Plateau and Wyoming Basins north to the Columbia Plateau, central Rocky Mountains and extends east into the western Great Plains. Elevations ranging from 90 m along the Columbia River up to 2500 m in high plateaus and mountains. In the Mojave Desert and southern Great Basin it occurs at mid-elevations (800-1800 m). These communities occur in a variety of landforms. Shrublands are common on windswept mesas, ridges, mountain slopes, canyons, benchlands, colluvial slopes, alluvial fans and flats, broad basins, valleys and plains. Grassland and steppe occur in both lowland and upland areas and may occupy swales, playas, mesatops, plateau parks, canyon bottoms and slopes, foothills, alluvial terraces, valleys, and plains. Sites range from gentle to steep slopes on all aspects.

**Climate:** The climate is semi-arid and is generally hot in summers and cold in winters with low annual precipitation, ranging from 4-40 cm and high inter-annual variation, although annual precipitation in canyon bottoms can be <10 cm. Temperatures are continental with large annual and diurnal variations. In the southern and eastern range extent, significant portion of the

precipitation falls in July through October during the summer monsoon storms, with the rest falling as snow during the winter and early spring months. In the northern and western extent, much of the precipitation falls as snow in winter and spring, and summer drought is common.

**Soil/substrate/hydrology:** Soils are variable but are generally shallow, calcareous, and range from sandy to finer-textured (clays to silt-loams) that are often derived from limestone, sandstone or shale. Some sites can be flat, poorly drained and intermittently flooded with a shallow or perched water table often within 1 m depth (West 1983e). Other sites are alluvial or eolian sand or deposits including extensive sandy plains and stabilized sandsheets that may form small hummocks or small coppice dunes. Eolian processes are evident on these sites, such as pediceled plants, occasional blowouts or small dunes, but the generally higher vegetative cover and less prominent geomorphic features distinguish this macrogroup from active and stabilized dune complexes. Dark-colored cryptogamic soil crusts composed of lichens, mosses, fungi, and algae are often present in fairly undisturbed areas. Sandy soils may have more cryptogamic crusts than clayish or silty soil surfaces. These cryptogams tend to increase the stability of the highly erodible sandy soils during torrential summer rains and heavy wind storms (Kleiner and Harper 1977).

**Dynamics:** Fire dynamics are variable depending on dominant species. Many grasslands and shrublands are fire-adapted, while others, such as blackbrush, are fire-intolerant (Loope and West 1979). Following fires, these communities are often colonized by non-native grasses, which create abundant fine fuels that facilitate recurrent fires and delay shrub regeneration (Reid et al. 1999).

In shallow regolith situations, secondary succession, in the sense of site preparation by seral plants, may not occur at all (Loope and West 1979). When this vegetation (especially *Artemisia filifolia*-dominated stands) occurs on deeper loessal soils, some consider this shrub invasion of semi-desert shrub-steppe (Loope 1977).

#### DISTRIBUTION

**Geographic Range:** This broadly defined semi-arid grassland, shrubland and steppe macrogroup occurs throughout the intermountain western U.S. from eastern Washington, southern Idaho and southwestern and south-central Montana south to southeastern California, northern Arizona and New Mexico, including mid-elevation sites in eastern and central Mojave Desert, the Columbia Plateau, Great Basin, Colorado Plateau, central Rocky Mountains, and Wyoming Basins region, extending into the western Great Plains.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA?, MX?, US

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

#### TNC Ecoregions [optional]:

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

#### Omernik Ecoregions:

#### Federal Lands [optional]:

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- > Blackbush (212) (Shiflet 1994)
- >< Bluebunch Wheatgrass (101) (Shiflet 1994)
- > Colorado Plateau - Mohavian Blackbush Semi-Desert (West 1983d)
- > Grama - Galleta (502) (Shiflet 1994)
- >< Idaho Fescue (102) (Shiflet 1994)
- > Mohave Desertscrub, Blackbrush Series - 153.12 (Brown et al. 1979)
- > Mohave Desertscrub, Blackbrush Series, Blackbrush Series, *Coleogyne ramosissima*-*Yucca* spp. Association - 153.122 (Brown et al. 1979)
- > Mohave Desertscrub, Blackbrush Series, Blackbrush Series, *Coleogyne ramosissima* Association - 153.121 (Brown et al. 1979)
- > Mohave Desertscrub, Joshuatree Series - 153.15 (Brown et al. 1979)
- > Mohave Desertscrub, Joshuatree Series, *Yucca brevifolia*-*Acamptopappus sphaerocephalus*-*Larrea divaricata*-Mixed Scrub Association - 153.151 (Brown et al. 1979)
- > Mohave Desertscrub, Joshuatree Series, *Yucca brevifolia*-*Coleogyne ramosissima* Association - 153.152 (Brown et al. 1979)
- > Mohave Desertscrub, Joshuatree Series, *Yucca brevifolia*-*Larrea divaricata* Association - 153.153 (Brown et al. 1979)
- > Southwestern Utah Galleta-Threeawn Shrub Steppe. (West 1983e)

## LOWER LEVEL UNITS

**Groups:**

- G296 Mojave Mid-Elevation Mixed Desert Scrub
- G312 Colorado Plateau Blackbrush - Mormon-tea Shrubland
- G311 Intermountain Semi-Desert Grassland
- G310 Intermountain Semi-Desert Shrubland & Steppe
- G775 Intermountain Sparsely Vegetated Dune Scrub & Grassland

**AUTHORSHIP**

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** K.A. Schulz and P. Comer

**Acknowledgments:**

**Version Date:** 04/16/2015

**Classif Resp Region:** West

**Internal Author:** KAS 10-14, 4-15

**REFERENCES**

**References:** Branson et al. 1976, Brown et al. 1979, Cable 1967, Cable 1969, Cable 1975b, FEIS 1998, Faber-Langendoen et al. 2015, Hanson 1929, Kleiner and Harper 1972, Kleiner and Harper 1977, Loope 1977, Loope and West 1979, McClaran and Van Devender 1995, Reid et al. 1999, Shiflet 1994, Stout et al. 2013, Thatcher 1975, Tuhy and MacMahon 1988, Tuhy et al. 2002, USFS 1937, Warren et al. 1982, Weaver and Albertson 1956, West 1983d, West 1983e, West et al. 1972

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3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

M171. Great Basin & Intermountain Dry Shrubland & Grassland

**G311. Intermountain Semi-Desert Grassland**

**Type Concept Sentence:**

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**OVERVIEW**

**Scientific Name:** *Pleuraphis jamesii* - *Achnatherum hymenoides* - *Hesperostipa comata* Semi-Desert Grassland Group

**Common Name (Translated Scientific Name):** James' Galleta - Indian Ricegrass - Needle-and-Thread Semi-Desert Grassland Group

**Type Concept:** This widespread group includes semi-arid to arid grasslands throughout the intermountain western U.S. They occur on sites over an elevational range of approximately 1100 to 3290 m in most of its range and 350 to 425 m in the Columbia Basin on a variety of landforms, including swales, playas, mesas, alluvial flats, and plains. This group may constitute the matrix over large areas of intermountain basins, and also may occur as large patches in mosaics with semi-desert shrublands. Grasslands in areas of higher precipitation, at higher elevation, typically belong to other groups. Substrates are often well-drained sandy or loam soils derived from sedimentary parent materials but are quite variable and may include fine-textured soils derived from igneous and metamorphic rocks. The dominant perennial bunchgrasses and shrubs within this group are all drought-resistant plants. Dominant or codominant species are *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Achnatherum nelsonii*, *Achnatherum speciosum*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, *Poa cusickii*, *Poa secunda*, and *Pseudoroegneria spicata*. Scattered shrubs and dwarf-shrubs often are present, especially *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex* spp., *Coleogyne* spp., *Ephedra* spp., *Gutierrezia sarothrae*, and *Krascheninnikovia lanata*, which are the typical dominant species of adjacent shrublands.

**Classification Comments:** This group was merged with former Columbia Basin Foothill & Canyon Dry Grassland Group (G274), which was very similar compositionally and a northern variant of this intermountain group. Communities dominated by *Achnatherum lettermanii*, *Achnatherum nelsonii*, and *Agrostis variabilis* are poorly understood and require further documentation. The only occurrence of a community dominated by *Agrostis variabilis* is known from Utah and may be the result of disturbance. *Achnatherum speciosum* is a southern Great Basin species, which extends in distribution into the Mojave and Colorado deserts, for now its communities are included here. Occurrences of this semi-desert grassland group in the relatively high-elevation basins of Wyoming and south-central Montana resemble in species composition the foothill grasslands that grow at slightly higher elevations and in the Columbia Plateau.

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland

**Diagnostic Characteristics:** This group consists of semi-arid to arid grasslands often creating the matrix over large areas. Characteristic graminoids include *Achnatherum hymenoides*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, *Poa cusickii*, *Poa secunda*, and *Pseudoroegneria spicata*.

#### VEGETATION

**Physiognomy and Structure:** Medium to tall bunchgrass-dominated group occurring with scattered shrubs as a matrix community or interspersed among shrub-dominated communities. Cover within this group is variable from dense to less than 25% cover.

**Floristics:** The dominant perennial bunchgrasses and shrubs within this group are all drought-resistant plants. Dominant or codominant species are *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Achnatherum nelsonii*, *Achnatherum speciosum*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, *Poa cusickii*, *Poa secunda*, and *Pseudoroegneria spicata*. Other graminoids may include *Aristida purpurea*, *Carex filifolia*, *Elymus elymoides*, *Koeleria macrantha*, *Leymus salinus*, or *Sporobolus cryptandrus*. Scattered shrubs and dwarf-shrubs often are present, especially *Artemisia tridentata ssp. tridentata*, *Artemisia tridentata ssp. wyomingensis*, *Atriplex* spp., *Coleogyne* spp., *Ephedra* spp., *Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. Forb cover is also sparse but can be relatively diverse. Common forbs are *Gaura coccinea*, *Balsamorhiza sagittata*, *Hymenopappus filifolius*, *Machaeranthera canescens*, *Sphaeralcea coccinea*, *Vicia americana*, *Lappula occidentalis* (= *Lappula redowskii*), *Lithophragma glabrum*, *Lupinus pusillus*, *Opuntia aurea* (= *Opuntia basilaris* var. *aurea*), *Opuntia polyacantha*, *Plantago patagonica*, *Pediomelum argophyllum*, *Artemisia campestris*, *Artemisia dracunculus*, *Artemisia ludoviciana*, and species of *Antennaria*, *Astragalus*, *Cryptantha*, *Eriogonum*, *Gilia*, and *Lappula*. Cryptogams are important in some stands with up to 40% ground cover on sites in the Colorado Plateau. Exotic species such as *Bromus tectorum*, *Draba verna*, *Lactuca serriola*, *Salsola tragus*, *Bassia scoparia* (= *Kochia scoparia*), *Poa pratensis*, *Sisymbrium altissimum*, and *Tragopogon dubius* are present in many of these stands.

G311 Intermountain Semi-Desert Grassland Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Aristida purpurea</i> var. <i>longiseta</i> - <i>Poa secunda</i> Herbaceous Vegetation	G3/S1	CEGL001781
<i>Aristida purpurea</i> var. <i>longiseta</i> - <i>Pseudoroegneria spicata</i> - <i>Sporobolus cryptandrus</i> Herbaceous Vegetation	G2/S1	CEGL001589
<i>Aristida purpurea</i> var. <i>longiseta</i> - <i>Sporobolus cryptandrus</i> Herbaceous Vegetation	G1/S1	CEGL001515
<i>Pseudoroegneria spicata</i> - <i>Balsamorhiza sagittata</i> - <i>Poa secunda</i> Herbaceous Vegetation	G3/SNA	CEGL001662
<i>Pseudoroegneria spicata</i> - <i>Festuca idahoensis</i> Canyon Herbaceous Vegetation	G3/S2	CEGL001669
<i>Pseudoroegneria spicata</i> - <i>Opuntia polyacantha</i> - ( <i>Poa secunda</i> ) Herbaceous Vegetation	G3/S2?	CEGL001673
<i>Pseudoroegneria spicata</i> - <i>Poa secunda</i> Lithosolic Herbaceous Vegetation	G3/S3	CEGL001678
<i>Sporobolus cryptandrus</i> - <i>Poa secunda</i> Herbaceous Vegetation	G2/S1S2	CEGL001516

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** Low-elevation grasslands in the Intermountain West region occur in semi-arid to arid climates at approximately 1450 to 2320 m (4750-7610 feet) elevation, but can reach as low as 350 m in the Columbia Basin. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesatops, plateau parks, alluvial flats, plains and extend into dry foothills. In the Columbia Plateau stands extend up into the Columbia and Snake river canyons on stream terraces and dry, rocky slopes. These grasslands typically occur on relatively xeric sites. This group experiences cold temperate conditions. Hot summers and cold winters with freezing temperatures and snow are common. Annual precipitation is usually from 20-40 cm (7.9-15.7 inches). A significant portion of the precipitation falls in July through October during the summer monsoon storms, with the rest falling as snow during the winter and early spring months. These grasslands occur on a variety of aspects and slopes. Sites may range from flat to moderately steep. Soils supporting this group also vary from deep to shallow, and from sandy to finer-textured. The substrate is typically derived from sandstone or shale. Some occurrences on sandy soils have a high cover of cryptogams on the soil surface. These cryptogams tend to increase the stability of the highly erodible sandy soils of these grasslands during torrential summer rains and heavy wind storms (Kleiner and Harper 1977).

**Dynamics:** *Achnatherum hymenoides* is one of the most drought-tolerant grasses in the western U.S. (USFS 1937). It is also a valuable forage grass in arid and semi-arid regions. Improperly managed livestock grazing could increase soil erosion, decrease cover of this palatable plant species and increase weedy species (USDA 1937). *Hesperostipa comata* is a deep-rooted grass that uses soil



moisture below 0.5 m during the dry summers. Burning generally kills or severely damages *Hesperostipa comata* plants. After fire, regeneration of this non-rhizomatous bunchgrass is through seed and may take many years to reach prefire densities. *Pleuraphis jamesii* is both drought- and grazing-resistant (USFS 1937, Weaver and Albertson 1956, West et al. 1972). In parts of its range it increases under grazing, and in others parts it decreases. The grass is favored in mixedgrass stands because it is only moderately palatable to livestock, but decreases when heavily grazed during drought and in the more arid portions of its range where it is the dominant grass (West et al. 1972). This grass reproduces extensively from scaly rhizomes. These rhizomes make the plant resistant to trampling by livestock and have good soil binding properties (USFS 1937, Weaver and Albertson 1956, West et al. 1972). The cool-season annual grass *Bromus tectorum* can be an effective competitor for winter soil moisture because it can germinate in the fall, over-winter, then begin re-growing in the early spring before it is warm enough for many perennial grasses, completing its lifecycle and depleting soil moisture before the dry summer weather begins. This annual species also produces abundant fine fuels that carry fire well and increase the frequency of fires (FEIS 1998).

#### DISTRIBUTION

**Geographic Range:** This group occurs throughout the intermountain western U.S. on dry plains, foothills and mesas, at approximately 1450 to 2320 m (4750-7610 feet) elevation. Stands extend up into the Columbia and Snake river canyons on stream terraces and dry, rocky slopes. In the Bighorn Basin of north-central Wyoming, there may be some semi-desert grasslands, but this is uncertain.

**Nations:** MX?, US

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

**TNC Ecoregions [optional]:** 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 322A:CC, 331A:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CP, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:C?, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CP, M331J:CP, M332G:CC, M333A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Arches)

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- > Grama - Galleta (502) (Shiflet 1994)
- = Southeastern Utah galleta-threawn shrub steppe (West 1983e)

#### LOWER LEVEL UNITS

##### Alliances:

- A3976 *Pseudoroegneria spicata* - *Festuca idahoensis* - *Opuntia polyacantha* Dry Canyon Slope Grassland Alliance
- A1290 *Achnatherum speciosum* Herbaceous Alliance
- A1262 *Achnatherum hymenoides* - *Pseudoroegneria spicata* - *Muhlenbergia pungens* Herbaceous Alliance
- A1287 *Pleuraphis jamesii* Herbaceous Alliance
- A1270 *Hesperostipa comata* Bunch Herbaceous Alliance
- A3977 *Sporobolus cryptandrus* - *Aristida purpurea* var. *longiseta* - *Poa secunda* Sandy Stream Terrace Grassland Alliance

#### AUTHORSHIP

**Primary Concept Source:** N.E. West (1983e)

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

**Acknowledgments:**

**Version Date:** 2015/04/16

#### REFERENCES

**References:** Bowers 1982, Cable 1967, Cable 1969, Cable 1975b, Castle 1954, FEIS 1998, Faber-Langendoen et al. 2015, Kleiner and Harper 1972, Kleiner and Harper 1977, McClaran and Van Devender 1995, Ramaley 1939b, Shiflet 1994, USFS 1937, Van Pelt 1978, Weaver and Albertson 1956, West 1983e, West et al. 1972

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

M171. Great Basin & Intermountain Dry Shrubland & Grassland

### G310. Intermountain Semi-Desert Shrubland & Steppe [Proposed]

**Type Concept Sentence:**

## OVERVIEW

**Scientific Name:** *Chrysothamnus viscidiflorus* - *Ericameria nauseosa* - *Krascheninnikovia lanata* Shrubland Group

**Common Name (Translated Scientific Name):** Yellow Rabbitbrush - Rubber Rabbitbrush - Winterfat Shrubland Group

**Type Concept:** This group occurs throughout the Colorado Plateau, Arizona - New Mexico Mountains, west to the Mojave Desert and north to the Wyoming Basin on alluvial flats and fans, talus slopes, plateaus, and bluffs. Slopes range from gentle to steep, and substrates are variable and include sandstone talus, fine-textured alluvium, sand, clay, loams, cinder, cobbles, and coarse gravels. This semi-arid steppe can either be shrub-, dwarf-shrub-, or grass-dominated with a sparse shrub layer. Common shrubs include *Atriplex canescens*, *Eriogonum corymbosum*, *Ericameria nauseosa*, *Ephedra viridis*, *Ephedra torreyana*, *Krascheninnikovia lanata*, *Chrysothamnus viscidiflorus*, *Tetradymia canescens*, and *Gutierrezia sarothrae*. Herbaceous species include *Pleuraphis jamesii*, *Bromus tectorum*, *Achnatherum hymenoides*, *Aristida purpurea*, and *Hesperostipa comata*. Disturbance and grazing have impacted many occurrences, and in some cases may be important in maintaining these communities.

**Classification Comments:** This group encompasses a somewhat broad range of semi-desert shrublands in the Intermountain West. Many of these communities are somewhat disturbance-maintained, early-seral types. Additional data and analysis are needed to clarify the associations that should be placed here. Shrub communities occurring over talus included in this group are part of a continuum and can be highly variable, and some dwarf-shrub communities can technically be defined as herbaceous types.

**Internal Comments:** DFL 12-5-12: Canada? added based on member assoc.

**Other Comments:**

**Similar NVC Types:**

**Diagnostic Characteristics:** This group occurs as open shrub, dwarf-shrub, or shrub herbaceous communities ranging from 5-30% total vegetation cover. The most important shrubs in this group include *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, and *Atriplex canescens*. Herbs may include *Pleuraphis jamesii*, *Bromus tectorum*, *Achnatherum hymenoides*, *Aristida purpurea*, *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Sphaeralcea coccinea*, *Sporobolus cryptandrus*, and *Hesperostipa comata*. Scattered *Juniperus* spp. are common, but rarely attain more than 5% cover.

## VEGETATION

**Physiognomy and Structure:** Open shrub, dwarf-shrub, or shrub herbaceous communities dominated by cold-deciduous, broad-leaved shrub, dwarf-shrub species, or perennial grasses.

**Floristics:** The most important shrubs in this group include *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, and *Atriplex canescens*. Other commonly present to codominant species include *Ephedra viridis*, *Ephedra torreyana*, *Tetradymia canescens*, *Coleogyne ramosissima*, *Fallugia paradoxa*, *Isocoma drummondii*, *Opuntia* spp., *Eriogonum* spp., *Grayia spinosa*, *Lycium pallidum*, *Purshia tridentata*, and *Artemisia* spp. Semi-desert grasses are common, including *Achnatherum hymenoides*, *Aristida purpurea*, *Leymus salinus* ssp. *salinus*, *Pleuraphis jamesii*, *Poa secunda*, *Pseudoroegneria spicata*, *Elymus elymoides*, *Muhlenbergia pungens*, and *Hesperostipa comata*. Perennial forbs may include *Phlox hoodii*, *Sphaeralcea coccinea*, *Sphaeralcea munroana*, *Achillea millefolium*, *Astragalus purshii*, *Calochortus macrocarpus*, *Chamaesyce* spp., and *Erigeron* spp. Annuals may be seasonally present to abundant depending on precipitation and disturbance. Exotic annuals such as *Bromus tectorum* or *Salsola kali* can be abundant.

G310 Intermountain Semi-Desert Shrubland & Steppe Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Krascheninnikovia lanata</i> / <i>Hesperostipa comata</i> Dwarf-shrubland	G3/SNA	CEGL001327
<i>Krascheninnikovia lanata</i> / <i>Poa secunda</i> Dwarf-shrubland	G3/S1	CEGL001326

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This group occurs throughout the Intermountain West from the western Great Basin to the Northern Rocky Mountains and Colorado Plateau at elevations ranging from 300 m up to 2500 m. The climate where this group occurs is generally hot in summers and cold in winters with low annual precipitation, ranging from 18-40 cm and high inter-annual variation. Much of the precipitation falls as snow, and growing-season drought is characteristic. Temperatures are continental with large annual and diurnal variations. Sites are generally alluvial fans and flats with moderate to deep soils. Some sites can be flat, poorly drained and intermittently flooded with a shallow or perched water table often within 1 m depth (West 1983e). Substrates are generally shallow, calcareous, fine-textured soils (clays to silt-loams), derived from alluvium; deep, fine to medium-textured alluvial soils with some source of subirrigation during the summer season, or sandstone talus over shale. Soils may be alkaline and typically moderately saline (West 1983e).

**Dynamics:****DISTRIBUTION**

**Geographic Range:** This group occurs throughout the intermountain western U.S., typically at lower elevations, and extends into Wyoming and Montana across the Great Divide Basin. It barely gets as far north as north-central Montana.

**Nations:** CA?, US

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

**TNC Ecoregions [optional]:** 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 331B:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242C:CC, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332E:CP, M332G:CC, M333A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Arches)

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Proposed.

**SYNONYMY**

- = Southeastern Utah galleta-threawn shrub steppe (West 1983e)

**LOWER LEVEL UNITS****Alliances:**

- A2650 *Opuntia* spp. Colorado Plateau Shrubland Alliance
- A2540 *Ericameria teretifolia* Shrubland Alliance
- A3197 *Ericameria parryi* Shrubland Alliance
- A3196 *Ericameria nauseosa* Shrubland & Shrub Herbaceous Alliance
- A3203 *Gutierrezia sarothrae* - *Gutierrezia microcephala* Dwarf-shrubland Alliance
- A1032 *Glossopetalon spinescens* Shrubland Alliance
- A0834 *Chrysothamnus albidus* Shrubland Alliance
- A3202 *Krascheninnikovia lanata* Dwarf-shrubland & Dwarf-shrub Herbaceous Alliance
- A3195 *Chrysothamnus viscidiflorus* Shrubland & Shrub Herbaceous Alliance

**AUTHORSHIP**

**Primary Concept Source:** N.E. West (1983e)

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

**Acknowledgments:** P. Comer

**Version Date:** 2010/03/19

**REFERENCES**

**References:** Branson et al. 1976, Faber-Langendoen et al. 2015, Hanson 1929, Shiflet 1994, Stout et al. 2013, Tuhy et al. 2002, West 1983e

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

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

**Type Concept Sentence:** This semi-arid intermountain western U.S. macrogroup is characterized by short sagebrush taxa that form an open to moderately dense dwarf-shrub layer on shallow, rocky, calcareous or alkaline soils. Stands are dominated by one of several diagnostic *Artemisia* taxa depending on location and habitat, including *Artemisia arbuscula* ssp. *arbuscula*, *Artemisia arbuscula* ssp. *longiloba*, *Artemisia arbuscula* ssp. *longicaulis*, *Artemisia arbuscula* ssp. *thermopola*, *Artemisia bigelovii*, *Artemisia frigida*, *Artemisia nova*, *Artemisia rigida*, or *Artemisia tripartita* ssp. *rupicola*.

**OVERVIEW**

**Scientific Name:** *Artemisia arbuscula* - *Artemisia nova* - *Artemisia rigida* Great Basin & Intermountain Dwarf-shrubland & Steppe Macrogroup

**Common Name (Translated Scientific Name):** Little Sagebrush - Black Sagebrush - Scabland Sagebrush Great Basin & Intermountain Dwarf-shrubland & Steppe Macrogroup

**Type Concept:** This broadly defined semi-arid dwarf-shrubland and steppe occurs throughout much of the intermountain western U.S. The vegetation is characterized by an open to moderately dense shrub or dwarf-shrub layer with a sparse to moderately dense herbaceous layer. Several different short sagebrush taxa may dominate depending on location and habitat. *Artemisia nova* is most widespread, occurring throughout most of the region on mid- to low-elevation, gravelly, calcareous soils. *Artemisia arbuscula ssp. arbuscula* occurs on low- to high-elevation sites often on shallow, fine-textured soils with a dense clay layer that impedes drainage in spring. *Artemisia arbuscula ssp. longiloba* is widespread in the Columbia Basin, Great Basin, southwestern Montana, southwestern Wyoming, and badlands in the western Great Plains. It occurs on shallow, alkaline, calcareous soils derived from shale. *Artemisia bigelovii* occurs throughout much of the Colorado Plateau and extends across northern New Mexico into southeastern Colorado on shallow soils on limestone hills and shale outcrops. *Artemisia rigida* is restricted to the Columbia Plateau scablands with shallow, poorly drained, lithic soil over fractured basalt that is often saturated in winter, but typically dries out completely to bedrock by midsummer. These stands are typically codominated by diagnostic *Eriogonum* species: *Eriogonum compositum*, *Eriogonum douglasii*, *Eriogonum microthecum*, *Eriogonum niveum*, *Eriogonum sphaerocephalum*, *Eriogonum strictum*, and/or *Eriogonum thymoides*. These same *Eriogonum* species may be dominant without *Artemisia rigida*. Another local diagnostic/dominant species is *Artemisia papposa* that is restricted to poorly drained, mesic sites in southern Idaho and southeastern Oregon. Several other more restricted taxa include *Artemisia tripartita ssp. rupicola*, *Artemisia arbuscula ssp. longicaulis*, *Artemisia arbuscula ssp. thermopola*, and *Artemisia frigida*. Other shrub associates may be present such as *Artemisia tridentata ssp. wyomingensis*, *Artemisia tridentata ssp. vaseyana*, *Ephedra torreyana*, *Ephedra viridis*, *Grayia spinosa*, or *Purshia tridentata*, depending on habitat. The herbaceous layer, if present, ranges from sparse cushion plants, such as *Arenaria hookeri*, *Eriogonum brevicaulis*, and *Phlox hoodii*, to moderate to dense cover of perennial grasses. Characteristic grasses include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Danthonia unispicata*, *Elymus elymoides*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Scattered forbs may include species of *Allium*, *Antennaria*, *Balsamorhiza*, *Lomatium*, *Phlox*, and *Sedum*. Some stands have significant biological crust formation on the soil surface. Sites are generally xeric and may be wind-blown ridges and benches, gravelly alluvial fans, hilltops, canyons, gravelly draws, and dry flats. Most stands occur from 1000 to 3000 m elevation with some extending up to 3800 m in subalpine and alpine habitats of the Sierra Nevada. Substrates are variable, but are typically alluvium derived from limestone, shale, basalt, rhyolite or volcanics.

**Classification Comments:** Groups in this macrogroup are distinguished largely by the predominant shrub species. Other shrubs, especially shrubby *Artemisia* species such as *Artemisia tridentata* or *Artemisia tripartita*, are absent or uncommon in this dwarf-shrubland macrogroup.

**Similar NVC Types:** Stands in this macrogroup (M170) may look similar to stands in Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup (M169), but they are not dominated by *Artemisia tridentata*, although *Artemisia tridentata* may be present.

- M169 Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe

**Diagnostic Characteristics:** This semi-arid macrogroup of the Intermountain West is characterized by an open to moderately dense dwarf-shrub layer with >10% shrub cover and a sparse to dense herbaceous layer. Several different taxa of sagebrush are strong diagnostic species and vary depending on geographic location and by habitat, including *Artemisia arbuscula ssp. arbuscula*, *Artemisia arbuscula ssp. longicaulis*, *Artemisia arbuscula ssp. longiloba*, *Artemisia arbuscula ssp. thermopola*, *Artemisia bigelovii*, *Artemisia frigida*, *Artemisia nova*, *Artemisia rigida*, and *Artemisia tripartita ssp. rupicola*. Associated herbaceous taxa are semi-desert perennial grasses and forbs. Stands characterized by *Artemisia rigida* are typically codominated by one of several species of *Eriogonum* which may also be dominant without *Artemisia rigida*. Another local diagnostic/dominant dwarf-shrub is *Artemisia papposa*. Other sagebrush taxa such as *Artemisia tridentata ssp. wyomingensis* and *Artemisia tridentata ssp. vaseyana* may be present to codominant, but not dominant. The composition of the herbaceous layer is important in separating shrublands from steppe communities within the macrogroup, but not among other macrogroups.

## VEGETATION

**Physiognomy and Structure:** The vegetation in this broadly defined macrogroup includes an open to moderately dense (10-25% cover) dwarf-shrub layer dominated by microphyllous evergreen shrubs with a sparse to dense herbaceous layer usually dominated by perennial graminoids (often bunchgrasses).

**Floristics:** This broadly defined dwarf-shrubland and steppe macrogroup includes an open to moderately dense dwarf-shrub layer with a sparse to dense herbaceous layer. Several different taxa of sagebrush may dominate depending on geographic location and habitat. *Artemisia nova* is most widespread, occurring throughout most of the region on mid- to low-elevation, gravelly, calcareous well-drained soils. *Artemisia arbuscula ssp. arbuscula* occurs on low- to high-elevation sites often on shallow, fine-textured soils with a dense clay layer that impedes drainage in spring. *Artemisia arbuscula ssp. longiloba* is widespread in the Columbia Basin, Great Basin, southwestern Wyoming, and badlands in the western Great Plains (Zamora and Tueller 1973, Knight 1994). It occurs on

shallow, alkaline, calcareous soils derived from shale. *Artemisia bigelovii* occurs throughout much of the Colorado Plateau and extends across northern New Mexico into southeastern Colorado on shallow soils on limestone hill and shale outcrops (Francis 1986, Shaw et al. 1989). Several other more restricted taxa may dominate, including *Artemisia tripartita ssp. rupicola* (central Wyoming), *Artemisia arbuscula ssp. longicaulis* (Lahontan Basin of northwestern Nevada, southeastern Oregon, and northeastern California), *Artemisia arbuscula ssp. thermopola* (ridgetops and benches in mountains at 1830 to 2690 m in southern Idaho), and *Artemisia frigida* (described from sites in the Rocky Mountains) (Zamora and Tueller 1973, Hironaka 1978, Knight 1994). *Artemisia rigida* is restricted to the scablands in the Columbia Basin and portions of the Snake River plain with shallow, poorly drained, lithic soils over fractured basalt that are often saturated from fall to spring by winter precipitation but typically dry out completely to bedrock by midsummer (Daubenmire 1970, Franklin and Dyrness 1973). Stands are typically codominated by diagnostic species of *Eriogonum* that include *Eriogonum compositum*, *Eriogonum douglasii*, *Eriogonum microthecum*, *Eriogonum niveum*, *Eriogonum sphaerocephalum*, *Eriogonum strictum*, and/or *Eriogonum thymoides* (Daubenmire 1970). These same *Eriogonum* species are also diagnostic species that may be dominant without *Artemisia rigida* (Daubenmire 1970). Another local diagnostic/dominant dwarf-shrub is *Artemisia papposa* that is restricted to poorly drained, mesic to wet sites in southern foothill basins of the Smokey Mountains of south-central Idaho and on the high plateaus of the Owyhee Plateau of southwestern Idaho and southeastern Oregon (Jankovsky-Jones et al. 2001). Other shrubs present to codominant may include *Artemisia tridentata ssp. wyomingensis*, *Artemisia tridentata ssp. vaseyana*, *Chrysothamnus viscidiflorus*, *Ephedra torreyana*, *Ephedra viridis*, *Grayia spinosa*, or *Purshia tridentata*, depending on habitat. The herbaceous layer is variable. If present, it ranges from sparse cushion plants, such as *Arenaria hookeri*, *Astragalus bisulcatus*, *Astragalus jejunus*, *Eriogonum brevicaulis*, *Minuartia nuttallii* (= *Arenaria nuttallii*), *Phlox hoodii*, *Stenotus acaulis*, and *Trifolium gymnocarpon*, to moderate to dense cover of perennial grasses. Characteristic graminoids may include *Achnatherum hymenoides*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Carex filifolia*, *Danthonia unispicata*, *Elymus elymoides*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Koeleria macrantha*, *Leymus salinus*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Scattered forbs are common and include species of *Allium*, *Antennaria*, *Astragalus*, *Balsamorhiza*, *Calochortus*, *Lomatium*, *Phlox*, *Sedum*, and *Stenotus*. Individual sites can be dominated by grasses and semi-woody forbs, such as *Stenotus stenophyllus*. Annuals may be seasonally abundant, and cover of moss and lichen is often high in undisturbed areas (1-60% cover).

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This broadly defined semi-arid dwarf-shrubland and steppe macrogroup occurs throughout much of the intermountain western U.S. Sites are generally xeric on wind-blown, shallow, gravelly or finer-textured alkaline soils. In the channeled scablands of the Columbia Basin and portions of the Snake River plain at 190-1830 m elevation, it forms extensive low xeric shrublands that occur under a relatively extreme range of seasonally wet to dry soil-moisture conditions (Daubenmire 1970, Franklin and Dyrness 1973). Here substrates are typically shallow lithic soils with limited water-holding capacity over fractured basalt. Because of poor drainage through basalt, these soils are often saturated from fall to spring by winter precipitation but typically dry out completely to bedrock by midsummer (Daubenmire 1970). Throughout eastern Oregon, northern Nevada, southern Idaho, western Montana, western Wyoming, and western Colorado, stands typically occur on mountain ridges and flanks and broad terraces, ranging from 1000 to 3000 m in elevation with stands extending to 3800 m elevation in subalpine and alpine habitats of the Sierra Nevada (Franklin and Dyrness 1973, Zamora and Tueller 1973, Hironaka 1979, Baker and Kennedy 1985, Francis 1986, Knight 1994). Substrates are shallow, fine-textured soils, poorly drained clays, shallow-soiled areas, almost always very stony, characterized by recent rhyolite or basalt or are alkaline soils derived from shale (Zamora and Tueller 1973, Baker and Kennedy 1985). These clay soils inhibit root depth and may create a perched water table. In central and southern Wyoming, sites are typically very windy, gently rolling hills and long, gently sloping pediments and fans with shallow, rocky soils (Knight 1994). This macrogroup forms the matrix vegetation and large patches on the margins of high-elevation basins. At higher elevations this type forms a mosaic with Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup (M169) and is restricted to wind-blown ridges. In the Colorado Plateau, Tavaputs Plateau and Uinta Basin, stands occur in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m. Soils are often rocky, shallow, and alkaline. This macrogroup also extends across northern New Mexico and Wyoming into the western Great Plains on limestone hills and shale outcrops (Francis 1986, Shaw et al. 1989).

#### Dynamics:

#### DISTRIBUTION

**Geographic Range:** This broadly defined semi-arid dwarf-shrubland and steppe macrogroup occurs throughout the intermountain western U.S. from eastern Washington, southern Idaho, southeast and southwestern Montana to northern Arizona and New Mexico, including the Columbia Plateau, Great Basin, Colorado Plateau, and Wyoming Basins regions.

#### Spatial Scale & Pattern [optional]:

**Nations:** US

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

**TNC Ecoregions [optional]:**

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

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- > *Artemisia arbuscula* Communities (Young et al. 2007a)
- > *Artemisia arbuscula* habitat types (Zamora and Tueller 1973)
- > *Artemisia longiloba* habitat types (Zamora and Tueller 1973)
- > *Artemisia nova* Communities (Young et al. 2007a)
- > *Artemisia nova* habitat types (Zamora and Tueller 1973)
- > *Artemisia rigida/Poa sandbergia* Association (Franklin and Dyrness 1973)
- > *Artemisia rigida/Poa sandbergia* Habitat Type (Daubenmire 1970)
- ? *Eriogono nivei-Artemisietum tridentatae* (Rivas-Martínez 1997)
- > Black Sagebrush (405) (Shiflet 1994)
- > Black Sagebrush - Bluebunch Wheatgrass (320) (Shiflet 1994)
- > Black Sagebrush - Idaho Fescue (321) (Shiflet 1994)
- ? Black sage community (*Artemisia nova-Atriplex-Neotoma* Faciation) (Fautin 1946)
- > Bluegrass Scabland (106) (Shiflet 1994)
- < Great Basin Desertscrub, Sagebrush Series - 152.11 (Brown et al. 1979)
- > Great Basin Desertscrub, Sagebrush Series, *Artemisia nova* Association - 152.113 (Brown et al. 1979)
- >< Great Basin Sagebrush (West and Young 2000)
- > Great Basin-Colorado Plateau sagebrush semi-desert (West 1983a)
- > Low Sagebrush (406) (Shiflet 1994)
- > Other Sagebrush Types (408) (Shiflet 1994) [*Artemisia bigelovii* shrublands are included in this macrogroup.]
- < Sagebrush Series (Brown et al. 1998)
- >< Sagebrush Steppe (West and Young 2000)
- > Stiff Sagebrush (407) (Shiflet 1994)
- > Threetip Sagebrush (404) (Shiflet 1994) [*Artemisia tripartita ssp. rupicola* shrublands are included in this macrogroup in the Wyoming Basins.]
- >< Western Intermountain sagebrush steppe (West 1983c) [Range overlaps.]

#### LOWER LEVEL UNITS

##### Groups:

- G307 Columbia Plateau Scabland Shrubland
- G308 Intermountain Low & Black Sagebrush Shrubland & Steppe

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** K.A. Schulz and M. Jennings

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** KAS 10-14

#### REFERENCES

**References:** Baker and Kennedy 1985, Beetle and Johnson 1982, Brown 1982a, Brown et al. 1979, Brown et al. 1998, Copeland 1980a, Daubenmire 1970, Dick-Peddie 1993, Faber-Langendoen et al. 2015, Fautin 1946, Francis 1986, Franklin and Dyrness 1973, Ganskopp 1979, Hall 1973, Hironaka 1978, Hironaka et al. 1983, Jankovsky-Jones et al. 2001, Johnson and Simon 1985, Jones 1992b, Knight 1994, Knight et al. 1987, Poulton 1955, Rivas-Martínez 1997, Shaw et al. 1989, Shiflet 1994, West 1983a, West 1983c, West and Young 2000, Young et al. 2007a, Zamora and Tueller 1973

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3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

M170. Great Basin & Intermountain Dwarf Sagebrush Shrubland & Steppe

**G307. Columbia Plateau Scabland Shrubland****Type Concept Sentence:****OVERVIEW**

**Scientific Name:** *Artemisia rigida* - *Eriogonum* spp. Dwarf-Shrubland & Steppe Group

**Common Name (Translated Scientific Name):** Scabland Sagebrush - Buckwheat species Dwarf-Shrubland & Steppe Group

**Type Concept:** This group is found in the Columbia Plateau region and forms extensive low shrublands. These xeric shrublands occur under relatively extreme soil-moisture conditions. Substrates are typically shallow lithic soils with limited water-holding capacity over fractured basalt. Because of poor drainage through basalt, these soils are often saturated from fall to spring by winter precipitation but typically dry out completely to bedrock by midsummer. Total vegetation cover is typically low, generally less than 50% and often much less than that. Vegetation is characterized by an open dwarf-shrub canopy dominated by *Artemisia rigida* along with other dwarf-shrub species, particularly *Eriogonum* spp. which sometimes dominates the dwarf-shrub layer without *Artemisia rigida*. Other shrubs, especially shrubby *Artemisia* spp., are uncommon in this group. These sites are characterized by low cover of perennial bunchgrasses, such as *Danthonia unispicata*, *Elymus elymoides*, *Festuca idahoensis*, or primarily *Poa secunda*, as well as scattered forbs, including species of *Allium*, *Antennaria*, *Balsamorhiza*, *Lomatium*, *Phlox*, and *Sedum*. Individual sites can be dominated by grasses and semi-woody forbs, such as *Stenotus stenophyllus*. Annuals may be seasonally abundant, and cover of moss and lichen is often high in undisturbed areas (1-60% cover).

**Classification Comments:** Other shrubs, especially shrubby *Artemisia* species such as *Artemisia tridentata* or *Artemisia tripartita*, are absent or uncommon in this *Artemisia rigida*- and *Eriogonum* spp.-dominated dwarf-shrubland group.

**Internal Comments:** mjr 10-12: CA confirmed based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

**Diagnostic Characteristics:** The group is characterized by an open dwarf-shrub layer dominated by *Artemisia rigida*, an indicator for this type. It is typically codominated by one of several species of *Eriogonum*, such as *Eriogonum compositum*, *Eriogonum douglasii*, *Eriogonum microthecum*, *Eriogonum niveum*, *Eriogonum sphaerocephalum*, *Eriogonum strictum*, or *Eriogonum thymoides*.

**VEGETATION**

**Physiognomy and Structure:** Vegetation structure is a sparse to moderately dense dwarf-shrub canopy (10-25% cover and <0.5 m tall). Occasionally, woody cover may exceed 25%. If present, the herbaceous layer typically has low cover.

