

**APPENDIX D**

---

**DESCRIPTION OF VEGETATION  
MACROGROUPS**



## APPENDIX D

# DESCRIPTION OF VEGETATION MACROGROUPS

## Introduction

Table D-1 provides a list of all the vegetation macrogroups occurring on BLM-administered lands in the western U.S., as well as their associated classes, subclasses, formations, and divisions. This section provides descriptions of the subset of macrogroups that comprise the majority of the BLM's proposed vegetation treatments, as referenced in Table 4-9 of this PEIS.

The macrogroup is a middle-level classification in the hierarchy of the revised United States National Vegetation Classification<sup>1</sup>. The middle-level classifications are based on plant physiognomy, biogeography, and floristics. The macrogroup level classification is based on “combinations of moderate sets of diagnostic plant species and diagnostic growth forms that reflect biogeographic differences.”

The ecological context of the macrogroup level is sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes. An example of a scientific name for a macrogroup is the *Pseudotsuga menziesii-Quercus garryana-Pinus ponderosa-Arbutus menziesii* (Douglas-fir-Oregon white oak-ponderosa pine-Pacific madrone) macrogroup. The colloquial name for this macrogroup is Northern Vancouverian Montane and Foothill Forest.

In order to match the geographical breakdown in the 2007 PEIS, the macrogroup descriptions in this section are presented by ecoregion. Descriptions for macrogroups found in more than one ecoregion are repeated, where applicable. Descriptions come directly from the U.S. National Vegetation Classification web site.

## Marine Ecoregion

### Californian-Vancouverian Foothill and Valley Forest and Woodland

These forests occur along the Pacific Coast lowlands from southern California to southern British Columbia. They occur inland from the coast, in the dry interior lowland valleys, some on the east side of the Cascades, and are drought-tolerant. These forests are not part of the Temperate Coastal Rainforest. Dominant species within this macrogroup are *Pseudotsuga menziesii*, *Pinus ponderosa*, *Quercus garryana*, *Quercus kelloggii* (California black oak), *Lithocarpus densiflorus* (tanoak), *Umbellularia californica* (California laurel), and *Arbutus menziesii*.

### Vancouverian Lowland and Montane Rainforest

This macrogroup consists of tall forests 164 to 328 feet (50 to 100 meters) dominated by evergreen needle-leaved trees of the Pacific Northwest coast, limited to the coast, in lowland valleys, and lower mountain slopes (below subalpine snow pack) of the Coastal and Cascade Ranges. Forests include those influenced by salt spray exposure, the interior forests of the windward and leeward Coast and Cascade Ranges, and cool temperate lower montane forests where winter snowpack typically lasts for 2 to 6 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.

<sup>1</sup> Available at: <http://usnvc.org/>

**TABLE D-1**  
**Vegetation Classification System for Western States**

Formation Class	Formation Subclass	Formation	Division	Macrogroup
Forest and Woodland	Temperate Forest	Warm Temperate Forest	Southwestern North American Warm Temperate Forest	California Forest and Woodland
				Californian-Vancouverian Foothill and Valley Forest and Woodland
				Comanchian Forest and Woodland
				Madrean Warm Lowland Evergreen Woodland
				Madrean Warm Montane Forest and Woodland
			Southwestern North American Warm Temperate Scrub and Woodland	Southern Plains Scrub Woodland and Shrubland
		Cool Temperate Forest	Western North American Cool Temperate Forest	Southern Vancouverian Montane and Foothill Forest
				Vancouverian Lowland and Montane Rainforest
				Northern Rocky Mountain Lower Montane and Foothill Forest
				Rocky Mountain Subalpine and High Montane Conifer Forest
				Sierra Madre High Montane Forest
				Southern Rocky Mountain Lower Montane Forest
				Vancouverian Subalpine Forest
			Western North American Cool Temperate Woodland and Scrub	Intermountain Singleleaf Pinyon-Western Juniper Woodland
Rocky Mountain Two-Needle Pinyon-Juniper Woodland				