**Floristics:** This group is found in the Columbia Plateau region and forms extensive low shrublands. These xeric shrublands occur under relatively extreme soil-moisture conditions. Vegetation is characterized by an open dwarf-shrub canopy dominated by *Artemisia rigida* along with other dwarf-shrub species, particularly *Eriogonum* spp. which sometimes dominates the dwarf-shrub layer without *Artemisia rigida*. Diagnostic species of *Eriogonum* include *Eriogonum compositum*, *Eriogonum douglasii*, *Eriogonum microthecum*, *Eriogonum niveum*, *Eriogonum sphaerocephalum*, *Eriogonum strictum*, and *Eriogonum thymoides*. Other shrubs are uncommon. This group does not include mixed stands codominated by *Artemisia rigida* and other *Artemisia* species such as *Artemisia tridentata*. Low cover of perennial bunchgrasses, such as *Danthonia unispicata*, *Elymus elymoides*, *Festuca idahoensis*, or primarily *Poa secunda*, as well as scattered forbs, including species of *Allium*, *Antennaria*, *Balsamorhiza*, *Lomatium*, *Phlox*, and *Sedum*, characterize these sites. Individual sites can be dominated by grasses and semi-woody forbs, such as *Stenotus stenophyllus*. Annuals may be seasonally abundant, and cover of moss and lichen is often high in undisturbed areas (1-60% cover).

<b>G307 Columbia Plateau Scabland Shrubland Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Artemisia rigida</i> / <i>Poa secunda</i> Shrub Herbaceous Vegetation	G4/S3S4	CEGL001528
<i>Artemisia rigida</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	G3/S2	CEGL001529
<i>Eriogonum compositum</i> / <i>Poa secunda</i> Dwarf-shrub Herbaceous Vegetation	G2/S2	CEGL001784
<i>Eriogonum douglasii</i> / <i>Poa secunda</i> Dwarf-shrub Herbaceous Vegetation	G4/S2	CEGL001785
<i>Eriogonum microthecum</i> - <i>Physaria oregona</i> Dwarf-shrubland	G2/S1	CEGL001737
<i>Eriogonum niveum</i> / <i>Poa secunda</i> Dwarf-shrub Herbaceous Vegetation	G3/S3	CEGL001786
<i>Eriogonum sphaerocephalum</i> / <i>Poa secunda</i> Dwarf-shrub Herbaceous Vegetation	G3/S2	CEGL001448
<i>Eriogonum strictum</i> / <i>Poa secunda</i> Dwarf-shrub Herbaceous Vegetation	G3/SNA	CEGL001788

<i>Eriogonum thymoides</i> / <i>Poa secunda</i> Dwarf-shrub Herbaceous Vegetation	G3/S3	CEGL001449
<i>Salvia dorrii</i> / <i>Pseudoroegneria spicata</i> Dwarf-shrubland	G4/SNA	CEGL001453

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This group is found in the Columbia Plateau region and forms extensive low shrublands. These xeric shrublands occur under relatively extreme soil-moisture conditions. Substrates are typically shallow lithic soils with limited water-holding capacity over fractured basalt. Because of poor drainage through basalt, these soils are often saturated from fall to spring by winter precipitation but typically dry out completely to bedrock by midsummer. Total vegetation cover is typically low, generally less than 50% and often much less than that.

#### Dynamics:

### DISTRIBUTION

**Geographic Range:** This group occurs in the Columbia Plateau region of southern Idaho, eastern Oregon and eastern Washington, and extreme northern Nevada.

#### Nations: US

**States/Provinces:** CA, ID, NV, OR, UT?, WA

**TNC Ecoregions [optional]:** 6:C, 7:C, 68:C

**USFS Ecoregions (2007):** 331A:CC, 341E:C?, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:C?, M261G:CC, M332G:CC, M333A:PP, M341A:CC

#### Omernik Ecoregions:

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

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

### SYNONYMY

- > *Artemisia rigida/Poa sandbergia* Association (Franklin and Dyrness 1973)
- > *Artemisia rigida/Poa sandbergia* Habitat Type (Daubenmire 1970)
- > *Eriogonum compositum-Poa secunda* Habitat Type (Daubenmire 1970)
- > *Eriogonum douglasii-Poa secunda* Habitat Type (Daubenmire 1970)
- > *Eriogonum microthecum-Physaria oregana* Habitat Type (Daubenmire 1970)
- > *Eriogonum niveum-Poa secunda* Habitat Type (Daubenmire 1970)
- > *Eriogonum sphaerocephalum-Poa secunda* Habitat Type (Daubenmire 1970)
- > *Eriogonum thymoides-Poa secunda* Habitat Type (Daubenmire 1970)
- > Bluegrass Scabland (106) (Shiflet 1994)
- = Edaphic Series - Lithosols (Daubenmire 1970)
- > Stiff Sagebrush (407) (Shiflet 1994)

### LOWER LEVEL UNITS

#### Alliances:

- A1568 *Eriogonum* spp. / *Poa secunda* Dwarf-shrub Herbaceous Alliance
- A1129 *Salvia dorrii* Dwarf-shrubland Alliance
- A1574 *Artemisia rigida* Shrub Herbaceous Alliance
- A1107 *Eriogonum microthecum* Dwarf-shrubland Alliance

### AUTHORSHIP

**Primary Concept Source:** R.F. Daubenmire (1970)

**Author of Description:** K.A. Schulz

#### Acknowledgments:

**Version Date:** 2010/03/27

### REFERENCES

**References:** Copeland 1980a, Daubenmire 1970, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Ganskopp 1979, Hall 1973, Johnson and Simon 1985, Poulton 1955, Shiflet 1994

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

M170. Great Basin & Intermountain Dwarf Sagebrush Shrubland & Steppe



**G308. Intermountain Low & Black Sagebrush Shrubland & Steppe [Proposed]****Type Concept Sentence:****OVERVIEW**

**Scientific Name:** *Artemisia arbuscula* - *Artemisia bigelovii* - *Artemisia nova* Shrubland & Steppe Group

**Common Name (Translated Scientific Name):** Little Sagebrush - Bigelow's Sagebrush - Black Sagebrush Shrubland & Steppe Group

**Type Concept:** This broadly defined semi-arid dwarf-shrubland and steppe occurs throughout much of the intermountain western U.S. Sites are generally xeric and may be wind-blown ridges and benches, gravelly alluvial fans, hilltops, canyons, gravelly draws, and dry flats. Substrates are typically shallow, gravelly or finer-textured alkaline, calcareous soils. Most stands occur from 1000 to 3000 m elevation with some extending to 3800 m in subalpine and alpine habitats of the Sierra Nevada. Substrates are variable, but are typically alluvium derived from limestone, shale, basalt, rhyolite or volcanics. The vegetation in this broadly defined shrubland and steppe group includes an open to moderately dense shrub or dwarf-shrub layer with a sparse to dense herbaceous layer. Several different taxa of sagebrush may dominate depending on location and by habitat. *Artemisia nova* is most widespread, occurring throughout most of the region on mid- to low-elevation, gravelly, calcareous soils. *Artemisia arbuscula* ssp. *arbuscula* occurs on low- to high-elevation sites often on shallow, fine-textured soils with a dense clay layer that impedes drainage in spring. *Artemisia arbuscula* ssp. *longiloba* is widespread in the Columbia Basin and Great Basin into southwestern Wyoming and badlands in the western Great Plains. It occurs on shallow, alkaline, calcareous soils derived from shale. *Artemisia bigelovii* occurs throughout much of the Colorado Plateau and extends across northern New Mexico and southeastern Colorado on shallow soils on limestone hills and shale outcrops. Several other more restricted taxa include *Artemisia tripartita* ssp. *rupicola*, *Artemisia arbuscula* ssp. *longicaulis*, *Artemisia arbuscula* ssp. *thermopola*, and *Artemisia frigida*. Other shrubs present to codominant may include *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tridentata* ssp. *vaseyana*, *Ephedra torreyana*, *Ephedra viridis*, *Grayia spinosa*, or *Purshia tridentata*, depending on habitat. The herbaceous layer, if present, ranges from sparse cushion plants such as *Arenaria hookeri*, *Eriogonum brevicaulis*, and *Phlox hoodii* to moderate to dense cover of perennial grasses. Characteristic grasses include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Some stands have significant biological crust formation on the soil surface.

**Classification Comments:** Alliances in this group are distinguished largely by the predominant species: *Artemisia nova*, *Artemisia bigelovii*, and the nominal subspecies of *Artemisia arbuscula*, and by the importance of the perennial graminoid layer (>20% cover) in the shrub herbaceous alliances. The *Artemisia arbuscula* subspecies are distinguished by the nominal subspecies taxonomically and by the different environments which they occupy. *Artemisia arbuscula* ssp. *longicaulis* Shrubland Alliance (A2548) occurs in more alkaline and less stony settings than *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (A3219). *Artemisia arbuscula* ssp. *thermopola* - *Artemisia papposa* / *Festuca idahoensis* Dwarf-shrubland Alliance (A4122) occurs in more calcareous soils and has a restricted distribution. Beetle and Johnson (1982) report that *Artemisia arbuscula* ssp. *arbuscula* grows in soils with a high volume of gravel (even though soil may be in clay textural class, or contain a clay-rich layer that impedes drainage), and that *Artemisia arbuscula* ssp. *longiloba* grows in clay soils, often alkaline, that contain no gravels.

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

**Diagnostic Characteristics:** This group has an open to moderately dense shrub or dwarf-shrub layer with a sparse to dense herbaceous layer. Several different taxa of sagebrush are diagnostic depending on location and by habitat: *Artemisia nova*, *Artemisia arbuscula* ssp. *arbuscula*, *Artemisia arbuscula* ssp. *longiloba*, *Artemisia arbuscula* ssp. *longicaulis*, *Artemisia bigelovii*, *Artemisia tripartita* ssp. *rupicola*, *Artemisia arbuscula* ssp. *longicaulis*, *Artemisia arbuscula* ssp. *thermopola*, and *Artemisia frigida*. In all cases, these sagebrush taxa tend to occur in shallow, rocky, calcareous or alkaline soils, often fine-textured and sometimes with a claypan impeding drainage. Associated herbaceous taxa are semi-desert grasses and forbs.

**VEGETATION**

**Physiognomy and Structure:** The vegetation in this broadly defined shrubland and steppe group includes an open to moderately dense shrub or dwarf-shrub layer dominated by microphyllous evergreen shrubs with a sparse to dense herbaceous layer usually dominated by perennial graminoids (often bunch grasses).

**Floristics:** This broadly defined shrubland and steppe group includes an open to moderately dense shrub or dwarf-shrub layer with a sparse to dense herbaceous layer. Several different taxa of sagebrush may dominate depending on location and by habitat. *Artemisia nova* is most widespread, occurring throughout most of the region on mid- to low-elevation, gravelly, calcareous soils. *Artemisia arbuscula* ssp. *arbuscula* occurs on low- to high-elevation sites often on shallow, fine-textured soils with a dense clay layer

that impedes drainage in spring. *Artemisia arbuscula ssp. longiloba* is widespread in the Columbia Basin and Great Basin into southwestern Wyoming and badlands in the western Great Plains. It occurs on shallow, alkaline, calcareous soils derived from shale. *Artemisia bigelovii* occurs throughout much of the Colorado Plateau and extends across northern New Mexico and southeastern Colorado on shallow soils on limestone hill and shale outcrops. Several other more restricted taxa may dominate, including *Artemisia tripartita ssp. rupicola* (central Wyoming), *Artemisia arbuscula ssp. longicaulis* (Lahontan Basin of northwestern Nevada, southeastern Oregon, and northeastern California), *Artemisia arbuscula ssp. thermopola* (ridgetops and benches in mountains at 1830 to 2690 m in southern Idaho), and *Artemisia frigida* (described from sites in the Rocky Mountains). Other shrubs present to codominant may include *Artemisia tridentata ssp. wyomingensis*, *Artemisia tridentata ssp. vaseyana*, *Ephedra torreyana*, *Ephedra viridis*, *Grayia spinosa*, or *Purshia tridentata*, depending on habitat. The herbaceous layer is variable. If present, it ranges from sparse cushion plants such as *Arenaria hookeri*, *Astragalus bisulcatus*, *Astragalus jejunus*, *Eriogonum brevicaulis*, *Minuartia nuttallii* (= *Arenaria nuttallii*), *Phlox hoodii*, *Stenotus acaulis*, and *Trifolium gymnocarpon* to moderate to dense cover of perennial grasses. Characteristic grasses may include *Achnatherum hymenoides*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Elymus elymoides*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus salinus*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, and *Pseudoroegneria spicata*. Some stands have significant biological crust formation on soil surface.

G308 Intermountain Low & Black Sagebrush Shrubland & Steppe Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Artemisia arbuscula ssp. arbuscula</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	G5/S1	CEGL001409
<i>Artemisia arbuscula ssp. arbuscula</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	G5/S2	CEGL001412

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This broadly defined semi-arid dwarf-shrubland and steppe group occurs throughout much of the intermountain western U.S. Sites are generally xeric and may be on wind-blown, shallow, gravelly or finer-textured alkaline soils. Throughout eastern Oregon, northern Nevada, southern Idaho, western Montana, western Wyoming, and western Colorado, stands typically occur on mountain ridges and flanks and broad terraces, ranging from 1000 to 3000 m in elevation with stands extending to 3800 m elevation in subalpine and alpine habitats of the Sierra Nevada. Substrates are shallow, fine-textured soils, poorly drained clays, shallow-soiled areas, almost always very stony, characterized by recent rhyolite or basalt or are alkaline soils derived from shale (Zamora and Tueller 1973, Baker and Kennedy 1985). In central and southern Wyoming, typical sites are very windy, gently rolling hills and long, gently sloping pediments and fans with shallow, often rocky soils where this group forms the matrix vegetation and large patches on the margins of high-elevation basins. In higher elevation areas, it forms a mosaic with Intermountain Mountain Big Sagebrush Shrubland & Steppe Group (G304) and is restricted to wind-blown ridges. In the Colorado Plateau, Tavaputs Plateau and Uinta Basin, stands occur in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m. Soils are often rocky, shallow, and alkaline. This group also extends across northern New Mexico and Wyoming into the western Great Plains on limestone hills and shale outcrops.

**Dynamics:** This broadly defined semi-arid dwarf-shrubland and steppe group occurs throughout much of the intermountain western U.S. Sites are generally xeric and may be on wind-blown, shallow, gravelly or finer-textured alkaline soils. Throughout eastern Oregon, northern Nevada, southern Idaho, western Montana, western Wyoming, and western Colorado, stands typically occur on mountain ridges and flanks and broad terraces, ranging from 1000 to 3000 m in elevation with stands extending to 3800 m elevation in subalpine and alpine habitats of the Sierra Nevada. Substrates are shallow, fine-textured soils, poorly drained clays, shallow-soiled areas, almost always very stony, characterized by recent rhyolite or basalt or are alkaline soils derived from shale (Zamora and Tueller 1973, Baker and Kennedy 1985). In central and southern Wyoming, typical sites are very windy, gently rolling hills and long, gently sloping pediments and fans with shallow, often rocky soils where this group forms the matrix vegetation and large patches on the margins of high-elevation basins. In higher elevation areas, it forms a mosaic with Intermountain Mountain Big Sagebrush Shrubland & Steppe Group (G304) and is restricted to wind-blown ridges. In the Colorado Plateau, Tavaputs Plateau and Uinta Basin, stands occur in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m. Soils are often rocky, shallow, and alkaline. This group also extends across northern New Mexico and Wyoming into the western Great Plains on limestone hills and shale outcrops.

### DISTRIBUTION

**Geographic Range:** This broadly defined semi-arid dwarf-shrubland and steppe group occurs throughout much of the intermountain western U.S.

**Nations:** US

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

**TNC Ecoregions [optional]:** 6:C, 8:C, 9:C, 10:C, 11:C, 12:P, 17:P, 18:C, 19:C, 20:C, 21:P, 26:C, 27:C, 28:C

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313D:CC, 315A:C?, 315B:CC, 315H:CC, 321A:CC, 331A:CC, 331B:CC, 331F:CC, 331G:CC, 331K:CP, 331L:C?, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341E:CP, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CP, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:CC, M261G:CC, M313A:CC, M313B:CC, M331A:C?, M331B:CC, M331D:CC, M331E:CC, M331F:CP, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:??, M341A:CC, M341B:CC, M341C:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed. USNVC Confidence from peer reviewer, not AE. This is a very broad group and further review may suggest splitting into two or three groups.

#### SYNONYMY

- > *Artemisia arbuscula* habitat types (Zamora and Tueller 1973)
- > *Artemisia longiloba* habitat types (Zamora and Tueller 1973)
- > *Artemisia nova* habitat types (Zamora and Tueller 1973)
- >< Black Sagebrush (405) (Shiflet 1994)
- >< Black Sagebrush - Bluebunch Wheatgrass (320) (Shiflet 1994)
- >< Black Sagebrush - Idaho Fescue (321) (Shiflet 1994)
- < Great Basin Desertscrub, Sagebrush Series - 152.11 (Brown et al. 1979)
- > Great Basin Desertscrub, Sagebrush Series, *Artemisia nova* Association - 152.113 (Brown et al. 1979)
- < Great Basin Desertscrub, Sagebrush Series, *Artemisia tridentata* Association - 152.111 (Brown et al. 1979)
- < Great Basin Desertscrub, Sagebrush Series, *Artemisia tridentata*-Mixed Scrub-Grass Association - 152.112 (Brown et al. 1979)
- = Great Basin-Colorado Plateau sagebrush semi-desert (West 1983a)
- >< Low Sagebrush (406) (Shiflet 1994)
- >< Other Sagebrush Types (408) (Shiflet 1994) [*Artemisia bigelovii* shrublands are included in this group.]
- >< Threetip Sagebrush (404) (Shiflet 1994) [*Artemisia tripartita* ssp. *rupicola* shrublands are included in this group in the Wyoming Basins.]

#### LOWER LEVEL UNITS

**Alliances:**

- A3221 *Artemisia arbuscula* ssp. *longiloba* Shrubland Alliance
- A3223 *Artemisia bigelovii* Shrubland Alliance
- A3222 *Artemisia nova* Shrubland Alliance
- A2548 *Artemisia arbuscula* ssp. *longicaulis* Shrubland Alliance
- A3219 *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance
- A2565 *Artemisia frigida* Dwarf-shrubland Alliance
- A4122 *Artemisia arbuscula* ssp. *thermopola* - *Artemisia papposa* / *Festuca idahoensis* Dwarf-shrubland Alliance

#### AUTHORSHIP

**Primary Concept Source:** N.E. West (1983a)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2010/03/27

#### REFERENCES

**References:** Baker and Kennedy 1985, Beetle and Johnson 1982, Brown 1982a, Brown et al. 1979, Dick-Peddie 1993, Faber-Langendoen et al. 2015, Francis 1986, Jones 1992b, Knight 1994, Knight et al. 1987, Shiflet 1994, West 1983a, West 1983c, Zamora and Tueller 1973

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3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

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

**Type Concept Sentence:** This macrogroup includes the big sagebrush shrubland and shrub-steppe that is a matrix and large-patch type throughout much of the intermountain western U.S. and that is dominated by *Artemisia tridentata*, *Purshia tridentata*, and several local dominants such as *Artemisia cana* and *Artemisia tripartita* ssp. *tripartita*.

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#### OVERVIEW

**Scientific Name:** *Artemisia tridentata* - *Artemisia tripartita* ssp. *tripartita* - *Purshia tridentata* Great Basin & Intermountain Shrubland & Steppe Macrogroup

**Common Name (Translated Scientific Name):** Big Sagebrush - Threetip Sagebrush - Antelope Bitterbrush Great Basin & Intermountain Shrubland & Steppe Macrogroup

**Type Concept:** This sagebrush shrubland and shrub-steppe macrogroup is widely distributed in the western U.S. It has an open to dense (10-80% cover) short-shrub canopy (<2 m tall) dominated by *Artemisia tridentata*. *Purshia tridentata* is less widespread but often dominates or codominates with *Artemisia tridentata*, especially in relatively mesic and montane stands. The subspecies of *Artemisia tridentata* vary by habitat and geographic range. The most widespread taxa are *Artemisia tridentata* ssp. *wyomingensis* and *Artemisia tridentata* ssp. *tridentata*. Some stands are codominated by associated shrub species *Atriplex canescens*, *Atriplex confertifolia*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria nauseosa*, *Grayia spinosa*, *Sarcobatus vermiculatus*, or *Tetradymia canescens*. *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *xericensis*, and *Artemisia tripartita* ssp. *tripartita* are characteristic of relatively mesic environments. Mesic associates include *Peraphyllum ramosissimum*, *Prunus virginiana*, and *Symphoricarpos* spp. At montane elevations, *Artemisia tridentata* ssp. *vaseyana*, *Artemisia cana*, and related taxa such as *Artemisia tridentata* ssp. *spiciformis* dominate, sometimes with *Purshia tridentata* codominating or dominating stands. *Amelanchier utahensis* and *Symphoricarpos oreophilus* are common montane associates. The understory of this macrogroup is variable and characterized by a sparse to dense (5-50% cover) herbaceous layer that is dominated by a variety of perennial graminoid associates. On xeric sites *Achnatherum hymenoides*, *Hesperostipa comata*, *Poa secunda*, and other semi-desert associates are common. On relatively mesic or montane sites, associates include *Achnatherum occidentale*, *Bromus carinatus*, *Calamagrostis rubescens*, *Carex pensylvanica*, *Danthonia intermedia*, *Deschampsia caespitosa*, *Elymus trachycaulus*, *Festuca arizonica*, *Festuca idahoensis*, *Leucopoa kingii*, *Leymus cinereus*, *Poa fendleriana*, and *Pseudoroegneria spicata*. Shrub-steppes characterized by an open shrub canopy and abundant native graminoid understory are more common in the less xeric northern extent, at montane elevations and mesic microsites such as along drainages. Shrublands are more common in the drier southern extent with the core distribution in the Great Basin and Colorado Plateau. Stands are found as low as 500 m elevation in the northwestern Great Plains and up to 2500 m in the Rocky Mountains and Colorado Plateau. Xeric stands occur on flat to steeply sloping upland slopes on alluvial fans and terraces, toeslopes, lower and middle slopes, draws, badlands, foothills, and rocky slopes. Mesic stands occur on stream terraces, point bars, valley floors, alluvial fans, floodplains, washes, gullies, stabilized dunes, mesic uplands, and swales. Montane stands occur on stony flats, broad ridgetops, and mountain slopes. All aspects are represented, but occurrences at higher elevations may be restricted to south- or west-facing slopes. Soils vary from deep and well-developed to shallow rocky and poorly developed substrates.

**Classification Comments:** This wide-ranging and broadly defined macrogroup is characterized by *Artemisia tridentata* and several other less common sagebrushes, such as *Artemisia cana*, *Artemisia rothrockii*, *Artemisia tripartita* ssp. *tripartita*, and *Purshia tridentata*. S.K. Rust and other ecologists think Intermountain Mountain Big Sagebrush Shrubland & Steppe Group (G304) should be moved out of this macrogroup and into Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macrogroup (M048) or Southern Rocky Mountain Montane Shrubland Macrogroup (M049) because of the strong associations with *Artemisia tridentata* ssp. *vaseyana* and relatively mesic montane environment versus the warmer, drier environment characterized by the occurrence of *Artemisia tridentata* ssp. *wyomingensis* and *Artemisia tridentata* ssp. *tridentata* that occurs on the lower-elevation plateaus and planes of the Columbia Basin and Great Basin (S.K. Rust personal comm. 2014). Until further review, G304 will stay in this macrogroup.

**Similar NVC Types:** Stands in this macrogroup (M169) may look similar to stands in Great Basin & Intermountain Dwarf Sagebrush Shrubland & Steppe Macrogroup (M170), but stands in the latter macrogroup are dominated by dwarf-shrubs such as *Artemisia nova*, *Artemisia arbuscula* ssp. *arbuscula*, *Artemisia arbuscula* ssp. *longiloba*, *Artemisia arbuscula* ssp. *longicaulis*, *Artemisia bigelovii*, *Artemisia tripartita* ssp. *rupicola*, *Artemisia arbuscula* ssp. *longicaulis*, *Artemisia arbuscula* ssp. *thermopola*, *Artemisia frigida*, and *Artemisia rigida*, although *Artemisia tridentata* may be present.

- M170 Great Basin & Intermountain Dwarf Sagebrush Shrubland & Steppe: is dominated by dwarf-shrubs.

**Diagnostic Characteristics:** This sagebrush shrubland and shrub-steppe macrogroup has an open to dense (10-80% cover) short-shrub canopy (<2 m tall) dominated by strong diagnostic species *Artemisia tridentata*. *Purshia tridentata* is a less widespread diagnostic species that often dominates or codominates with *Artemisia tridentata* or other shrubs. *Artemisia tridentata* subspecies vary by habitat and geographic range and are valuable as diagnostic taxa for classification. The most widespread diagnostic taxa are *Artemisia tridentata* ssp. *wyomingensis* and *Artemisia tridentata* ssp. *tridentata*. Stands may be codominated by associated shrub species *Amelanchier utahensis*, *Atriplex canescens*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria nauseosa*, or *Sarcobatus vermiculatus*. Relatively mesic environments are characterized by large *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *xericensis*, and *Artemisia tripartita* ssp. *tripartita*. At montane elevations *Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *spiciformis*, and *Artemisia cana* ssp. *viscidula* are the dominant diagnostic taxa. The understory is variable (5-50%) and dominated by a variety of perennial graminoid associates. Shrub-steppe with abundant native graminoid understory is more common in the less xeric northern extent and at montane elevations, as well as mesic microsites such as along drainages.

## VEGETATION

**Physiognomy and Structure:** This microphyllous-leaved evergreen and broad-leaved, cold-deciduous macrogroup is structurally characterized by open to dense sagebrush with associated shrubs interspersed. A sparse to dense perennial herbaceous understory dominated by bunchgrasses is common. Scattered forbs may be present, but typically are not.

**Floristics:** This sagebrush shrubland and shrub-steppe macrogroup is characterized by an open to dense (10-80% cover) short-shrub canopy (<2 m tall) that is dominated by *Artemisia tridentata*. *Purshia tridentata* frequently dominates or codominates with *Artemisia tridentata*. The subspecies of *Artemisia tridentata* have diagnostic value for community classification and vary by habitat and geographic range. *Artemisia tridentata* ssp. *wyomingensis* and *Artemisia tridentata* ssp. *tridentata* are the most widespread taxa and dominate throughout much of range of this macrogroup. They may be codominated by associated shrub species such as *Atriplex canescens*, *Chrysothamnus viscidiflorus*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria nauseosa*, or *Sarcobatus vermiculatus*. *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *hercynensis*, and *Artemisia tripartita* ssp. *tripartita* are characteristic of relatively mesic environments and may be codominated by *Peraphyllum ramosissimum*, *Prunus virginiana*, *Ribes cereum*, or *Symphoricarpos* spp. At montane elevations, *Artemisia tridentata* ssp. *vaseyana*, related taxa *Artemisia tridentata* ssp. *spiciformis*, and *Artemisia cana* ssp. *viscidula* are the dominant taxa. *Purshia tridentata* may also dominate or codominate montane stands. Common montane associates are *Amelanchier utahensis* and *Symphoricarpos oreophilus*. The understory is variable (5-50% cover) and dominated by a variety of perennial graminoid associates. On xeric sites *Achnatherum hymenoides*, *Hesperostipa comata*, *Poa secunda*, and other semi-desert associates are common. Montane and relatively mesic sites include *Achnatherum occidentale*, *Bromus carinatus*, *Calamagrostis rubescens*, *Carex pensylvanica*, *Danthonia intermedia*, *Deschampsia caespitosa*, *Elymus trachycaulus*, *Festuca arizonica*, *Festuca campestris*, *Festuca idahoensis*, *Leucopoa kingii*, *Leymus cinereus*, *Poa fendleriana*, and *Pseudoroegneria spicata*. Shrub-steppe with abundant native graminoid understory is more common in the less xeric northern extent and at montane elevations, as well as mesic microsites such as along drainages. Shrublands are more common in the drier southern extent with the core distribution in the Great Basin and Colorado Plateau.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This shrubland and shrub-steppe macrogroup is widely distributed in the western U.S., at elevations as low as 300 m in the Okanagan Valley of British Columbia and 500 m in the northwestern Great Plains and up to 2500 m in the Rocky Mountains and Colorado Plateau. Xeric stands occur on flat to steeply sloping upland slopes on alluvial fans and terraces, toeslopes, lower and middle slopes, draws, badlands, foothills, and rocky slopes. Mesic stands occur on stream terraces, point bars, valley floors, alluvial fans, floodplains, washes, gullies, stabilized dunes, mesic uplands, and swales. Montane stands occur on stony flats, broad ridgetops, and mountain slopes. All aspects are represented, but the occurrences at higher elevations may be restricted to south- or west-facing slopes.

**Climate:** Climate ranges from semi-arid in the western Great Basin to subhumid in the northern plains and Rocky Mountains with much of the precipitation falling primarily as snow. Temperatures are continental with large annual and diurnal variations. Annual precipitation ranges from 18-40 cm in semi-arid areas and up to 90 cm in montane and subalpine zones. Growing-season drought is common. The amount and reliability of growing-season moisture increase eastward and with higher elevation.

**Soil/substrate/hydrology:** Soils vary from deep and well-developed to shallow, rocky and poorly developed substrates. Soil textures range from sands to loam and clay loams, and silt derived from alluvium, loess, shale, and sandstone. There is often a significant amount of coarse fragments in the soil profile. Montane soils tend to be moderately deep and well-drained, often with high volume of coarse fragments. In drier regions, these shrublands are usually associated with perennial or ephemeral stream drainages with water tables less than 3 m from the soil surface. In British Columbia stands often occur on lacustrine soils with silty textures.

**Dynamics:** The natural fire regime of this macrogroup likely maintains a patchy distribution of shrubs so that the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions in the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Response to grazing can be variable depending on the type of grazer and the season in which grazing occurs. *Hesperostipa comata* can increase in abundance in response to either grazing or fire. In central and eastern Montana (and possibly elsewhere), complexes of prairie dog towns are common in instances of this macrogroup with low sagebrush density. Microphytic crust is very important for soil moisture retention, mitigating soil erosion, and seed germination in communities of this macrogroup.

Healthy montane sagebrush shrublands can be quite productive (roughly 100-150 gC m<sup>-2</sup> year<sup>-1</sup>), though productivity is correlated with precipitation during the growing season. They are often grazed by domestic livestock, and are strongly preferred during the growing season (Padgett et al. 1989). Prolonged livestock use can cause a decrease in net primary productivity as well as the abundance of native bunchgrasses. It can also increase the canopy cover of shrubs and non-native grass species such as *Bromus tectorum* and *Poa pratensis*. *Artemisia cana* resprouts vigorously following spring fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance (Hansen et al. 1995).

*Artemisia tridentata* is top-killed by fire and will not resprout. Stands re-establish from seedbanks or from off-site sources depending on severity of burn and usually takes over ten years for it to form occurrences having 20% or more cover. However, a study on Wyoming big sagebrush shrub-steppe in central and southeast Montana stands where median time since fire was 22 years

(ranging from 4 to 67 years) found no Wyoming big sagebrush canopy cover recovery for 17 of the 24 sites, and the oldest burn was only 8% recovered (Cooper et al. 2007). Lesica et al. (2005) did a similar study in southwest Montana with similar findings. Wyoming big sagebrush stands tend to occur on drier sites than the other subspecies and may be slower to recover on drier sites (Howard 1999). Tirmenstein (1999c) and Howard (1999) found sites with high-severity or repeated burns that kill the banked sagebrush seeds and mycorrhizal spores are slow to establish new shrubs so severity of fire and other fire characteristics, such as seasonality, size/extent, complexity, intensity, and type of fire as well as fire-return interval, influence post-fire recovery. According to Johnson (2000b), fire-return intervals of 30-70 years maintain perennial bunchgrasses and non-sprouting shrubs like sagebrush; fire-return intervals of 10-30 years eliminate short-lived, sprouting shrubs; and fire-return intervals of 2-5 years eliminate perennial grasses and non-sprouting shrubs leaving invasive annual grasses and forbs.

The condition of most sagebrush steppe has been degraded due to fire suppression, overgrazing by livestock, invasion by pinyon and juniper, and the invasion and subsequent domination of the herbaceous canopy by *Bromus tectorum*. It is unclear how long it will take to restore degraded occurrences.

#### DISTRIBUTION

**Geographic Range:** This shrubland and shrub-steppe macrogroup is widely distributed from the Great Basin, Columbia River Basin, Colorado Plateau, Rocky Mountains, northeastern Great Plains and as far east as the Dakotas and into British Columbia in some southern valleys.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

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

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 315A:CC, 315H:CC, 321A:??, 322A:CC, 331A:CP, 331B:C?, 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331J:CC, 331M:C?, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CC, M261E:CC, M261F:C?, M261G:CC, M313A:CP, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333D:CC, M334A:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

#### Omernik Ecoregions:

#### Federal Lands [optional]:

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

#### SYNONYMY

- > *Artemisia cana ssp. bolanderi* Communities (Young et al. 2007a)
- > *Artemisia tridentata ssp. tridentata* Communities (Young et al. 2007a)
- > *Artemisia tridentata ssp. vaseyana* Communities (Young et al. 2007a)
- > *Artemisia tridentata ssp. wyomingensis* Communities (Young et al. 2007a)
- > *Artemisia tridentata* Communities (Young et al. 2007a)
- > *Artemisietalia tridentatae* (Rivas-Martínez 1997)
- > Antelope Bitterbrush - Bluebunch Wheatgrass (104) (Shiflet 1994) [*Purshia tridentata* shrublands are included in this macrogroup.]
- > Antelope Bitterbrush - Idaho Fescue (105) (Shiflet 1994) [*Purshia tridentata* shrublands are included in this macrogroup.]
- > Basin Big Sagebrush (401) (Shiflet 1994) [This is the primary macrogroup crosswalking to this SRM type.]
- > Big Sagebrush - Bluebunch Wheatgrass (314) (Shiflet 1994)
- > Big Sagebrush - Idaho Fescue (315) (Shiflet 1994)
- > Bitterbrush (210) (Shiflet 1994) [*Purshia tridentata* steppe is included in this macrogroup.]
- > Bitterbrush - Bluebunch Wheatgrass (317) (Shiflet 1994) [Bitterbrush-dominated communities are included in the big sage steppe macrogroup.]
- > Bitterbrush - Idaho Fescue (318) (Shiflet 1994) [Bitterbrush-dominated communities are included in the big sage steppe macrogroup.]
- > Bitterbrush - Rough Fescue (319) (Shiflet 1994) [Bitterbrush-dominated communities are included in the big sage steppe macrogroup.]
- < Great Basin Desertscrub, Sagebrush Series - 152.11 (Brown et al. 1979)
- > Great Basin Desertscrub, Sagebrush Series, *Artemisia tridentata* Association - 152.111 (Brown et al. 1979)
- > Great Basin Desertscrub, Sagebrush Series, *Artemisia tridentata*-Mixed Scrub-Grass Association - 152.112 (Brown et al. 1979)
- > Great Basin Sagebrush (West and Young 2000)
- > Great Basin-Colorado Plateau sagebrush semi-desert (West 1983a)
- >< Other Sagebrush Types (408) (Shiflet 1994) [*Artemisia tridentata ssp. spiciformis* shrublands are included in this macrogroup.]

- > Sagebrush - Grass (612) (Shiflet 1994) [*Artemisia tridentata* ssp. *tridentata* steppe communities are included in this macrogroup.]
- > Sagebrush Steppe (West and Young 2000)
- > Sagebrush association (*Artemisietum tridentatae*) (Billings 1945)
- > Sagebrush community (*Artemisia-Agropyron-Lepus* Association) (Fautin 1946)
- > Threetip Sagebrush (404) (Shiflet 1994) [*Artemisia tripartita* ssp. *tripartita* shrublands are included in this macrogroup in the northern Great Basin, Columbia Plateau and northern Rockies regions.]
- > Threetip Sagebrush - Idaho Fescue (324) (Shiflet 1994) [*Artemisia tripartita* ssp. *tripartita* communities are included in this macrogroup.]
- > Western Intermountain sagebrush steppe (West 1983c) [Range overlaps.]

#### LOWER LEVEL UNITS

##### Groups:

- G303 Intermountain Dry Tall Sagebrush Shrubland
- G302 Intermountain Mesic Tall Sagebrush Shrubland & Steppe
- G304 Intermountain Mountain Big Sagebrush Shrubland & Steppe

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** K.A. Schulz and M. Jennings

**Acknowledgments:** We have incorporated significant descriptive information previously compiled by M.E. Hall.

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** KAS 10-14

#### REFERENCES

**References:** Baker and Kennedy 1985, Barbour and Major 1977, Barbour and Major 1988, Billings 1945, Blackburn and Tueller 1970, Brown 1982a, Brown et al. 1979, Chappell et al. 1997, Cooper et al. 2007, Daubenmire 1970, Faber-Langendoen et al. 2015, Fautin 1946, Hansen and Hoffman 1988, Hansen et al. 1995, Hironaka et al. 1983, Holland and Keil 1995, Howard 1999, Johnson 2000b, Johnston 2001, Knight 1994, Lesica et al. 2005, Lloyd et al. 1990, Mueggler and Stewart 1980, Nicholson et al. 1991, Padgett et al. 1989, Rivas-Martínez 1997, Rust pers. comm., Shiflet 1994, Steen and Coupé 1997, Tirmenstein 1999c, Tisdale 1947, West 1983a, West 1983c, West and Young 2000, Young et al. 2007a, van Ryswyk et al. 1966

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### 3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland  
M169. Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe

## G302. Intermountain Mesic Tall Sagebrush Shrubland & Steppe

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Artemisia tridentata* - *Artemisia tripartita* - *Purshia tridentata* Big Sagebrush Steppe Group

**Common Name (Translated Scientific Name):** Basin Big Sagebrush - Threetip Sagebrush - Antelope Bitterbrush Big Sagebrush Steppe Group

**Type Concept:** This widespread matrix-forming sagebrush steppe group occurs throughout much of the western U.S. in the Great Basin, Columbia Plateau, northwestern Great Plains, eastern Sierra Nevada, Wyoming Basins, Rocky Mountains, and Colorado Plateau between elevations of 1200 and 2400 m. Soils vary from deep and well-developed to shallow, rocky and poorly developed sandy loams, loamy sands, sand, silt loams, and clay loams derived from alluvium, loess, shale, and sandstone. This group may occur on stream terraces, point bars, valley floors, alluvial fans, floodplains, washes, gullies, stabilized dunes, swales, and rocky slopes. Stands are characterized by open to sparse shrublands dominated by *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) or *Artemisia tripartita* ssp. *tripartita* which tend to occupy more mesic sites with well-developed soil, and *Purshia tridentata* which tends to occupy drier, rockier soils and positions, as well as sandy dune areas. Some *Artemisia tridentata* ssp. *wyomingensis* associations are included here, where they occur in biophysical settings conducive to an abundant herbaceous layer, and more mesic-indicator species. Herbaceous layers are often dense and dominated by perennial bunchgrasses. Common graminoids include *Pseudoroegneria spicata*, *Poa secunda*, *Leymus cinereus*, *Festuca idahoensis*, *Festuca campestris*, *Pascopyrum smithii*, *Achnatherum hymenoides*, *Achnatherum occidentale*, *Carex pensylvanica*, and *Hesperostipa comata*. In some cases scattered trees may form an emergent layer of individual trees; species include *Pinus ponderosa*, *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, or *Cercocarpus ledifolius*. Many perennial forb species are important in these shrublands, and microphytic crust is very important in this group.

**Classification Comments:** This group is a solid concept at its core, although the associations considered "mesic tall sagebrush" probably need adjustment. These communities tend to occur in the northern Great Basin and Northern Rockies, or on somewhat more mesic settings than the dry tall sagebrush group. Slightly higher precipitation and less evapotranspiration stress combined with deeper soils allow for the significant bunchgrass and perennial forb component of the shrublands in this group.

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G303 Intermountain Dry Tall Sagebrush Shrubland
- G304 Intermountain Mountain Big Sagebrush Shrubland & Steppe

**Diagnostic Characteristics:** Stands are characterized by open to sparse shrublands dominated by *Artemisia tridentata* (*ssp. tridentata*, *ssp. xericensis*) or *Artemisia tripartita ssp. tripartita* which tend to occupy more mesic sites with well-developed soil, and *Purshia tridentata* which tends to occupy drier, rockier soils and positions, as well as sandy dune areas. Herbaceous layers are often dense and dominated by perennial bunchgrasses. Common graminoids include *Pseudoroegneria spicata*, *Poa secunda*, *Leymus cinereus*, *Festuca idahoensis*, *Festuca campestris*, *Pascopyrum smithii*, *Achnatherum hymenoides*, *Achnatherum occidentale*, *Carex pensylvanica*, and *Hesperostipa comata*.

## VEGETATION

**Physiognomy and Structure:** These are microphyllous evergreen or deciduous scrublands, with a significant component of perennial grasses. The group is structurally characterized by open to dense sagebrush or bitterbrush with associated shrubs interspersed and/or a dense understory of perennial bunch grasses.

**Floristics:** This shrub and shrub herbaceous group is characterized by communities dominated by *Artemisia tridentata ssp. tridentata*, *Artemisia tridentata ssp. xericensis*, *Artemisia tridentata ssp. wyomingensis*, *Artemisia tripartita ssp. tripartita*, and *Purshia tridentata*. Other associated shrubs may include *Symphoricarpos longiflorus*, *Symphoricarpos rotundifolius*, *Chrysothamnus viscidiflorus*, *Artemisia frigida*, *Prunus virginiana*, *Peraphyllum ramosissimum*, *Ribes cereum*, and *Arctostaphylos uva-ursi*. Herbaceous layers are often dense and dominated by perennial bunchgrasses. Common graminoids include *Achnatherum hymenoides*, *Achnatherum occidentale*, *Carex pensylvanica*, *Elymus lanceolatus*, *Festuca campestris*, *Festuca idahoensis*, *Hesperostipa comata*, *Koeleria macrantha*, *Leymus cinereus*, *Muhlenbergia montana*, *Pascopyrum smithii*, *Poa secunda*, and *Pseudoroegneria spicata*. In some cases scattered trees may form an emergent layer of individual trees; species include *Pinus ponderosa*, *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, or *Cercocarpus ledifolius*.

G302 Intermountain Mesic Tall Sagebrush Shrubland & Steppe Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Artemisia tridentata</i> ( <i>ssp. tridentata</i> , <i>ssp. xericensis</i> ) / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	G2G4/S1	CEGL001018
<i>Artemisia tridentata</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	G4Q/S3	CEGL001530
<i>Artemisia tridentata ssp. tridentata</i> / <i>Hesperostipa comata</i> Shrubland	G4?/S2	CEGL002966
<i>Artemisia tridentata ssp. tridentata</i> / <i>Leymus cinereus</i> Shrubland	G2/S1	CEGL001016
<i>Artemisia tridentata ssp. wyomingensis</i> / <i>Hesperostipa comata</i> Shrubland	G2/S1	CEGL001051
<i>Artemisia tridentata ssp. wyomingensis</i> / <i>Poa secunda</i> Shrubland	G4/S3	CEGL001049
<i>Artemisia tridentata ssp. wyomingensis</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	G5?/S3	CEGL001535
<i>Artemisia tridentata ssp. wyomingensis</i> / <i>Pseudoroegneria spicata</i> Shrubland	G5?/SNR	CEGL001009
<i>Artemisia tridentata ssp. wyomingensis</i> – <i>Purshia tridentata</i> Shrubland	GNR/SNR	TBD (Hallock et al. 2007)
<i>Artemisia tripartita ssp. tripartita</i> / <i>Festuca campestris</i> Shrub Herbaceous Vegetation	G2?/S1S2	CEGL001537
<i>Artemisia tripartita ssp. tripartita</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	G3/S3	CEGL001536
<i>Artemisia tripartita ssp. tripartita</i> / <i>Hesperostipa comata</i> Shrub Herbaceous Vegetation	G1/S1	CEGL001539
<i>Artemisia tripartita ssp. tripartita</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	G2G3/S1	CEGL001538



G302 Intermountain Mesic Tall Sagebrush Shrubland & Steppe Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Purshia tridentata</i> / <i>Achnatherum hymenoides</i> Shrubland	G1/S1	CEGL001058
<i>Purshia tridentata</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	G3G5/S3	CEGL002674
<i>Purshia tridentata</i> / <i>Hesperostipa comata</i> Shrub Herbaceous Vegetation	G2/S1	CEGL001498
<i>Purshia tridentata</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	G3/S2	CEGL001495

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This widespread matrix-forming group occurs throughout much of the western U.S. between elevations of 600 m in the northern extents to 2500 m in southern range limits. This group may occur on stream terraces, point bars, valley floors, alluvial fans, floodplains, washes, gullies, stabilized dunes, mesic uplands, swales, and rocky slopes. Slopes are variable from gentle to very steep. *Climate:* The climate where this group occurs is semi-arid with annual precipitation ranging from 18-40 cm and high inter-annual variation. Much of the precipitation falls as snow, and growing-season drought is characteristic. Temperatures are continental with large annual and diurnal variations. *Soil/substrate/hydrology:* Soils vary from deep and well-developed to rocky and poorly developed sandy loams, loamy sands, sand, silt loams, and clay loams derived from alluvium, loess, shale, and sandstone. In drier regions, these shrublands are usually associated with perennial or ephemeral stream drainages with water tables less than 3 m from the soil surface.

**Dynamics:** The natural fire regime of this group likely maintains a patchy distribution of shrubs so that the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions in the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Response to grazing can be variable depending on the type of grazer and the season in which grazing occurs. *Hesperostipa comata* can increase in abundance in response to either grazing or fire. In central and eastern Montana (and possibly elsewhere), complexes of prairie dog towns are common in this group. Microphytic crust is very important in this group.

### DISTRIBUTION

#### Geographic Range:

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 4:P, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 26:C, 68:C

**USFS Ecoregions (2007):** 313A:CC, 331D:CC, 331G:CC, 341A:CC, 341B:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:C?, 342I:CC, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:C?, M332D:CC, M332E:CC, M332F:CC, M332G:CC

#### Omernik Ecoregions:

**Federal Lands [optional]:** NPS (Arches, Curecanti, Dinosaur, Fossil Butte, Golden Spike, Grand Teton?, John Day Fossil Beds, Mesa Verde, Natural Bridges, Zion); USFS (Arapaho-Roosevelt, Bridger-Teton, Shoshone)

### CONFIDENCE LEVEL

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

### SYNONYMY

- < AB Antelope-brush Shrub/Grassland (Ecosystems Working Group 1998)
- >> Antelope Bitterbrush - Bluebunch Wheatgrass (104) (Shiflet 1994) [*Purshia tridentata* shrublands are included in this group.]
- >> Antelope Bitterbrush - Idaho Fescue (105) (Shiflet 1994) [*Purshia tridentata* shrublands are included in this group.]
- < Basin Big Sagebrush (401) (Shiflet 1994) [This is the primary group crosswalking to this SRM type.]
- >> Big Sagebrush - Bluebunch Wheatgrass (314) (Shiflet 1994)
- >> Big Sagebrush - Idaho Fescue (315) (Shiflet 1994)
- >> Bitterbrush (210) (Shiflet 1994) [*Purshia tridentata* steppe is included in this group.]
- > Bitterbrush - Bluebunch Wheatgrass (317) (Shiflet 1994) [Bitterbrush-dominated communities are included in the big sage steppe group.]
- > Bitterbrush - Idaho Fescue (318) (Shiflet 1994) [Bitterbrush-dominated communities are included in the big sage steppe group.]
- > Bitterbrush - Rough Fescue (319) (Shiflet 1994) [Bitterbrush-dominated communities are included in the big sage steppe group.]
- < Great Basin Desertscrub, Sagebrush Series - 152.11 (Brown et al. 1979)
- < Great Basin Desertscrub, Sagebrush Series, *Artemisia tridentata* Association - 152.111 (Brown et al. 1979)
- < Great Basin Desertscrub, Sagebrush Series, *Artemisia tridentata*-Mixed Scrub-Grass Association - 152.112 (Brown et al. 1979)
- < SS Big Sagebrush Shrub/Grassland (Ecosystems Working Group 1998) [low-elevation sites; high elevation.]

#### WA groups

- >< Sagebrush - Grass (612) (Shiflet 1994) [*Artemisia tridentata* ssp. *tridentata* steppe communities are included in this group.]
- >< Threetip Sagebrush (404) (Shiflet 1994) [*Artemisia tripartita* ssp. *tripartita* shrublands are included in this group in the northern Great Basin, Columbia Plateau and northern Rockies regions.] I]
- < Threetip Sagebrush - Idaho Fescue (324) (Shiflet 1994) [*Artemisia tripartita* ssp. *tripartita* communities are included in this group.]
- = Western Intermountain sagebrush steppe (West 1983c)
- >< Wyoming Big Sagebrush (403) (Shiflet 1994)

#### LOWER LEVEL UNITS

##### Alliances:

- A3179 *Purshia tridentata* - *Artemisia tridentata* Mesic Shrubland & Steppe Alliance
- A3183 *Artemisia tridentata* ssp. *tridentata* - *Artemisia tridentata* ssp. *xericensis* Mesic Shrubland & Steppe Alliance
- A1528 *Artemisia tripartita* ssp. *tripartita* - *Artemisia tridentata* Mesic Shrubland & Steppe Alliance
- A3182 *Artemisia tridentata* ssp. *wyomingensis* Mesic Shrubland & Steppe Alliance

#### AUTHORSHIP

**Primary Concept Source:** N.E. West (1983c)

**Author of Description:** M.E. Hall and K.A. Schulz

**Acknowledgments:**

**Version Date:** 2010/03/26

#### REFERENCES

**References:** Barbour and Billings 1988, Barbour and Major 1977, Barbour and Major 1988, Brown 1982a, Brown et al. 1979, Daubenmire 1970, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Hironaka et al. 1983, Holland and Keil 1995, Knight 1994, Mueggler and Stewart 1980, Shiflet 1994, West 1983a, West 1983c

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#### 3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland  
M169. Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe

### G303. Intermountain Dry Tall Sagebrush Shrubland

**Notes (Rocchio):** doesn't look like any Associations are in WA; however, what is distinction between 302/303? We have shrub-steppe in areas that get < 10 in./yr.--is that mesic? Art tri tri or Art tri wyo/Poa secunda are dry Associations. Some Hes com and Pse spi are also dry types. I spoke to Gwen Kittel about this and she agreed that G302 vs. G303 was not clear. Needs more attention.

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Artemisia tridentata* ssp. *wyomingensis* - *Artemisia tridentata* ssp. *tridentata* Tall Sagebrush Group

**Common Name (Translated Scientific Name):** Wyoming Big Sagebrush - Basin Big Sagebrush Tall Shrubland Group

**Type Concept:** This shrubland and shrub herbaceous group is widely distributed from the Great Basin, Columbia River Basin, Colorado Plateau, northern Rocky Mountains, northeastern Great Plains and as far east as the Dakotas at elevations as low as 500 m in the northwestern Great Plains to 2500 m in the Rocky Mountains and Colorado Plateau. This group occurs on flat to steeply sloping upland slopes on alluvial fans and terraces, toeslopes, lower and middle slopes, draws, badlands, and foothills. Sites with little slope tend to have deep soils, while those with steeper slopes have shallow to moderately deep soils. Climate ranges from arid in the western Great Basin to subhumid in the northern plains and Rocky Mountains with much of the precipitation falling primarily as snow. The amount and reliability of growing-season moisture increase eastward and with increasing elevation. Stands are dominated by *Artemisia tridentata* ssp. *wyomingensis* and *Artemisia tridentata* ssp. *tridentata* and, in some cases, codominated by *Amelanchier utahensis*, *Atriplex canescens*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria nauseosa*, or *Sarcobatus vermiculatus*. Other common shrubs include *Artemisia frigida*, *Atriplex confertifolia*, *Atriplex gardneri*, *Chrysothamnus* spp., *Ericameria* spp., *Grayia spinosa*, *Krascheninnikovia lanata*, *Peraphyllum ramosissimum*, *Prunus virginiana*, *Purshia tridentata*, *Symphoricarpos longiflorus*, and *Tetradymia* spp. The herbaceous layer may be sparse to strongly dominated by graminoids including *Achnatherum hymenoides*, *Achnatherum lettermanii* (= *Stipa lettermanii*), *Achnatherum pinetorum*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Bromus tectorum*, *Carex filifolia*, *Elymus albicans*, *Elymus elymoides*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata* (= *Stipa comata*), *Leymus ambiguus*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. A sparse layer of cold-deciduous needle-leaved or scale-leaved evergreen trees may occasionally be emergent over the shrubs.

**Classification Comments:** This group tends to occur in drier biophysical settings than the two similar tall sagebrush groups (G302, G304). Hence, it tends to have a less abundant herbaceous component, with the predominant grasses being more adapted to drier

conditions. In addition, the co-occurring shrub taxa will include more desert species as well as cacti. This is a slid group in concept, but the specific associations included in it need to be reviewed and will require some adjustment.

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G302 Intermountain Mesic Tall Sagebrush Shrubland & Steppe
- G304 Intermountain Mountain Big Sagebrush Shrubland & Steppe

**Diagnostic Characteristics:** Stands are dominated by *Artemisia tridentata ssp. wyomingensis* or *Artemisia tridentata ssp. tridentata* and, in some cases, codominated by *Amelanchier utahensis*, *Atriplex canescens*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria nauseosa*, or *Sarcobatus vermiculatus*. The herbaceous component may be sparse to strongly dominated by graminoids and tends to include more semi-desert taxa with core distribution in the Great Basin and Colorado Plateau regions.

**VEGETATION**

**Physiognomy and Structure:** This deciduous scrub and grassland group is structurally characterized by open to dense sagebrush with associated shrubs interspersed and/or a dense understory of perennial bunch grasses.

**Floristics:** Stands are dominated by *Artemisia tridentata ssp. wyomingensis* and *Artemisia tridentata ssp. tridentata* and, in some cases, codominated by *Atriplex canescens*, *Ephedra nevadensis*, *Ephedra viridis*, *Ericameria nauseosa*, *Amelanchier utahensis*, or *Sarcobatus vermiculatus*. Other common shrubs include *Artemisia frigida*, *Atriplex confertifolia*, *Atriplex gardneri*, *Chrysothamnus* spp., *Ericameria* spp., *Grayia spinosa*, *Krascheninnikovia lanata*, *Peraphyllum ramosissimum*, *Prunus virginiana*, *Purshia tridentata*, *Symphoricarpos longiflorus*, and *Tetradymia* spp. A sparse layer of cold-deciduous needle-leaved or scale-leaved evergreen trees may occasionally be emergent over the shrubs. The herbaceous layer may be sparse to strongly dominated by graminoids including *Achnatherum hymenoides*, *Achnatherum lettermanii* (= *Stipa lettermanii*), *Achnatherum pinetorum*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Bromus tectorum*, *Carex filifolia*, *Elymus albicans*, *Elymus elymoides*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata* (= *Stipa comata*), *Leymus ambiguus*, *Pleuraphis jamesii*, *Poa fendleriana*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. Trees found across the range include *Pinus ponderosa*, *Pinus flexilis*, *Pinus jeffreyi*, *Pinus monophylla*, *Pinus edulis*, *Juniperus occidentalis*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Juniperus monosperma*, *Populus tremuloides*, *Quercus garryana*, *Quercus gambelii*, *Cercocarpus ledifolius*, and *Yucca brevifolia*.

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** This shrubland group is widely distributed in the western U.S., at elevations as low as 500 m in the northwestern Great Plains to 2500 m in the Rocky Mountains and Colorado Plateau. This group occurs on flat to steeply sloping upland slopes on alluvial fans and terraces, toeslopes, lower and middle slopes, draws, badlands, and foothills. *Climate:* Climate ranges from arid in the western Great Basin to subhumid in the northern plains and Rocky Mountains with much of the precipitation falling primarily as snow. The amount and reliability of growing-season moisture increase eastward and with increasing elevation. *Soil/substrate/hydrology:* Sites with little slope tend to have deep soils while those with steeper slopes have shallow to moderately deep soils. Soil texture is loamy sand, loam, sandy loam, or clay loam (Hansen and Hoffman 1988), and there is often a significant amount of coarse fragments in the soil profile.

**Dynamics:** The natural fire regime of this group likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is that of a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Response to grazing can be variable depending on the type of grazer and the season in which grazing occurs. *Hesperostipa comata* can increase in abundance in response to either grazing or fire. Microphytic crust is very important in this group.

**DISTRIBUTION**

**Geographic Range:** This shrubland and shrub herbaceous group is widely distributed from the Great Basin, Columbia River Basin, Colorado Plateau, northern Rocky Mountains, northeastern Great Plains and as far east as the Dakotas.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 12:C, 18:C, 19:C, 20:C, 26:C, 27:C

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 322A:CC, 331A:CP, 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331J:C?, 341A:CC, 341B:CC, 341C:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, M242C:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333D:CC, M334A:CC, M341A:CC, M341B:CC, M341C:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Arches, Bighorn Canyon, Black Canyon of the Gunnison?, Bryce Canyon, Canyon de Chelly, Canyonlands, Capitol Reef, Colorado, Curecanti, Death Valley, Dinosaur, Fossil Butte, Glen Canyon, Golden Spike, Grand Canyon, Hovenweep, John Day Fossil Beds, Mesa Verde, Natural Bridges, Theodore Roosevelt, Zion); USFS (Arapaho-Roosevelt, Custer, Medicine Bow, Shoshone, Thunder Basin); USFWS (Ouray)

#### CONFIDENCE LEVEL

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

#### SYNONYMY

- >< Basin Big Sagebrush (401) (Shiflet 1994)
- >< Big Sagebrush - Bluebunch Wheatgrass (314) (Shiflet 1994)
- >< Big Sagebrush - Idaho Fescue (315) (Shiflet 1994)
- < Great Basin Desertscrub, Sagebrush Series - 152.11 (Brown et al. 1979)
- < Great Basin Desertscrub, Sagebrush Series, *Artemisia tridentata* Association - 152.111 (Brown et al. 1979)
- = Great Basin-Colorado Plateau sagebrush semi-desert (West 1983a)
- < SS Big Sagebrush Shrub/Grassland (Ecosystems Working Group 1998) [low-elevation sites; high elevation.]
- >< Wyoming Big Sagebrush (403) (Shiflet 1994)

#### LOWER LEVEL UNITS

##### Alliances:

- A3194 *Artemisia tridentata* ssp. *tridentata* - *Artemisia tridentata* ssp. *xericensis* Dry Shrubland Alliance
- A3198 *Artemisia tridentata* - Mixed Shrub Dry Shrubland Alliance
- A3184 *Artemisia tridentata* ssp. *wyomingensis* Dry Shrubland Alliance

#### AUTHORSHIP

**Primary Concept Source:** N.E. West (1983a)

**Author of Description:** M.E. Hall and K.A. Schulz

**Acknowledgments:**

**Version Date:** 2010/03/26

#### REFERENCES

**References:** Baker and Kennedy 1985, Barbour and Billings 1988, Barbour and Major 1988, Blackburn and Tueller 1970, Brown 1982a, Brown et al. 1979, Chappell et al. 1997, Daubenmire 1970, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Hansen and Hoffman 1988, Hironaka et al. 1983, Holland and Keil 1995, Knight 1994, Mueggler and Stewart 1980, Shiflet 1994, West 1983a, West 1983c

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

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Artemisia tridentata* ssp. *spiciformis* - *Artemisia tridentata* ssp. *vaseyana* - *Artemisia cana* ssp. *viscidula* Tall Shrubland & Steppe Group

**Common Name (Translated Scientific Name):** Spiked Big Sagebrush - Mountain Big Sagebrush - Mountain Silver Sagebrush Tall Shrubland & Steppe Group

**Type Concept:** This group includes sagebrush communities occurring at foothills (in Wyoming) to montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the Southern Rockies. In Montana, it occurs on mountain "islands" in the north-central portion of the state and possibly along the Boulder River south of Absarokee and at higher elevations. In British Columbia, it occurs between 450 and 1650 m in the southern Fraser Plateau and the Thompson and Okanagan basins. Climate is cool, semi-arid to subhumid. This group primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this group shows an affinity for mild topography, fine soils, some source of subsurface moisture or more mesic sites, zones of higher precipitation, and areas of snow accumulation. Across its range of distribution, this is a compositionally diverse group. It is composed primarily of *Artemisia tridentata* ssp. *vaseyana*, *Artemisia cana* ssp. *viscidula*, and related taxa such as *Artemisia tridentata* ssp. *spiciformis*. *Purshia tridentata* may codominate or even dominate some stands. Other common shrubs include *Symphoricarpos* spp., *Amelanchier* spp., *Ericameria nauseosa*, *Peraphyllum ramosissimum*, *Ribes cereum*, and *Chrysothamnus viscidiflorus*. *Artemisia tridentata* ssp. *wyomingensis* may be present to codominant if the stand is clearly montane as indicated by montane indicator species such as *Festuca idahoensis*, *Leucopoa kingii*, or *Danthonia intermedia*. Most stands have an abundant perennial herbaceous layer (over 25% cover, and in many cases over 50% cover), but this group also includes *Artemisia tridentata* ssp. *vaseyana* shrublands. Common graminoids include *Danthonia intermedia*, *Festuca arizonica*, *Festuca idahoensis*, *Hesperostipa comata*, *Poa fendleriana*, *Elymus trachycaulus*, *Bromus carinatus*, *Poa secunda*, *Leucopoa kingii*, *Deschampsia caespitosa*, *Calamagrostis rubescens*, and *Pseudoroegneria spicata*. Species of *Achnatherum* are common, including

*Achnatherum nelsonii ssp. dorei*, *Achnatherum nelsonii ssp. nelsonii*, *Achnatherum hymenoides*, and others. In many areas, wildfires can maintain an open herbaceous-rich steppe condition, although at most sites, shrub cover can be unusually high for a steppe system (>40%), with the moisture providing equally high grass and forb cover.

**Classification Comments:** *Artemisia cana* is often found in mesic to wet swales and toeslopes. Some *Artemisia cana ssp. viscidula* communities are included in this group, when they are not composed of more obligate wetland taxa, such as *Juncus*, wetland Carices, and such.

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G303 Intermountain Dry Tall Sagebrush Shrubland
- G302 Intermountain Mesic Tall Sagebrush Shrubland & Steppe

**Diagnostic Characteristics:** Sagebrush-dominated group where *Artemisia tridentata ssp. vaseyana*, *Artemisia cana ssp. viscidula*, and related taxa such as *Artemisia tridentata ssp. spiciformis* are the typical dominants with *Purshia tridentata* codominating or dominating some stands. Herbaceous layers are abundant with 25-50% cover and dominated by perennial species such as *Danthonia intermedia*, *Festuca arizonica*, *Festuca idahoensis*, *Hesperostipa comata*, *Poa fendleriana*, *Elymus trachycaulus*, *Bromus carinatus*, *Poa secunda*, *Leucopoa kingii*, *Deschampsia caespitosa*, *Calamagrostis rubescens*, and *Pseudoroegneria spicata*.

#### VEGETATION

**Physiognomy and Structure:** Microphyllous-leaved evergreen and broad-leaved, cold-deciduous shrub-steppe group with open to dense cover of sagebrush species and an abundant perennial herbaceous layer of graminoid and forb species.

**Floristics:** Vegetation types within this group are usually less than 1.5 m tall and dominated by *Artemisia tridentata ssp. vaseyana*, *Artemisia cana ssp. viscidula*, or *Artemisia tridentata ssp. spiciformis*. A variety of other shrubs can be found in some occurrences, but these are seldom dominant. They include *Artemisia rigida*, *Artemisia arbuscula*, *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, *Symphoricarpos oreophilus*, *Purshia tridentata*, *Peraphyllum ramosissimum*, *Ribes cereum*, *Rosa woodsii*, *Ceanothus velutinus*, and *Amelanchier alnifolia*. *Artemisia tridentata ssp. wyomingensis* may be present to codominant if the stand is clearly montane to subalpine as indicated by montane indicator species such as *Festuca idahoensis*, *Leucopoa kingii*, or *Danthonia intermedia*. The canopy cover is usually between 20 and 80%. The herbaceous layer is usually well-represented, but bare ground may be common in particularly arid or disturbed occurrences. Graminoids that can be abundant include *Festuca idahoensis*, *Festuca thurberi*, *Festuca ovina*, *Elymus elymoides*, *Deschampsia caespitosa*, *Danthonia intermedia*, *Danthonia parryi*, *Achnatherum* and *Hesperostipa* spp. (= *Stipa* spp.), *Pascopyrum smithii*, *Bromus carinatus*, *Elymus trachycaulus*, *Koeleria macrantha*, *Pseudoroegneria spicata*, *Poa fendleriana* or *Poa secunda*, and *Carex* spp. Forbs are often numerous and an important indicator of health. Forbs may include species of *Castilleja*, *Potentilla*, *Erigeron*, *Phlox*, *Astragalus*, *Geum*, *Lupinus*, and *Eriogonum*, as well as *Balsamorhiza sagittata*, *Achillea millefolium*, *Antennaria rosea*, *Eriogonum umbellatum*, *Fragaria virginiana*, *Artemisia ludoviciana*, *Hymenoxys hoopesii* (= *Helenium hoopesii*), etc.

G304 Intermountain Mountain Big Sagebrush Shrubland & Steppe Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Artemisia tridentata ssp. vaseyana</i> / <i>Festuca campestris</i> Shrub Herbaceous Vegetation	G3Q/SNR	CEGL001531
<i>Artemisia tridentata ssp. vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	G5/SNR	CEGL001533

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This group occurs in many of the western United States, usually at middle elevations (1000-2500 m). The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25 to 90 cm/year. Much of this precipitation falls as snow. Temperatures are continental with large annual and diurnal variation. In general, this group shows an affinity for mild topography, fine soils, and some source of subsurface moisture. Soils generally are moderately deep to deep, well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes; soils often have a substantial volume of coarse fragments, and are derived from a variety of parent materials. This group primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, but the higher elevation occurrences may be restricted to south- or west-facing slopes.

**Dynamics:** Healthy sagebrush shrublands are very productive, are often grazed by domestic livestock, and are strongly preferred during the growing season (Padgett et al. 1989). Prolonged livestock use can cause a decrease in the abundance of native bunch grasses and increase in the cover of shrubs and non-native grass species such as *Poa pratensis*. *Artemisia cana* resprouts vigorously following spring fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance (Hansen et al. 1995). *Artemisia tridentata* is generally killed by fires and may take over ten years to form occurrences of some 20% cover or more. The condition of most sagebrush steppe has been degraded due to fire suppression and heavy livestock grazing. It is unclear how long restoration will take to restore degraded occurrences.

#### DISTRIBUTION

**Geographic Range:** This group is found at montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the Southern Rockies. In British Columbia, it occurs in the southern Fraser Plateau and the Thompson and Okanagan basins. This group also occurs in central Montana in the Rocky Mountain island ranges

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 6:C, 7:C, 8:C, 9:C, 12:C, 18:C, 19:C, 20:C, 26:C, 68:C

**USFS Ecoregions (2007):** 313A:CC, 313B:CP, 315A:CC, 315H:CC, 321A:??, 322A:CC, 331B:C?, 331F:CC, 331G:CC, 331J:CC, 331M:C?, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CC, M261E:CC, M261F:C?, M261G:CC, M313A:CP, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

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

#### SYNONYMY

- >< Big Sagebrush - Bluebunch Wheatgrass (314) (Shiflet 1994)
- >< Big Sagebrush - Idaho Fescue (315) (Shiflet 1994)
- > Big Sagebrush - Rough Fescue (316) (Shiflet 1994)
- >< Chokecherry - Serviceberry - Rose (421) (Shiflet 1994) [Montane sagebrush has inclusions of choke cherry-, serviceberry- and rose-dominated shrublands.]
- >< Low Sagebrush (406) (Shiflet 1994)
- = Mountain Big Sagebrush (402) (Shiflet 1994)
- < Other Sagebrush Types (408) (Shiflet 1994) [*Artemisia tridentata* ssp. *spiciformis* shrublands are included in this group.]
- = Western Intermountain sagebrush steppe (West 1983c)

#### LOWER LEVEL UNITS

**Alliances:**

- A3208 *Artemisia tridentata* ssp. *vaseyana* - Mixed Shrubland Alliance
- A1098 *Artemisia rothrockii* Shrubland Alliance
- A3200 *Artemisia cana* ssp. *bolanderi* - *Artemisia cana* ssp. *viscidula* Shrubland & Steppe Alliance
- A3207 *Artemisia tridentata* ssp. *spiciformis* - *Artemisia tridentata* ssp. *vaseyana* Shrubland & Steppe Alliance

#### AUTHORSHIP

**Primary Concept Source:** N.E. West (1983c)

**Author of Description:** M.E. Hall

**Acknowledgments:**

**Version Date:** 2010/03/19

#### REFERENCES

**References:** Faber-Langendoen et al. 2015, Hansen et al. 1995, Hironaka et al. 1983, Johnston 2001, Mueggler and Stewart 1980, Padgett et al. 1989, Shiflet 1994, West 1983c

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3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

## M093. Great Basin Saltbush Scrub

**Type Concept Sentence:** This widespread cool semi-desert macrogroup centers in the Intermountain West of the U.S. and is typically composed of saltbush shrublands. Dominants include *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex corrugata*, *Atriplex cuneata*, *Atriplex gardneri*, *Atriplex lentiformis*, *Atriplex obovata*, *Atriplex polycarpa*, and *Atriplex spinifera*, either singly or mixed, sometimes codominated by other associated species. Substrates are typically saline, alkaline, fine-textured soils developed from shale or alluvium.

### OVERVIEW

**Scientific Name:** *Atriplex confertifolia* - *Atriplex canescens* - *Atriplex corrugata* Great Basin Scrub Macrogroup

**Common Name (Translated Scientific Name):** Shadscale Saltbush - Fourwing Saltbush - Mat Saltbush Great Basin Scrub Macrogroup

**Type Concept:** This widespread cool semi-desert macrogroup centers in the Intermountain West of the U.S. The vegetation is characterized by open to moderately dense cover of shrubs (<2 m tall), both short shrubs and/or dwarf-shrubs, with a typically sparse herbaceous layer composed of perennial bunchgrasses. Dominant shrubs may include *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex cuneata*, *Atriplex lentiformis*, *Atriplex obovata*, *Atriplex polycarpa*, and *Atriplex spinifera*. Dominant dwarf-shrubs may include *Atriplex corrugata*, *Atriplex gardneri*, *Picrothamnus desertorum*, *Sarcobatus vermiculatus* (= *Sarcobatus baileyi*) (Carson Desert), and *Psoralea polydenius* (sandy soils). Sometimes stands are codominated by *Artemisia tridentata*, *Krascheninnikovia lanata*, or species of *Ephedra* and *Lycium*. Some stands dominated by *Grayia spinosa* are also included in this macrogroup. Many other shrubs may be present, especially in transition areas with desert or montane scrub. Medium-tall and short perennial grasses often dominate the sparse to moderately dense graminoid layer, including *Achnatherum hymenoides*, *Bouteloua gracilis*, *Distichlis spicata*, *Elymus elymoides*, *Hesperostipa comata*, *Leymus ambiguus*, *Leymus salinus*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. The species present depend on the geographic range of the grasses, soil alkalinity/salinity, and past land use. A number of annual species may also grow in association with the shrubs and grasses, although they are usually rare and confined to areas of recent disturbance. Forb cover is generally sparse. This salt-desert shrubland macrogroup is matrix-forming in the Intermountain West. It forms large, small and linear patches in the Mojave and Sonoran deserts and extends east into the southern Great Plains. It occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos shale and semi-arid, windswept plains and basins across parts of Wyoming. Elevations range between 1520 and 2200 m (4987-7218 feet). Sites can be found on all aspects and include valley bottoms, alluvial and alkaline flats, mesas and plateaus, playas, drainage terraces, washes and interdune basins, bluffs, and gentle to moderately steep sandy or rocky slopes. Soils are shallow to moderately deep, poorly developed, and a product of a semi-arid climate. Substrates are typically saline, alkaline, fine-textured soils developed from shale or alluvium. Infiltration rate is typically low. Soil surface is often very barren and interspaces between the characteristic plant clusters are commonly covered by a microphytic crust.

**Classification Comments:** This macrogroup is more broadly defined. Some *Grayia spinosa*-dominated stands occur on flats, toeslopes and coppice dunes that have a silty component to them. If they occur on deep sand or dunes, then consider a dune group. Stands in this macrogroup may grade into sparse vegetation macrogroups on shale barrens/badlands. Welsh (1957) observed that *Atriplex corrugata* stands were restricted to north and east aspects on Mancos shale, with south and west aspects nearly barren.

### Similar NVC Types:

- M086 Chihuahuan Desert Scrub: may share widespread species, but typically has Chihuahuan Desert indicator species present.
- M171 Great Basin & Intermountain Dry Shrubland & Grassland: shares floristics, including *Krascheninnikovia lanata* and various herbaceous species, but *Atriplex* spp. are not characteristic.
- M118 Intermountain Basins Cliff, Scree & Badland Sparse Vegetation: may share species, but badland vegetation is much sparser and has fewer species.

**Diagnostic Characteristics:** The macrogroup is characterized by an open to moderately dense shrubland composed of one or more *Atriplex* species, such as *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex corrugata*, *Atriplex gardneri*, *Atriplex polycarpa*, or *Atriplex spinifera*. Other dominant or codominant dwarf-shrubs may include *Artemisia longifolia*, *Artemisia pedatifida* (very important in Wyoming, rare in Colorado stands), or *Picrothamnus desertorum*, sometimes with a mix of other low shrubs, such as *Grayia spinosa*, *Krascheninnikovia lanata* or *Tetradymia spinosa*. Occasional individuals or small clumps of *Artemisia tridentata* ssp. *wyomingensis* may be present in some stands within this macrogroup but do not codominate.

### VEGETATION

**Physiognomy and Structure:** This macrogroup typically has an open canopy composed of facultatively deciduous, extremely xeromorphic, subdesert short and dwarf-shrubs often with a sparse to moderately dense herbaceous layer dominated by perennial graminoids.

**Floristics:** This widespread cool semi-desert scrub macrogroup is highly variable and ranges from almost pure occurrences of single species to fairly complex mixtures. The vegetation is characterized by open to moderately dense cover of shrubs (<2 m tall), both short shrubs and/or dwarf-shrubs, with a typically sparse herbaceous layer composed of perennial bunchgrasses with large open spaces between the plants (Blaisdell and Holmgren 1984). Dominant short shrubs may include *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex cuneata*, *Atriplex lentiformis*, *Atriplex obovata*, *Atriplex polycarpa*, and *Atriplex spinifera*. Stands are sometimes codominated by *Artemisia tridentata*, *Krascheninnikovia lanata*, or species of *Ephedra* and *Lycium*. Dominant dwarf-shrubs may include *Atriplex corrugata*, *Atriplex gardneri*, *Picrothamnus desertorum*, *Sarcobatus vermiculatus* (= *Sarcobatus baileyi*) (Carson Desert), and *Psoralea polydenius* (sandy soils). Some stands dominated by *Grayia spinosa* are also included in this macrogroup. Other shrubs may be present, especially in transition areas with desert or montane scrub. Common associated species are *Acacia greggii*, *Chrysothamnus* spp., *Encelia frutescens*, *Ephedra nevadensis*, *Ephedra viridis*, *Frankenia salina*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Lycium andersonii*, *Lycium pallidum*, *Lycium shockleyi*, *Parthenium confertum*, *Psoralea polydenius*, *Purshia stansburiana*, *Suaeda* spp., *Tetradymia spinosa*, *Tiquilia latior*, and *Yucca glauca*. Northward in Wyoming and Montana, the type is most often associated with shale foothills and badlands where soils are saline, but also on alkaline clays and silts with low infiltration rates. There, relatively pure stands of *Atriplex gardneri* or (in southeastern Montana) *Artemisia pedatifida* are found, with some *Artemisia longifolia*, *Atriplex confertifolia*, *Krascheninnikovia lanata*, *Picrothamnus desertorum*, and *Tetradymia spinosa*. Warm-season medium-tall and short perennial grasses dominate in the sparse to moderately dense graminoid layer. The species present depend on the geographic range of the grasses, soil alkalinity/salinity, and past land use. Species may include *Achnatherum hymenoides*, *Achnatherum thurberianum*, *Bouteloua gracilis*, *Distichlis spicata*, *Elymus elymoides*, *Hesperostipa comata*, *Leymus ambiguus*, *Leymus salinus*, *Muhlenbergia torreyi*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. A number of annual species may also grow in association with the shrubs and grasses, although they are usually rare and confined to areas of recent disturbance (Blaisdell and Holmgren 1984). Forb cover is generally sparse. Perennial forbs that might occur include *Chaetopappa ericoides*, *Mentzelia* spp., *Sphaeralcea coccinea*, and *Xylorhiza venusta*. Annual natives include *Monolepis nuttalliana*, *Plantago* spp., or *Vulpia octoflora*. Associated halophytes include *Salicornia bigelovii*, *Salicornia rubra*, and *Suaeda* species. Exotic annuals that may occur include *Bromus rubens*, *Bromus tectorum*, *Descurainia sophia*, and *Salsola kali*. Cacti such as species of *Opuntia* and *Echinocereus* may be present in some occurrences. Trees are not usually present but some scattered *Juniperus* spp. may be found.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This salt-desert shrubland macrogroup is matrix-forming in the Intermountain West and forms large, small and linear patches in the Mojave and Sonoran deserts. It occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos shale and arid, windswept plains and basins across parts of Wyoming. This macrogroup comprises arid to semi-arid shrublands on lowland and upland sites usually at elevations between 1520 and 2200 m (4987-7218 feet). Sites can be found on all aspects and include valley bottoms, alluvial and alkaline flats, mesas and plateaus, playas, drainage terraces, washes and interdune basins, bluffs, and gentle to moderately steep sandy or rocky slopes. Slopes are typically gentle to moderately steep but are sometimes unstable and prone to surface movement.

**Climate:** This is typically a macrogroup of extreme climatic conditions, with warm to hot summers and freezing winters. Climate is largely temperate and semi-arid with mean annual precipitation ranging from 13-33 cm. The period of greatest precipitation is typically in mid to late summer, although in the more northern areas, a moist period is to be expected in the cold part of the year. However, in Montana and Wyoming, approximately two-thirds of the annual precipitation falls in spring and early summer. In Colorado and Utah, over half the precipitation occurs in the late-summer monsoons as high-intensity thunderstorms. However, plotted seasonality of occurrence is probably of less importance on this desert vegetation than in other types because desert precipitation comes with an extreme irregularity that does not appear in graphs of long-term seasonal or monthly averages (Blaisdell and Holmgren 1984).

**Soil/substrate/hydrology:** Soils are shallow to moderately deep, poorly developed, and a product of a semi-arid climate. Substrates are typically saline, alkaline, fine-textured soils developed from shale or alluvium and may be associated with shale badlands. Infiltration rate is typically low. In Wyoming and possibly elsewhere, inclusions of non-saline, gravelly barrens or rock outcrops may be present. In Montana, this type is found on gentle slopes, rolling plains and badlands in the northeastern Great Plains, as well as in the Wyoming Basin in extreme south-central and southeastern portions of the state. Across its range, the shallow soils of much of the area are poorly developed Entisols. Vegetation within this macrogroup is tolerant of these soil conditions but not restricted to it and can occur on level pediment remnants where coarse-textured and well-developed soil profiles have been derived from sandstone gravel and are alkaline, or on Mancos shale badlands, where soil profiles are typically fine-textured and non-alkaline throughout (West and Ibrahim 1968). On Mancos shale (and possibly other saline marine shales), stands may be restricted to gentler slopes and cooler north and east aspects, with steeper south and west aspects nearly barren (Welsh 1957). Many areas are degraded due to erosion and may resemble "badlands." Soil surface is often very barren and interspaces between the characteristic plant clusters are commonly covered by a microphytic crust (West 1982). Stands can also occur in alluvial basins where parent materials from other habitats have been deposited over Mancos shale and the soils are heavy-textured and saline-alkaline throughout the profile (West and Ibrahim 1968).



**Dynamics:** West (1982) stated that "salt desert shrub vegetation occurs mostly in two kinds of situations that promote soil salinity, alkalinity, or both. These are either at the bottom of drainages in enclosed basins or where marine shales outcrop." However, salt-desert shrub vegetation may be an indication of climatically dry as well as physiologically dry soils (Blaisdell and Holmgren 1984). Not all salt-desert shrub soils are salty, and their hydrologic characteristics may often be responsible for the associated vegetation (Naphan 1966). Species of the salt-desert shrub complex have different degrees of tolerance to salinity and aridity, and they tend to sort themselves out along a moisture/salinity gradient (West 1982). Species and communities are apparently sorted out along physical, chemical, moisture, and topographic gradients through complex relations that are not understood and are in need of further study (Blaisdell and Holmgren 1984).

The winter months are a good time for soil moisture accumulation and storage within stands in this macrogroup. There is generally at least one good snowstorm per season that will provide sufficient moisture to the vegetation. The winter moisture accumulation amounts will affect spring plant growth. Plants may grow as little as a few inches to 1 m. Unless more rains come in the spring, the soil moisture will be depleted in a few weeks, growth will slow and ultimately cease, and the perennial plants will assume their various forms of dormancy (Blaisdell and Holmgren 1984). If effective rain comes later in the warm season, some of the species will renew their growth from the stage at which it had stopped. Others, having died back, will start over as if emerging from winter dormancy (Blaisdell and Holmgren 1984). *Atriplex confertifolia* shrubs often develop large leaves in the spring, which increase the rate of photosynthesis. As soil moisture decreases, the leaves are lost, and the plant takes on a dead appearance. During late fall, very small overwintering leaves appear which provide some photosynthetic capability through the remainder of the year. Other communities are maintained by intra- or inter-annual cycles of flooding followed by extended drought, which favor accumulation of transported salts. The moisture supporting these intermittently flooded wetlands is usually derived off-site, and they are dependent upon natural watershed function for persistence (Reid et al. 1999).

*Atriplex corrugata*-dominated shrublands are the most saline-tolerant of the Mancos shale plant communities studied by Branson et al. (1976). *Atriplex corrugata* can completely dominate these extremely saline sites (Branson et al. 1976). It is a true evergreen dwarf-shrub retaining leaves for several years, and branches are capable of rooting at the nodes. This plant utilizes winter soil moisture, beginning new growth in March when the soils are relatively warm and moist. It flowers in April, and by mid-July fruits are shattered (Branson et al. 1976). If the soils dry out in mid-summer, it can go dormant until the late-summer monsoon rains begin. Large areas of *Atriplex corrugata* died during the extreme drought of 2002 in the Four Corners area. By 2004, new seedlings were established and spreading; shrub cover recovered to approximately 50% of what it was before the drought. *Atriplex gardneri*-dominated vegetation is another saline/drought-tolerant example of the Mancos shale plant communities studied by Branson et al. (1976). Although very slow-growing, it can completely dominate these extremely saline sites (Branson et al. 1976).

In summary, desert communities of perennial plants are dynamic and changing. The composition within this macrogroup may change dramatically and may be both cyclic and unidirectional. Superimposed on the compositional change is great variation from year to year in growth of all the vegetation, the sum of varying growth responses of individual species to specific conditions of different years (Blaisdell and Holmgren 1984). Desert plants grow when temperature is satisfactory, but only if soil moisture is available at the same time. Because the amount of moisture is variable from year to year and because different species flourish under different seasons of soil moisture, seldom do all components of the vegetation thrive in the same year (Blaisdell and Holmgren 1984).