MACROGROUP DESCRIPTIONS

**TABLE D-1 (Cont.)  
Vegetation Classification System for Western States**

<b>Formation Class</b>	<b>Formation Subclass</b>	<b>Formation</b>	<b>Division</b>	<b>Macrogroup</b>
Forest and Woodland (cont.)	Temperate Forest (Cont.)	Temperate Flooded and Swamp Forest	Western North American Flooded and Swamp Forest	Rocky Mountain and Great Basin Flooded and Swamp Forest
				Vancouverian Flooded and Swamp Forest
			Southwestern North American Warm Temperate Flooded and Swamp Forest	Warm Mediterranean and Desert Riparian, Flooded and Swamp Forest
				Western North American Warm Temperate Ruderal Flooded and Swamp Forest
	Boreal Forest	Lowland and Montane Boreal Forest	North American Boreal Forest	North American Subalpine and Subarctic Woodland
				Western North American Boreal Conifer and Hardwood Forest
		Boreal Flooded and Swamp Forest	North American Boreal Flooded and Swamp Forest	North American Boreal Flooded Forest
				North American Boreal Swamp Forest
				Western Boreal Flooded and Swamp Scrub and Forest
Shrubland and Grassland	Mediterranean Scrub and Grassland	Mediterranean Scrub	California Chaparral	
			California Coastal Scrub	
	Mediterranean Grassland and Forb Meadow	California Grassland and Meadow	California Annual and Perennial Grassland	
			California Ruderal Grassland and Meadow	

**TABLE D-1 (Cont.)  
 Vegetation Classification System for Western States**

Formation Class	Formation Subclass	Formation	Division	Macrogroup
Shrubland and Grassland (Cont.)	Temperate and Boreal Shrubland and Grassland	Temperate Grassland, Meadow and Shrubland	Western North American Grassland and Shrubland	Northern Rocky Mountain-Vancouverian Montane and Foothill Grassland and Shrubland
				Northern Vancouverian Lowland and Montane Grassland and Shrubland
				Rocky Mountain-Vancouverian Subalpine and High Montane Mesic Grass and Forb Meadow
				Southern Rocky Mountain Montane Grassland and Shrubland
				Southern Vancouverian Lowland Grassland and Shrubland
			Great Plains Grassland and Shrubland	Great Plains Mixedgrass Prairie and Shrubland
			Great Plains Shortgrass Prairie and Shrubland	
		Western North American Interior Sclerophyllous Chaparral Shrubland	Cool Interior Chaparral	
			Warm Interior Chaparral	
		Boreal Grassland, Meadow and Shrubland	North American Boreal Grassland, Meadow and Shrubland	North American Boreal Shrubland and Grassland
		Temperate and Boreal Scrub and Herb Coastal Vegetation	Pacific North American Coast Scrub and Herb Vegetation	Cool Pacific Coastal Beach, Dune and Bluff Vegetation
				Warm Pacific Coastal Beach, Dune and Bluff Vegetation
		Temperate and Boreal Bog and Fen	North American Bog and Fen	North American Boreal Bog and Fen
North Pacific Bog and Fen				
Rocky Mountain Subalpine and Montane Fen				

**TABLE D-1 (Cont.)  
Vegetation Classification System for Western States**

<b>Formation Class</b>	<b>Formation Subclass</b>	<b>Formation</b>	<b>Division</b>	<b>Macrogroup</b>
Shrubland and Grassland (Cont.)	Temperate and Boreal Shrubland and Grassland (Cont.)	Temperate and Boreal Freshwater Wet Meadow and Marsh	Western North American Freshwater Wet Meadow and Marsh	Western North American Boreal Wet Meadow and Marsh
				Western North American Lowland Freshwater Wet Meadow, Marsh and Shrubland
				Western North American Montane Wet Meadow and Low Shrubland
				Western North American Ruderal Wet Meadow and Marsh
				Western North American Vernal Pool
		Southwestern North American Warm Desert Freshwater Marsh	Warm Desert Freshwater Shrubland, Meadow and Marsh	
		Salt Marsh	Temperate and Boreal Pacific Coastal Salt Marsh	North American Pacific Coastal Salt Marsh
			North American Western Interior Brackish Marsh	Cool Semi-Desert Alkaline-Saline Wetland
				Warm Semi-Desert and Mediterranean Alkaline-Saline Wetland
				Apacherian-Chihuahuan Semi-Desert Grassland and Steppe
Semi-Desert	Warm Semi-Desert Scrub and Grassland		Warm Semi-Desert Scrub and Grassland	North American Warm Desert Scrub and Grassland
		Mojave-Sonoran Semi-Desert Scrub		
		North American Warm Desert Alkaline-Saline Semi-Desert Scrub		
		North American Warm Desert Xero-Riparian		