#### DISTRIBUTION

**Geographic Range:** The distribution of this widespread macrogroup centers in the Intermountain West of the U.S. from the Columbia Plateau south into the Mojave Desert and Sonoran Desert. In the north it extends east into the basins and plains across Wyoming, and Montana and possibly into Canada. To the south it extends from the Colorado Plateau across northern New Mexico into the southern Great Plains.

#### Spatial Scale & Pattern [optional]:

**Nations:** CA?, MX?, US

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

#### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315B:CP, 315H:CC, 321A:CC, 322A:CC, 331A:CP, 331B:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:PP, M261D:CP, M261E:CP, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332A:CP, M332E:CC, M332F:CC, M332G:CP, M341A:CC, M341B:CC, M341C:CC, M341D:CC

#### Omernik Ecoregions:

#### Federal Lands [optional]:

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- > *Atriplex canescens* (Fourwing saltbush scrub) Alliance (Sawyer et al. 2009) [36.310.00]

#### WA groups

- > *Atriplex confertifolia* (Shadscale scrub) Alliance (Sawyer et al. 2009) [36.320.00]
- > *Atriplex hymenelytra* (Desert holly scrub) Alliance (Sawyer et al. 2009) [36.330.00]
- > *Atriplex polycarpa* (Allscale scrub) Alliance (Sawyer et al. 2009) [36.340.00]
- > *Atriplicetum confertifolio gardnerii* association (Rivas-Martínez 1997)
- > *Atriplici canescentis-Psorothamnetum polydenii* association (Peinado et al. 2013)
- > *Atriplici confertifoliae-Sarcobatetum baileyi* association (Peinado et al. 2013)
- > *Atriplicion confertifolio-gardnerii* Alliance (Rivas-Martínez 1997)
- > Biotic Matrix of the Shadscale and Associated Communities (Fautin 1946)
- > Dalea association (*Daleetum polydenii*) (Billings 1945)
- > Great Basin Desertscrub, Mixed Shrub Series152.15 (Brouillet et al. 1998)
- > Great Basin Desertscrub, Saltbush Series152.17 (Brouillet et al. 1998)
- > Great Basin Desertscrub, Shadscale Series, *Atriplex confertifolia* Association - 152.121 (Brown et al. 1979)
- > Great Basin Desertscrub, Shadscale Series, *Atriplex confertifolia*-Mixed Shrub Association - 152.122 (Brown et al. 1979)
- > Great Basin Desertscrub, Shadscale Series152.12 (Brouillet et al. 1998)
- > Great Basin Desertscrub, Winterfat Series, *Eurotia lanata* Association - 152.151 (Brown et al. 1979)
- > Great Basin Desertscrub, Winterfat Series, *Eurotia lanata*-Mixed Shrub Association - 152.152 (Brown et al. 1979)
- > Great Basin Desertscrub, Winterfat Series152.16 (Brouillet et al. 1998)
- ? Intermountain Salt-Desert Shrubland (West 1983b)
- > Little Greasewood-Shadscale association (*Sarcobatetum baileyi*) (Billings 1945)
- > Mat-*Atriplex* Association (Graham 1937)
- > Mohave Desertscrub, Saltbush Series153.16 (Brouillet et al. 1998)
- >< Other Sagebrush Types (408) (Shiflet 1994)
- > Salt Desert Plant Communities (Thorne et al. 2007)
- = Salt Desert Shrub (414) (Shiflet 1994)
- >< Saltbush - Greasewood (501) (Shiflet 1994)
- > Saltbush Desert Shrubland (Knight 1994)
- > Saltbush Desert shrubland (Knight et al. 1987)
- > Saltbush Scrub (Schoenherr and Burk 2007)
- > Shadscale Community (Fautin 1946)
- > Sonoran Desertscrub, Saltbush Series154.17 (Brouillet et al. 1998)
- > Tetradymia Community (Fautin 1946)
- > Vegetation of Bajadas, Hills, and Washes; *Atriplex hymenelytra* Scrub (Keeler-Wolf 2007)
- > Vegetation of Lower Basins and Playas, Saltbush Scrub (Keeler-Wolf 2007)
- > Vegetation of Upper Bajadas and Mountain Slopes; Shadscale Scrub (*Atriplex confertifolia*) (Keeler-Wolf 2007)
- > Vegetation on Manco Shale (Welsh 1957)
- > Winter-fat association (*Eurotietum lanatae*) (Billings 1945)
- > Winterfat Community (Fautin 1946)

#### LOWER LEVEL UNITS

##### Groups:

- G301 Intermountain Dwarf Saltbush - Sagebrush Scrub
- G300 Intermountain Shadscale - Saltbush Scrub

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** KAS 10-14

#### REFERENCES

**References:** Billings 1945, Billings 1949, Billings 1950, Blaisdell and Holmgren 1984, Branson et al. 1967, Branson et al. 1976, Brouillet et al. 1998, Brown 1982a, Brown et al. 1979, Campbell 1977, Faber-Langendoen et al. 2015, Fautin 1946, Francis 1986, Graham 1937, Holland and Keil 1995, Keeler-Wolf 2007, Knight 1994, Knight et al. 1987, Naphan 1966, Peinado et al. 2013, Potter et al. 1985, Reid et al. 1999, Rivas-Martínez 1997, Sawyer et al. 2009, Schoenherr and Burk 2007, Shiflet 1994, Stout et al. 2013, Thorne et al. 2007, Vasek and Barbour 1988, Welsh 1957, West 1979, West 1982, West 1983b, West and Ibrahim 1968

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### 3. Desert & Semi-Desert

#### 3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

**G300. Intermountain Shadscale - Saltbush Scrub [Proposed]****Type Concept Sentence:****OVERVIEW**

**Scientific Name:** *Atriplex confertifolia* - *Atriplex canescens* - *Krascheninnikovia lanata* Scrub Group

**Common Name (Translated Scientific Name):** Shadscale Saltbush - Fourwing Saltbush Scrub Group

**Type Concept:** This extensive group includes open-canopied shrublands of typically saline basins, alluvial slopes and plains across the Intermountain western U.S. This type also extends in limited distribution into the southern Great Plains. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more *Atriplex* species, such as *Atriplex confertifolia*, *Atriplex canescens*, *Atriplex cuneata*, *Atriplex obovata*, *Atriplex polycarpa*, or *Atriplex spinifera*. Northern occurrences lack *Atriplex* species and are typically dominated by *Grayia spinosa* and/or *Krascheninnikovia lanata*. Other shrubs present to codominant may include *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Ephedra nevadensis*, *Grayia spinosa*, *Krascheninnikovia lanata*, *Lycium* spp., *Picrothamnus desertorum*, or *Tetradymia* spp. In Wyoming, occurrences are typically a mix of *Atriplex confertifolia*, *Grayia spinosa*, *Artemisia tridentata* ssp. *wyomingensis*, *Sarcobatus vermiculatus*, *Krascheninnikovia lanata*, and various *Ericameria* or *Chrysothamnus* species. Some places are a mix of *Atriplex confertifolia* and *Artemisia tridentata* ssp. *wyomingensis*. In the Great Basin, *Sarcobatus vermiculatus* is generally absent but, if present, does not codominate. The herbaceous layer varies from sparse to moderately dense and is dominated by perennial graminoids such as *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus lanceolatus* ssp. *lanceolatus*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Pleuraphis rigida*, *Poa secunda*, or *Sporobolus airoides*. Various forbs are also present.

**Classification Comments:** Some *Grayia spinosa*-dominated stands tends to occur on coppice dunes that have a silty component to them. If they occur on deep sand or dunes, then consider a dune group.

**Internal Comments:** KAS 2-10: In MT, KRALAN were initially included here, but they might better fit with WY basins low sage steppe. KRALAN communities do not typically occur on salty sites. In MT? In northern Nevada, KRALAN dominates some alkaline basins so KRALAN is variable - also occurs in the southwestern Great Plains.

**Other Comments:**

**Similar NVC Types:**

- G299 Chihuahuan Desert Lowland Basin Scrub

**Diagnostic Characteristics:** The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more *Atriplex* species, such as *Atriplex confertifolia*, *Atriplex canescens*, *Atriplex polycarpa*, or *Atriplex spinifera*.

**VEGETATION**

**Physiognomy and Structure:** This group is a facultatively deciduous, extremely xeromorphic, subdesert short shrubland with a typically open shrub canopy and sparse to moderately dense herbaceous layer dominated by perennial graminoids.

**Floristics:** This widespread cool semi-desert scrub group is highly variable and ranges from almost pure occurrences of single species to fairly complex mixtures. The characteristic mix of low shrubs and grasses is sparse, with large open spaces between the plants (Blaisdell and Holmgren 1984). Occurrences have a sparse to moderately dense cover of woody species that is dominated by *Atriplex canescens* (may codominate with *Artemisia tridentata*), *Atriplex confertifolia* (may codominate with *Lycium andersonii*), *Atriplex cuneata*, *Atriplex obovata*, *Picrothamnus desertorum*, or *Krascheninnikovia lanata*. Other shrubs may be present, especially in transition areas with desert or montane scrub. Species include *Purshia stansburiana*, *Psoralea polydenius*, *Ephedra* spp., *Acacia greggii*, *Encelia frutescens*, *Tiquilia latior*, *Parthenium confertum*, *Atriplex polycarpa*, *Atriplex lentiformis*, *Atriplex spinifera*, *Picrothamnus desertorum* (= *Artemisia spinescens*), *Frankenia salina*, *Artemisia frigida*, *Chrysothamnus* spp., *Lycium* spp., *Suaeda* spp., *Yucca glauca*, and *Tetradymia spinosa*. Dwarf-shrubs include *Gutierrezia sarothrae* and several species of *Eriogonum*, but generally do not form a distinct layer as the main shrub layer is often >0.5 m tall.

Warm-season medium-tall and short perennial grasses dominate in the sparse to moderately dense graminoid layer. The species present depend on the geographic range of the grasses, soil alkalinity/salinity, and past land use. Species may include *Pleuraphis jamesii*, *Bouteloua gracilis*, *Sporobolus airoides*, *Sporobolus cryptandrus*, *Achnatherum hymenoides*, *Elymus elymoides*, *Distichlis spicata*, *Leymus salinus*, *Pascopyrum smithii*, *Hesperostipa comata*, *Pseudoroegneria spicata*, *Poa secunda*, *Leymus ambiguus*, and *Muhlenbergia torreyi*. A number of annual species may also grow in association with the shrubs and grasses, although they are usually rare and confined to areas of recent disturbance (Blaisdell and Holmgren 1984). Forb cover is generally sparse. Perennial forbs that might occur include *Sphaeralcea coccinea*, *Chaetopappa ericoides*, *Xylorhiza venusta*, *Descurainia sophia*, and

*Mentzelia* species. Annual natives include *Plantago* spp., *Vulpia octoflora*, or *Monolepis nuttalliana*. Associated halophytic annuals include *Salicornia rubra*, *Salicornia bigelovii*, and *Suaeda* species. Exotic annuals that may occur include *Salsola kali*, *Bromus rubens*, and *Bromus tectorum*. Cacti such as species of *Opuntia* and *Echinocereus* may be present in some occurrences. Trees are not usually present but some scattered *Juniperus* spp. may be found.

G300 Intermountain Shadscale - Saltbush Scrub Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Grayia spinosa</i> / <i>Poa secunda</i> Shrubland	G1/S1	CEGL001351

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This salt-desert shrubland group is matrix-forming in the Intermountain West. This group composes arid to semi-arid shrublands on lowland and upland sites usually at elevations between 1520 and 2200 m (4987-7218 feet). Sites can be found on all aspects and include valley bottoms, alluvial and alkaline flats, mesas and plateaus, playas, drainage terraces, washes and interdune basins, bluffs, and gentle to moderately steep sandy or rocky slopes. Slopes are typically gentle to moderately steep but are sometimes unstable and prone to surface movement. Many areas within this group are degraded due to erosion and may resemble "badlands." Soil surface is often very barren and interspaces between the characteristic plant clusters are commonly covered by a microphytic crust (West 1982).

**Climate:** This is typically a vegetation group of extreme climatic conditions, with warm to hot summers and freezing winters. Annual precipitation ranges from approximately 13-33 cm. In much of the group, the period of greatest moisture will be mid to late summer, although in the more northern areas, a moist period is to be expected in the cold part of the year. However, plotted seasonality of occurrence is probably of less importance on this desert vegetation than in other types because desert precipitation comes with an extreme irregularity that does not appear in graphs of long-term seasonal or monthly averages (Blaisdell and Holmgren 1984). **Soil/substrate/hydrology:** Soils are shallow to moderately deep, poorly developed, and a product of an arid climate and little precipitation. Soils are often alkaline or saline. Vegetation within this group is tolerant of these soil conditions but not restricted to it. The shallow soils of much of the area are poorly developed Entisols. Vegetation within this group can occur on level pediment remnants where coarse-textured and well-developed soil profiles have been derived from sandstone gravel and are alkaline, or on Mancos shale badlands, where soil profiles are typically fine-textured and non-alkaline throughout (West and Ibrahim 1968). They can also occur in alluvial basins where parent materials from the other habitats have been deposited over Mancos shale and the soils are heavy-textured and saline-alkaline throughout the profile (West and Ibrahim 1968).

**Dynamics:** West (1982) stated that "salt desert shrub vegetation occurs mostly in two kinds of situations that promote soil salinity, alkalinity, or both. These are either at the bottom of drainages in enclosed basins or where marine shales outcrop." However, salt-desert shrub vegetation may be an indication of climatically dry as well as physiologically dry soils (Blaisdell and Holmgren 1984). Not all salt-desert shrub soils are salty, and their hydrologic characteristics may often be responsible for the associated vegetation (Naphan 1966). Species of the salt-desert shrub complex have different degrees of tolerance to salinity and aridity, and they tend to sort themselves out along a moisture/salinity gradient (West 1982). Species and communities are apparently sorted out along physical, chemical, moisture, and topographic gradients through complex relations that are not understood and are in need of further study (Blaisdell and Holmgren 1984).

The winter months are a good time for soil moisture accumulation and storage within stands in this group. There is generally at least one good snowstorm per season that will provide sufficient moisture to the vegetation. The winter moisture accumulation amounts will affect spring plant growth. Plants may grow as little as a few inches to 1 m. Unless more rains come in the spring, the soil moisture will be depleted in a few weeks, growth will slow and ultimately cease, and the perennial plants will assume their various forms of dormancy (Blaisdell and Holmgren 1984). If effective rain comes later in the warm season, some of the species will renew their growth from the stage at which it had stopped. Others, having died back, will start over as if emerging from winter dormancy (Blaisdell and Holmgren 1984). *Atriplex confertifolia* shrubs often develop large leaves in the spring, which increase the rate of photosynthesis. As soil moisture decreases, the leaves are lost, and the plant takes on a dead appearance. During late fall, very small overwintering leaves appear which provide some photosynthetic capability through the remainder of the year. Other communities are maintained by intra- or inter-annual cycles of flooding followed by extended drought, which favor accumulation of transported salts. The moisture supporting these intermittently flooded wetlands is usually derived off-site, and they are dependent upon natural watershed function for persistence (Reid et al. 1999).

In summary, desert communities of perennial plants are dynamic and changing. The composition within this group may change dramatically and may be both cyclic and unidirectional. Superimposed on the compositional change is great variation from year to year in growth of all the vegetation, the sum of varying growth responses of individual species to specific conditions of different years (Blaisdell and Holmgren 1984). Desert plants grow when temperature is satisfactory, but only if soil moisture is available at the same time. Because the amount of moisture is variable from year to year and because different species flourish under different seasons of soil moisture, seldom do all components of the vegetation thrive in the same year (Blaisdell and Holmgren 1984).

**DISTRIBUTION**

**Geographic Range:** The distribution of this widespread group centers in the Intermountain West of the U.S., and extends in limited distribution across northern New Mexico into the southern Great Plains. In Wyoming, this group occurs in the Great Divide and Bighorn basins.

**Nations:** MX?, US

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

**TNC Ecoregions [optional]:** 4:?, 6:C, 8:?, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C, 26:C, 27:C, 28:C

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315B:CP, 315H:CC, 321A:CC, 322A:CC, 331A:CP, 331B:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:PP, M261D:CP, M261E:CP, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332A:CP, M332E:CC, M332F:CC, M332G:CP, M341A:CC, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Arches)

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Proposed.

**SYNONYMY**

- < Biotic Matrix of the Shadscale and Associated Communities (Fautin 1946)
- > Great Basin Desertscrub, Shadscale Series, *Atriplex confertifolia* Association - 152.121 (Brown et al. 1979)
- > Great Basin Desertscrub, Shadscale Series, *Atriplex confertifolia*-Mixed Shrub Association - 152.122 (Brown et al. 1979)
- > Great Basin Desertscrub, Winterfat Series, *Eurotia lanata* Association - 152.151 (Brown et al. 1979)
- > Great Basin Desertscrub, Winterfat Series, *Eurotia lanata*-Mixed Shrub Association - 152.152 (Brown et al. 1979)
- = Intermountain salt desert shrublands (West 1983b)
- < Mesquite Series - 153.24 (Brown et al. 1979)
- < Salt Desert Shrub (414) (Shiflet 1994)
- >< Saltbush - Greasewood (501) (Shiflet 1994)
- > Shadscale Community (Fautin 1946)
- > Tetradymia Community (Fautin 1946)
- > Winterfat Community (Fautin 1946)

**LOWER LEVEL UNITS****Alliances:**

- A3174 *Atriplex polycarpa* Shrubland Alliance
- A0872 *Atriplex hymenelytra* Shrubland Alliance
- A0869 *Atriplex canescens* Shrubland Alliance
- A3180 *Atriplex obovata* - *Atriplex cuneata* Dwarf-shrubland Alliance
- A0870 *Atriplex confertifolia* Shrubland Alliance
- A3171 *Grayia spinosa* Shrubland Alliance

**AUTHORSHIP**

**Primary Concept Source:** N.E. West (1983b)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2010/03/19

**REFERENCES**

**References:** Barbour and Major 1988, Blaisdell and Holmgren 1984, Branson et al. 1967, Branson et al. 1976, Brown 1982a, Brown et al. 1979, Campbell 1977, Faber-Langendoen et al. 2015, Fautin 1946, Francis 1986, Holland and Keil 1995, Knight 1994, Knight et al. 1987, Naphan 1966, Reid et al. 1999, Shiflet 1994, Stout et al. 2013, West 1979, West 1982, West 1983b, West and Ibrahim 1968

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3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

**M095. Great Basin & Intermountain Xeric-Riparian Scrub**

**Type Concept Sentence:** This macrogroup covers shrublands along dry washes and valley floors dominated by *Atriplex canescens*, *Ericameria nauseosa*, *Artemisia tridentata* ssp. *tridentata*, and other species within the cool temperate desert of western North America.

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## OVERVIEW

**Scientific Name:** Great Basin & Intermountain Xeric-Riparian Scrub Macrogroup

**Common Name (Translated Scientific Name):** Great Basin & Intermountain Xeric-Riparian Scrub Macrogroup

**Type Concept:** This macrogroup consists of shrublands along temporary watercourses (washes) on sandy terraces, wash bottoms, and basin floors dominated by *Artemisia filifolia*, *Artemisia tridentata* ssp. *tridentata*, *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex gardneri*, *Brickellia longifolia*, *Ephedra torreyana*, *Ephedra viridis*, *Ericameria nauseosa*, *Fraxinus anomala*, *Gutierrezia sarothrae*, *Lycium andersonii*, *Purshia stansburiana*, *Quercus havardii*, *Rhus trilobata*, and *Suaeda moquinii* (= *Suaeda torreyana*). Herbaceous cover is sparse, although non-native annuals such as *Bromus tectorum* and *Salsola tragus* are sometimes abundant. This macrogroup occurs within the cool temperate desert of the intermountain western U.S.

**Classification Comments:**

**Similar NVC Types:**

**Diagnostic Characteristics:** Open scattered to dense shrublands dominated by *Atriplex canescens* or *Ericameria nauseosa*.

## VEGETATION

**Physiognomy and Structure:** Broadleaf deciduous shrubland.

**Floristics:** Stands have generally fairly open cover of *Atriplex canescens* or *Ericameria nauseosa*. Associated shrubs include *Artemisia filifolia*, *Artemisia tridentata* ssp. *tridentata*, *Atriplex confertifolia*, *Atriplex gardneri*, *Brickellia longifolia*, *Ephedra torreyana*, *Ephedra viridis*, *Ericameria nauseosa*, *Fraxinus anomala*, *Gutierrezia sarothrae*, *Lycium andersonii*, *Purshia stansburiana*, *Quercus havardii*, *Rhus trilobata*, *Sarcobatus vermiculatus*, and *Suaeda moquinii* (= *Suaeda torreyana*). Herbaceous cover is sparse (<10% cover) with a variety of grasses and forbs such as *Achnatherum hymenoides*, *Artemisia dracunculoides*, *Descurainia pinnata*, *Elymus elymoides*, *Glycyrrhiza lepidota*, *Hesperostipa comata*, *Hordeum jubatum*, *Muhlenbergia porteri*, *Pleuraphis jamesii*, *Sphaeralcea parvifolia*, *Sporobolus contractus*, *Sporobolus cryptandrus*, *Stanleya pinnata*, and *Wyethia scabra*. Non-native annuals such as *Bromus tectorum* and *Salsola tragus* are sometimes present to abundant.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup occurs approximately from 1000 to 2500 m in elevation, along dry washes and intermittent stream courses, along the edges or within the flat wash and valley bottoms, and on elevated side terraces. Soils and substrates are rapidly drained, sandy or gravelly soils derived from alluvium, gneiss, shale, cinder and sandstone.

**Dynamics:** This macrogroup experiences severe disturbance by flash floods. The vegetation is usually scattered, occurring in parts of the channel protected from the worst flooding, and shrubs have extensive root systems to allow them to resprout quickly when damaged or partially uprooted by flooding, as well as small roots to immediately take advantage of recent moisture.

## DISTRIBUTION

**Geographic Range:** This macrogroup occurs throughout the intermountain western U.S. extending east into the western Great Plains.

**Spatial Scale & Pattern [optional]:**

**Nations:** US

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

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313D:CC, 315H:PP, 331B:CC, 331H:C?, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342E:CC, 342F:CC, 342G:CC, M313A:CC, M313B:CP, M331I:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

## SYNONYMY

- ? Rabbitbrush association (*Chrysothamnnetum nauseosi*) (Billings 1945)
- < Riparian (422) (Shiflet 1994)

## LOWER LEVEL UNITS

## Groups:

- G559 Cool Semi-Desert Shrub & Herb Wash-Arroyo

## AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** K.A. Schulz and G. Kittel

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** KAS/GK 10-14

## REFERENCES

**References:** Billings 1945, Comer et al. 2003, Faber-Langendoen et al. 2015, Knight 1994, Shiflet 1994, West 1983b

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

M095. Great Basin & Intermountain Xeric-Riparian Scrub

### G559. Cool Semi-Desert Shrub & Herb Wash-Arroyo [Proposed]

**Notes (Rocchio):** we have Inter-Mountain Basins Wash Ecological Systems--so we should have this? I spoke to Gwen Kittel and she is considering.

**Type Concept Sentence:**

## OVERVIEW

**Scientific Name:** *Atriplex canescens* - *Ericameria nauseosa* Shrubland Wash-Arroyo Group

**Common Name (Translated Scientific Name):** Fourwing Saltbush - Rubber Rabbitbrush Shrubland Wash-Arroyo Group

**Type Concept:** This group is known from western and eastern Utah from 1178 to 2104 m in elevation. Stands occur in or near temporary watercourses on sandy terraces, wash bottoms, point bars, and basin floors that are flat or gently sloping. Substrates are rapidly drained, sandy or gravelly soils derived from alluvium, gneiss, shale, cinder and sandstone. Scattered large rocks, gravel and bare ground cover most of the unvegetated surface, although some litter is typically present. Stands are sparse to dense (1-65% cover) and dominated by *Atriplex canescens* or *Ericameria nauseosa*. Associated shrubs include *Artemisia tridentata*, *Artemisia filifolia*, *Atriplex gardneri*, *Atriplex confertifolia*, *Brickellia longifolia*, *Ephedra torreyana*, *Ephedra viridis*, *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Fraxinus anomala*, *Purshia stansburiana*, *Quercus havardii*, *Sarcobatus vermiculatus*, *Lycium andersonii*, *Rhus trilobata*, and *Suaeda moquinii* (= *Suaeda torreyana*). Herbaceous cover is sparse (<10% cover) with a variety of grasses and forbs such as *Achnatherum hymenoides*, *Artemisia dracunculus*, *Muhlenbergia porteri*, *Sporobolus cryptandrus*, *Sphaeralcea parvifolia*, *Sporobolus contractus*, *Stanleya pinnata*, *Descurainia pinnata*, *Elymus elymoides*, *Glycyrrhiza lepidota*, *Hesperostipa comata*, *Hordeum jubatum*, *Pleuraphis jamesii*, and *Wyethia scabra*. Non-native annuals such as *Bromus tectorum* and *Salsola tragus* are sometimes present to abundant.

**Classification Comments:**

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

**Diagnostic Characteristics:** This shrubland group is characterized by a sparse to dense (1-65% cover) shrub layer dominated by *Atriplex canescens* or *Ericameria nauseosa*. Stands occur in or near temporary watercourses on sandy terraces, wash bottoms, point bars, and basin floors that are flat or gently sloping.

## VEGETATION

**Physiognomy and Structure:** This group is defined as a broadleaf deciduous shrubland with 1-65% cover. Herbaceous cover is generally low to sparse and characterized by a mixed composition of graminoids.

**Floristics:** Stands are sparse to dense (1-65% cover) and dominated by *Atriplex canescens* or *Ericameria nauseosa*. Associated shrubs include *Artemisia tridentata*, *Artemisia filifolia*, *Atriplex gardneri*, *Atriplex confertifolia*, *Brickellia longifolia*, *Ephedra torreyana*, *Ephedra viridis*, *Ericameria nauseosa*, *Gutierrezia sarothrae*, *Fraxinus anomala*, *Purshia stansburiana*, *Quercus havardii*, *Sarcobatus vermiculatus*, *Lycium andersonii*, *Rhus trilobata*, and *Suaeda moquinii* (= *Suaeda torreyana*). Herbaceous cover is sparse (<10% cover)

with a variety of grasses and forbs such as *Achnatherum hymenoides*, *Artemisia dracunculus*, *Muhlenbergia porteri*, *Sporobolus cryptandrus*, *Sphaeralcea parvifolia*, *Sporobolus contractus*, *Stanleya pinnata*, *Descurainia pinnata*, *Elymus elymoides*, *Glycyrrhiza lepidota*, *Hesperostipa comata*, *Hordeum jubatum*, *Pleuraphis jamesii*, and *Wyethia scabra*. Non-native annuals such as *Bromus tectorum* and *Salsola tragus* are sometimes present to abundant.

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This group is known from western and eastern Utah from 1178 to 2104 m in elevation.

**Soil/substrate/hydrology:** Substrates are rapidly drained, sandy or gravelly soils derived from alluvium, gneiss, shale, cinder and sandstone. Scattered large rocks, gravel and bare ground cover most of the unvegetated surface, although some litter is typically present.

**Dynamics:** This group is often associated with a combination of dry conditions, coarse-textured substrates and intermittent severe disturbance by flash floods. The vegetation is usually scattered, occurring in parts of the channel protected from the worst flooding, and shrubs have extensive root systems to allow them to resprout quickly when damaged or partially uprooted by flooding.

#### DISTRIBUTION

**Geographic Range:** This group occurs throughout the intermountain western U.S. extending east into the western Great Plains.

**Nations:** US

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

**TNC Ecoregions [optional]:** 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C

**USFS Ecoregions (2007):** 313A:CC, 313B:CC, 313D:CC, 315H:PP, 331B:CC, 331H:C?, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342E:CC, 342F:CC, 342G:CC, M313A:CC, M313B:CP, M331I:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

- < Riparian (422) (Shiflet 1994)

#### LOWER LEVEL UNITS

**Alliances:**

- A3266 *Atriplex canescens* - *Ericameria nauseosa* - *Psoralea polydenius* Desert Wash Alliance

#### AUTHORSHIP

**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2011)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2011/01/03

#### REFERENCES

**References:** Comer et al. 2003, Faber-Langendoen et al. 2015, Knight 1994, Shiflet 1994, West 1983b

## M118. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation

**Type Concept Sentence:** This sparsely vegetated macrogroup occurs in a variety of landscapes and a variety of exposed rock and badland substrates the interior western U.S. from the Columbia Plateau south to the Great Basin and Colorado Plateau, and east into Wyoming basins. Characteristic species are variable depending on substrate and other environmental condition and most of the species also occur in non-sparse vegetation macrogroups, although some of the sites with harsh soil properties may have of endemic species.

#### OVERVIEW

**Scientific Name:** *Atriplex* spp. - *Ephedra* spp. - *Eriogonum* spp. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation Macrogroup

**Common Name (Translated Scientific Name):** Saltbush species - Joint-fir species - Buckwheat species Intermountain Basins Cliff, Scree & Badland Sparse Vegetation Macrogroup

**Type Concept:** This macrogroup consists of landscapes that are sparsely vegetated by vascular plants and are on a variety of rock and badland substrates in the interior western U.S. from the Columbia Plateau south to the Great Basin and Colorado Plateau, east into Wyoming Basins. Species are variable depending on substrate, nutrient availability, and other environmental conditions.



Characteristic shrub species in lower elevation semi-desert, lava field, and badland areas include *Artemisia tridentata*, *Atriplex* spp., *Ephedra* spp., *Eriogonum* spp., *Fallugia paradoxa*, *Grayia spinosa*, *Psoralea* spp., *Purshia tridentata*, *Salvia dorrii*, and *Sarcobatus vermiculatus*. Characteristic herbs include species of *Achnatherum*, *Camissonia*, *Cleome*, *Eriogonum*, and *Mentzelia*. Characteristic species of canyon, foothill and lower montane sites include shrubs *Artemisia tridentata*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, *Holodiscus* spp., and trees *Juniperus occidentalis* (Columbia Basin), *Juniperus osteosperma*, *Pinus edulis* and *Pinus ponderosa* (Colorado Plateau), and *Pinus monophylla* (Great Basin). Most of the species also occur in non-sparse vegetation macrogroups. However, many of the sites have harsh plant growing soil properties such as strongly alkalinity and/or salinity with thin soil or unstable, eroding substrates that limit the abundance and numbers of species that can occur. Some sites have a high number of endemic perennial species. This cool semi-desert type occurs in a variety of sites ranging from low elevation basins to middle elevations foothill and lower montane sites, but does not include higher elevation cool temperate sites in montane and subalpine zones. Landforms include lava fields, cliffs and canyon sides, ridgetops, and rock outcrops on mesas, plateaus, and mountains. Substrates are variable and include sandstone slick rock, shale badlands and volcanic deposits.

**Classification Comments:** This macrogroup is very diverse floristically and so it is difficult to determine indicator species. More diagnostic is the sparse cover of vascular plants and/or presence and sometimes abundance of nonvascular species (e.g., algae, bacteria, bryophytes, lichens, and microfungi).

**Similar NVC Types:** This macrogroup contains cool semi-desert sites that lack warm-semi-desert indicator species that are intolerant of extended periods of freezing temperatures and found in North American Warm Semi-Desert Cliff, Scree & Rock Vegetation Macrogroup (M117). However, the macrogroup may occur in high elevation sites in desert mountains where extended freezing periods occur.

- M117 North American Warm Semi-Desert Cliff, Scree & Rock Vegetation: criteria are needed to determine where this macrogroup (M118) transitions into this cool desert macrogroup (M117).
- M171 Great Basin & Intermountain Dry Shrubland & Grassland: is similar and transitions with this macrogroup when vegetation becomes sparse (1-9% total vascular cover).
- M093 Great Basin Saltbush Scrub
- M115 Great Plains Badlands Vegetation: M118 is similar and transitions into this Great Plains macrogroup (M115) in Wyoming.
- M116 Great Plains Cliff, Scree & Rock Vegetation: M118 is similar and transitions into this Great Plains macrogroup (M116) in Wyoming.

**Diagnostic Characteristics:** Diagnostic characteristics of this lithomorphic macrogroup are near barren or sparsely vegetated rock and badland substrates and its geographic location, which is the intermountain western U.S. However, it is often composed of a mix of woody vegetation, especially shrubs and herbs (particularly cushion plants), although either may be absent on a given site. Characteristic species include *Arctostaphylos patula*, *Artemisia tridentata*, *Atriplex canescens*, *Atriplex corrugata*, *Atriplex gardneri*, *Artemisia pedatifida*, *Atriplex confertifolia*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, *Ephedra* spp., *Eriogonum corymbosum*, *Eriogonum heermannii*, *Eriogonum ovalifolium*, *Fallugia paradoxa*, *Glossopetalon* spp., *Grayia spinosa*, *Holodiscus* spp., *Ivesia* sp., *Juniperus occidentalis*, *Juniperus osteosperma*, *Pinus edulis*, *Pinus monophylla*, *Pinus ponderosa*, *Purshia tridentata*, *Salvia dorrii*, and *Sarcobatus vermiculatus*. Nonvascular species, especially lichens, but also algae, bacteria and mosses, are important on some sites, and biological soil crusts (associations of nonvascular species) can be particularly important and diverse (based on substrate, moisture availability, disturbance, etc.) (Belnap and Lange 2003).

## VEGETATION

**Physiognomy and Structure:** This macrogroup may be composed of woody plants, including both trees and shrubs, herbaceous plants, and/or nonvascular plants. Shrubs are especially common and were chosen as indicator species, however, herbs, especially cushion plants, and nonvascular organisms such as mosses or lichens may be more common.

**Floristics:** This macrogroup consists of sparsely vegetated rock and badland substrates from a variety of landscapes in the interior western U.S. Species are variable depending on substrate and other environmental conditions. Characteristic shrub species in lower elevation semi-desert, lava field, and badland areas include *Artemisia tridentata*, *Atriplex canescens*, *Atriplex corrugata*, *Atriplex gardneri*, *Artemisia pedatifida*, *Atriplex confertifolia*, *Ephedra* spp., *Eriogonum corymbosum*, *Eriogonum heermannii*, *Eriogonum ovalifolium*, *Fallugia paradoxa*, *Grayia spinosa*, *Purshia tridentata*, *Salvia dorrii*, and *Sarcobatus vermiculatus*. Characteristic herbs include species of *Achnatherum*, *Camissonia*, *Cleome*, *Eriogonum*, and *Mentzelia*. Characteristic species of canyon, foothill and lower montane sites include forb *Ivesia* sp., shrubs *Arctostaphylos patula*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, *Ephedra* spp., *Glossopetalon* spp., *Holodiscus* spp., *Purshia tridentata*, and trees *Juniperus occidentalis* (Columbia Basin), *Juniperus osteosperma*, *Pinus edulis* and *Pinus ponderosa* (Colorado Plateau), and *Pinus monophylla* (Great Basin). Shrubs may include *Cercocarpus ledifolius*, *Ephedra* spp., *Ivesia* sp., and. Most of the species also occur in non-sparse vegetation macrogroups. However, some of the sites with harsh soil properties have a high number of endemic perennial species (Welsh 1979, Welsh and Chatterly 1985).

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** This macrogroup consists of landscapes that are sparsely vegetated by vascular plants on a variety of rock and badland substrates. This cool semi-desert type ranges from low elevation basins to middle elevations foothill and lower montane sites, but does not include higher elevation cool temperate sites in upper montane and subalpine zones. Landforms include lava fields, cliffs and canyon sides, ridgetops, and rock outcrops on mesas, plateaus, and mountains. Substrates are variable and include sandstone slick rock, shale badlands and volcanic deposits such as lava, cinder, ash, tuff and basalt dikes. Some substrates, such as marine shales are strongly alkaline and/or saline which chemically limits plant growth. Active substrates such as scree slopes are difficult sites for plants to grow. Physical properties of substrates may also limit plant growth. Some massive rock substrates lack cracks where vascular plants can root. Badland sites often have heavy clay soils that reduce water infiltration increasing erosion rates and reducing soil moisture for plants.

**Dynamics:** Following wildfire, various associations which are typically woodland and shrubland will have transitional stages that are sparsely vegetated. However, most stands in this macrogroup are edaphic types and are largely defined by their substrates. Biological soil crusts can improve soil stability and soil fertility, and disturbances such as grazing and non-native species invasion can negatively impact these crusts (Belnap and Eldridge 2003, Belnap et al. 2006).

**DISTRIBUTION**

**Geographic Range:** This sparsely vegetated macrogroup occurs in the interior western U.S. from the Columbia Plateau south to the Great Basin and Colorado Plateau, east into Wyoming Basins.

**Spatial Scale & Pattern [optional]:**

**Nations:** US

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

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 341:C, 342:C, M261:C, M313:C, M331:C, M332:C, M341:C

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

**SYNONYMY**

- >< Littleleaf Mountain-Mahogany (417) (Shiflet 1994)
- >< Pinyon - Juniper: 239 (Eyre 1980)

**LOWER LEVEL UNITS****Groups:**

- G570 Intermountain Basins Cliff, Scree & Badland Sparse Vegetation

**AUTHORSHIP**

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** KAS 10-14

**REFERENCES**

**References:** Barbour and Billings 2000, Belnap and Eldridge 2003, Belnap and Lange 2003, Belnap et al. 2006, Brodo et al. 2001, Day and Wright 1985, Eyre 1980, Faber-Langendoen et al. 2015, Graybosch and Buchanan 1983, Hansen et al. 2004c, Nachlinger and Reese 1996, Shiflet 1994, Tisdale et al. 1965, Welsh 1979, Welsh and Chatterly 1985

3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

M118. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation

**G570. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation**

**Type Concept Sentence:**

**OVERVIEW**

**Scientific Name:** *Atriplex* spp. - *Cercocarpus* spp. - *Ephedra* spp. Intermountain Basins Sparse Vegetation Group

**Common Name (Translated Scientific Name):** Saltbush species - Mountain-mahogany species - Joint-fir species Intermountain Basins Sparse Vegetation Group

**Type Concept:** This group consists of barren and sparsely vegetated substrates from a variety of landscapes in the interior western U.S. from the Columbia Plateau south to the Great Basin and Colorado Plateau, east into Wyoming basins and plains. Landforms include cliffs and canyon sides, mesas and plateaus, and mountains. Sparse vegetation also occurs on special substrates such as shale outcrops, badlands and volcanic deposits such as lava, cinder, ash, tuff and basalt dikes. Rock substrates include bedrock, slickrock, and unstable talus and scree slopes. Some substrates, such as marine shales, are strongly alkaline and/or saline which chemically limits plant growth. Active substrates such as scree slopes are difficult sites for plants to grow. Physical properties of substrates may also limit plant growth. Some massive rock substrates lack cracks where vascular plants can root. Badland sites often have heavy clay soils that reduce water infiltration increasing erosion rates and reducing soil moisture for plants. Vegetation is variable depending on environmental variables of the sites, which range from relatively low-elevation semi-desert to subalpine cliffs and rock outcrops. Lower elevation sites often have herbaceous or shrub species present, whereas foothill, montane and subalpine sites may also include trees. Most of the species also occur in non-sparse vegetation groups. However, some of the sites with harsh soil properties have a high number of endemic perennial species. Characteristic shrub species in lower elevation semi-desert, lava field, and badland areas include *Artemisia tridentata*, *Atriplex canescens*, *Atriplex corrugata*, *Atriplex gardneri*, *Artemisia pedatifida*, *Atriplex confertifolia*, *Ephedra* spp., *Eriogonum corymbosum*, *Eriogonum heermannii*, *Eriogonum ovalifolium*, *Fallugia paradoxa*, *Grayia spinosa*, *Purshia tridentata*, *Salvia dorrii*, and *Sarcobatus vermiculatus*. Characteristic herbs include species of *Achnatherum*, *Camissonia*, *Cleome*, *Eriogonum*, and *Mentzelia*. Foothill sites include *Pinus edulis* and *Pinus ponderosa* (Colorado Plateau), *Pinus monophylla*, *Pinus longaeva* (Great Basin), *Juniperus osteosperma*, *Cercocarpus intricatus*, and *Cercocarpus ledifolius*. At montane and subalpine elevations, scattered trees may be present, such as *Pinus ponderosa*, *Pinus flexilis*, *Abies concolor*, *Pseudotsuga menziesii*, and *Picea engelmannii*. Shrubs may include *Arctostaphylos patula*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Ephedra* spp., *Holodiscus* spp., *Ivesia* sp., and *Purshia tridentata*.

**Classification Comments:** This group is very diverse floristically and so it is difficult to determine indicator species. More diagnostic is the sparse cover of vascular plants and/or presence and sometimes dominance of nonvascular (lichen) species. This broadly defined lithomorphic group was developed by NatureServe. M. Reid (9-13): I am removing dune communities from this group; they are now placed in Intermountain Sparsely Vegetated Dune Scrub & Grassland Group (G775). We need to revisit and get clear on criteria for differentiating this group from other vegetated groups. Generally this group is conceived of as sparsely vegetated associations occurring on rocky or badland substrates.

**Internal Comments:** mjr 5-15: Canada removed based on members. DFL 11-20-12: Canada? added.

**Other Comments:**

**Similar NVC Types:**

- G569 North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation
- G565 Rocky Mountain Cliff, Scree & Rock Vegetation
- G567 Great Plains Cliff, Scree & Rock Vegetation

**Diagnostic Characteristics:** Diagnostic characteristics of this lithomorphic group are barren to sparsely vegetated substrates and its geographic location, which is the intermountain western U.S. However, it is often composed of a mix of woody vegetation, especially shrubs and herbs (particularly cushion plants), although either may be absent on a given site.

## VEGETATION

**Physiognomy and Structure:** This lithomorphic group may be composed of woody plants, including both trees and shrubs, herbaceous plants, and/or nonvascular plants. Shrubs are especially common and were chosen as indicator species, however, herbs, especially cushion plants, and nonvasculars such as mosses or lichens may be more common.

**Floristics:** This group consists of sparsely vegetated substrates which are variable depending on environmental factors of the sites. Sites range from relatively low-elevation semi-desert to subalpine cliffs and rock outcrops. Lower elevation sites often have herbaceous or shrub species present, whereas foothill, montane and subalpine sites may also include trees. Most of the species also occur in non-sparse vegetation groups. However, some of the sites with harsh soil properties have a high number of endemic perennial species (Welsh 1979, Welsh and Chatterly 1985). Characteristic shrub species in lower elevation semi-desert, lava field, and badland areas include *Artemisia tridentata*, *Atriplex canescens*, *Atriplex corrugata*, *Atriplex gardneri*, *Artemisia pedatifida*, *Atriplex confertifolia*, *Ephedra* spp., *Eriogonum corymbosum*, *Eriogonum ovalifolium*, *Fallugia paradoxa*, *Grayia spinosa*, *Purshia tridentata*, *Salvia dorrii*, and *Sarcobatus vermiculatus*. Characteristic herbs include species of *Achnatherum*, *Camissonia*, *Cleome*, *Eriogonum*, and *Mentzelia*. Foothill sites include *Pinus edulis* and *Pinus ponderosa* (Colorado Plateau), *Pinus monophylla*, *Pinus longaeva* (Great Basin), *Juniperus osteosperma*, *Cercocarpus intricatus*, *Cercocarpus ledifolius*, and *Ephedra* spp. At montane and subalpine elevations, scattered trees may be present, such as *Pinus ponderosa*, *Pinus flexilis*, *Abies concolor*, *Pseudotsuga menziesii*,

WA groups

and *Picea engelmannii*. Shrubs may include *Arctostaphylos patula*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Ephedra* spp., *Holodiscus* spp., and *Purshia tridentata*.

#### **No Associations identified yet for Washington.**

#### **ENVIRONMENT & DYNAMICS**

**Environmental Description:** This group consists of barren and sparsely vegetated substrates from a variety of landscapes in the interior western U.S. from the Columbia Plateau south to the Great Basin and Colorado Plateau, east into Wyoming basins and plains. Landforms include cliffs and canyon sides, mesas and plateaus, and mountains. Sparse vegetation also occurs on special substrates such as shale outcrops, active sand dunes, badlands and volcanic deposits such as lava, cinder, ash, tuff and basalt dikes. Rock substrates include bedrock and unstable talus and scree slopes. Some substrates, such as marine shales, are strongly alkaline and/or saline which chemically limits plant growth. Active substrates such as scree slopes are difficult sites for plants to grow. Physical properties of substrates may also limit plant growth. Some massive rock substrates lack cracks where vascular plants can root. Badland sites often have heavy clay soils that reduce water infiltration increasing erosion rates and reducing soil moisture for plants.

**Dynamics:** Following wildfire, various associations which are typically woodland and shrubland will have transitional stages that are sparsely vegetated. *Populus tremuloides* will slowly re-colonize steep, unstable talus and scree slopes following ten-year-old forest fires in Great Basin National Park, although the seral community is transitional.

#### **DISTRIBUTION**

**Geographic Range:** This sparsely vegetated group occurs in the interior western U.S. from the Columbia Plateau south to the Great Basin and Colorado Plateau, east into Wyoming basins and plains.

**Nations:** US

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

**TNC Ecoregions [optional]:** 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 12:?, 18:C, 19:C, 20:C, 21:C

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:** BLM (Grand Staircase-Escalante); NPS (Arches, Canyonlands, Capitol Reef, Glen Canyon, Great Basin, Petrified Forest); USFS (Spring Mountains)

#### **CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Low.

#### **SYNONYMY**

- >< Littleleaf Mountain-Mahogany (417) (Shiflet 1994)
- >< Pinyon - Juniper: 239 (Eyre 1980)

#### **LOWER LEVEL UNITS**

**Alliances:**

- A4053 *Eriogonum ovalifolium* - *Fallugia paradoxa* - *Andropogon hallii* Sparsely Vegetated Lava & Cinder Alliance
- A4051 *Pinus ponderosa* - *Cercocarpus intricatus* Bedrock Cliff & Canyon Alliance
- A4052 *Ephedra* spp. - *Leymus salinus* - *Eriogonum corymbosum* Badlands Cold Desert Sparse Vegetation Alliance
- A4050 *Ephedra viridis* - *Chrysothamnus viscidiflorus* - *Rhus trilobata* Talus Sparse Scrub Alliance

#### **AUTHORSHIP**

**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al.

**Author of Description:** K.A. Schulz, mod. M.S. Reid

**Acknowledgments:**

**Version Date:** 2013/09/09

#### **REFERENCES**

**References:** Barbour and Billings 2000, Brodo et al. 2001, Day and Wright 1985, ENTRIX, Inc. 2007, Eyre 1980, Faber-Langendoen et al. 2015, Graybosch and Buchanan 1983, Hansen et al. 2004c, Logan Simpson Design 2011, Nachlinger and Reese 1996, Shiflet 1994, Tisdale et al. 1965, Welsh 1979, Welsh and Chatterly 1985

### **M499. Western North American Cool Semi-Desert Ruderal Scrub & Grassland [Proposed]**

**Type Concept Sentence:** This upland cool semi-desert scrub and grassland macrogroup contains disturbed dry grasslands and shrublands dominated by non-native species or ruderal native species and is found from low-elevation basins to foothills throughout the western U.S. and Canada.

## OVERVIEW

**Scientific Name:** *Agropyron cristatum* - *Bromus tectorum* - *Sisymbrium altissimum* Western North American Ruderal Semi-Desert Scrub & Grassland Macrogroup

**Common Name (Translated Scientific Name):** Crested Wheatgrass - Cheatgrass - Tall Tumblemustard Western North American Ruderal Semi-Desert Scrub & Grassland Macrogroup

**Type Concept:** This macrogroup contains disturbed grasslands and scrub found in semi-desert basins, piedmonts, and foothills throughout the western U.S. and Canada, possibly extending into lower montane zones on warm aspects. Vegetation of the macrogroup can be a monoculture of a single non-native graminoid species, or a mix of several non-native forbs and graminoids. Dominant graminoids include *Agropyron cristatum* (which has been purposefully seeded for forage or to prevent soil erosion, but has become naturalized), *Bromus tectorum* (an annual prolific seed-producer and highly invasive grass species), and *Bromus japonicus*. Invasive and wind- and animal-distributed non-native forb species include *Descurainia sophia*, *Erodium cicutarium*, *Halogeton glomeratus*, *Sisymbrium altissimum*, and *Zygophyllum fabago*. Numerous other non-native herbaceous species may be present to dominant. Invasive non-native shrublands are less common. This macrogroup can also include vegetation dominated by native ruderal species when vegetation is the result of anthropomorphic disturbance. These are dry grasslands, forb-dominated meadows or shrublands that occur in cool semi-arid climates. Stands occur on flat to moderately steep ground that can be large areas or narrow strips adjacent to roadsides or under powerlines and other disturbed areas. Soils are mostly mineral and well-drained. Soils may be compacted and eroded with biological crusts absent because of disturbance.

**Classification Comments:** This macrogroup may be difficult to determine from native grasslands where native species are present. The test is that the non-native species, especially invasive species, far outweigh native species in abundance, such that a well-trained observer cannot tell what the native counterpart may have been or to do so is only speculation. This macrogroup can also include vegetation dominated by native ruderal species when caused by anthropomorphic disturbance such as old fields.

**Similar NVC Types:** Vegetation included in this macrogroup is similar to poor-condition natural desert scrub and grassland types that have been degraded by, but are not dominated by, invasive, non-native species and can still be recognized as a native type.

- M493 Western North American Ruderal Grassland & Shrubland: may overlap where vegetation shares wide-ranging non-native species.
- M498 Great Plains Ruderal Grassland & Shrubland: may overlap where vegetation shares wide-ranging non-native species.
- M301 Western North American Ruderal Wet Shrubland, Meadow & Marsh: may overlap in transition zones where upland forbs intermix with wetter forbs and graminoids.
- M512 North American Warm Desert Ruderal Scrub & Grassland: is similar but typically has more heat-tolerant or cold-sensitive species, such *Bromus rubens* or *Eragrostis lehmanniana*, dominating the vegetation.

**Diagnostic Characteristics:** This widespread upland semi-desert scrub and grassland macrogroup is dominated by invasive, non-native shrubs, grasses or forbs. Widespread dominant and diagnostic herbaceous species include naturalized forage species such as *Agropyron cristatum* and numerous other non-native herbaceous species such as *Bromus tectorum*, *Bromus japonicus*, *Halogeton glomeratus*, *Salsola tragus*, *Sisymbrium altissimum*, *Taeniatherum caput-medusae*, *Verbascum thapsus*, and *Zygophyllum fabago*. No invasive non-native shrub species have been identified as being diagnostic to this type.

## VEGETATION

**Physiognomy and Structure:** This macrogroup includes ruderal vegetation with an open to dense shrub canopy and/or an herbaceous layer dominated by annual or perennial grasses or forbs.

**Floristics:** Vegetation of the macrogroup can be a monoculture of a single non-native graminoid species, or a mix of several non-native forbs and graminoids. Graminoids include cool semi-arid *Agropyron cristatum* and other species which may have been purposefully seeded to prevent soil erosion or for forage livestock, but have become naturalized. Other invasive wind- and animal-distributed non-native species diagnostic of this macrogroup may include *Bromus tectorum*, *Bromus japonicus*, *Descurainia sophia*, *Halogeton glomeratus*, *Hypericum perforatum*, *Salsola tragus*, *Sisymbrium altissimum*, *Taeniatherum caput-medusae*, *Verbascum thapsus*, and *Zygophyllum fabago*. Numerous other non-native herbaceous species may be present to dominant. Invasive non-native shrublands are less common. This macrogroup can also include vegetation dominated by native ruderal species when vegetation is the result of anthropomorphic disturbance. However, ruderal native shrublands such as *Gutierrezia sarothrae* and *Ericameria* spp. are included in native macrogroups.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This ruderal macrogroup occurs in cool semi-arid areas throughout western North America and is composed of disturbed upland grasslands and scrub dominated by non-native species. Most stands occur below approximately 1500 m (5000 feet) in elevation. Generally, these are areas that have been heavily disturbed by heavy equipment, such as old plowed

fields, townsites, abandoned mill sites, and livestock holding areas. It is abundant in waste areas often as abandoned pastures that are no longer irrigated, construction areas, roadside margins or other weedy places. However, it also occurs over vast acres of livestock-grazed lands in the semi-arid west, where livestock such as cows and horses have broken soil biotic crust, compacted soil and reduced native plant vigor. Sites are not mowed or otherwise maintained. *Climate*: Climate is cool semi-arid continental, with most of the precipitation falling during the winter and spring. Below freezing temperatures are common in the winter.

*Soil/substrate/hydrology*: This macrogroup occurs on disturbed mesic to dry soils. The physical environmental settings are similar to both semi-desert grassland and semi-desert shrub-steppe macrogroups.

**Dynamics**: Most of the invasive diagnostic species are cool-season (C3) plants such as *Agropyron cristatum* and *Bromus tectorum*. Cheatgrass expansion has radically changed fire regimes and vegetation over large areas in the Intermountain West. Cheatgrass invades native vegetation such as big sagebrush shrubland, then produces large amounts of fine fuels that readily carry fire, increasing the number, size and frequency of burns (FRI = 3-5 year) which reduces cover of perennial vegetation and favors dominance by annual grasses (Young and Evans 1978, Zouhar 2003). Crested wheatgrass burns quickly and is therefore less susceptible to damage by fire than some native bunchgrass species that have a thick cespitose growth form. The fire may stay longer in the culms, resulting in heat transfer to the ground and the death of the plant (DePuit 1986). In crested wheatgrass, there is usually little heat transfer into the soil, so the tillers and root system are usually undamaged (DePuit 1986). Thus the more frequent fire regime caused by the introduction of *Bromus tectorum* also favors the maintenance of *Agropyron cristatum* over the establishment or survival of native bunchgrasses (S. Rust pers. comm. 2014).

#### DISTRIBUTION

**Geographic Range**: This macrogroup contains disturbed grasslands and scrub found in semi-desert basins, piedmont, and foothills throughout the western U.S. and Canada, and possibly extending into lower montane zones on warm aspects.

**Spatial Scale & Pattern [optional]**:

**Nations**: CA, US

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

**TNC Ecoregions [optional]**:

**USFS Ecoregions (2007)**:

**Omernik Ecoregions**:

**Federal Lands [optional]**:

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments**: Proposed.

#### SYNONYMY

- > *Agropyron cristatum* (Crested wheatgrass rangelands) Ruderal Stands (Sawyer et al. 2009) [42.030.00]
- > *Bromus tectorum* (Cheatgrass grassland) Ruderal Stands (Sawyer et al. 2009) [42.020.00]
- >< Crested Wheatgrass (614 ) (Shiflet 1994) [Represents crested wheatgrass in Northern Great Plains, but does not necessarily represent Interior West include other dominant diagnostic species.]

#### LOWER LEVEL UNITS

**Groups**:

- G600 Great Basin & Intermountain Ruderal Dry Shrubland & Grassland

#### AUTHORSHIP

**Primary Concept Source**: K.A. Schulz, in Faber-Langendoen et al. (2014)

**Author of Description**: K.A. Schulz

**Acknowledgments**:

**Version Date**: 10/15/2014

**Classif Resp Region**: West

**Internal Author**: DFL 5-12

#### REFERENCES

**References**: Billings 1994, DePuit 1986, Faber-Langendoen et al. 2015, Felger 1990, Hopkins and Kovalchik 1983, Johnson and O'Neil 2000, Mack 1981b, Maser et al. 1084, Rust pers. comm., Sawyer et al. 2009, Shiflet 1994, Young and Evans 1978, Zlatnik 1999a, Zouhar 2003

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3. Desert & Semi-Desert

3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

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

## G600. Great Basin & Intermountain Ruderal Dry Shrubland & Grassland [Proposed]

**Type Concept Sentence:** This semi-desert interior western U.S. ruderal shrubland and grassland group includes shrubland, shrub-steppe and grassland stands that are strongly dominated (>90% relative canopy cover) by invasive, exotic species. Additionally, this group contains shrubland and shrub-steppe that are dominated or codominated by native shrub species (>10% relative cover) with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species.

### OVERVIEW

**Scientific Name:** Great Basin & Intermountain Ruderal Dry Shrubland & Grassland Group

**Common Name (Translated Scientific Name):** Great Basin & Intermountain Ruderal Dry Shrubland & Grassland Group

**Type Concept:** This semi-desert interior western U.S. ruderal shrubland and grassland group includes shrubland, shrub-steppe and grassland stands that are strongly dominated (>90% relative canopy cover) by invasive, exotic species. Diagnostic invasive shrubs include *Alhagi maurorum*, *Cytisus striatus*, *Zygophyllum fabago*, or other exotic shrubs. Herbaceous stands include open to dense grasslands and forblands composed of either exotic annual or biennial grasses or forbs with low cover of perennial species (<10% absolute cover) or stands with a significant perennial herbaceous layer (>10% absolute cover) strongly dominated by exotics (>90% relative cover) with or without annuals and biennials present to dominant. There are relatively few cool, semi-arid invasive perennial graminoids such as *Agropyron cristatum*. Relatively mesic, invasive perennial hay grasses such as *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense* are typically absent or have low cover and are restricted to mesic microsites as they are more common in higher elevation or higher latitude, temperate climates or relatively mesic sites. Numerous exotic perennial herbaceous species may compose these stands, such as *Acroptilon repens*, *Cardaria draba*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea iberica*, *Centaurea biebersteinii* (= *Centaurea stoebe* ssp. *micranthos*), *Centaurea triumfettii* (= *Centaurea virgata*), *Euphorbia esula*, *Hypericum perforatum*, *Lepidium latifolium*, *Peganum harmala*, or a mixture of other exotic forbs and graminoids. Stands dominated by annuals may be composed of annual grasses such as *Bromus arvensis* (= *Bromus japonicus*), *Bromus hordeaceus*, *Bromus madritensis*, *Bromus tectorum*, *Taeniatherum caput-medusae*, or annual forbs, including *Bassia scoparia* (= *Kochia scoparia*), *Brassica nigra*, *Centaurea melitensis*, *Centaurea solstitialis*, *Crupina vulgaris*, *Cynoglossum officinale*, *Descurainia sophia*, *Erodium cicutarium*, *Hyoscyamus niger*, *Isatis tinctoria*, *Salsola tragus*, *Sisymbrium altissimum*, *Taraxacum officinale*, or a mixture of other exotic annual forbs and grasses. Additionally, this group contains semi-desert shrublands and shrub-steppe that are dominated or codominated by native shrub species such as *Artemisia tridentata* with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species such as *Agropyron cristatum* or *Bromus tectorum*. Stands occur in disturbed dry to mesic basins, alluvial fans, and foothills elevations up to 2200 m and are restricted to areas with the cool, semi-arid climate found in the intermountain western U.S. region. Stands can be large areas or narrow strips adjacent to roadsides or under powerlines and other disturbed areas. Soils are mostly mineral and well-drained. Due to disturbance, soils may be compacted. It is an early-successional type that may occur in areas disturbed by fire, grazing or mining. This group may grade into wetter areas and may have transition zones where mesic forbs intermix with wetter forbs and graminoids found in Western North American Ruderal Wet Shrubland, Meadow & Marsh Group (G524). This group does not include the mesic introduced hay grasses such as *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense* that have escaped from improved pasture and irrigated meadow to invade montane grasslands. These grasslands are classified in the more temperate Interior Western North American Ruderal Grassland & Shrubland Group (G624).

**Classification Comments:** This group may be difficult to determine from native degraded shrublands and grasslands when non-native species codominate. The test is that the non-native species, especially invasive species, far outweigh (>90% relative cover) native species in abundance and richness, such that a well-trained observer cannot tell what the native counterpart may have been or to do so is only speculation. Dominant and diagnostic semi-arid exotic species *Agropyron cristatum* can be present to codominant in Interior Western North American Ruderal Grassland & Shrubland Group (G624) when codominated by relatively mesic species such as *Bromus inermis* or exotic forage grasses such as *Agrostis stolonifera*, *Dactylis glomerata*, *Phleum pratense*, and *Poa pratensis* that are characteristic of more temperate climates.

This group may grade into wetter areas and may have transition zones where mesic forbs intermix with wetter forbs and graminoids found in Western North American Ruderal Wet Shrubland, Meadow & Marsh Group (G524). This group does not include the mesic introduced hay grasses such as *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense* that have escaped from improved pasture and irrigated meadow to invade montane grasslands. These grasslands are classified in the more temperate Interior Western North American Ruderal Grassland & Shrubland Group (G624).

**Internal Comments:** MSR 1-7-11: new

**Other Comments:**

**Similar NVC Types:**

- G624 Interior Western North American Ruderal Grassland & Shrubland: has similar ruderal alliances but rather than occurring in cool, semi-arid sites, stands occur in cool, temperate regions and include montane, subalpine and alpine areas. Vegetation lacks obligate wetland species and is not dominated by facultative wetland species.
- G648 Southern Vancouverian Lowland Ruderal Grassland & Shrubland: may include similar alliances, but is restricted to lowlands west of the Cascade Range.
- G524 Western North American Ruderal Wet Shrubland, Meadow & Marsh: has similar ruderal alliances but occurs on mesic to wet sites and vegetation either includes obligate wetland species or is dominated by facultative wetland species.
- G677 North American Warm Desert Ruderal Scrub & Grassland: may include similar alliances, but is restricted warm, semi-arid desert regions.

**Diagnostic Characteristics:** This ruderal shrubland and grassland group occurs in the semi-arid interior western U.S. and includes shrubland, shrub-steppe and grassland stands that are strongly dominated (>90% relative canopy cover) by invasive, exotic species. Additionally, this group contains shrubland and shrub-steppe that is dominated or codominated by native shrub species (>10% relative cover) with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species.

### VEGETATION

**Physiognomy and Structure:** This group includes shrubland and shrub-steppe stands that have an open to dense shrub canopy, and annual and perennial grasslands and forblands with an open to dense herbaceous layer.

**Floristics:** This ruderal shrubland and grassland group includes shrubland and shrub-steppe stands that have an open to dense shrub canopy (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by invasive, introduced shrub species such as *Alhagi maurorum*, *Cytisus striatus*, *Zygophyllum fabago*, or other exotic shrubs. Additionally, this group includes shrubland and shrub-steppe that is dominated or codominated by native shrub species (>10% relative cover) with a significant herbaceous understory (>10% absolute cover) that is strongly dominated (>90% relative canopy cover) by exotic herbaceous species. Herbaceous layers are composed of either exotic annuals with low cover of perennial species, or high cover of exotic perennials. Also included in this group are open to dense ruderal herbaceous stands without a shrub layer (<10% absolute cover). The herbaceous understory (>10% absolute cover) is strongly dominated (>90% relative canopy cover) by exotic herbaceous species. Herbaceous layers are composed of either exotic annuals with low cover of perennial species (<5% absolute cover), or moderate perennial cover (>10% absolute cover) dominated by of exotic perennials, either graminoids or forbs or a combination. There are relatively few cool, semi-arid perennial graminoids such as *Agropyron cristatum* (which has frequently been purposefully seeded to prevent soil erosion or provide livestock forage). The relatively mesic, invasive perennial hay grasses such as *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense* are typically absent or have low cover and are restricted to mesic microsites as they are more common in higher elevation or higher latitude, temperate climates or relatively mesic sites. Numerous exotic perennial herbaceous species may compose these stands such as *Acroptilon repens*, *Cardaria draba*, *Centaurea calcitrapa*, *Centaurea diffusa*, *Centaurea iberica*, *Centaurea biebersteinii* (= *Centaurea stoebe* ssp. *micranthos*), *Centaurea triumfettii* (= *Centaurea virgata*), *Hypericum perforatum*, *Lepidium latifolium*, *Peganum harmala*, or a mixture of other exotic forbs and graminoids. Stands dominated by annuals may be composed of annual grasses such as *Bromus arvensis* (= *Bromus japonicus*), *Bromus hordeaceus*, *Bromus madritensis*, *Bromus tectorum*, *Taeniatherum caput-medusae*, or annual forbs, including *Bassia scoparia* (= *Kochia scoparia*), *Brassica nigra*, *Centaurea melitensis*, *Centaurea solstitialis*, *Crupina vulgaris*, *Cynoglossum officinale*, *Descurainia sophia*, *Erodium cicutarium*, *Hyoscyamus niger*, *Isatis tinctoria*, *Lepidium perfoliatum*, *Salsola tragus*, *Sisymbrium altissimum*, *Taraxacum officinale*, or a mixture of other exotic annual forbs and grasses.

### ENVIRONMENT & DYNAMICS

**Environmental Description:** This interior western U.S. ruderal shrubland and grassland group is found on disturbed dry to mesic, basins, alluvial fans, and foothills elevations (up to 2200 m). Stands can be large areas or narrow strips adjacent to roadsides or under powerlines, in waste places such as abandoned agricultural fields that are no longer irrigated, oil and gas development areas, and other disturbed areas. *Climate:* This group occurs in the cool, semi-arid, continental, climate found intermountain western U.S. region. *Soil/substrate/hydrology:* Soils are mostly mineral and well-drained. Due to disturbance, soils may be compacted. It is an early-successional type that may occur in areas disturbed by fire, grazing or mining. However, it also occurs over vast acres of heavily overgrazed lands in the arid west, where livestock such as cows and horses have broken soil biotic crust, compacted soil and reduced native plant vigor.

**Dynamics:** Most of the invasive diagnostic species are cool-season (C3) plants such as *Agropyron cristatum* and *Bromus tectorum*. Cheatgrass expansion has radically changed fire regimes and vegetation over large areas in the Intermountain West. Cheatgrass invades native vegetation such as big sagebrush shrubland, then produces large amounts of fine fuels that readily carry fire, increasing the number, size and frequency of burns (fire-return interval = 3-5 year) which reduces cover of perennial vegetation and favors dominance by annual grasses (Young and Evans 1978, Zouhar 2003). Crested wheatgrass burns quickly and is therefore less susceptible to damage by fire than some native bunchgrass species that have a thick cespitose growth form. The fire may stay longer



in the culms, resulting in heat transfer to the ground and the death of the plant (DePuit 1986). In crested wheatgrass, there is usually little heat transfer into the soil, so the tillers and root system are usually undamaged (DePuit 1986). Thus the more frequent fire regime caused by the introduction of *Bromus tectorum* also favors the maintenance of *Agropyron cristatum* over the establishment or survival of native bunchgrasses (S. Rust pers. comm. 2014).

#### DISTRIBUTION

**Geographic Range:** This ruderal group contains disturbed semi-arid grasslands, meadows, shrublands and shrub-steppe found in the interior western U.S. on disturbed dry to mesic, basins, alluvial fans, and foothills elevations (up to 2200 m). Stands do not extend up into the cool, temperate zone in included mountain ranges. This group does not extend south to the warm deserts or east into the Great Plains or west into cismontane California or the west side of the Cascades.

**Nations:** CA, US

**States/Provinces:** AZ, CA, CO, ID, MT, ND, NV, SD, SK, UT, WY

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

#### LOWER LEVEL UNITS

#### Alliances:

- A3253 *Alhagi maurorum* - *Zygophyllum fabago* Ruderal Shrubland Alliance
- A1814 *Bromus tectorum* - *Taeniatherum caput-medusae* Ruderal Annual Grassland Alliance
- A4148 *Agropyron cristatum* Western Ruderal Perennial Grassland Alliance
- A3257 *Centaurea solstitialis* - *Isatis tinctoria* - *Salsola tragus* Ruderal Annual Forb Alliance
- A3255 *Cardaria draba* - *Centaurea* spp. - *Lepidium latifolium* Ruderal Perennial Forb Alliance

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2015)

**Author of Description:** G. Kittel and K.A. Schulz

**Acknowledgments:**

**Version Date:** 2015/04/16

#### REFERENCES

**References:** DePuit 1986, Faber-Langendoen et al. 2015, Johnson and O'Neil 2000, Maser et al. 1084, Rust pers. comm., Young and Evans 1978, Zouhar 2003

## 4. POLAR & HIGH MONTANE SCRUB, GRASSLAND & BARRENS

Tundra, alpine and tropical high montane habitats dominated by cryomorphic growth forms (including *dwarf-shrubs*, associated *herbs*, *lichens* and *mosses*), with low height and open to closed canopy.

### 4.B. Temperate to Polar Alpine & Tundra Vegetation

Alpine dwarf-shrublands, forb meadows, grasslands, and cryptogam barrens occurring above treeline in temperate and boreal regions around the globe, predominantly in North America and Eurasia, with more isolated occurrences in the Southern Hemisphere. Polar tundra is dominated by dwarf-shrubs, cushion shrubs, sedges and grasses, mosses and lichens, and is found in the high latitudes north of 60°N in the Arctic region and south of 50°S in the Antarctic region, in permafrost soils that range from dry to seasonally saturated.

#### 4.B.1. Temperate & Boreal Alpine Dwarf-Shrub & Grassland

Alpine dwarf-shrublands, forb meadows and grasslands occurring above treeline in temperate and boreal regions around the globe, predominantly in North America and Eurasia, with more isolated occurrences in the Southern Hemisphere.

## 4.B.1.Nb. Western North American Alpine Dwarf-Shrub & Grassland

4. Polar & High Montane Scrub, Grassland & Barrens

4.B.1.Nb. Western North American Alpine Dwarf-Shrub & Grassland

### M099. Rocky Mountain & Sierran Alpine Scrub, Forb Meadow & Grassland

**Type Concept Sentence:** This alpine macrogroup includes sparse cushion plants to dense turf or dwarf-shrublands. It occurs at and above upper timberline in relatively dry conditions throughout the central and southern Rocky Mountain cordillera from New Mexico north into Canada and includes alpine areas in the Utah high plateaus and high ranges in the Great Basin west into the Sierra Nevada and southern and eastern Cascades and southern interior mountain ranges of British Columbia.

#### OVERVIEW

**Scientific Name:** *Dryas octopetala* - *Carex elynoides* - *Silene acaulis* Rocky Mountain & Sierran Alpine Scrub, Forb Meadow & Grassland Macrogroup

**Common Name (Translated Scientific Name):** Eight-petal Mountain-avens - Blackroot Sedge - Moss Champion Rocky Mountain & Sierran Alpine Scrub, Forb Meadow & Grassland Macrogroup

**Type Concept:** This macrogroup occurs at and above upper timberline throughout the Rocky Mountain cordillera from New Mexico and the Sierra Nevada north into southwestern Alberta and southeastern and south-central British Columbia. Vegetation physiognomy ranges from sparse cushion plants to dense turf or dwarf-shrublands. Most fell-field plants are cushioned or matted, frequently succulent, flat to the ground in rosettes, and often densely haired and thickly cutinized. Plant cover is 15-50%, while exposed rocks with crustose lichens make up the rest. Fell-fields are usually found within or adjacent to alpine dry turf. Common species include *Arenaria capillaris*, *Geum rossii*, *Kobresia myosuroides*, *Minuartia obtusiloba*, *Myosotis asiatica*, *Paronychia pulvinata*, *Phlox pulvinata*, *Silene acaulis*, *Trifolium dasyphyllum*, and *Trifolium parryi*. The moderately dense to dense cover of low-growing, perennial graminoids and forbs include *Artemisia arctica*, *Carex elynoides*, *Carex siccata*, *Carex scirpoidea*, *Carex nardina*, *Carex rupestris*, *Festuca brachyphylla*, *Festuca idahoensis*, *Geum rossii*, *Juncus drummondii*, *Kobresia myosuroides*, *Phlox pulvinata*, and *Trifolium dasyphyllum*. Dwarf-shrublands are characterized by a semi-continuous layer of ericaceous dwarf-shrubs or dwarf willows less than 0.5 m in height. Dense tufts of graminoids and scattered forbs occur. *Dryas octopetala*- and *Dryas integrifolia*-dominated communities occur on more windswept and drier sites than the heath communities. Within the heath-willow communities *Cassiope mertensiana*, *Salix arctica*, *Salix reticulata*, *Salix vestita*, or *Phyllodoce empetriformis* can be dominant shrubs. *Ledum glandulosum*, *Kalmia microphylla*, *Phyllodoce glanduliflora*, and *Vaccinium* spp. may also be shrub associates. Snowbed communities are characterized by *Sibbaldia procumbens* and *Carex subnigricans*. Species composition overlaps across the range of this macrogroup, although there is some significant regional and local variation. The drier alpine vegetation of the Great Basin ranges and Sierra Nevada may include lower elevation semi-desert species such as *Carex filifolia*, *Poa fendleriana*, *Poa secunda*, and *Artemisia frigida*. Environments are varied due to climatic and site variation. Wind and its effect on snow movement has a strong local effect, producing wind-scoured fell-fields, dry turf, snow accumulation heath communities, and short growing season snowbed sites. Fell-fields are typically free of snow during the winter as they are found on ridgetops, upper slopes and exposed saddles, whereas dry turf is found on gentle to moderate slopes, flat ridges, valleys, and basins where the soil has become relatively stabilized and the water supply is more-or-less constant. Dwarf-shrubland sites tend to be in level or concave areas with late-lying snow and subirrigation from surrounding slopes.

**Classification Comments:** Alpine turf, fell-field and dwarf-shrubland are included together for several reasons. Although these types can be quite different and can have relatively abrupt boundaries in saddles, there is often a long transition on broad alpine slopes. Species composition is similar across the distribution of this macrogroup, although there is some significant regional and local variation. The generally drier and patchier alpine vegetation of the Great Basin ranges and Sierra Nevada may include lower elevation semi-desert species such as *Carex filifolia*, *Poa fendleriana*, *Poa secunda*, and *Artemisia frigida*. The dwarf-shrublands are more distinct in the mesic northern extent than in the southern and drier ranges in the Great Basin and Colorado Plateau. In the northern extent, the dwarf-shrub layers tend to be denser and characterized by distinctive alpine heath species *Cassiope mertensiana*, *Phyllodoce empetriformis*, *Salix glauca*, and *Salix reticulata*. In the southern extent, stands dominated by *Salix arctica*, *Salix reticulata*, or *Salix nivalis* are less distinctive and occur as patches within the alpine turf or mesic bands around snowbeds (Cooper et al. 1997). *Dryas octopetala* and *Dryas integrifolia* often occur on harsh windblown sites on dry turf, cushion plant fell-fields or unstable scree slopes, whereas the heath types of *Cassiope mertensiana*, *Salix reticulata*, or *Phyllodoce empetriformis* occur as snowbed or wetland communities (Cooper et al. 1997). Some of the dwarf *Salix* species, such as *Salix arctica*, form mesic patches within the larger alpine turf communities (Lewis 1970, Zwinger and Willard 1996, Cooper et al. 1997).

This macrogroup includes Mount Lassen and Mount Shasta and the eastern portion of the southern Cascades because of the relatively dry climate that does not typically form an "alpine heath" typical of stands in Vancouverian Alpine Scrub, Forb Meadow & Grassland Macrogroup (M101), except as part of snowbed or wetland communities.

**Similar NVC Types:**

- M075 Western North American Montane-Subalpine Wet Shrubland & Wet Meadow
- M101 Vancouverian Alpine Scrub, Forb Meadow & Grassland: is relatively mesic alpine in comparison with different diagnostic species.
- M404 Western Boreal Alpine Vegetation: is relatively mesic alpine in comparison with different diagnostic species.

**Diagnostic Characteristics:** This macrogroup includes open to closed-(shrub) canopy, herbaceous stands dominated by alpine graminoids and forbs (especially cushion plants), as well as open to closed, often evergreen (ericaceous) dwarf-shrubland stands. The vegetation occurs as a mosaic of small-patch plant communities. Stands include alpine turf and fell-fields dominated or codominated by *Antennaria* spp., *Calamagrostis breweri*, *Carex elynoides*, *Carex helleri*, *Carex filifolia*, *Carex rupestris*, and *Kobresia myosuroides* and forbs such as *Geum rossii*, especially cushion plants *Trifolium dasyphyllum* and *Phlox pulvinata* (fell-fields). Dwarf-shrublands are characterized by *Dryas octopetala* and *Dryas integrifolia*, *Ericameria discoidea*, on drier sites, and *Cassiope mertensiana*, *Salix arctica*, *Salix reticulata*, *Salix vestita*, or *Phyllodoce empetriformis* with *Ledum glandulosum*, *Kalmia microphylla*, *Phyllodoce glanduliflora*, and *Vaccinium* spp. present to codominant on more typical mesic heath communities in the northern portion of the Central Rockies.

**VEGETATION**

**Physiognomy and Structure:** This macrogroup is variable structurally and includes graminoid- and forb (cushion plant)-dominated, open to closed-canopy, herbaceous stands as well as stands with dwarf-shrublands. Although some turf communities are extensive, the vegetation overall is a mosaic of small-patch plant communities.

**Floristics:** This widespread distributed macrogroup has variable vegetation structure and composition, ranging from sparsely vegetated fell-fields to dense turf or dwarf-shrublands. Most fell-field plants are cushioned or matted, frequently succulent, flat to the ground in rosettes, and often densely haired and thickly cutinized. Plant cover on fell-fields is 15-50%, while exposed rocks covered with crustose lichens make up the rest. They are usually found on wind-exposed ridges and saddles, within or adjacent to alpine dry turf. Common species include *Arenaria capillaris*, *Geum rossii*, *Kobresia myosuroides*, *Minuartia obtusiloba*, *Myosotis asiatica*, *Paronychia pulvinata*, *Phlox pulvinata*, *Potentilla nivea*, *Potentilla villosa*, *Potentilla diversifolia*, *Saxifraga bronchialis*, *Silene acaulis*, *Trifolium dasyphyllum*, and *Trifolium parryi*. The low-growing, perennial vegetation ranges from sparse to moderate cover dominated by cushion plants to moderately dense to dense cover of low-growing, perennial graminoids and forbs forming a turf. Rhizomatous, sod-forming sedges are the dominant graminoids, and prostrate and mat-forming plants with thick rootstocks or taproots characterize the forbs. Dominant species include *Artemisia arctica*, *Carex elynoides*, *Carex siccata*, *Carex scirpoidea*, *Carex nardina*, *Carex rupestris*, *Festuca brachyphylla*, *Festuca idahoensis*, *Geum rossii*, *Juncus drummondii*, *Kobresia myosuroides*, *Phlox pulvinata*, and *Trifolium dasyphyllum*. Dwarf-shrubland stands are characterized by a semi-continuous layer of ericaceous dwarf-shrubs or dwarf willows which form a heath type ground cover less than 0.5 m in height. Dense tufts of graminoids and scattered forbs occur. *Dryas octopetala*- and *Dryas integrifolia*-dominated communities occur on more windswept and drier sites than the heath communities. Dwarf willows are often found with *Dryas*, including *Salix nivalis* or *Salix reticulata*. Within the heath communities *Cassiope mertensiana* (dominates in snowier climates), *Salix arctica*, *Salix vestita*, *Phyllodoce empetriformis*, or *Phyllodoce glanduliflora* can be dominant shrubs. *Ledum glandulosum*, *Kalmia microphylla*, *Phyllodoce glanduliflora*, and *Vaccinium* spp. may also be shrub associates. Snowbed communities are also included in this macrogroup and are characterized by indicator species *Carex subnigricans* and *Sibbaldia procumbens* with *Juncus drummondii* and *Luzula piperi* common on eroding sites.

Species composition overlaps across the range of this macrogroup, although there is some significant regional and local variation. In Great Basin and Sierra Nevada stands, common species include *Aquilegia pubescens*, *Castilleja nana*, *Draba densifolia*, *Eriogonum incanum*, *Leptodactylon pungens*, *Minuartia nuttallii* (= *Arenaria nuttallii*), *Oxyria digyna*, *Phlox covillei*, and *Phlox pulvinata*. Characteristic graminoid species include *Carex congdonii*, *Calamagrostis breweri*, *Calamagrostis purpurascens*, *Carex exserta*, *Juncus parryi*, and *Trisetum spicatum*. Common forbs include many of the fell-field species and *Antennaria media*, *Arenaria kingii*, *Erigeron compositus*, *Erigeron pygmaeus*, *Eriogonum gracilipes*, *Eriogonum ovalifolium*, *Eriogonum roseum*, *Penstemon heterodoxus*, *Phlox covillei*, *Podistera nevadensis*, *Raillardiopsis muirii* (= *Raillardella muirii*), and others. Alpine dwarf-shrublands are dominated or codominated by *Cassiope mertensiana*, *Ericameria discoidea*, *Kalmia microphylla*, *Polygonum shastense*, *Phyllodoce breweri*, *Ribes cereum*, *Salix arctica*, and *Vaccinium caespitosum*.

The drier alpine vegetation of the Great Basin ranges and Sierra Nevada may include lower elevation semi-desert species such as *Carex filifolia*, *Poa fendleriana*, *Poa secunda* and *Artemisia frigida*. In the northern range, meadows can be extensive at lower elevations. Key species of these meadows are *Arnica latifolia*, *Erigeron peregrinus*, *Lupinus arcticus*, *Senecio triangularis*, *Valeriana sitchensis*, and *Veratrum viride*; other species include *Carex spectabilis*, *Claytonia lanceolata*, *Erythronium grandiflorum*, *Pulsatilla occidentalis* (= *Anemone occidentalis*), and *Trollius laxus* ssp. *albiflorus*. Floristic information was compiled from Baker (1980a), Bamberg (1961), Bamberg and Major (1968), Billings (2000), Cooper et al. (1997), Holland and Keil (1995), Komarkova (1976, 1980), Lewis (1970), Sawyer and Keeler-Wolf (1995, 2007), Sawyer et al. (2009), Willard (1963), and Zwinger and Willard (1996).

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This widespread alpine macrogroup occurs at and above the upper treeline throughout the Rocky Mountain cordillera and alpine areas of mountain ranges in Utah and Nevada, and in isolated alpine sites in the northeastern Cascades south to the Sierra Nevada. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana and in the mountains of into southwestern Alberta and southeastern British Columbia. Sierran Nevada stands begin around 3500 m elevation in the southern mountains and begin at approximately 2700 m in the Klamath Mountains and southern Cascade Range. This macrogroup includes wind-scoured fell-fields and dry turf and dwarf-shrublands. Fell-fields are typically free of snow during the winter as they are found on ridgetops, upper slopes and exposed saddles, whereas dry turf is found on gentle to moderate slopes, flat ridges, valleys, and basins where the soil has become relatively stabilized and the water supply is more-or-less constant. Dwarf-shrubland sites tend to be level or concave areas of glacial topography, with late-lying snow and subirrigation from surrounding slopes. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season.

Climate is continental temperate, and due to the high elevations, long cold snowy winters and a very short growing season result. It is typically drier than either the Vancouverian or Boreal alpine vegetation. The precipitation regime is strongly seasonal, with most precipitation falling in the winter months as snow. Summers are mostly dry. Substrates are variable across fell-fields, alpine turf and dwarf-shrub vegetation. Fell-field sites are generally shallow, stony, low in organic matter, and poorly developed with wind deflation often resulting in a gravelly pavement. Alpine turf sites have deeper, more developed soils, although there may have moderately high cover of cobbles and boulders present. The dwarf-shrubland soils have become relatively stabilized, are moist but well-drained, strongly acidic, and often have substantial peat layers. Environmental information was compiled from Baker (1980a), Bamberg (1961), Bamberg and Major (1968), Billings 2000, Cooper et al. (1997), Holland and Keil (1995), Komarkova (1976, 1980), Lewis (1970), Sawyer and Keeler-Wolf (1995, 2007), Sawyer et al. (2009), Willard (1963), and Zwinger and Willard (1996).

**Dynamics:** Vegetation in these areas is controlled by snow retention, wind desiccation, soil moisture and a short growing season. Disturbances tend to be small-scale and localized, such as by burrowing pocket gophers. Permafrost may only occur in localized areas, such as in the Canadian Rockies.