**TABLE D-1 (Cont.)  
Vegetation Classification System for Western States**

<b>Formation Class</b>	<b>Formation Subclass</b>	<b>Formation</b>	<b>Division</b>	<b>Macrogroup</b>
Semi-Desert (Cont.)	Cool Semi-Desert Scrub and Grassland	Cool Semi-Desert Scrub and Grassland	Western North American Cool Semi-Desert Scrub and Grassland	Great Basin and Intermountain Dry Shrubland and Grassland
				Great Basin and Intermountain Dwarf Sage Shrubland and Steppe
				Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe
				Great Basin and Intermountain Xero-Riparian Scrub
				Great Basin Saltbrush Scrub
Polar and High Montane Vegetation	Temperate and Boreal Alpine Vegetation	Alpine Scrub, Forb Meadow and Grassland	Western North American Alpine Scrub, Forb Meadow and Grassland	Rocky Mountain Alpine Scrub, Forb Meadow and Grassland
				Sierra Madre Alpine Scrub, Forb Meadow and Grassland
				Vancouverian Alpine Scrub, Forb Meadow and Grassland
	Tundra	Dwarf-Shrub, Herb and Nonvascular Tundra	Arctic Tundra	North American Arctic Tundra
				Tundra Wet Meadow
Aquatic Vegetation	Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation	North American Freshwater Aquatic Vegetation	Western North American Freshwater Aquatic Vegetation

Source: Developed by the BLM based on the Federal Geographic Data Committee Vegetation Subcommittee's National Vegetation Classification Standard, Version 2 (Federal Geographic Data Committee 2008).

Forests along the immediate coast experience uniformly wet and mild climate, where precipitation averages 79 to 118 inches (2,000 to 3,000 millimeters) per year, with frequent fog and low clouds during warmer months, and additional precipitation from fog drip can be significant. Away from the coast, climate is still mild but with more moisture and temperature extremes. Major forest tree species are *Pseudotsuga menziesii*, *Tsuga heterophylla* (western hemlock), *Thuja plicata* (western redcedar), *Abies amabilis* (Pacific silver fir), *Chamaecyparis nootkatensis* (Alaska cedar), and *Picea sitchensis* (Sitka spruce). The deciduous broad-leaved trees *Alnus rubra* (red alder) and *Acer macrophyllum* (bigleaf maple) are abundant on recently disturbed sites. *Pinus contorta* (lodgepole pine) is common along the ocean. *Abies grandis* (grand fir) and *Pinus monticola* (western white pine) occur sporadically and *Sequoia sempervirens* (redwood), *Umbellularia californica*, and *Chamaecyparis lawsoniana* (Port Orford cedar) are found in southern Oregon and northern California.

### **Southern Vancouverian Lowland Grassland and Shrubland**

This macrogroup is found from Vancouver Island down the Pacific 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 occurrences of this macrogroup, though sometimes it can be found on relatively level ridgelines. Attributable 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. Bunchgrasses are often dominant and may include *Calamagrostis nutkaensis* (Pacific reedgrass), *Festuca rubra* (red fescue), *Festuca roemerii* (Roemer's fescue), or *Danthonia californica* (California oatgrass). Dwarf-shrub species imbedded in the herbaceous cover often include *Arctostaphylos uva-ursi* (kinnikinnick), *Arctostaphylos Columbiana* (hairy manzanita), *Arctostaphylos nevadensis* (pinemat manzanita), *Gaultheria shallon* (salal), *Juniperus communis* (common juniper), *Rubus spectabilis* (salmonberry), and *Vaccinium ovatum* (California huckleberry). Occasionally, scattered

stunted trees, such as *Picea sitchensis*, *Pseudotsuga menziesii* or *Quercus garryana*, can be present.

## **Mediterranean Ecoregion**

### **California Forest and Woodland**

This macrogroup consists of savannas, woodlands, and forests dominated by Californian endemic oak and conifer species. These woodlands occur almost entirely within California below 8,000 ft (2,450 m) (8,000 ft). They include the oak woodlands of *Quercus agrifolia* (California live oak), *Quercus lobata* (valley oak), and *Quercus douglasii* (blue oak). Stands include rare endemic evergreen coniferous forests limited to the coast including *Hesperocyparis macrocarpa* (Monterey cypress), *Cupressus sargentii* (Sargent's cypress), *Pinus muricata* (Bishop pine), and *Pinus torreyana* (Torrey pine), as well as the more widespread, rugged *Pinus sabiniana* (California foothill pine) and *Pinus coulteri* (Coulter pine).