## DISTRIBUTION

**Geographic Range:** This macrogroup occurs above upper timberline throughout the Rocky Mountain cordillera from New Mexico north into southwestern Alberta and south-central and southeastern British Columbia, Canada, and includes alpine areas west in the Utah high plateaus and high ranges in the Great Basin and Sierra Nevada. Stands of this macrogroup also extend north into the Klamath Mountains and drier southern and eastern Cascade Range, and south as far south as the Peninsular Ranges and White Mountains.

### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

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

### TNC Ecoregions [optional]:

**USFS Ecoregions (2007):** 322A:CC, 331J:CC, 341D:CC, 341E:CP, 341F:CP, 341G:CP, 342B:CC, 342J:CP, M242B:CC, M242C:CC, M242D:CC, M261A:CP, M261D:CC, M261E:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CP, M341C:CC, M341D:CC

### Omernik Ecoregions:

**Federal Lands [optional]:**

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

## SYNONYMY

- < AT Alpine Tundra (mesic to dry sites) (Ecosystems Working Group 1998)
- < Alpine Grassland (213) (Shiflet 1994) [SRM type 213 includes all alpine communities in Sierra, Klamath and California Cascades, both herbaceous and shrub dominated, and wet meadows.]
- < Alpine Rangeland (410) (Shiflet 1994)

## LOWER LEVEL UNITS

### Groups:

- G316 Rocky Mountain & Sierran Alpine Dwarf-Shrubland
- G314 Rocky Mountain & Sierran Alpine Turf & Fell-Field
- G571 Rocky Mountain & Sierran Alpine Bedrock & Scree

## AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** KAS 10-14

#### REFERENCES

**References:** Achuff and Coen 1980, Baker 1980a, Bamberg 1961, Bamberg and Major 1968, Barbour and Billings 2000, Barbour and Major 1988, Barbour et al. 2007a, Beder 1967, Billings 2000, Broad 1973, Bryant and Scheinberg 1970, Cooper et al. 1997, Crack 1977, Douglas and Bliss 1977, Eady 1971, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Hamet-Ahti 1978, Hamilton 1981, Holland and Keil 1995, Hrapko and LaRoi 1978, Komarkova 1976, Komarkova 1980, Kuchar 1975, Lewis 1970, MacKenzie 2005, Ogilvie 1976, Pojar and Stewart 1991, Polster 1979, Sawyer and Keeler-Wolf 1995, Sawyer and Keeler-Wolf 2007, Sawyer et al. 2009, Selby 1980, Shiflet 1994, Trottier 1972, Willard 1963, Zwinger and Willard 1996

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4. Polar & High Montane Scrub, Grassland & Barrens

4.B.1.Nb. Western North American Alpine Dwarf-Shrub & Grassland

M099. Rocky Mountain & Sierran Alpine Scrub, Forb Meadow & Grassland

### G316. Rocky Mountain & Sierran Alpine Dwarf-Shrubland [Proposed]

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Dryas octopetala* - *Phyllodoce* spp. - *Salix arctica* Dwarf-Shrubland Group

**Common Name (Translated Scientific Name):** Eight-petal Mountain-avens - Mountain-heath species - Arctic Willow Dwarf-Shrubland Group

**Type Concept:** This widespread group occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada, but is more prominent in the northern extent. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana and in the mountains of Alberta. This group occurs in areas of level or concave glacial topography, with late-lying snow and subirrigation from surrounding slopes. Soils have become relatively stabilized in these sites, are moist but well-drained, strongly acidic, and often with substantial peat layers. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. The vegetation is characterized by a semi-continuous layer of ericaceous dwarf-shrubs or dwarf willows which form a heath type ground cover less than 0.5 m in height. Dense tufts of graminoids and scattered forbs occur. *Dryas octopetala*- and *Dryas integrifolia*-dominated communities occur on more windswept and drier sites than the heath communities. Within the heath communities *Cassiope mertensiana*, *Salix arctica*, *Salix reticulata*, *Salix vestita*, or *Phyllodoce empetriformis* can be dominant shrubs. *Vaccinium* spp., *Ledum glandulosum*, *Phyllodoce glanduliflora*, and *Kalmia microphylla* may also be shrub associates. The herbaceous layer is a mixture of forbs and graminoids, especially sedges, including *Erigeron* spp., *Luetkea pectinata*, *Antennaria lanata*, *Oreostemma alpigenum* (= *Aster alpigenus*), *Pedicularis* spp., *Castilleja* spp., *Deschampsia caespitosa*, *Caltha leptosepala*, *Erythronium* spp., *Juncus parryi*, *Luzula piperi*, *Carex spectabilis*, *Carex nigricans*, and *Polygonum bistortoides*.

**Classification Comments:** This group is more distinct in the mesic northern extent than in the southern and drier ranges in the Great Basin and Colorado Plateau. In the northern extent, the dwarf-shrub layers tend to be denser and characterized by distinctive alpine heath species *Cassiope mertensiana*, *Phyllodoce empetriformis*, *Salix glauca*, and *Salix reticulata*. In the southern extent, stands dominated by *Salix arctica*, *Salix reticulata*, or *Salix nivalis* are less distinctive and occur as patches within the alpine turf or mesic bands around snowbeds (Cooper et al. 1997).

The diagnostic species in this physiognomically defined alpine group occur on a variety of sites. *Dryas octopetala* and *Dryas integrifolia* often occur on harsh wind-blown sites on dry turf, cushion plant fell-fields or unstable scree slopes, whereas the heath types of *Cassiope mertensiana*, *Salix reticulata*, or *Phyllodoce empetriformis* occur as snowbed or wetland communities (Cooper et al. 1997). Some of the dwarf *Salix* species, such as *Salix arctica*, form mesic patches within the larger alpine turf communities (Lewis 1970, Zwinger and Willard 1996, Cooper et al. 1997).

**Internal Comments:** DFL 9-13: AK? added. KAS 12-10: I am still looking for a better Author concept for the Northern Rocky Mountains alpine dwarf-shrubland stands. Cooper et al. (1997) include alpine many dwarf-shrublands with snowbed communities.

**Other Comments:**

**Similar NVC Types:**

- G271 Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow
- G520 Vancouverian & Rocky Mountain Subalpine & Alpine Snowbed, Wet Meadow & Dwarf-Shrubland

#### WA groups

- G320 North Pacific Alpine-Subalpine Turf & Herbaceous Meadow
- G317 North Pacific Alpine-Subalpine Dwarf-Shrubland & Heath
- G314 Rocky Mountain & Sierran Alpine Turf & Fell-Field

**Diagnostic Characteristics:** This alpine group is characterized by a semi-continuous layer of ericaceous dwarf-shrubs or dwarf willows which form a heath type ground cover less than 0.5 m in height. Characteristic species include drier site *Dryas octopetala* and *Dryas integrifolia* to the more typical mesic heath communities dominated by *Cassiope mertensiana*, *Salix arctica*, *Salix reticulata*, *Salix vestita*, or *Phyllodoce empetriformis* with *Vaccinium* spp., *Ledum glandulosum*, *Phyllodoce glanduliflora*, and *Kalmia microphylla* present to codominant.

#### VEGETATION

**Physiognomy and Structure:** This group is characterized by a semi-continuous layer of ericaceous dwarf-shrubs or dwarf willows which form a heath type ground cover less than 0.5 m in height. Dense tufts of graminoids and scattered forbs may occur forming an herbaceous layer.

**Floristics:** The vegetation in this alpine group is characterized by a semi-continuous layer of ericaceous dwarf-shrubs or dwarf willows which form a heath type ground cover less than 0.5 m in height. Dense tufts of graminoids and scattered forbs occur. *Dryas octopetala*- and *Dryas integrifolia*-dominated communities occur on more windswept and drier sites than the heath communities. Within the heath communities *Cassiope mertensiana*, *Salix arctica*, *Salix reticulata*, *Salix vestita*, or *Phyllodoce empetriformis* can be dominant shrubs. *Vaccinium* spp., *Ledum glandulosum*, *Phyllodoce glanduliflora*, and *Kalmia microphylla* may also be shrub associates. The herbaceous layer is a mixture of forbs and graminoids, especially sedges, including *Erigeron* spp., *Luetkea pectinata*, *Antennaria lanata*, *Oreostemma alpigenum* (= *Aster alpigenus*), *Pedicularis* spp., *Castilleja* spp., *Deschampsia caespitosa*, *Caltha leptosepala*, *Erythronium* spp., *Juncus parryi*, *Luzula piperi*, *Carex spectabilis*, *Carex nigricans*, and *Polygonum bistortoides*. Floristic information was compiled from Bamberg (1961), Willard (1963), Bamberg and Major (1968), Lewis (1970), Komarkova (1976, 1980), Zwinger and Willard (1996), Cooper et al. (1997), and Billings (2000).

**No Associations identified yet for Washington.**

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This widespread group occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada, but is more prominent in the northern extent. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana and in the mountains of Alberta. This group occurs in areas of level or concave glacial topography, with late-lying snow and subirrigation from surrounding slopes. Soils have become relatively stabilized in these sites, are moist but well-drained, strongly acidic, and often have substantial peat layers.

**Dynamics:**

#### DISTRIBUTION

**Geographic Range:** This group occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 4:P, 7:C, 8:C, 9:C, 11:C, 19:C, 20:C, 21:C, 68:P

**USFS Ecoregions (2007):** 331J:CC, 341G:PP, 342J:PP, M242B:CC, M242C:C?, M242D:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CP, M332E:CC, M332F:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:PP, M341B:PP, M341C:PP

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

- < Alpine Rangeland (410) (Shiflet 1994)

#### LOWER LEVEL UNITS

**Alliances:**

- A3175 *Ribes cereum* - *Ribes montigenum* - *Dasiphora fruticosa* ssp. *floribunda* Alpine Shrubland Alliance

- A3177 *Phyllodoce empetrifloris* - *Phyllodoce glanduliflora* / *Sibbaldia procumbens* Snowbed Dwarf-shrubland Alliance
- A3176 *Salix arctica* - *Salix nivalis* - *Salix reticulata* Dwarf-shrubland Alliance
- A3178 *Dryas integrifolia* - *Dryas octopetala* - *Arctostaphylos uva-ursi* Rocky Mountain Fell-field Dwarf-shrubland Alliance

#### AUTHORSHIP

**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2011)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2010/12/17

#### REFERENCES

**References:** Bamberg 1961, Bamberg and Major 1968, Billings 2000, Cooper et al. 1997, Faber-Langendoen et al. 2015, Komarkova 1976, Komarkova 1980, Lewis 1970, Shiflet 1994, Willard 1963, Zwinger and Willard 1996

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4. Polar & High Montane Scrub, Grassland & Barrens  
4.B.1.Nb. Western North American Alpine Dwarf-Shrub & Grassland  
M099. Rocky Mountain & Sierran Alpine Scrub, Forb Meadow & Grassland

### G314. Rocky Mountain & Sierran Alpine Turf & Fell-Field [Proposed]

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Carex elynoides* - *Kobresia myosuroides* - *Phlox pulvinata* Alpine Turf & Fell-Field Group

**Common Name (Translated Scientific Name):** Blackroot Sedge - Bellardi Bog Sedge - Cushion Phlox Alpine Turf & Fell-Field Group

**Type Concept:** This widespread group occurs at and above upper treeline throughout the Rocky Mountain cordillera and alpine areas of mountain ranges in Utah and Nevada, and isolated alpine sites in the northeastern Cascades. It includes both wind-scoured fell-fields and dry turf. Fell-fields are typically free of snow during the winter as they are found on ridgetops, upper slopes and exposed saddles, whereas dry turf is found on gentle to moderate slopes, flat ridges, valleys, and basins where the soil has become relatively stabilized and the water supply is more-or-less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. Fell-field substrates are generally shallow, stony, low in organic matter, and poorly developed with wind deflation often resulting in a gravelly pavement. Alpine turf sites have deeper, more developed soils, although there may be moderately high cover of cobbles and boulders present.

The vegetation is generally composed of low-growing perennial forbs and graminoids. On fell-field sites, total vegetation cover ranges from sparse to moderate cover dominated by cushion plants, whereas on turf sites, it ranges from open to moderately dense or dense cover dominated by graminoids or a mixture of graminoids and forbs (especially cushion plants). The graminoids are typically rhizomatous, sod-forming sedges such as *Carex elynoides*, *Carex scirpoidea*, *Carex siccata*, *Carex nardina*, *Carex rupestris*, and *Kobresia myosuroides*. Most fell-field plants are cushioned or matted, frequently succulent, flat to the ground in rosettes, and often densely haired and thickly cutinized. Common species include *Arenaria capillaris*, *Geum rossii*, *Minuartia obtusiloba*, *Myosotis asiatica*, *Paronychia pulvinata*, *Phlox pulvinata*, *Silene acaulis*, *Trifolium dasyphyllum*, and *Trifolium parryi*. Many other graminoids, forbs, and prostrate shrubs can also be found, including *Calamagrostis purpurascens*, *Deschampsia caespitosa*, *Dryas octopetala*, *Festuca brachyphylla*, *Festuca idahoensis*, *Leucopoa kingii*, *Poa arctica*, *Poa glauca*, *Poa secunda* (Great Basin), *Saxifraga* spp., *Selaginella densa*, *Solidago* spp., and *Polygonum bistortoides*. Fell-fields are usually found within or adjacent to alpine dry turf with many of the same prostrate and mat-forming plants found in both, frequently with broad transition zones.

Although alpine dry turf may form the matrix or large patches of the alpine zone, it typically intermingles with alpine bedrock and scree, ice field, fell-field, alpine dwarf-shrubland, and alpine/subalpine wet meadow systems. Great Basin alpine areas tend to be drier with smaller turf patches and include some species common in desert scrub such as *Poa secunda*.

**Classification Comments:** Alpine turf and fell-field are included together for several reasons. Although these types can be quite different and can have relatively abrupt boundaries in saddles, there is often a long transition on broad alpine slopes.

**Internal Comments:** DFL 9-13: AK? added. MSR 11-12: CEG001902 (CA?) is in this group that does NOT occur in CA; it may need to be split, but not until I know if it's in CA. mjr 10-12: CA? added based on member association distribution.

**Other Comments:**

#### Similar NVC Types:

- G317 North Pacific Alpine-Subalpine Dwarf-Shrubland & Heath
- G316 Rocky Mountain & Sierran Alpine Dwarf-Shrubland
- G320 North Pacific Alpine-Subalpine Turf & Herbaceous Meadow

**Diagnostic Characteristics:** This alpine group is characterized by dominance of low-growing herbaceous perennial plants, including graminoids *Carex elynoides*, *Carex rupestris*, and *Kobresia myosuroides*, forbs such as *Geum rossii*, and cushion plants *Trifolium dasyphyllum* and *Phlox pulvinata*.

#### VEGETATION

**Physiognomy and Structure:** The vegetation is a sparse to dense, low-growing herbaceous layer dominated by perennial forbs and/or graminoids.

**Floristics:** Most fell-field plants are cushioned or matted, frequently succulent, flat to the ground in rosettes, and often densely haired and thickly cutinized. Plant cover is 15-50%, while exposed rocks make up the rest. Fell-fields are usually found within or adjacent to alpine dry turf. Common species include *Arenaria capillaris*, *Geum rossii*, *Kobresia myosuroides*, *Minuartia obtusiloba*, *Myosotis asiatica*, *Paronychia pulvinata*, *Phlox pulvinata*, *Sibbaldia procumbens*, *Silene acaulis*, *Trifolium dasyphyllum*, and *Trifolium parryi*.

The low-growing, perennial vegetation ranges from sparse to moderate cover dominated by cushion plants on fell-fields sites to moderately dense to dense cover of low-growing, perennial graminoids and forbs. Rhizomatous, sod-forming sedges are the dominant graminoids, and prostrate and mat-forming plants with thick rootstocks or taproots characterize the forbs. Dominant species 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*. Many other graminoids, forbs, and prostrate shrubs can also be found, including *Calamagrostis purpurascens*, *Deschampsia caespitosa*, *Dryas octopetala*, *Leucopoa kingii*, *Poa arctica*, *Saxifraga* spp., *Selaginella densa*, *Sibbaldia procumbens*, *Silene acaulis*, *Solidago* spp., and *Trifolium parryi*. Although alpine dry tundra is the matrix of the alpine zone, it typically intermingles with alpine bedrock and scree, ice field, fell-field, alpine dwarf-shrubland, and alpine/subalpine wet meadow systems. Floristic information was compiled from Bamberg (1961), Willard (1963), Bamberg and Major (1968), Komarkova (1976, 1980), Baker (1980a), Zwinger and Willard (1996), Cooper et al. (1997), and Billings (2000).

**No Associations identified yet for Washington.**

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This widespread group occurs at and above upper treeline throughout the Rocky Mountain cordillera and alpine areas of mountain ranges in Utah and Nevada, and in isolated alpine sites in the northeastern Cascades. It includes both wind-scoured fell-fields and dry turf. Fell-fields are typically free of snow during the winter as they are found on ridgetops, upper slopes and exposed saddles, whereas dry turf is found on gentle to moderate slopes, flat ridges, valleys, and basins where the soil has become relatively stabilized and the water supply is more-or-less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. Fell-field substrates are generally shallow, stony, low in organic matter, and poorly developed with wind deflation often resulting in a gravelly pavement. Alpine turf sites have deeper, more developed soils, although there may be moderately high cover of cobbles and boulders present.

**Dynamics:**

#### DISTRIBUTION

**Geographic Range:** This group occurs above upper treeline throughout the North American Rocky Mountain cordillera, including alpine areas of ranges in the Great Basin, and isolated alpine sites in the northeastern Cascades.

**Nations:** CA, US

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

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

**USFS Ecoregions (2007):** 331J:CC, 341E:PP, 341G:PP, 342B:PP, 342J:PP, M242B:CP, M242C:CC, M242D:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CP, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CP, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Great Basin)

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

- < AT Alpine Tundra (mesic to dry sites) (Ecosystems Working Group 1998)
- < Alpine Rangeland (410) (Shiflet 1994)



## LOWER LEVEL UNITS

### Alliances:

- A3363 *Phlox covillei* - *Ericameria discoidea* Fell-field Herbaceous Alliance
- A3365 *Carex helleri* [Snowbank Turf] Herbaceous Alliance
- A3154 *Minuartia obtusiloba* - *Paronychia pulvinata* - *Silene acaulis* Rocky Mountain Alpine Fell-Field Alliance
- A3172 *Juncus drummondii* - *Juncus parryi* - *Sibbaldia procumbens* Rocky Mountain Alpine Snowbed Alliance
- A3155 *Carex elynoides* - *Carex rupestris* - *Kobresia myosuroides* Rocky Mountain Alpine Turf Alliance

### AUTHORSHIP

**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2011)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2010/12/17

### REFERENCES

**References:** Baker 1980a, Bamberg 1961, Bamberg and Major 1968, Billings 2000, Cooper et al. 1997, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Komarkova 1976, Komarkova 1980, Shiflet 1994, Willard 1963, Zwinger and Willard 1996

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4. Polar & High Montane Scrub, Grassland & Barrens

4.B.1.Nb. Western North American Alpine Dwarf-Shrub & Grassland

M099. Rocky Mountain & Sierran Alpine Scrub, Forb Meadow & Grassland

## G571. Rocky Mountain & Sierran Alpine Bedrock & Scree [Proposed]

**Type Concept Sentence:**

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### OVERVIEW

**Scientific Name:** *Dryas octopetala* - *Saxifraga* spp. Rocky Mountain Alpine Bedrock & Scree Group

**Common Name (Translated Scientific Name):** Eight-petal Mountain-avens - Saxifrage species Rocky Mountain Alpine Bedrock & Scree Group

**Type Concept:** This alpine group consists of exposed rock and rubble at or above the upper treeline in the Rocky Mountains, from Alberta and British Columbia, Canada, south into New Mexico, and west into the highest mountain ranges of the Great Basin and the Sierra Nevada. It is composed of barren and sparsely vegetated alpine substrates, typically including bedrock outcrops, talus and scree slopes, upper mountain slopes, and summits. The lower elevational limit for the alpine zone varies with latitude ranging from near 3660 m (12,000 feet) in the southern extent to near 2286 m (7500 feet) in the northern extent. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit vascular plant growth. Vascular plants growing on loose substrates typically have either an extensive shallow root and rhizome system or a massive taproot that anchors the plant. Sparse cover of forbs, grasses, low shrubs and small trees may be present with total vascular plant cover typically less than 25% due to the high cover of exposed rock. Many species are tiny, growing in cracks in rock outcrops. Nonvascular (lichen)-dominated communities are common and may greatly exceed 25% cover in some areas.

**Classification Comments:** This group is composed of sparse cover of alpine plants sometimes with abundant nonvascular (lichen) cover. Because it occurs on rock outcrops, it may occur as inclusions within the more extensive Rocky Mountain & Sierran Alpine Turf & Fell-Field Group (G314).

**Internal Comments:** DFL 9-13: AK? added. MSR 11-12: this group may occur in CA, according to Todd's list, but we need CNPS to tell us that. mjr 10-12: CA added based on member association distribution.

**Other Comments:**

### Similar NVC Types:

- G319 North Pacific Alpine-Subalpine Bedrock & Scree
- G565 Rocky Mountain Cliff, Scree & Rock Vegetation
- G318 North Vancouverian Montane Massive Bedrock, Cliff & Talus

**Diagnostic Characteristics:**

### VEGETATION

**Physiognomy and Structure:** This group includes sparsely vegetated and nonvascular-dominated rocks growing above upper treeline.

**Floristics:** This group is composed of barren and sparsely vegetated alpine substrates. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit vascular plant growth. Vascular plants growing on loose substrates typically have either an extensive shallow root and rhizome system or a massive taproot that anchors the plant. Sparse cover of forbs, grasses, low shrubs and small trees may be present with total vascular plant cover typically less than 25% due to the high cover of exposed rock. Many species are tiny, growing in cracks in rock outcrops. Some characteristic species include *Dryas octopetala*, *Astragalus kentrophyta*, *Astragalus molybdenus* (= *Astragalus plumbeus*), *Collomia larsenii*, *Thlaspi montanum* var. *montanum* (= *Thlaspi alpestre*), *Townsendia leptotes*, *Townsendia rothrockii*, *Trisetum spicatum*, and alpine species of *Eriogonum* and *Phlox*. Other associated species include *Achillea millefolium*, *Besseya alpina*, *Campanula rotundifolia*, *Festuca brachyphylla*, *Geum rossii*, *Heuchera parvifolia* var. *nivalis*, *Ionactis alpina*, *Luzula spicata*, *Minuartia nuttallii*, *Phacelia sericea*, *Poa lettermanii*, *Ranunculus pygmaeus*, *Saxifraga caespitosa* ssp. *delicatula*, *Senecio fremontii*, *Silene acaulis*, *Trifolium dasyphyllum*, and *Trisetum spicatum*. Characteristic species in the Sierra Nevada include *Achnatherum swallenii*, *Athyrium americanum*, *Carex perglobosa*, *Castilleja nana*, *Cirsium scopulorum*, *Hulsea algida*, *Ivesia cryptocaulis*, *Oxyria digyna*, *Polemonium viscosum*, *Saxifraga bronchialis*, *Saxifraga chrysantha*, *Saxifraga mertensiana*, *Saxifraga rivularis*, *Selaginella watsonii*, *Senecio taraxacoides*, *Silene acaulis*, and *Sphaeromeria argentea*. *Ericameria discoidea*, *Juniperus communis*, and *Ribes montigenum* are common shrub associates.

Nonvascular (lichen)-dominated communities are common and may greatly exceed 25% in cover in some areas. Lichens are diverse. Common lichens on boulderfields are *Buellia* sp., *Candelaria* sp., *Cladonia pyxidata*, *Lecidea atrobrunnea*, *Rhizocarpon geographicum*, *Rhizoplaca chrysoleuca* (= *Lecanora rubina*), *Umbilicaria proboscidea*, *Umbilicaria anthracina*, *Umbilicaria proboscidea*, *Xanthoparmelia conspersa* (= *Parmelia conspersa*), *Xanthoria elegans* (= *Caloplaca elegans*), and on late-melting snowbeds sites *Solorina crocea* (Zwinger and Willard 1996). Common and abundant bryophytes may include *Aulacomnium palustre*, *Bryum* spp., *Hypnum revolutum*, *Philonotis fontana*, *Pohlia* sp., *Polytrichastrum alpinum*, *Polytrichum piliferum*, and *Philonotis fontana* var. *pumila* (= *Philonotis tomentella*). Floristic information was compiled from Willard (1963), Komarkova (1976, 1980), Zwinger and Willard (1996), and Cooper et al. (1997).

**No Associations identified yet for Washington.**

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** This alpine group consists of exposed rock and rubble at or above the upper treeline in the Rocky Mountains, from Alberta and British Columbia, Canada, south into New Mexico, and west into the highest mountain ranges of the Great Basin and the Sierra Nevada. The lower elevational limit for the alpine zone varies with latitude ranging from near 3660 m (12,000 feet) in the southern extent to near 2286 m (7500 feet) in the northern extent. The alpine zone in the Sierra Nevada begins at 3200 m (10,500) in the south and lower to 2895 m (9500 feet) in the northern extent (Zwinger and Willard 1996). The alpine zone extends further downslope on cooler north aspects. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit vascular plant growth.

**Dynamics:** Stands in the more xeric alpine in the Great Basin and southern Sierra Nevada include lower elevation semi-desert species such as *Poa secunda* and *Petrophyton caespitosum*.

#### DISTRIBUTION

**Geographic Range:** This group is restricted to the highest elevations of the Rocky Mountains, from Alberta and British Columbia, Canada, south into New Mexico, and west into the highest mountain ranges of the Great Basin and the Sierra Nevada.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 7:C, 8:C, 9:C, 11:C, 19:C, 20:C, 21:C, 68:C

**USFS Ecoregions (2007):** 331G:PP, 331J:P?, 341A:C?, 341B:CC, 341E:CP, 341F:CP, 341G:CC, 342A:CC, 342B:C?, 342C:C?, 342D:CP, 342H:C?, 342J:CP, M242D:PP, M313A:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

- >< Alpine Rangeland (410) (Shiflet 1994)
- > Boulder Fields (Zwinger and Willard 1996)
- > Talus and Scree Slopes (Zwinger and Willard 1996)

## LOWER LEVEL UNITS

**Alliances:**

- A4088 *Polemonium* spp. - *Castilleja* spp. - *Trisetum* spp. Alpine Rock Sparse Vegetation Alliance
- A3786 Sierran Alpine Nonvascular Sparsely Vegetated Alliance
- A4022 Alpine Sparse Bryophyte Alliance
- A4021 Alpine Sparse Vascular Herbaceous Alliance

## AUTHORSHIP

**Primary Concept Source:** B.E. Willard (1963)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2015/05/20

## REFERENCES

**References:** Cooper et al. 1997, Faber-Langendoen et al. 2015, Komarkova 1976, Komarkova 1980, Shiflet 1994, Willard 1963, Zwinger and Willard 1996

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4. Polar & High Montane Scrub, Grassland & Barrens

4.B.1.Nb. Western North American Alpine Dwarf-Shrub & Grassland

**M101. Vancouverian Alpine Scrub, Forb Meadow & Grassland [Proposed]**

**Type Concept Sentence:** This macrogroup consists of well-vegetated to sparsely vegetated tundra areas above the environmental limit of trees in the Pacific Northwest coastal region north to maritime Alaska, including the Aleutian Islands, and is dominated by dwarf-shrubs genera such as *Cassiope*, *Empetrum*, *Phyllodoce*, *Salix*, and *Vaccinium* and herbaceous species such as *Anemone narcissiflora*, *Carex breweri*, *Festuca brachyphylla*, *Nephrophyllidium crista-galli*, *Polygonum bistortoides*, *Sanguisorba canadensis*, and *Valeriana sitchensis*.

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## OVERVIEW

**Scientific Name:** Vancouverian Alpine Scrub, Forb Meadow & Grassland Macrogroup

**Common Name (Translated Scientific Name):** Vancouverian Alpine Scrub, Forb Meadow & Grassland Macrogroup

**Type Concept:** This macrogroup consists primarily of alpine vegetation where dwarf-shrubs characterize the cover. The dwarf-shrubs vary in cover from sparse to continuous. Herbaceous meadows are also common, but even they often have a dwarf-shrub component. Sparsely vegetated sites are characteristic of the higher elevations and exposed sites. Dominant dwarf-shrub species include *Cassiope mertensiana*, *Cassiope tetragona*, *Dryas octopetala*, *Empetrum nigrum*, *Harrimanella stelleriana*, *Loiseleuria procumbens*, *Luetkea pectinata*, *Phyllodoce aleutica*, *Phyllodoce empetriformis*, *Phyllodoce glanduliflora*, *Salix arctica*, *Salix nivalis*, *Salix reticulata*, *Vaccinium uliginosum*, and *Vaccinium vitis-idaea*. Herbaceous species include *Aconitum delphiniifolium*, *Anemone narcissiflora*, *Arenaria capillaris*, *Artemisia arctica*, *Carex breweri*, *Carex capitata*, *Carex macrochaeta*, *Carex nardina*, *Carex proposita*, *Carex spectabilis*, *Castilleja unalaschcensis*, *Chamerion* spp., *Eriogonum pyrolifolium*, *Festuca brachyphylla*, *Festuca roemerii*, *Fritillaria camschatcensis*, *Geranium erianthum*, *Lupinus nootkatensis*, *Nephrophyllidium crista-galli*, *Packera cana*, *Pedicularis contorta*, *Phlox diffusa*, *Polemonium acutiflorum*, *Polygonum bistortoides*, *Sanguisorba canadensis*, *Saxifraga tolmiei*, *Senecio triangularis*, *Valeriana sitchensis*, *Veratrum viride* and *Viola* spp. This macrogroup occurs in the Pacific Northwest coastal region north to maritime Alaska, including the Aleutian Islands. It is primarily on alpine and subalpine sites, but it can also be found at lower elevations on the Alaska Peninsula, Aleutian Islands and Kodiak Island, where it is found on cliffs, rocky outcrops, exposed summits, windswept ridges, fell-fields, valley bottoms, sideslopes, stabilized dunes, terraces, moraines and fans. The dominant disturbances are snow avalanche, soil creep and freeze-thaw action.

**Classification Comments:****Similar NVC Types:**

- M075 Western North American Montane-Subalpine Wet Shrubland & Wet Meadow
- M404 Western Boreal Alpine Vegetation
- M099 Rocky Mountain & Sierran Alpine Scrub, Forb Meadow & Grassland

**Diagnostic Characteristics:** The macrogroup is characterized by dwarf-shrub vegetation, often called alpine heath. Associated species are composed of a mixture of mesic to wet alpine and subalpine graminoids and forbs from the Pacific Northwest and Alaska.

## VEGETATION

**Physiognomy and Structure:** This macrogroup is characterized by an open to closed dwarf-shrub canopy frequently dominated by Ericaceous or *Salix* species, or an herbaceous layer, often composed of a mixture of perennial graminoids and forbs.

**Floristics:** Overall species composition is diverse, and species richness is often very high; typically no single species is dominant. Dominant dwarf-shrub species include *Cassiope lycopodioides* (Haida Gwaii), *Cassiope mertensiana*, *Cassiope tetragona*, *Empetrum nigrum*, *Harrimanella stelleriana*, *Luetkea pectinata*, *Phyllodoce aleutica*, *Phyllodoce empetriformis*, and *Phyllodoce glanduliflora*. Other common species may include *Loiseleuria procumbens*, *Vaccinium caespitosum*, *Vaccinium deliciosum*, *Vaccinium membranaceum*, *Vaccinium uliginosum*, and *Vaccinium vitis-idaea*. Ericaceous species typically dominate, but sites dominated by *Salix arctica*, *Salix nivalis*, and *Salix reticulata* are included. Scattered tall shrubs and dwarf trees may also be present. Common herbaceous species include *Aconitum delphinifolium*, *Anemone narcissiflora*, *Arenaria capillaris*, *Artemisia arctica*, *Athyrium filix-femina*, *Carex breweri*, *Carex capitata*, *Carex filifolia*, *Carex macrochaeta*, *Carex nardina*, *Carex proposita*, *Carex spectabilis*, *Castilleja unalaschcensis*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Chamerion latifolium*, *Deschampsia caespitosa*, *Eriogonum pyrolifolium*, *Festuca brachyphylla*, *Festuca roemeri*, *Fritillaria camschatcensis*, *Geranium erianthum*, *Lupinus arcticus*, *Lupinus latifolius*, *Lupinus nootkatensis*, *Lupinus sellulus*, *Nephrophyllidium crista-galli*, *Oreostemma alpigenum*, *Packera cana*, *Pedicularis contorta*, *Phlox diffusa*, *Polemonium acutiflorum*, *Polygonum bistortoides*, *Sanguisorba canadensis*, *Saxifraga tolmiei*, *Senecio triangularis*, *Valeriana sitchensis*, *Valeriana sitchensis*, *Veratrum viride*, and *Viola* spp. Bryophyte cover is often high.

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This macrogroup occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest coast north to southeastern maritime Alaska, primarily on alpine and subalpine sites, but it can also be found at lower elevations. A high snowpack characterizes this environment and much of this macrogroup occurs on slopes and depressions where snow lingers, the soil has become relatively stabilized, and the water supply is more-or-less constant. However, there are sites where wind scours snow off, and sites are characterized by the absence of persistent snow, wind desiccation, permafrost, and a short growing season. In the Aleutian Islands, stands occur on sideslopes, shoulder slopes, and low summits, and the terrain varies from gently sloping to steep. Sparsely vegetated stands occur on exposed summits, windswept ridges, and fell-fields. These sites are characterized by harsh environmental conditions. Slopes vary from moderately sloped to flat. The substrate is colluvium, residuum, or glacial till.

**Dynamics:** The dominant disturbances are snow avalanche, soil creep and freeze-thaw action.

## DISTRIBUTION

**Geographic Range:** This macrogroup occurs in the mountains of the Pacific Northwest coast north to southeastern maritime Alaska, primarily on alpine and subalpine sites, but it is also found at lower elevations on the Aleutian Islands, Kenai Fjords and in Prince William Sound.

### Spatial Scale & Pattern [optional]:

**Nations:** CA, US

**States/Provinces:** AK, BC, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 322A:CC, 341D:CC, 341F:CP, 342B:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

## SYNONYMY

- >< AM Alpine Meadow (Ecosystems Working Group 1998)
- >< AT Alpine Tundra (Ecosystems Working Group 1998)
- < Alpine Grassland (213) (Shiflet 1994) [SRM type 213 includes all alpine communities in Sierra, Klamath and California Cascades, both herbaceous and shrub dominated, and wet meadows.]
- >< Alpine Idaho Fescue (108) (Shiflet 1994)
- ? Coastal Mountain-heather Alpine (CMA) zone (MacKenzie 2005)
- >< II.D.2.d - Mountain-heath tundra (Viereck et al. 1992)
- >< II.D.2.e - Cassiope tundra (Viereck et al. 1992)
- >< III.A.2.f - Mesic sedge-herb meadow tundra (Viereck et al. 1992)
- >< III.B.2.a - Mixed herbs (Viereck et al. 1992)
- ? Mesic Forb Alpine (Boggs et al. 2008a)

## LOWER LEVEL UNITS

**Groups:**

- G317 North Pacific Alpine-Subalpine Dwarf-Shrubland & Heath
- G320 North Pacific Alpine-Subalpine Turf & Herbaceous Meadow
- G362 Aleutian Ericaceous Dwarf-Shrubland & Heath
- G319 North Pacific Alpine-Subalpine Bedrock & Scree

## AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 10-14

## REFERENCES

**References:** Archer 1963, BCMF 2006, Banner et al. 2004, Barbour and Billings 2000, Billings 2000, Boggs et al. 2003, Boggs et al. 2008a, Boggs et al. 2008b, Brink 1959, Byrd 1984, Croll et al. 2005, Daniels et al. 2004, DeVelice et al. 1999, Douglas and Ballard 1971, Douglas and Bliss 1977, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Fleming and Spencer 2007, Franklin and Dyrness 1973, Franklin and Trappe 1963, Franklin et al. 1971, Fraser 1970, Gorman 1907, Hamann 1972, MacKenzie 2005, Pojar and Stewart 1991, Shacklette et al. 1969, Shiflet 1994, Talbot et al. 1984, Taylor and Douglas 1978, Viereck et al. 1992, del Moral 1979

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4. Polar & High Montane Scrub, Grassland & Barrens

4.B.1.Nb. Western North American Alpine Dwarf-Shrub & Grassland

M101. Vancouverian Alpine Scrub, Forb Meadow & Grassland

**G317. North Pacific Alpine-Subalpine Dwarf-Shrubland & Heath [Proposed]**

**Type Concept Sentence:**

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## OVERVIEW

**Scientific Name:** *Empetrum nigrum* - *Phyllodoce empetriformis* - *Cassiope mertensiana* Alpine-Subalpine Dwarf-Shrubland & Heath Group

**Common Name (Translated Scientific Name):** Black Crowberry - Pink Mountain-heath - Western Moss-heather Alpine-Subalpine Dwarf-Shrubland & Heath Group

**Type Concept:** This tundra group occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest coast north to southeastern, maritime Alaska primarily on alpine and subalpine sites, but it can also be found at lower elevations (e.g., Kenai Fjords and Prince William Sound). It occurs above 2350 m (7200 feet) in the Klamath Mountains and Cascade Range north into the Cascade and Coastal mountains of British Columbia where it is confined to the coldest, wind-blown areas above treeline and above the subalpine parkland. It occurs on slopes and depressions where snow lingers, the soil has become relatively stabilized, and the water supply is more-or-less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. In Alaska, stands occur on sideslopes, shoulder slopes, and low summits, and the terrain varies from gently sloping to steep. This group also includes sparsely vegetated alpine stands that occur on exposed summits, windswept ridges, and fell-fields. These sites are characterized by harsh environmental conditions. Slopes vary from moderately sloped to flat. The vegetation ranges from a sparse to moderately dense dwarf-shrub layer (alpine heath) or herbaceous meadow with a heath understory; however, in some areas dwarf-shrub cover is continuous. Dominant dwarf-shrub species include *Cassiope mertensiana*, *Cassiope tetragona*, *Empetrum nigrum*, *Harrimanella stelleriana*, *Luetkea pectinata*, *Phyllodoce aleutica*, *Phyllodoce empetriformis*, and *Phyllodoce glanduliflora*. Other common species may include *Arctostaphylos uva-ursi*, *Dryas octopetala*, *Loiseleuria procumbens*, *Vaccinium uliginosum*, and *Vaccinium vitis-idaea*. Ericaceous species typically dominate, but sites dominated by *Salix arctica*, *Salix nivalis*, and *Salix reticulata* are included in this group. Scattered tall shrubs and dwarf trees may also be present. Common herbaceous species include *Valeriana sitchensis*, *Aconitum delphinifolium*, *Anemone narcissiflora*, *Artemisia arctica*, *Carex macrochaeta*, *Castilleja unalaschcensis*, *Geranium erianthum*, *Lupinus nootkatensis*, *Sanguisorba canadensis*, *Saxifraga tolmiei*, and *Viola* spp. On slopes on the outer coast and also in Kenai Fjords and Prince William Sound, *Nephrophyllidium crista-galli* is common.

**Classification Comments:** This is a wide-ranging and variable alpine-subalpine dwarf-shrubland group.

**Internal Comments:** mjr 10-12: CA added based on member association distribution.

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

- G305 Central Rocky Mountain High Montane Mesic Shrubland
- G271 Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow
- G520 Vancouverian & Rocky Mountain Subalpine & Alpine Snowbed, Wet Meadow & Dwarf-Shrubland
- G316 Rocky Mountain & Sierran Alpine Dwarf-Shrubland
- G320 North Pacific Alpine-Subalpine Turf & Herbaceous Meadow
- G314 Rocky Mountain & Sierran Alpine Turf & Fell-Field

**Diagnostic Characteristics:** This Pacific Northwest to Alaskan alpine dwarf-shrubland group is dominated or codominated by *Cassiope mertensiana*, *Cassiope tetragona*, *Empetrum nigrum*, *Harrimanella stelleriana*, *Luetkea pectinata*, *Phyllodoce aleutica*, *Phyllodoce empetriformis*, and *Phyllodoce glanduliflora*.

**VEGETATION**

**Physiognomy and Structure:** This group is characterized by an open to closed dwarf-shrub canopy frequently dominated by Ericaceous species.

**Floristics:** The vegetation ranges from a sparse to moderately dense dwarf-shrub layer (alpine heath) or herbaceous meadow with a heath understory; however, in some areas dwarf-shrub cover is continuous. Vegetation is controlled by snow retention, wind desiccation, permafrost, and a short growing season. Dominant dwarf-shrub species include *Cassiope mertensiana*, *Cassiope tetragona*, *Empetrum nigrum*, *Harrimanella stelleriana*, *Luetkea pectinata*, *Phyllodoce aleutica*, *Phyllodoce empetriformis*, and *Phyllodoce glanduliflora*. Other common species may include *Loiseleuria procumbens*, *Vaccinium caespitosum*, *Vaccinium deliciosum*, *Vaccinium membranaceum*, *Vaccinium uliginosum*, and *Vaccinium vitis-idaea*. Ericaceous species typically dominate, but sites dominated by *Salix arctica*, *Salix nivalis*, and *Salix reticulata* are included in this group. Scattered tall shrubs and dwarf trees may also be present. Common herbaceous species include *Aconitum delphiniifolium*, *Anemone narcissiflora*, *Artemisia arctica*, *Carex filifolia*, *Carex macrochaeta*, *Castilleja unalaschcensis*, *Festuca brachyphylla*, *Geranium erianthum*, *Lupinus latifolius*, *Lupinus nootkatensis*, *Oreostemma alpigenum*, *Sanguisorba canadensis*, *Saxifraga tolmiei*, *Valeriana sitchensis*, and *Viola* spp. On slopes on the outer coast and also in Kenai Fjords and Prince William Sound, *Nephrophyllidium crista-galli* is common. Dwarf-shrubs that typically occur on exposed summits, windswept ridges, and fell-fields are *Empetrum nigrum*, *Vaccinium uliginosum*, *Loiseleuria procumbens*, *Phyllodoce aleutica*, *Harrimanella stelleriana*, and *Luetkea pectinata*. Lichens may be common. Total vegetation cover ranges from 10 to 25%. Floristic information was compiled from Franklin and Dyrness (1973), Viereck et al. (1992), DeVelice et al. (1999), Billings (2000), and Boggs et al. (2008a).

<b>G317 North Pacific Alpine-Subalpine Dwarf-Shrubland &amp; Heath Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Arctostaphylos uva-ursi</i> Dwarf-shrubland	G3G4/S3S4	CEGL001392
<i>Cassiope mertensiana</i> - <i>Phyllodoce empetriformis</i> Dwarf-shrubland	G3G4/S3S4	CEGL001408
<i>Cassiope mertensiana</i> / <i>Luetkea pectinata</i> Dwarf-shrubland	G3G4/S3S4	CEGL001397
<i>Cassiope mertensiana</i> Dwarf-shrubland	G3G4/S3S4	CEGL001395
<i>Dryas octopetala</i> Dwarf-shrub Herbaceous Vegetation	G3?/S3?	CEGL001891
<i>Empetrum nigrum</i> / <i>Lupinus sellulus</i> var. <i>lobbii</i> Dwarf-shrubland	G3G4/S3S4	CEGL001400
<i>Empetrum nigrum</i> Dwarf-shrubland	G3G4/S3S4	CEGL001399
<i>Luetkea pectinata</i> - <i>Saxifraga tolmiei</i> Herbaceous Vegetation	G5/S4	CEGL001918
<i>Phyllodoce empetriformis</i> / <i>Lupinus arcticus</i> ssp. <i>subalpinus</i> Dwarf-Shrubland	G4?/S4	CEGL001406
<i>Phyllodoce empetriformis</i> / <i>Lupinus latifolius</i> Dwarf-shrubland	G4?/S4	CEGL001406
<i>Phyllodoce empetriformis</i> / <i>Vaccinium deliciosum</i> Dwarf-shrubland	G4/S4	CEGL001407
<i>Phyllodoce empetriformis</i> Parkland Dwarf-shrubland	G5/SNA	CEGL001404
<i>Phyllodoce glanduliflora</i> / <i>Oreostemma alpigenum</i> Dwarf-shrubland	G3G4/S3S4	CEGL001408
<i>Salix cascadenis</i> / <i>Festuca brachyphylla</i> Dwarf-shrubland	G3G4/S3S4	CEGL001433
<i>Salix nivalis</i> / <i>Festuca brachyphylla</i> Dwarf-shrubland	G3G4/S3S4	CEGL001434
<i>Tauschia stricklandii</i> - <i>Vaccinium deliciosum</i> Herbaceous Vegetation	G2/S2	CEGL001994
<i>Vaccinium deliciosum</i> Parkland Dwarf-shrubland	G4G5/S4S5	CEGL001427
<i>Vaccinium membranaceum</i> - <i>Vaccinium deliciosum</i> Dwarf-shrubland	G4?Q/S4?	CEGL001428

## ENVIRONMENT & DYNAMICS

**Environmental Description:** This tundra group occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest coast north to southeastern, maritime Alaska primarily on alpine and subalpine sites, but it can also be found at lower elevations (e.g., Kenai Fjords and Prince William Sound). It occurs above 2350 m (7200 feet) in the Klamath Mountains and Cascade Range north into the Cascade and Coastal mountains of British Columbia where it is confined to the coldest, wind-blown areas above treeline and above the subalpine parkland. It occurs on slopes and depressions where snow lingers, the soil has become relatively stabilized, and the water supply is more or less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. In Alaska, stands occur on sideslopes, shoulder slopes, and low summits, and the terrain varies from gently sloping to steep. This group also includes sparsely vegetated alpine stands that occur on exposed summits, windswept ridges, and fell-fields. These sites are characterized by harsh environmental conditions. Slopes vary from moderately sloped to flat.

### Dynamics:

## DISTRIBUTION

**Geographic Range:** This alpine group occurs in the mountains of the Pacific Northwest coast north to southeastern, maritime Alaska primarily on alpine and subalpine sites, but it can also be found at lower elevations (e.g., Kenai Fjords and Prince William Sound).

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 3:C, 69:C, 70:C, 81:C

**USFS Ecoregions (2007):** M242A:CC, M242B:CC, M242C:CC, M242D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

## SYNONYMY

- < AM Alpine Meadow (Ecosystems Working Group 1998)
- < AT Alpine Tundra (Ecosystems Working Group 1998)
- >< II.D.2.d - Mountain-heath tundra (Vioreck et al. 1992)
- >< II.D.2.e - Cassiope tundra (Vioreck et al. 1992)
- >< III.B.2.a - Mixed herbs (Vioreck et al. 1992)

## LOWER LEVEL UNITS

### Alliances:

- A3334 *Phyllodoce aleutica* - *Harrimanella stelleriana* Dwarf-shrubland Alliance
- A3332 *Salix cascadiensis* - *Salix nivalis* - *Salix reticulata* Dwarf-shrubland Alliance
- A3330 *Vaccinium caespitosum* - *Vaccinium membranaceum* - *Vaccinium scoparium* Cascadian Dwarf-shrubland Alliance
- A4086 *Arctostaphylos uva-ursi* Cascadian Dwarf-shrubland Alliance
- A3335 *Dryas drummondii* - *Dryas integrifolia* Dwarf-shrubland Alliance
- A3333 *Salix rotundifolia* - *Salix setchelliana* Dwarf-shrubland Alliance
- A1577 *Dryas octopetala* Dwarf-shrub Herbaceous Alliance
- A1078 *Empetrum nigrum* Dwarf-shrubland Alliance
- A3331 *Phyllodoce empetriformis* - *Cassiope mertensiana* - *Vaccinium deliciosum* Dwarf-shrubland Alliance

## AUTHORSHIP

**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2011)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2010/12/17

## REFERENCES

**References:** BCMF 2006, Billings 2000, Boggs et al. 2008a, Boggs et al. 2008b, DeVelice et al. 1999, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Vioreck et al. 1992

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4. Polar & High Montane Scrub, Grassland & Barrens  
 4.B.1.Nb. Western North American Alpine Dwarf-Shrub & Grassland  
 M101. Vancouverian Alpine Scrub, Forb Meadow & Grassland

**G319. North Pacific Alpine-Subalpine Bedrock & Scree [Proposed]****Type Concept Sentence:****OVERVIEW**

**Scientific Name:** *Racomitrium* spp. - *Stereocaulon* spp. - *Phlox* spp. North Pacific Alpine-Subalpine Bedrock, Scree & Rock Crevice Group

**Common Name (Translated Scientific Name):** Racomitrium Moss species - Snow Lichen species - Phlox species North Pacific Alpine-Subalpine Bedrock, Scree & Rock Crevice Group

**Type Concept:** This group consists of exposed rock and rubble above the forestline (subalpine parkland and above) in the North Pacific mountain ranges and is restricted to the highest elevations in the Cascade Range, from southwestern British Columbia south into northern California, and also north into southeastern Alaska. It is composed of barren and sparsely vegetated alpine substrates, typically including bedrock outcrops, scree slopes, rock crevices, upper mountain slopes, summits and nunataks. Species composition is variable and may include *Artemisia arctica*, *Astragalus alpinus*, *Carex microchaeta*, *Carex* spp., *Minuartia arctica*, *Paxistima myrsinites*, *Saxifraga* spp., *Lomatium* spp., *Luina hypoleuca*, *Phlox* spp., *Salix rotundifolia*, *Saxifraga sibirica* (= *Saxifraga bracteata*), *Saxifraga bronchialis*, *Sibbaldia procumbens*, and *Silene acaulis*. Nonvascular (lichen)-dominated communities are common. Common nonvascular genera include *Racomitrium* and *Stereocaulon*. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. In Alaska, this group usually occurs above alpine dwarf-shrub, herbaceous meadow, and dwarf-shrub-herbaceous systems typically at elevations higher than 915 m (3000 feet) (possibly higher in southeastern Alaska). There can be sparse cover of forbs, grasses, lichens, shrubs and small trees, but the total vascular plant cover is typically less than 25% due to the high cover of exposed rock.

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

- G571 Rocky Mountain & Sierran Alpine Bedrock & Scree: occurs in the Rocky Mountains.
- G318 North Vancouverian Montane Massive Bedrock, Cliff & Talus: occurs below upper treeline in montane elevations.
- G565 Rocky Mountain Cliff, Scree & Rock Vegetation: occurs below upper treeline at montane elevations in the Rocky Mountains.

**Diagnostic Characteristics:****VEGETATION**

**Physiognomy and Structure:** Nonvascular-dominated rocks and vascular-dominated scree and rock crevices above treeline in the Pacific Northwest.

**Floristics:** There can be sparse cover of forbs, grasses, lichens, shrubs and small trees, but the total vascular plant cover is typically less than 25% due to the high cover of exposed rock. Species composition is variable and may include *Artemisia arctica*, *Astragalus alpinus*, *Carex microchaeta*, *Carex* spp., *Lomatium* spp., *Luina hypoleuca*, *Minuartia arctica*, *Paxistima myrsinites*, *Phlox* spp., *Salix rotundifolia*, *Saxifraga bronchialis*, *Saxifraga sibirica* (= *Saxifraga bracteata*), *Sibbaldia procumbens*, and *Silene acaulis*. Common nonvascular genera include *Racomitrium* and *Stereocaulon*. Floristic information compiled from Meidinger and Pojar (1991) and Viereck et al. (1992).

**No Associations identified yet for Washington.****ENVIRONMENT & DYNAMICS**

**Environmental Description:** *Soil/substrate/hydrology:* It is composed of barren and sparsely vegetated alpine substrates, typically including bedrock outcrops, scree slopes, rock crevices, upper mountain slopes, summits and nunataks. Nonvascular (lichen)-dominated communities are common. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. Environmental information compiled from Meidinger and Pojar (1991) and Viereck et al. (1992).

**Dynamics:****DISTRIBUTION**

**Geographic Range:** This group is restricted to the highest elevations in the North Pacific ranges, from southeastern Alaska south into northern Oregon.

**Nations:** CA, US



WA groups

**States/Provinces:** AK, BC, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:C, 4:P, 69:C, 70:C, 81:C

**USFS Ecoregions (2007):** 342I:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Proposed.

#### SYNONYMY

- = AN Alpine Sparsely Vegetated (Ecosystems Working Group 1998)

#### LOWER LEVEL UNITS

##### Alliances:

- A3781 *Paxistima myrsinites* - *Saxifraga* spp. - *Luina hypoleuca* Rock Crevice Alliance
- A3780 *Phlox* spp. - *Lomatium* spp. - *Carex* spp. Talus & Scree Sparse Alliance
- A4087 *Rhizocarpon geographicum* Sparsely Vegetated Nonvascular Alliance

#### AUTHORSHIP

**Primary Concept Source:** R. Crawford, M.S. Reid et al., in Faber-Langendoen et al. (2011)

**Author of Description:** R. Crawford, M.S. Reid, C. Chappell, T. Boucher, G. Kittel

**Acknowledgments:**

**Version Date:** 2015/05/20

#### REFERENCES

**References:** Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Meidinger and Pojar 1991, Viereck et al. 1992

## G320. North Pacific Alpine-Subalpine Turf & Herbaceous Meadow [Proposed]

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Carex macrochaeta* - *Carex spectabilis* - *Phlox diffusa* ssp. *longistylis* Alpine-Subalpine Turf & Herbaceous Meadow Group

**Common Name (Translated Scientific Name):** Longawn Sedge - Showy Sedge - Spreading Phlox Alpine-Subalpine Turf & Herbaceous Meadow Group

**Type Concept:** This mesic alpine and subalpine herbaceous meadow group occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest coast and extends north to maritime and boreal transition regions of Alaska where it is found on mountain sideslopes. Stands occur above 2350 m (7200 feet) elevation in the Klamath Mountains and Cascade Range north into the Cascade and Coastal mountains of British Columbia where it is confined to the coldest, wind-blown areas above treeline and above the subalpine parkland. The slope shape is usually straight to concave (depressions) where snow lingers, the soil has become relatively stabilized, and the water supply is more-or-less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. The substrate is colluvium, residuum, or glacial till. The vegetation is characterized by a moderately dense to dense herbaceous layer, often composed of a mixture of graminoids such as *Calamagrostis canadensis* (often present but not dominant), *Carex breweri*, *Carex capitata*, *Carex macrochaeta*, *Carex nardina*, *Carex proposita*, *Carex spectabilis*, *Festuca brachyphylla*, *Festuca roemerii*, and forbs such as *Arenaria capillaris*, *Aconitum delphinifolium*, *Anemone narcissiflora*, *Artemisia arctica*, *Athyrium filix-femina*, *Castilleja unalaschcensis*, *Chamerion* spp., *Eriogonum pyrolifolium*, *Fritillaria camschatcensis*, *Geranium erianthum*, *Lupinus* spp., *Nephrophyllidium crista-galli*, *Packera cana*, *Pedicularis contorta*, *Phlox diffusa*, *Polemonium acutiflorum*, *Polygonum bistortoides*, *Sanguisorba canadensis*, *Saxifraga tolmiei*, *Senecio triangularis*, *Valeriana sitchensis*, and *Veratrum viride*. Some stands have an open herbaceous layer. Scattered dwarf-shrubs may be present with low cover. The dominant disturbances are snow avalanche, soil creep and freeze-thaw action.

**Classification Comments:**

**Internal Comments:** mjr 10-12: CA added based on member association distribution.

**Other Comments:**

**Similar NVC Types:**

- G271 Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow
- G520 Vancouverian & Rocky Mountain Subalpine & Alpine Snowbed, Wet Meadow & Dwarf-Shrubland

WA groups

- G314 Rocky Mountain & Sierran Alpine Turf & Fell-Field
- G317 North Pacific Alpine-Subalpine Dwarf-Shrubland & Heath
- G316 Rocky Mountain & Sierran Alpine Dwarf-Shrubland

**Diagnostic Characteristics:** The group is characterized by a moderately dense to dense herbaceous layer, often composed of a mixture of mesic to wet alpine and subalpine graminoids and forbs from the Pacific Northwest and Alaska.

**VEGETATION**

**Physiognomy and Structure:** The group is characterized by a moderately dense to dense herbaceous layer, often composed of a mixture perennial graminoids and forbs.

**Floristics:** The vegetation is characterized by a moderately dense to dense herbaceous layer, often composed of a mixture of graminoids such as *Calamagrostis canadensis* (often present but not dominant), *Carex breweri*, *Carex capitata*, *Carex macrochaeta*, *Carex nardina*, *Carex proposita*, *Carex spectabilis*, *Festuca brachyphylla*, *Festuca roemeri*, and forbs such as *Arenaria capillaris*, *Aconitum delphinifolium*, *Anemone narcissiflora*, *Artemisia arctica*, *Athyrium filix-femina*, *Castilleja unalaschcensis*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Chamerion latifolium*, *Eriogonum pyrolifolium*, *Fritillaria camschatcensis*, *Geranium erianthum*, *Lupinus arcticus*, *Lupinus nootkatensis*, *Lupinus sellulus*, *Nephrophyllidium crista-galli*, *Packera cana*, *Pedicularis contorta*, *Phlox diffusa*, *Polemonium acutiflorum*, *Polygonum bistortoides*, *Sanguisorba canadensis*, *Saxifraga tolmiei*, *Senecio triangularis*, *Valeriana sitchensis*, and *Veratrum viride*. Overall species composition is diverse, and species richness is often very high; typically no single species is dominant. However, some stands have a more open herbaceous layer. Scattered dwarf-shrubs may be present with low cover such as *Cassiope mertensiana*, *Phyllodoce empetriformis*, *Phyllodoce glanduliflora*, and *Luetkea pectinata*. Floristic information was compiled from Franklin and Dyrness (1973), Viereck et al. (1992), DeVelice et al. (1999), Billings (2000), and Boggs et al. (2008a).

<b>G320 North Pacific Alpine-Subalpine Turf &amp; Herbaceous Meadow Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Antennaria lanata</i> Herbaceous Vegetation	G4/S4	CEGL001949
<i>Calamagrostis purpurascens</i> Herbaceous Vegetation	G2/S2	CEGL001850
<i>Carex breweri</i> Herbaceous Vegetation	G3?/S3?	CEGL001805
<i>Carex capitata</i> Herbaceous Vegetation	G3?/S3?	CEGL001807
<i>Carex nardina</i> Scree Herbaceous Vegetation	GNR/SNR	CEGL001812
<i>Carex proposita</i> Herbaceous Vegetation	G3?/S1	CEGL001859
<i>Carex scirpoidea ssp. pseudoscirpoidea</i> Herbaceous Vegetation	G3?/S2	CEGL001865
<i>Carex spectabilis</i> - <i>Polygonum bistortoides</i> Herbaceous Vegetation	G4/S4	CEGL001828
<i>Carex spectabilis</i> - <i>Carex nigricans</i> - ( <i>Potentilla flabellifolia</i> ) Herbaceous Vegetation	G4Q/S4	CEGL001829
<i>Carex spectabilis</i> Herbaceous Vegetation	G5/S4S5	CEGL001827
<i>Erigeron aureus</i> - <i>Lupinus sellulus var. lobbii</i> Herbaceous Vegetation	G3G4/S3S4	CEGL001961
<i>Eriogonum pyrolifolium</i> - <i>Luzula piperi</i> Herbaceous Vegetation	G4/S4	CEGL001963
<i>Festuca brachyphylla</i> Herbaceous Vegetation	G4?/SNR	CEGL001797
<i>Festuca roemeri</i> - <i>Delphinium glareosum</i> Herbaceous Vegetation	G2/S2	CEGL001613
<i>Festuca roemeri</i> - <i>Phlox diffusa ssp. longistylis</i> Herbaceous Vegetation	G2/S2	CEGL001622
<i>Luetkea pectinata</i> - <i>Saxifraga tolmiei</i> Herbaceous Vegetation	G5/S4	CEGL001918
<i>Lupinus arcticus ssp. subalpinus</i> - <i>Carex spectabilis</i> Herbaceous Vegetation	G4/S4	CEGL001973
<i>Minuartia obtusiloba</i> - <i>Lupinus sellulus var. lobbii</i> Herbaceous Vegetation	G3G4/S3S4	CEGL001952
<i>Pedicularis contorta</i> - <i>Carex spectabilis</i> Herbaceous Vegetation	G3?/S3?	CEGL001977
<i>Phlox diffusa ssp. longistylis</i> - <i>Arenaria capillaris</i> Herbaceous Vegetation	G3?/S3?	CEGL001978
<i>Phlox diffusa ssp. longistylis</i> - <i>Carex spectabilis</i> Herbaceous Vegetation	GNR/S3?	CEGL001979
<i>Saxifraga tolmiei</i> - <i>Luzula piperi</i> Herbaceous Vegetation	G4/S4	CEGL001986

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** This mesic alpine and subalpine herbaceous meadow group occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest coast and extends north to maritime and boreal transition regions of Alaska where it is found on mountain sideslopes. Stands occur above 2350 m (7200 feet) elevation in the Klamath Mountains and Cascade Range north into the Cascade and Coastal mountains of British Columbia where they are confined to the coldest, wind-blown areas above treeline and above the subalpine parkland. The slope shape is usually straight to concave (depressions) where snow lingers, the soil has become relatively stabilized, and the water supply is more-or-less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. The substrate is colluvium, residuum, or glacial till.

**Dynamics:** The dominant disturbances are snow avalanche, soil creep and freeze-thaw action.

**DISTRIBUTION**

**Geographic Range:** This mesic alpine and subalpine herbaceous meadow group occurs in the mountains of the Pacific Northwest coast and extends north to maritime and boreal transition regions of Alaska and from Kodiak Island through southeastern Alaska.

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 3:C, 69:C, 70:C, 71:C, 72:C, 74:C, 76:C, 81:C

**USFS Ecoregions (2007):** M242A:CC, M242B:CC, M242C:CC, M242D:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Glacier Bay); USFS (Chugach)

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Proposed.

**SYNONYMY**

- >< AM Alpine Meadow (Ecosystems Working Group 1998)
- >< AT Alpine Tundra (Ecosystems Working Group 1998)
- >< Alpine Idaho Fescue (108) (Shiflet 1994)
- >< III.A.2.f - Mesic sedge-herb meadow tundra (Viereck et al. 1992)
- >< III.B.2.a - Mixed herbs (Viereck et al. 1992)
- ? Mesic Forb Alpine (Boggs et al. 2008a)

**LOWER LEVEL UNITS****Alliances:**

- A3336 *Eriogonum* spp. - *Luzula* spp. Snowbed Alliance
- A3338 *Minuartia obtusiloba* - *Lupinus sellulus* var. *lobbii* Cascade Fell-field Alliance
- A3337 *Festuca brachyphylla* - *Festuca roemeri* - *Festuca saximontana* Alpine Meadow Alliance
- A1300 *Carex spectabilis* Subalpine Meadow Alliance
- A1640 *Antennaria lanata* - *Juncus parryi* Herbaceous Meadow Alliance

**AUTHORSHIP**

**Primary Concept Source:** K.A. Schulz, in Faber-Langendoen et al. (2011)

**Author of Description:** K.A. Schulz

**Acknowledgments:**

**Version Date:** 2010/12/17

**REFERENCES**

**References:** BCMF 2006, Billings 2000, Boggs et al. 2008a, DeVelice et al. 1999, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Franklin and Dyrness 1973, Shiflet 1994, Viereck et al. 1992

## 5. AQUATIC VEGETATION

Open freshwater and saltwater wetlands dominated by aquatic vegetation, either rooted with leaves rising up to or near the surface, or floating freely on the water surface. Stands typically have surface water, generally up to 2 m in depth, along ocean, lake, pond, and river margins in non-tidal, tidal and intertidal habitats.

## 5.A. Saltwater Aquatic Vegetation

Saltwater Aquatic Vegetation occurs in shallow to deep saline habitats where emergent vegetation is <10% cover, and submerged or floating aquatic plants have >1% cover, occurring around the globe from the equator to the polar regions.

### 5.A.2. Benthic Macroalgae Saltwater Vegetation

The vegetation includes subtidal or intertidal bottoms and other areas dominated by attached macroalgae, including kelp, intertidal furoids, and calcareous algae, which are usually submersed within or extend to the surface of the water column, though they may be exposed during low tides.

#### 5.A.2.Wb. Temperate Intertidal Shore

5. Aquatic Vegetation

5.A.2.Wb. Temperate Intertidal Shore

#### M106. Temperate Pacific Seaweed Intertidal Vegetation

**Type Concept Sentence:** This macrogroup is of marine algae living on tidal flats and rocky areas in the near-shore intertidal zone of the temperate North America Pacific Coast. Some dominant species include *Enteromorpha* spp., *Fucus distichus*, *Postelsia palmiformis*, and *Vaucheria longicaulis*.

##### OVERVIEW

**Scientific Name:** Temperate Pacific Seaweed Intertidal Vegetation Macrogroup

**Common Name (Translated Scientific Name):** Temperate Pacific Seaweed Intertidal Vegetation Macrogroup

**Type Concept:** This macrogroup consists of algal communities on coastal flats and intertidal rocky zones found along the north Pacific Coast from Kodiak Island and Cook Inlet, Alaska, south to central California. Dominant species include *Enteromorpha* spp., *Fucus distichus*, *Postelsia palmiformis*, and *Vaucheria longicaulis*. Habitats are tidal flats of mud or gravel, rocky intertidal pools and reefs. These habitats are exposed and inundated daily and sometimes twice daily.

**Classification Comments:**

**Similar NVC Types:**

- M184 Temperate Pacific Seagrass Intertidal Vascular Vegetation

**Diagnostic Characteristics:** Tidal surfaces with algal communities exposed daily at low tide.

##### VEGETATION

**Physiognomy and Structure:** Saltwater algae-dominated areas within the intertidal zone.

**Floristics:** Characteristic species include *Enteromorpha* spp., *Fucus distichus*, *Postelsia palmiformis*, and *Vaucheria longicaulis*. Floristic information compiled in part from Viereck et al. (1992), Holland and Keil (1995), and Boggs (2002).

##### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Soil/substrate/hydrology:* Tidal flats of mud and gravel or rocky substrates. Tidal flats form a narrow band along oceanic inlets and are more extensive at the mouths of larger rivers. Tidal inundation of salt or brackish water and exposure occurs daily (in some cases twice daily). Environmental information compiled in part from Viereck et al. (1992), Holland and Keil (1995), and Boggs (2002).

**Dynamics:** The near-shore intertidal zone is exposed daily at low tide. Depth and extent of inundation may be changed by tectonic uplift or subsidence, or by significant sedimentation.

##### DISTRIBUTION

**Geographic Range:** This macrogroup is found along the north Pacific Coast from Kodiak Island and Cook Inlet, Alaska, south to central California.

**Spatial Scale & Pattern [optional]:**

**Nations:** CA, US

WA groups

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 242A:CC, 261B:CC, 263A:CC, M242A:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

#### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** Moderate.

#### SYNONYMY

- >> III.B.3.d - Halophytic herb wet meadow (Viereck et al. 1992)
- >> III.D.2.a - Four-leaf marestail (Viereck et al. 1992)

#### LOWER LEVEL UNITS

**Groups:**

- G385 North American Pacific Intertidal Algal Flat

#### AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** K. Boggs and G. Kittel, mod. M.S. Reid

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK/MSR 10-14

#### REFERENCES

**References:** Boggs 2002, Comer et al. 2003, Faber-Langendoen et al. 2015, Holland and Keil 1995, Viereck et al. 1992

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5. Aquatic Vegetation

5.A.2.Wb. Temperate Intertidal Shore

M106. Temperate Pacific Seaweed Intertidal Vegetation

### G385. North American Pacific Intertidal Algal Flat [Proposed]

**Type Concept Sentence:**

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#### OVERVIEW

**Scientific Name:** *Vaucheria longicaulis* - *Enteromorpha* spp. North American Intertidal Algal Flat Group

**Common Name (Translated Scientific Name):** *Vaucheria* Marine Alga - Sea-lettuce species North American Intertidal Algal Flat Group

**Type Concept:** This group consists of algal communities on coastal flats found along the north Pacific Coast from Kodiak Island and Cook Inlet, Alaska, south to central California. Tidal flats form a narrow band along oceanic inlets and are more extensive at the mouths of larger rivers. Algae are the dominant vegetation on mud or gravel flats where little vascular vegetation is present due to the daily (in some cases twice daily) tidal flooding of salt or brackish water. Characteristic species include *Vaucheria longicaulis* and *Enteromorpha* spp. Vascular species are sparse, if present, and may include salt-tolerant species such as *Eleocharis palustris*, *Salicornia* spp., *Plantago maritima*, *Glaux maritima*, and other plants common to lower salt marshes; cover is less than 10%. The dominant processes are tectonic uplift or subsidence, isostatic rebound, and sediment deposition.

**Classification Comments:**

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G525 Temperate Pacific Freshwater Wet Mudflat: is not in the intertidal zone and is freshwater only.

**Diagnostic Characteristics:** Tidal mudflats with algal communities exposed daily at low tide.

#### VEGETATION

**Physiognomy and Structure:** Saltwater algae flats in the inter tidal zone.

**Floristics:** Characteristic species include *Vaucheria longicaulis* and *Enteromorpha* spp. Vascular species are sparse, if present, and may include salt-tolerant species such as *Eleocharis palustris*, *Salicornia* spp., *Plantago maritima*, *Glaux maritima*, and other plants common to lower salt marshes; cover is less than 10%. Floristic information compiled in part from Viereck et al. (1992), Holland and Keil (1995), and Boggs (2002).

**No Associations identified yet for Washington.**

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** *Soil/substrate/hydrology:* Tidal flats form a narrow band along oceanic inlets and are more extensive at the mouths of larger rivers. Algae are the dominant vegetation on mud or gravel flats where little vascular vegetation is present due to the daily (in some cases twice daily) tidal flooding of salt or brackish water. Environmental information compiled in part from Viereck et al. (1992), Holland and Keil (1995), and Boggs (2002).

**Dynamics:** Exposed daily at low tide.

**DISTRIBUTION**

**Geographic Range:** This group is found along the north Pacific Coast from Kodiak Island and Cook Inlet, Alaska, south to central California.

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 69:C, 70:C, 71:C

**USFS Ecoregions (2007):** 242A:CC, 261B:CC, 263A:CC, M242A:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Proposed.

**SYNONYMY**

- > III.B.3.d - Halophytic herb wet meadow (Viereck et al. 1992)
- > III.D.2.a - Four-leaf marestalk (Viereck et al. 1992)

**LOWER LEVEL UNITS**

**Alliances:**

**AUTHORSHIP**

**Primary Concept Source:** K. Boggs and G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** K. Boggs and G. Kittel, mod. M.S. Reid

**Acknowledgments:**

**Version Date:** 2011/01/03

**REFERENCES**

**References:** Boggs 2002, Comer et al. 2003, Faber-Langendoen et al. 2015, Holland and Keil 1995, Viereck et al. 1992

## 5.A.3. Benthic Vascular Saltwater Vegetation

The vegetation includes subtidal or intertidal bottoms of rooted vascular vegetation beds commonly dominated by any number of seagrass or eelgrass species, including species of *Cymodocea*, *Halodule*, *Thalassia*, *Halophila*, *Vallisneria*, *Ruppia*, *Phyllospadix*, and *Zostera*, and which are usually submersed in the water column or floating on the surface, or exposed during low tides.

### 5.A.3.We. Temperate Seagrass Aquatic Vegetation

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5. Aquatic Vegetation

5.A.3.We. Temperate Seagrass Aquatic Vegetation

## M184. Temperate Pacific Seagrass Intertidal Vascular Vegetation

**Type Concept Sentence:** This macrogroup contains the sub-tidal and intertidal zones of temperate North America Pacific Coast dominated by seagrass and surfgrass and other vascular species, including *Zostera marina* and *Phyllospadix scouleri*.

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## OVERVIEW

**Scientific Name:** Temperate Pacific Seagrass Intertidal Vascular Vegetation Macrogroup

**Common Name (Translated Scientific Name):** Temperate Pacific Seagrass Intertidal Vascular Vegetation Macrogroup

**Type Concept:** This macrogroup consists of marine near-shore intertidal beds dominated marine aquatic angiosperms. Beds are dominated by *Zostera marina* (= *Zostera pacifica*) and *Phyllospadix scouleri*. They occur throughout intertidal zones with clear water along the temperate North American Pacific Coast, from Baja California north to Bristol Bay, Alaska. Stands occur in subtidal zones that are never exposed, as well as intertidal zones exposed to air.

**Classification Comments:** This macrogroup includes only vascular marine plants.

### Similar NVC Types:

- M106 Temperate Pacific Seaweed Intertidal Vegetation: includes intertidal algae-dominated areas.
- M109 Western North American Freshwater Aquatic Vegetation

**Diagnostic Characteristics:** North American Pacific near-shore marine aquatic vascular herbaceous vegetation.

## VEGETATION

**Physiognomy and Structure:** Saltwater aquatic herbs in the near-shore shallow environment.

**Floristics:** Beds are dominated by *Zostera marina* (= *Zostera pacifica*) and *Phyllospadix scouleri*. Description is based on Barbour and Major (1988), Viereck et al. (1992), Holland and Keil (1995), and Boggs (2002).

## ENVIRONMENT & DYNAMICS

**Environmental Description:** *Soil/substrate/hydrology:* This macrogroup is found in intertidal zones with clear water in bays, inlets and lagoons. Subtidal portions are never exposed, while intertidal areas support species that can tolerate exposure to the air. Common substrates include marine silts. Stands occur in the subtidal/lower intertidal where the water is clear most of the time to allow for photosynthesis. Description combined from Barbour and Major (1988), Viereck et al. (1992), Holland and Keil (1995), and Boggs (2002).

### Dynamics:

## DISTRIBUTION

**Geographic Range:** This macrogroup is found in along the temperate North America Pacific Coast, from Baja California, Mexico, north through California, Oregon, Washington, British Columbia and north into the Gulf of Alaska, Cook Inlet, and Bristol Bay coasts.

### Spatial Scale & Pattern [optional]:

**Nations:** CA, MX, US

**States/Provinces:** AK, BC, CA, MXBC, OR, WA

**TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 242A:CC, 261B:CC, 263A:CC, M242A:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

## CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

## SYNONYMY

- = III.D.3.a - Eelgrass (Viereck et al. 1992)

## LOWER LEVEL UNITS

### Groups:

- G373 Temperate Pacific Seagrass

## AUTHORSHIP

**Primary Concept Source:** Faber-Langendoen et al. (2014)

**Author of Description:** P. Comer, G. Kittel, K. Boggs, T. Keeler-Wolf

**Acknowledgments:**

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 10-14

## REFERENCES

**References:** Barbour and Major 1988, Boggs 2002, Den Hartog 2003, Faber-Langendoen et al. 2015, Holland and Keil 1995, Viereck et al. 1992

5. Aquatic Vegetation

5.A.3.We. Temperate Seagrass Aquatic Vegetation

M184. Temperate Pacific Seagrass Intertidal Vascular Vegetation

### G373. Temperate Pacific Seagrass [Proposed]

**Type Concept Sentence:**

#### OVERVIEW

**Scientific Name:** *Zostera* spp. - *Phyllospadix* spp. Temperate Pacific Seagrass Group

**Common Name (Translated Scientific Name):** Eelgrass species - Surfgrass species Temperate Pacific Seagrass Group

**Type Concept:** This group consists of marine near-shore beds dominated by macrophytic algae and marine aquatic angiosperms. They are found throughout intertidal zones with clear water in bays, inlets and lagoons in the coastal areas of the North Pacific Coast, from California north through Oregon, Washington, British Columbia and north into the Gulf of Alaska, Cook Inlet, and Bristol Bay coasts. Subtidal portions are never exposed, while intertidal areas support species that can tolerate exposure to the air. Common substrates include marine silts, but may also include exposed bedrock and cobble, where many algal species become attached with holdfasts. Stands occur in the subtidal/lower intertidal where the water is clear most of the time to allow for photosynthesis. Substrate is usually marine silts but may be cobble. Beds are dominated by *Zostera marina* (= *Zostera pacifica*), *Phyllospadix scouleri*, *Fucus distichus*, *Postelsia palmiformis*, and a host of green and brown algae. Adjacent subtidal zones, where rocky substrates are common, support undersea kelp "forest."

**Classification Comments:**

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G381 Other Temperate Eel-grass Bed: is found along the Atlantic Coast.
- G380 North Atlantic Seagrass: is very similar but on the Atlantic Coast.

**Diagnostic Characteristics:** North American Pacific near-shore marine aquatic herbaceous vegetation.

#### VEGETATION

**Physiognomy and Structure:** Saltwater aquatic herbs in the near-shore shallow environment.

**Floristics:** Beds are dominated by *Zostera marina* (= *Zostera pacifica*), *Phyllospadix scouleri*, *Fucus distichus*, *Postelsia palmiformis*, and a host of green and brown algae. Adjacent subtidal zones, where rocky substrates are common, support undersea kelp "forest." Description combined from Barbour and Major (1988), Viereck et al. (1992), Holland and Keil (1995), and Boggs (2002).

G373 Temperate Pacific Seagrass Group [Proposed]	Global/ State Rank	NatureServe/ WANHP Code
<i>Zostera marina</i> Pacific Coast Vegetation	GNR/SNR	CWWA000423

#### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Soil/substrate/hydrology:* This group is found in intertidal zones with clear water in bays, inlets and lagoons. Subtidal portions are never exposed, while intertidal areas support species that can tolerate exposure to the air. Common substrates include marine silts, but may also include exposed bedrock and cobble, where many algal species become attached with holdfasts. Stands occur in the subtidal/lower intertidal where the water is clear most of the time to allow for photosynthesis. Description combined from Barbour and Major (1988), Viereck et al. (1992), Holland and Keil (1995), and Boggs (2002).

**Dynamics:**



**DISTRIBUTION**

**Geographic Range:** This group is found throughout intertidal zones with clear water in bays, inlets and lagoons in the coastal areas of the North Pacific Coast, from California north through Oregon, Washington, British Columbia and north into the Gulf of Alaska, Cook Inlet, and Bristol Bay coasts.

**Nations:** CA, MX, US

**States/Provinces:** AK, BC, CA, MXBC, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 14:C, 15:C, 16:C, 69:C, 70:C, 71:C, 74:C

**USFS Ecoregions (2007):** 242A:CC, 261B:CC, 263A:CC, M242A:CC

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Proposed.

**SYNONYMY**

- = III.D.3.a - Eelgrass (Viereck et al. 1992)

**LOWER LEVEL UNITS**

**Alliances:**

**AUTHORSHIP**

**Primary Concept Source:** C. Den Hartog (2003)

**Author of Description:** P. Comer, G. Kittel, K. Boggs, T. Keeler-Wolf

**Acknowledgments:**

**Version Date:** 2010/12/21

**REFERENCES**

**References:** Barbour and Major 1988, Boggs 2002, Den Hartog 2003, Faber-Langendoen et al. 2015, Holland and Keil 1995, Viereck et al. 1992

## 5.B. Freshwater Aquatic Vegetation

Freshwater Aquatic Vegetation occurs in shallow to deep freshwater habitats where emergent vegetation is <10% cover, and submerged or floating aquatic plants have >1% cover, occurring around the globe from the equator to the polar regions.

### 5.B.2. Temperate & Boreal Freshwater Aquatic Vegetation

Temperate & Boreal Freshwater Aquatic Vegetation occurs in shallow to deep freshwater habitats (e.g., lakes, ponds, canals, streams, rivers, and freshwater portions of estuaries) where emergent vegetation is <10% cover, and submerged or floating aquatic plants have >1% cover, occurring around the globe in both hemispheres, from the tropics north and south to the polar regions.

#### 5.B.2.Na. North American Freshwater Aquatic Vegetation

Floating-leaved and submergent aquatic vegetation found in permanently flooded but shallow freshwater sites across North America.

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5. Aquatic Vegetation

5.B.2.Na. North American Freshwater Aquatic Vegetation

### M109. Western North American Freshwater Aquatic Vegetation

**Type Concept Sentence:** This macrogroup consists of rooted and floating freshwater aquatic herbaceous vegetation dominated by western U.S. aquatic species *Azolla filiculoides*, *Azolla mexicana*, *Nuphar polysepala*, *Nymphaea tetragona*, *Stuckenia striata*, and several other cosmopolitan species, found throughout the temperate regions of western North America.

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**OVERVIEW**

**Scientific Name:** *Nuphar polysepala* - *Azolla filiculoides* - *Elodea nuttallii* Western North American Freshwater Aquatic Macrogroup  
**Common Name (Translated Scientific Name):** Rocky Mountain Pond-lily - Pacific Mosquito Fern - Western Waterweed Western North American Freshwater Aquatic Macrogroup

**Type Concept:** This macrogroup consists of rooted, floating, and submerged freshwater aquatic herbaceous vegetation found throughout the temperate regions of western North America. Their occurrence tends to be small-patch or linear in spatial pattern, confined to lakes, ponds, oxbows, and slow-moving portions of rivers and streams. In large bodies of water, they are usually restricted to the littoral region where penetration of light is the limiting factor for growth. A variety of rooted or floating aquatic herbaceous species may dominate, including (but not limited to) *Azolla filiculoides*, *Nuphar polysepala*, *Polygonum amphibium*, *Potamogeton foliosus*, *Potamogeton diversifolius*, *Potamogeton epihydrus*, *Potamogeton robbinsii*, *Ranunculus aquatilis*, *Ranunculus trichophyllus*, and *Wolffia* spp. Submerged vegetation, such as *Ceratophyllum demersum*, *Ceratophyllum echinatum*, *Elodea canadensis*, *Elodea nuttallii*, *Myriophyllum hippuroides*, and *Myriophyllum sibiricum*, is often present. These communities occur in water too deep for emergent vegetation. Species composition is often dominated by cosmopolitan species but many regionally characteristic species may also occur. Characteristic western U.S. species include *Azolla filiculoides*, *Azolla mexicana*, *Nuphar polysepala*, *Nymphaea tetragona*, and *Stuckenia striata*.

**Classification Comments:** Many dominant species are cosmopolitan; many species are regionally characteristic. The geographic split between eastern and western North America may be too arbitrary, and needs further review. These are open water wetlands with floating aquatic plants, and do *not* include the adjacent emergent marsh (*Scirpus*, *Schoenoplectus*, *Carex*, *Typha*, etc.). Characteristic western U.S. species include *Azolla filiculoides*, *Azolla mexicana*, *Nuphar polysepala*, *Nymphaea tetragona*, and *Stuckenia striata*. Presumably *Chara* spp. also belong in this type, as well as other macrogroups within the formation.

#### Similar NVC Types:

- M073 Vancouverian Lowland Wet Shrubland, Wet Meadow & Marsh: includes emergent vegetation, but not open-water rooted, floating and submerged aquatic vegetation.
- M184 Temperate Pacific Seagrass Intertidal Vascular Vegetation: includes aquatic marine saltwater vegetation.
- M401 North American Ruderal Aquatic Vegetation
- M108 Eastern North American Freshwater Aquatic Vegetation: includes aquatic floating and rooted vegetation found in lakes in eastern North America. Eastern U.S. species: *Alisma subcordatum*, *Azolla caroliniana* (and cosmopolitan), *Najas filifolia*, *Najas minor*, *Nuphar advena*, *Nymphaea odorata* (exotic in western U.S.), *Vallisneria americana*; east-central U.S.: *Cabomba caroliniana*, *Potamogeton tennesseensis*; northeastern and north-central U.S. and Canada: *Najas gracillima*, *Potamogeton bicupulatus*, *Potamogeton confervoides*, *Potamogeton hillii*, *Potamogeton oakesianus*, *Potamogeton obtusifolius*, *Potamogeton ogdenii*, *Potamogeton spirillus*, *Potamogeton strictifolius*, and *Potamogeton vaseyi*.

**Diagnostic Characteristics:** Open water with rooted or floating herbaceous aquatic vegetation dominated by western U.S. aquatic species *Azolla filiculoides*, *Azolla mexicana*, *Nuphar polysepala*, *Nymphaea tetragona*, *Stuckenia striata*, and several other cosmopolitan species.

## VEGETATION

**Physiognomy and Structure:** Rooted, floating, or submerged aquatic herbaceous vegetation.

**Floristics:** A variety of rooted, floating, or submerged aquatic herbaceous species may dominate, including western U.S. characteristic species such as *Azolla filiculoides*, *Azolla mexicana*, *Nuphar polysepala*, *Nymphaea tetragona*, and *Stuckenia striata*. Most common dominants found in western U.S. waterbodies include *Azolla filiculoides*, *Azolla mexicana*, *Bacopa eisenii*, *Brasenia schreberi*, *Callitriche heterophylla*, *Callitriche palustris*, *Ceratophyllum demersum*, *Elodea canadensis*, *Fontinalis antipyretica*, *Hippuris vulgaris*, *Isoetes bolanderi*, *Isoetes howellii*, *Isoetes nuttallii*, *Isoetes occidentalis*, *Isoetes tenella* (= *Isoetes echinospora*), *Lemna minor*, *Ludwigia palustris*, *Menyanthes trifoliata*, *Myriophyllum hippuroides*, *Myriophyllum sibiricum*, *Nuphar polysepala*, *Nymphaea odorata*, *Polygonum amphibium*, *Polygonum hydropiperoides*, *Potamogeton diversifolius*, *Potamogeton foliosus*, *Potamogeton natans*, *Potamogeton richardsonii*, *Ranunculus aquatilis*, *Ranunculus lobbii*, *Ranunculus trichophyllus*, *Sagittaria latifolia*, *Schoenoplectus subterminalis*, *Sparganium angustifolium*, *Sparganium eurycarpum*, *Stuckenia filiformis*, *Stuckenia striata*, *Utricularia macrorhiza*, *Utricularia minor*, *Utricularia ochroleuca*, *Wolffia borealis*, and *Wolffia columbiana*. These communities generally occur in water too deep for emergent vegetation. Floristic information compiled from Viereck et al. (1992), Holland and Keil (1995), Shephard (1995), Boggs (2000), and Boggs et al. (2008a).

## ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Temperate North America, west of the Great Plains. *Soil/substrate/hydrology:* Vegetation floating in freshwater is small-patch in size, confined to lakes, ponds, oxbows, and slow-moving portions of rivers and streams. In larger bodies of water, stands are usually restricted to the littoral region where penetration of light is the limiting factor for growth. Soils may be either mineral or organic, often with a mucky or mucky-mineral surface layer. Environmental information compiled from Viereck et al. (1992), Holland and Keil (1995), Shephard (1995), Boggs (2000), and Boggs et al. (2008a).

#### Dynamics:

**DISTRIBUTION**

**Geographic Range:** This macrogroup consists of freshwater aquatic herbaceous vegetation found throughout the temperate regions of western North America, from the Rocky Mountains, including New Mexico to Alberta, west to California and southern coastal Alaska.

**Spatial Scale & Pattern [optional]:**

**Nations:** CA, MX?, US

**States/Provinces:** AB?, AK, BC, CA, CO, ID, MT, NM, NV, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:C, 4:C, 5:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 13:C, 14:C, 15:C, 18:C, 20:C, 68:C, 69:C, 70:C, 71:C

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate. Easily recognizable in the field even though identification of taxa to species and subspecies can be difficult. However, it is strongly conceptual, has a wide geographic range, and diagnostic species may be difficult to distinguish from analogous type from eastern North America.

**SYNONYMY**

- < Freshwater Marshes: Open Water and Floating Island Zones (Mitsch and Gosselink 2000) [pp. 390-391]
- < III.D.1. - Freshwater aquatic herbaceous (Vioreck et al. 1992) [Alaska]
- < Shallow Waters (MacKenzie and Moran 2004) [British Columbia]

**LOWER LEVEL UNITS****Groups:**

- G544 Western North American Temperate Freshwater Aquatic Bed

**AUTHORSHIP**

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2014)

**Author of Description:** G. Kittel and D. Faber-Langendoen

**Acknowledgments:** Wetland and limnology scientists everywhere.

**Version Date:** 10/15/2014

**Classif Resp Region:** West

**Internal Author:** GK 4-11

**REFERENCES**

**References:** Boggs 2000, Boggs et al. 2008a, Christy 2004, Crowe et al. 2004, Faber-Langendoen et al. 2015, Holland and Keil 1995, Kunze 1994, MacKenzie and Moran 2004, Mitsch and Gosselink 2000, Sawyer et al. 2009, Shephard 1995, Shiflet 1994, Vioreck et al. 1992, Warner and Rubec 1997

5. Aquatic Vegetation

5.B.2.Na. North American Freshwater Aquatic Vegetation

M109. Western North American Freshwater Aquatic Vegetation

**G544. Western North American Temperate Freshwater Aquatic Bed**

**Type Concept Sentence:** This group consists of freshwater aquatic herbaceous vegetation found throughout the temperate regions of western North America. A variety of rooted or floating aquatic herbaceous species may dominate, including *Azolla* spp., *Nuphar polysepala*, *Polygonum* spp., *Potamogeton* spp., *Ranunculus* spp., and *Wolffia* spp. Submerged vegetation, such as *Myriophyllum* spp., *Ceratophyllum* spp., and *Elodea* spp., is often present.

**OVERVIEW**

**Scientific Name:** *Nuphar* spp. - *Potamogeton* spp. - *Lemna* spp. Freshwater Aquatic Group

**Common Name (Translated Scientific Name):** Pond-lily species - Pondweed species - Duckweed species Freshwater Aquatic Group

**Type Concept:** This group consists of freshwater aquatic herbaceous vegetation found throughout the temperate regions of western North America. Elevation ranges from near sea level to 2750 m (9000 feet). They generally do not tolerate freezing or drought. They are small patch in size, confined to lakes, ponds, oxbows, and slow-moving portions of rivers and streams that may become mudflats. These waterbodies may be part of large wetland complexes with emergent vegetation, shallow water pools, as well as large deep water areas. In large bodies of water, they are usually restricted to the littoral region where penetration of light is the limiting factor for growth. A variety of rooted or floating aquatic herbaceous species may dominate, including *Azolla* spp., *Nuphar*

*polysepala*, *Polygonum* spp., *Potamogeton* spp., *Ranunculus* spp., and *Wolffia* spp. Submerged vegetation, such as *Myriophyllum* spp., *Ceratophyllum* spp., and *Elodea* spp., is often present. These communities occur in water too deep for emergent vegetation, generally between 2-8 m depth.

**Classification Comments:** Shallow-water rooted aquatics that are found in marshes (amongst emergent vegetation) are part of Arid West Interior Freshwater Emergent Marsh Group (G531). How does this compare to eastern and arctic & boreal freshwater aquatic groups (G114 and G543)? Data from western U.S. ponds are needed for more details on community structure, dynamics and environmental parameters.

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G531 Arid West Interior Freshwater Emergent Marsh: includes shallow-water rooted aquatic vegetation that occurs adjacent and amongst emergent vegetation.
- G114 Eastern North American Freshwater Aquatic Vegetation: includes temperate aquatic beds east of the 100th meridian.
- G595 Eastern North American Ruderal Aquatic Vegetation

**Diagnostic Characteristics:** Aquatic vegetation floating or suspended in water column (macrophytes).

**VEGETATION**

**Physiognomy and Structure:** Aquatic herbaceous vegetation, floating, submerged, rooted and suspended.

**Floristics:** A variety of rooted or floating aquatic herbaceous species may dominate, including *Azolla* spp., *Nuphar polysepala*, *Polygonum* spp., *Potamogeton* spp., *Ranunculus* spp., and *Wolffia* spp. Submerged vegetation, such as *Myriophyllum* spp., *Ceratophyllum* spp., and *Elodea* spp., is often present. These communities occur in water too deep for emergent vegetation. Floristic information compiled from Viereck et al. (1992), Holland and Keil (1995), Shephard (1995), Boggs (2000), and Boggs et al. (2008a).

<b>G544 Western North American Temperate Freshwater Aquatic Bed Group</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Azolla</i> ( <i>filiculoides</i> , <i>mexicana</i> ) Herbaceous Vegetation	G4/S4	CEGL003017
<i>Brasenia schreberi</i> Western Herbaceous Vegetation	G4?/S3S4	CEGL005200
<i>Callitriche</i> ( <i>heterophylla</i> , <i>palustris</i> ) Herbaceous Vegetation	G4/S2	CEGL003301
<i>Ceratophyllum demersum</i> Western Herbaceous Vegetation	G5/S4S5	CEGL004017
<i>Elodea canadensis</i> Herbaceous Vegetation	G5/S4?	CEGL003303
<i>Fontinalis</i> ( <i>antipyretica</i> var. <i>antipyretica</i> , <i>antipyretica</i> var. <i>oregonensis</i> ) Nonvascular Vegetation	G4G5/S4	CEGL003304
<i>Hippuris vulgaris</i> Herbaceous Vegetation	G5/S2	CEGL003315
<i>Isoetes echinospora</i> - ( <i>Lobelia dortmanna</i> ) Herbaceous Vegetation	GNR/SNR	CWWA000425
<i>Lemna minor</i> Herbaceous Vegetation	G5/S5	CEGL003305
<i>Menyanthes trifoliata</i> Herbaceous Vegetation	G5/S4?	CEGL003410
<i>Myriophyllum hippuroides</i> Herbaceous Vegetation [Provisional]	G3/S2?	CEGL003331
<i>Myriophyllum sibiricum</i> Herbaceous Vegetation	GUQ/SNR	CEGL002000
<i>Nuphar lutea</i> ssp. <i>polysepala</i> Herbaceous Vegetation	G5/S4S5	CEGL002001
<i>Polygonum amphibium</i> Permanently Flooded Herbaceous Vegetation [Placeholder]	G5/S3?	CEGL002002
<i>Potamogeton</i> ( <i>foliosus</i> , <i>gramineus</i> ) - ( <i>Stuckenia filiformis</i> ) Herbaceous Vegetation	GNR/SNR	CWWA000418
<i>Potamogeton amplifolius</i> Herbaceous Vegetation	GNR/SNR	CWWA000390
<i>Potamogeton natans</i> Herbaceous Vegetation	G5?/S5	CEGL002925
<i>Ranunculus aquatilis</i> Herbaceous Vegetation	G5/S4	CEGL003307
<i>Sagittaria latifolia</i> Herbaceous Vegetation	G2/S1	CEGL003321
<i>Schoenoplectus subterminalis</i> Herbaceous Vegetation [Provisional]	G3/S2?	CEGL003309
<i>Sparganium angustifolium</i> Herbaceous Vegetation	G4/S3S4	CEGL001990

G544 Western North American Temperate Freshwater Aquatic Bed Group	Global/ State Rank	NatureServe/ WANHP Code
<i>Sparganium eurycarpum</i> Herbaceous Vegetation	G4/S2S3	CEGL003323
<i>Sparganium eurycarpum</i> Herbaceous Vegetation	G4/S2S3	CEGL003323
<i>Utricularia macrorhiza</i> Herbaceous Vegetation [Provisional]	G5/S4	CEGL003310
<i>Wolffia (borealis, columbiana)</i> Herbaceous Vegetation [Provisional]	G4/S1?	CEGL003311

### ENVIRONMENT & DYNAMICS

**Environmental Description:** *Climate:* Temperate North America, west of the Great Plains. *Soil/substrate/hydrology:* Small patch in size, confined to lakes, ponds, oxbows, and slow-moving portions of rivers and streams. In large bodies of water, they are usually restricted to the littoral region where penetration of light is the limiting factor for growth. Water depth varies from very shallow to the limit of light penetration, usually <4 m depending on the clarity of the water, but ranges from 2 to 8 m in depth. Species differentiate themselves with different depth tolerances, different substrates and nutrient and pH of the water and of the substrates. The amount and depth of organic matter in the sediment are also important. As sediment accumulates, emergent species may appear which compete directly for space/light/nutrients with floating species and floating-rooted species. The amount of wind and wave disturbance also plays a role in aquatic vegetation composition and structure; stands tend to occur on the leeward side of lakes where waves are minimal. The more sheltered the water surface, the more complex the aquatic vegetation may be. Communities changes with the environment along the shoreline, showing zonation: zones of erosion usually have small rosette forms with species such as *Isoetes*, *Subularia*, and *Ranunculus*. Communities tend to follow the amount and type of sediment rather than the bathymetry. The nutrient status of the lake itself also determines the aquatic vegetation composition. Environmental information compiled from Hutchinson (1975), Viereck et al. (1992), Holland and Keil (1995), Shephard (1995), Boggs (2000), and Boggs et al. (2008a).

**Dynamics:** Aquatic communities succeed as substrates change with sedimentation and accumulation of organic materials (or the reverse), and the amount of nutrients can shift species completely, such as near effluents. Segmented-leaved species can be more tolerant of wave action than entire-leaved species. Species also have differing tolerances to disturbance of wind and wave action.

### DISTRIBUTION

**Geographic Range:** This group consists of freshwater aquatic herbaceous vegetation found throughout the temperate regions of western North America. In Alaska, it occurs throughout the state, but only the south-central and non-boreal/non-arctic regions of the state are included with this group.

**Nations:** CA, MX?, US

**States/Provinces:** AK, BC, CA, CO, ID, MT, NM, NV, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:C, 4:C, 5:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 13:C, 14:C, 15:C, 18:C, 20:C, 68:C, 69:C, 70:C, 71:C

**USFS Ecoregions (2007):**

**Omernik Ecoregions:**

**Federal Lands [optional]:**

### CONFIDENCE LEVEL

**USNVC Confidence Level with Comments:** High.

### SYNONYMY

- < Wetlands (217) (Shiflet 1994)

### LOWER LEVEL UNITS

#### Alliances:

- A1746 *Isoetes* spp. Aquatic Herbaceous Alliance
- A3893 *Hippuris vulgaris* - *Ruppia* spp. - *Sparganium* spp. Rooted Floating Aquatic Alliance
- A2508 *Bacopa eisenii* Aquatic Herbaceous Alliance
- A2628 *Fontinalis antipyretica* Saturated Nonvascular Alliance
- A3924 *Elodea canadensis* Aquatic Herbaceous Alliance
- A3923 *Ceratophyllum demersum* Aquatic Herbaceous Alliance
- A3921 *Utricularia macrorhiza* - *Utricularia minor* - *Utricularia ochroleuca* Aquatic Herbaceous Alliance
- A3925 *Menyanthes trifoliata* Aquatic Herbaceous Alliance
- A3928 *Sagittaria latifolia* Aquatic Herbaceous Alliance
- A1747 *Lemna minor* - *Wolffia borealis* - *Wolffia columbiana* Herbaceous Alliance
- A3927 *Potamogeton natans* - *Polygonum amphibium* Floating Aquatic Alliance

- A1741 *Azolla filiculoides* - *Azolla mexicana* Aquatic Herbaceous Alliance
- A3926 *Nuphar polysepala* Western Aquatic Herbaceous Alliance
- A1761 *Myriophyllum sibiricum* - *Myriophyllum hippuroides* Aquatic Herbaceous Alliance
- A3929 *Schoenoplectus subterminalis* Aquatic Herbaceous Alliance
- A3922 *Brasenia schreberi* Aquatic Herbaceous Alliance
- A3920 *Ranunculus aquatilis* - *Callitriche palustris* - *Callitriche heterophylla* Aquatic Herbaceous Alliance

#### AUTHORSHIP

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel, P. Comer, C. Chappell, K. Boggs

**Acknowledgments:**

**Version Date:** 2015/05/07

#### REFERENCES

**References:** Boggs 2000, Boggs et al. 2008a, Christy 2004, Crowe et al. 2004, Faber-Langendoen et al. 2015, Holland and Keil 1995, Hutchinson 1975, Kunze 1994, Sawyer et al. 2009, Shephard 1995, Shiflet 1994, Viereck et al. 1992

## 6. OPEN ROCK VEGETATION

Tropical, temperate, and boreal habitats are characterized or dominated by plant growth forms, such as *lichen*, *bryophyte*, *alga*, or *fern*, that have structural adaptations for living on stable rock surfaces or on unstable rocky substrates, such as cliffs, talus, scree, pavement, cobble, lava or boulderfields, and with associated mesomorphic grass, shrub and tree growth forms.

### 6.B. Temperate & Boreal Open Rock Vegetation

Rocky habitats (such as cliffs, talus, scree, pavement, cobbles, recent lava flows, or large rock outcrops) characterized by temperate, including Mediterranean, and boreal lithomorphic and lithophilic growth forms, including saxicolous *lichens*, *bryophytes*, *algae*, and/or *ferns* and other pteridophytes. Tree growth forms typically have <10% cover, are very sparse; woody growth forms, when present, include cold-deciduous broad-leaved and needle-leaved trees and shrubs.

Vegetation found on temperate and boreal rocky habitats (such as cliffs, talus, recent lava flows, or rock outcrops) at low to moderate elevations at mid-latitudes from 23° to 70°N or S latitude around the globe that are characterized by nonvascular plant growth forms that have structural adaptations for living on these habitats.

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

Vegetation in temperate and boreal habitats found in rocky or rocklike habitats (such as cliffs, talus, scree, pavement, cobbles, lava, boulderfields, or badlands) at low elevations at mid-latitudes around the globe characterized by nonvascular plant growth forms that have structural adaptations for living on stable rock surfaces or in unstable rocky substrates. A sparse cover of vascular mesomorphic growth forms, including needle-leaved and cold-deciduous broad-leaved woody plants, may be present.

##### 6.B.1.Nb. Western North American Temperate Cliff, Scree & Rock Vegetation

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6. Open Rock Vegetation

6.B.1.Nb. Western North American Temperate Cliff, Scree & Rock Vegetation

#### M887. Western North American Temperate Cliff, Scree & Rock Vegetation

**Type Concept Sentence:** This sparsely vegetated rock outcrop and cliff face macrogroup is found on the Alaska peninsula and Aleutian Islands, 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%.

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#### OVERVIEW

**Scientific Name:** *Pseudotsuga menziesii* - *Pinus ponderosa* - *Pinus monticola* Rocky Mountain, Sierran & Southern Vancouverian Cliff, Scree & Rock Vegetation Macrogroup

**Common Name (Translated Scientific Name):** Douglas-fir - Ponderosa Pine - Western White Pine Rocky Mountain, Sierran & Southern Vancouverian Cliff, Scree & Rock Vegetation Macrogroup

**Type Concept:** This macrogroup is found throughout temperate western North America and consists of sparsely vegetated rock outcrops and cliff faces found on the Alaska peninsula and Aleutian Islands, Coast Mountains of British Columbia, the Rocky Mountain Cordillera, Cascades, Sierra Nevada and other ranges tall enough to have a temperate climate. The vegetation is highly variable and is typically sparse cover of vascular species with sparse to dense cover of lichens, mosses or other nonvascular organisms. Characteristic species include trees from the surrounding landscape, such as *Abies concolor*, *Abies lasiocarpa*, *Abies magnifica*, *Pinus albicaulis*, *Pinus contorta*, *Pinus flexilis*, *Pinus monticola*, *Pinus ponderosa*, *Pseudotsuga menziesii*, *Populus tremuloides*, *Tsuga mertensiana*, or *Pinus edulis*, *Pinus monophylla*, *Juniperus* spp., and *Cercocarpus ledifolius* at lower elevations. Common shrubs species may include *Amelanchier alnifolia*, *Arctostaphylos nevadensis*, *Holodiscus* spp., *Jamesia americana*, *Juniperus communis*, *Ledum glandulosum*, *Mahonia repens*, *Physocarpus* spp., *Ribes* spp., *Rosa woodsii*, or *Rhus trilobata*. Potential herbaceous species are numerous and may include sparse cover of *Aspidotis densa*, *Festuca viridula*, *Poa curtifolia*, and *Pseudoroegneria spicata*. Characteristic nonvascular species information is not available. Stands occur on moderate to steep slopes, cliff faces, narrow canyons, and rock outcrops. In general these are the dry, sparsely vegetated sites. Substrates are often unstable scree and talus that typically occur below cliff faces.

**Classification Comments:** More work is required to delineate a more accurate geographic distribution between lithomorphic macrogroups, which may be better defined by nonvascular species. However, insufficient information is available regarding moss and other nonvascular species information to validate this possibility. Moss and other nonvascular species information is needed. Oregon was included in the distribution of this macrogroup. However, more review of the macrogroup concept and distribution is needed to clarify this southern range extent.

#### Similar NVC Types:

**Diagnostic Characteristics:** Vegetation is composed of dense cover of mosses and/or nonvasculars (lichens) and sparse cover of herbaceous and woody vascular plants on exposed bedrock or talus. Woody plants include sparse to rarely forested mixed shrub and tree vegetation occupying cliffs, steep cliff faces, bald ridgetops and shoulder outcrops, narrow canyons, smaller rock outcrops and scree slopes of the Sierra Nevada, Cascade Range and Klamath Mountains. The importance of nonvascular species such as mosses and lichens is one of the defining characteristics which distinguish this macrogroup from surrounding shrub or treed macrogroups. *Pseudotsuga menziesii* and *Pinus ponderosa* are common throughout the range with *Pinus monticola* characteristic of the southern Cascades. There are many other tree and shrub species associated with this macrogroup.

## VEGETATION

**Physiognomy and Structure:** This macrogroup has highly variable structure and physiognomy. Stands range from sparse and often patchy vascular vegetation consisting of scattered trees, shrubs, and/or sparse vascular herbaceous cover (grasses and forbs) to vegetation dominated by nonvascular species (mosses and lichens) with occasional woody and herbaceous plants. Trees and shrubs often grow in dense clumps out of cracks in bedrock and small soil deposits and are often stunted.

**Floristics:** The vegetation is highly variable and is typically sparse cover of vascular species from the surrounding landscape with sparse to dense cover of lichens, mosses or other nonvascular organisms. Characteristic trees in Rocky Mountain stands include species from the surrounding landscape, such as *Abies concolor*, *Abies lasiocarpa*, *Pinus flexilis*, *Pinus ponderosa*, *Populus tremuloides*, *Pseudotsuga menziesii*, or *Pinus edulis* and *Juniperus* spp. at lower elevations. There may be scattered shrubs present, such as species of *Amelanchier*, *Holodiscus*, *Juniperus*, *Physocarpus*, *Rhus*, *Ribes*, *Rosa*, and *Jamesia americana*, or *Mahonia repens*. Characteristic species at low-elevation sites in the Cascades also include *Pseudotsuga menziesii* and *Pinus ponderosa*, as well as *Pinus monticola* trees with sparse ground cover of *Aspidotis densa*, *Arctostaphylos nevadensis*, and *Pseudoroegneria spicata*. Higher elevations have *Pinus contorta* var. *latifolia*, *Pinus albicaulis*, *Abies lasiocarpa*, and *Tsuga mertensiana* with *Juniperus communis*, *Ledum glandulosum*, *Vaccinium scoparium*, *Poa curtifolia*, and *Festuca viridula*. Vegetation in the Sierra Nevada and Klamath Mountains may include *Abies magnifica*, *Pinus contorta* var. *murrayana*, *Pinus jeffreyi*, *Pinus ponderosa*, *Pseudotsuga menziesii*, *Populus tremuloides*, or *Pinus monophylla*, *Juniperus osteosperma*, and *Cercocarpus ledifolius* at lower elevations. There may be shrubs, including species of *Arctostaphylos* or *Ceanothus*. Herbaceous cover is limited. In the northern Cascades to Alaska, scattered stunted trees include *Abies* spp., *Chamaecyparis nootkatensis* (not southern range), *Pinus contorta*, *Pseudotsuga menziesii* (not in Alaska), *Thuja plicata*, or *Tsuga* spp., and the broadleaf tree species *Arbutus menziesii* and *Quercus garryana*. There may be scattered shrubs as well, such as *Acer circinatum*, *Alnus viridis*, *Arctostaphylos columbiana*, *Arctostaphylos uva-ursi*, *Holodiscus discolor*, *Ribes* spp., and *Rosa gymnocarpa*. Herbaceous cover is limited and may include species such as *Selaginella wallacei*, *Polypodium glycyrrhiza*, *Cryptogramma acrostichoides*, and graminoids such as *Danthonia* spp., *Festuca roemerii*, *Koeleria macrantha*, and forbs such as *Collinsia parviflora*, *Eriophyllum lanatum*, *Heuchera glabra*, *Heuchera micrantha*, *Phlox diffusa*, *Saxifraga ferruginea*, *Saxifraga rufidula*, and *Sedum spathulifolium*. Mosses or lichens may be very dense, well-developed and display cover well over 10%. *Amphidium lapponicum*, *Cladina portentosa*, *Cystocoleus ebeneus*, *Dicranum scoparium*, *Polytrichum juniperinum*, and *Racomitrium* spp. are characteristic mosses and lichens in the Georgia Basin. Characteristic moss and nonvascular species information is not available for most of the range of the macrogroup. Floristic information was compiled from Hess and

Wasser (1982), Kruckeberg (1984), Andrews and Righter (1992), Ecosystems Working Group (1998), Larson et al. (2000a, b), Barbour et al. (2007a), and Sawyer et al. (2009).

### **No Associations identified yet for Washington**

#### **ENVIRONMENT & DYNAMICS**

**Environmental Description:** This macrogroup is located throughout temperate western North America from the Alaska peninsula and Aleutian Islands south to the Coast Mountains of British Columbia, the Rocky Mountain Cordillera, Cascades, Blue Mountains, Sierra Nevada and other ranges tall enough to have a temperate climate. Sites range from moderate to steep slopes, cliff faces, narrow canyons, and rock outcrops. In general these are the dry, sparsely vegetated sites.

*Soil/substrate/hydrology:* Parent material includes outcrops of various igneous (intrusives), sedimentary, and metamorphic bedrock types. In Cascades and Klamath Mountains thin rocky, ultramafic (peridotite, serpentinite) soils are also common. Also included are unstable scree and talus slopes that typically occur below cliff faces. In general these are the dry, sparsely vegetated places. Soil development is limited. Environmental information compiled from Hess and Wasser (1982), Andrews and Righter (1992), Ecosystems Working Group (1998), Larson et al. (2000a, b), Barbour et al. (2007a), and Sawyer et al. (2009).

**Dynamics:** Poor soil development, high levels of exposure and steep sites impede the establishment of species from surrounding communities and maintain occurrences of this macrogroup.

#### **DISTRIBUTION**

**Geographic Range:** This macrogroup is located throughout temperate western North America and consists of sparsely vegetated rock outcrops and cliff faces found on the Alaska peninsula and Aleutian Islands, Coast Mountains of British Columbia, the Rocky Mountain Cordillera, Cascades, Sierra Nevada and other ranges tall enough to have a temperate climate.

#### **Spatial Scale & Pattern [optional]:**

**Nations:** CA, MX, US

**States/Provinces:**

#### **TNC Ecoregions [optional]:**

**USFS Ecoregions (2007):** 242A:CC, 242B:C?, 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 322A:??, 331A:C?, 331B:CC, 331D:C?, 331G:CC, 331H:CC, 331I:CP, 331J:CC, 331K:CP, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CP, 342E:CC, 342F:CP, 342G:CP, 342H:CP, 342I:CC, 342J:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261B:CC, M261D:CC, M261E:CC, M261F:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341A:CC, M341B:CC

#### **Omernik Ecoregions:**

**Federal Lands [optional]:**

#### **CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Moderate.

#### **SYNONYMY**

#### **LOWER LEVEL UNITS**

#### **Groups:**

- G563 California Cliff, Scree & Rock Vegetation
- G565 Rocky Mountain Cliff, Scree & Rock Vegetation
- G573 Southern Vancouverian Cliff, Scree & Rock Vegetation
- G318 North Vancouverian Montane Massive Bedrock, Cliff & Talus

#### **AUTHORSHIP**

#### **Primary Concept Source:**

**Author of Description:** K.A. Schulz

#### **Acknowledgments:**

**Version Date:** 05/20/2015

**Classif Resp Region:** West

**Internal Author:** MSR 11-14; KAS 5-15

#### **REFERENCES**

**References:** Andrews and Righter 1992, Barbour et al. 2007a, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Hess and Wasser 1982, Kruckeberg 1984, Larson et al. 2000a, Larson et al. 2000b, Sawyer et al. 2009



## 6. Open Rock Vegetation

6.B.1.Nb. Western North American Temperate Cliff, Scree &amp; Rock Vegetation

M887. Western North American Temperate Cliff, Scree &amp; Rock Vegetation

**G565. Rocky Mountain Cliff, Scree & Rock Vegetation [Proposed]****Type Concept Sentence:****OVERVIEW****Scientific Name:** Nonvascular Rocky Mountain Cliff, Scree & Rock Group**Common Name (Translated Scientific Name):** Nonvascular Rocky Mountain Cliff, Scree & Rock Group

**Type Concept:** This group consists of barren and sparsely vegetated rock outcrops and cliff faces located throughout the Rocky Mountains and northeastern Cascade Ranges in North America. These sparsely vegetated surfaces (generally <10% plant cover) are found from foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous (intrusives), sedimentary, and metamorphic bedrock types. It also occurs on unstable scree and talus slopes that can occur below cliff faces. In general these are the dry, sparsely vegetated places. The biota reflects what is surrounding them, unless it is an extreme parent material. There is often very high cover of nonvascular lichens and, in wetter places, mosses. There may be small patches of dense vascular vegetation and can include scattered trees and/or shrubs. Characteristic trees include species from the surrounding landscape, such as *Pseudotsuga menziesii*, *Pinus ponderosa*, *Pinus flexilis*, *Populus tremuloides*, *Abies concolor*, *Abies lasiocarpa*, or *Pinus edulis* and *Juniperus* spp. at lower elevations. There may be scattered shrubs present, such as species of *Holodiscus*, *Ribes*, *Physocarpus*, *Rosa*, *Juniperus*, and *Jamesia americana*, *Mahonia repens*, *Rhus trilobata*, or *Amelanchier alnifolia*. Soil development is limited, as is herbaceous cover. Characteristic nonvascular species information is not available

**Classification Comments:** Need moss and other nonvascular species information.**Internal Comments:** DFL 9-13: AK? added. mjr 1-11: NV added for GRBA.**Other Comments:****Similar NVC Types:**

- G569 North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation
- G570 Intermountain Basins Cliff, Scree & Badland Sparse Vegetation
- G571 Rocky Mountain & Sierran Alpine Bedrock & Scree: occurs above treeline.
- G319 North Pacific Alpine-Subalpine Bedrock & Scree: occurs above treeline in the Pacific Northwest mountains.
- G318 North Vancouverian Montane Massive Bedrock, Cliff & Talus: occurs in the Pacific Northwest mountains.
- G567 Great Plains Cliff, Scree & Rock Vegetation

**Diagnostic Characteristics:** Dense covering of mosses and/or nonvasculars and sparse cover of herbaceous and woody vascular plants on exposed bedrock or talus.**VEGETATION****Physiognomy and Structure:** Nonvascular, woody and herbaceous vascular plants.

**Floristics:** Herbaceous cover is limited. Characteristic trees include species from the surrounding landscape, such as *Pseudotsuga menziesii*, *Pinus ponderosa*, *Pinus flexilis*, *Populus tremuloides*, *Abies concolor*, *Abies lasiocarpa*, or *Pinus edulis* and *Juniperus* spp. at lower elevations. There may be scattered shrubs present, such as species of *Holodiscus*, *Ribes*, *Physocarpus*, *Rosa*, *Juniperus*, and *Jamesia americana*, *Mahonia repens*, *Rhus trilobata*, or *Amelanchier alnifolia*. Characteristic nonvascular species information is not available. Floristic information compiled from Hess and Wasser (1982), Andrews and Righter (1992), Ecosystem Working Group (1998), and Larson et al. (2000).

<b>G565 Rocky Mountain Cliff, Scree &amp; Rock Vegetation [Proposed]</b>	<b>Global/ State Rank</b>	<b>NatureServe/ WANHP Code</b>
<i>Sullivantia hapemanii</i> - <i>Mimulus</i> spp. Wet Rock Herbaceous Vegetation [Placeholder]	GNR/SNR	CEGL005509

**No Associations identified yet for Washington**

**ENVIRONMENT & DYNAMICS**

**Environmental Description:** *Climate:* Temperate. *Soil/substrate/hydrology:* Foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous (intrusives), sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus slopes that typically occur below cliff faces. In general these are the dry, sparsely vegetated places. Soil development is limited. Environmental information compiled from Hess and Wasser (1982), Andrews and Righter (1992), Ecosystem Working Group (1998), and Larson et al. (2000).

**Dynamics:****DISTRIBUTION**

**Geographic Range:** This group is located throughout the Rocky Mountain, including the isolated island ranges of central Montana, and northeastern Cascade Ranges in North America.

**Nations:** CA, US

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

**TNC Ecoregions [optional]:** 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 25:C, 26:C, 68:C

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

**Omernik Ecoregions:**

**Federal Lands [optional]:** NPS (Great Basin)

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Proposed. Need moss and other nonvascular species information.

**SYNONYMY**

- < CL Cliff (Ecosystems Working Group 1998)
- < RO Rock (Ecosystems Working Group 1998)
- < TA Talus (Ecosystems Working Group 1998)

**LOWER LEVEL UNITS****Alliances:**

- A3742 Black Hills Cliff, Scree & Rock Alliance
- A0556 *Picea engelmannii* Sparsely Vegetated Alliance
- A4146 *Sullivantia hapemanii* - *Mimulus* spp. Wet Rock Herbaceous Alliance
- A3740 *Aletes anisatus* - *Holodiscus dumosus* - *Rubus idaeus* Cliff, Scree & Rock Alliance
- A3741 *Aquilegia flavescens* - *Phacelia hastata* Cliff, Scree & Rock Alliance

**AUTHORSHIP**

**Primary Concept Source:** G. Kittel, in Faber-Langendoen et al. (2011)

**Author of Description:** G. Kittel and M.S. Reid

**Acknowledgments:**

**Version Date:** 2010/12/21

**REFERENCES**

**References:** Andrews and Righter 1992, Comer et al. 2003, Ecosystems Working Group 1998, Faber-Langendoen et al. 2015, Hess and Wasser 1982, Larson et al. 2000a, NCC 2002, Neely et al. 2001, Peet 1981

6. Open Rock Vegetation

6.B.1.Nb. Western North American Temperate Cliff, Scree & Rock Vegetation

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

**G318. North Vancouverian Montane Massive Bedrock, Cliff & Talus**

**Type Concept Sentence:**

**OVERVIEW**

**Scientific Name:** Nonvascular North Vancouverian Montane Bedrock, Cliff & Talus Group

**Common Name (Translated Scientific Name):** Nonvascular North Vancouverian Montane Bedrock, Cliff & Talus Group

**Type Concept:** This group consists of sparsely vegetated rock outcrops and cliff faces found on the Alaska Peninsula and Aleutian Islands, Coast Mountains of British Columbia, Washington and Oregon, as well as in the Cascade Range south to just inside northern California (including Mount Lassen and Mount Shasta, but does not include the Sierra Nevada or Klamath Mountains). Substrates include active volcanic areas dominated by ash, pyroclastic deposits, lava, landslides and other exposed bare mineral and rock of various igneous, sedimentary, and metamorphic bedrock types. Periodic eruptions and earthquakes are the primary processes maintaining a primarily barren environment. Decades of inactivity slowly provide opportunity for vegetation development as primary successional stages. Elevation ranges from foothill to subalpine, and includes steep cliff faces, narrow canyons, larger rock outcrops, unstable scree and talus slopes. The dominant process is drought, especially farther south in its distribution, and other extreme growing conditions created by exposed rock or unstable slopes typically associated with steep slopes. Alaskan montane rock and talus is not drought-limited. Fractures in the rock surface and less steep or more stable slopes may be occupied by small patches of dense vegetation, typically scattered trees and/or shrubs. Characteristic trees include *Chamaecyparis nootkatensis*, *Tsuga* spp., *Thuja plicata*, *Pseudotsuga menziesii* (not in Alaska), or *Abies* spp. There may be scattered shrubs present, such as *Acer circinatum*, *Alnus viridis*, and *Ribes* spp. Soil development is limited as is herbaceous cover. Mosses or lichens may be very dense, well-developed and display cover well over 10%. Characteristic nonvascular species information is not available.

**Classification Comments:** Need moss and other nonvascular species information.

**Internal Comments:**

**Other Comments:**

**Similar NVC Types:**

- G571 Rocky Mountain & Sierran Alpine Bedrock & Scree: occurs above treeline.
- G319 North Pacific Alpine-Subalpine Bedrock & Scree: occurs above treeline in the Pacific Northwest mountains.
- G565 Rocky Mountain Cliff, Scree & Rock Vegetation

**Diagnostic Characteristics:** Greater than 10% dense covering of mosses and/or nonvascular plants and sparse cover of herbaceous and woody vascular plants on exposed bedrock or talus.

## VEGETATION

**Physiognomy and Structure:** Dense patches of moss and nonvascular cover and sparse herbaceous and woody vascular plant cover.

**Floristics:** Scattered, stunted characteristic trees include *Chamaecyparis nootkatensis* (not southern range), *Tsuga* spp., *Thuja plicata*, *Pseudotsuga menziesii* (not in Alaska), *Pinus contorta*, or *Abies* spp., and the broadleaf tree species *Arbutus menziesii* and *Quercus garryana*. There may be scattered shrubs as well, such as *Arctostaphylos columbiana*, *Arctostaphylos uva-ursi*, *Rosa gymnocarpa*, *Holodiscus discolor*, *Acer circinatum*, *Alnus viridis*, and *Ribes* spp. Herbaceous cover is limited and may include species such as *Selaginella wallacei*, *Polypodium glycyrrhiza*, *Cryptogramma acrostichoides*, and graminoids such as *Festuca roemerii*, *Danthonia* spp., *Koeleria macrantha*, and forbs such as *Sedum spathulifolium*, *Collinsia parviflora*, *Heuchera glabra*, *Heuchera micrantha*, *Phlox diffusa*, *Eriophyllum lanatum*, *Saxifraga ferruginea*, and *Saxifraga rufidula*. Mosses or lichens may be very dense, well-developed and display cover well over 10%. *Racomitrium* spp., *Polytrichum juniperinum*, *Dicranum scoparium*, *Amphidium lapponicum*, *Cladina portentosa*, and *Cystocoleus ebeneus* are characteristic mosses and lichens in the Georgia Basin. Characteristic moss and nonvascular species information is not available.

**No Associations identified yet for Washington**

## ENVIRONMENT & DYNAMICS

**Environmental Description:** *Soil/substrate/hydrology:* Substrates include active volcanic areas dominated by ash, pyroclastic deposits, lava, landslides and other exposed bare mineral and rock of various igneous, sedimentary, and metamorphic bedrock types. Periodic eruptions and earthquakes are the primary processes maintaining a primarily barren environment. Decades of inactivity slowly provide opportunity for vegetation development. Elevation ranges from foothill to subalpine and includes steep cliff faces, narrow canyons, larger rock outcrops, stable scree and talus slopes. The dominant process is substrate drought, especially farther south in its distribution, and other extreme growing conditions created by exposed rock or unstable slopes typically associated with steep slopes. Soil development is limited.

**Dynamics:**

## DISTRIBUTION

**Geographic Range:** This group consists of sparsely vegetated rock outcrops and cliff faces found on the Alaska Peninsula and Aleutian Islands, Coast Mountains of British Columbia, Washington and Oregon, as well as in the Cascade Range south to just inside northern California (Mount Lassen and Mount Shasta, but does not include the Sierra Nevada or Klamath Mountains).

WA groups

**Nations:** CA, US

**States/Provinces:** AK, BC, CA, OR, WA

**TNC Ecoregions [optional]:** 1:C, 2:C, 3:C, 4:C, 5:P, 69:C, 70:C, 72:C, 73:C, 81:C

**USFS Ecoregions (2007):** 242A:CC, 242B:C?, 342D:C?, 342H:CP, 342I:CC, M242A:CC, M242B:C?, M242C:CC, M242D:CP, M261A:CC, M261D:CP

**Omernik Ecoregions:**

**Federal Lands [optional]:**

**CONFIDENCE LEVEL**

**USNVC Confidence Level with Comments:** Low. Need moss and other nonvascular species information.

**SYNONYMY**

**LOWER LEVEL UNITS**

**Alliances:**

- A3779 North Pacific Nonvascular Sparse Alliance
- A4145 *Sullivantia oregana* - *Adiantum pedatum* Wet Rock Herbaceous Alliance
- A3778 *Veronica wormskjoldii* var. *stelleri* - *Carex circinata* Sparse Herbaceous Alliance

**AUTHORSHIP**

**Primary Concept Source:** Crawford et al., in Faber-Langendoen et al. (2011)

**Author of Description:** R. Crawford, G. Kittel, M.S. Reid, mod. C. Cadrin

**Acknowledgments:** C. Cadrin

**Version Date:** 2013/09/09

**REFERENCES**

**References:** British Columbia Conservation Foundation and Wildlife Inventory Section 1991, Faber-Langendoen et al. 2015, Kuramoto 1968, Madrone Consultants Ltd. 1999, Madrone Environmental Services 2008, McPhee et al. 2000, Milko 1984, Sawyer and Keeler-Wolf 1995, Stacey 2013, Ward et al. 1998, Wildlife Inventory Section 2000

# NO HIERARCHY ASSIGNED

G565 Rocky Mountain Cliff, Scree & Rock Vegetation [Proposed]	Global/ State Rank	NatureServe/ WANHP Code
<i>Alnus rubra</i> / <i>Carex obnupta</i> Ruderal Flooded Forest	GNR/SNR	not tracked
<i>Alnus rubra</i> / <i>Nonnative Grasses</i> Ruderal Flooded Forest	GNR/SNR	not tracked
<i>Prunus emarginata</i> Ruderal Flooded Forest	GNR/SNR	not tracked