### **Californian-Vancouverian Foothill and Valley Forest and Woodland**

These forests occur along the Pacific Coast lowlands from southern California to southern British Columbia. They occur inland from the coast, in the dry interior lowland valleys, some on the east side of the Cascades, and are drought-tolerant. These forests are not part of the Temperate Coastal Rainforest. Dominant species within this macrogroup are *Pseudotsuga menziesii*, *Pinus ponderosa*, *Quercus garryana*, *Quercus kelloggii*, *Lithocarpus densiflorus*, *Umbellularia californica*, and *Arbutus menziesii*.

### **Southern Vancouverian Montane and Foothill Forest**

This macrogroup includes forests and woodlands of foothill and lower montane elevations of the southern Cascade and Klamath Mountains, the Modoc Plateau, and the Sierra Nevada, Peninsula, and Transverse Ranges. This macrogroup covers a broad range of elevation and latitude, and for the most part occurs in relatively dry habitats. It includes dry montane *Pinus jeffreyi* (Jeffrey pine)-*Pinus ponderosa* woodlands; Sierran mixed conifer woodlands dominated by *Pseudotsuga menziesii*, *Pinus ponderosa*, *Calocedrus decurrens* (Incense cedar), *Abies concolor* (white fir), *Abies magnifica* (California red fir), *Pinus lambertiana*

(sugar pine), *Pinus jeffreyi*, or *Sequoiadendron giganteum* (giant sequoia); mixed conifer woodlands tolerant of serpentine soils; and the forests on the east side of the Sierra Nevada, on the Modoc Plateau and in the Warner Mountains that are dominated by *Pinus monticola* and/or *Abies concolor* var. *lowiana* (Sierra white fir) where *Pinus ponderosa* is often present, but *Pseudotsuga menziesii* is notably absent.

### California Chaparral

This macrogroup is composed of evergreen sclerophyllous shrubland that dominates the cismontane side of the coastal mountain ranges from about San Francisco south to Ensanada in Baja California, and east into the foothills of the Sierra Nevada. It reaches its greatest extent in the Transverse and Peninsular ranges of central and southern California but is also an important part of the western foothills of the Sierra Nevada. Chaparral occurs from sea level to 4,921 feet (1,500 meters). Chaparral is closely associated with the Mediterranean climate pattern of winter rain and summer drought. Within that climate regime it can be found under a wide range of rainfall and temperature conditions, but over 60 percent of the current distribution is in areas that receive between 10 and 30 inches (250 and 750 millimeters) of annual precipitation, and where average January daily temperature falls between 41 and 59 °F (5 and 15 °C), indicating that summer drought stress may limit chaparral shrub seedling establishment and that injury to adult shrubs from winter freezes may impose species-specific distributional limits. Chaparral soils tend to be shallow and rocky. Substrates include fractured sandstones and shales, coarse-grained decomposed granitic soils, fine-grained weathered volcanics, and mafic substrates such as serpentines and gabbros. These substrates add to the landscape diversity and have substantial effects on plant species diversity. The diversity of shrubs in chaparral includes shrub species such as *Adenostoma fasciculatum* (chamise), *Ceanothus cuneatus* (buckbrush), *Ceanothus megacarpus* (bigpod ceanothus), *Ceanothus crassifolius* (hoaryleaf ceanothis), several species of *Arctostaphylos* (manzanita), and *Cercocarpus montanus* (alderleaf mountain mahogany).

### Cool Interior Chaparral

This macrogroup consists of chaparral that 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 above 4,550 feet (1,500 meters), from the southern Cascades of Oregon to the Peninsular Ranges of California into Baja California, Mexico, where much annual precipitation occurs as snow. These hardy shrublands have open canopies with little undergrowth and are dominated by evergreen or winter-deciduous shrubs. Dominant shrubs include *Arctostaphylos glandulosa* (Eastwood's manzanita), *Arctostaphylos nevadensis*, *Arctostaphylos patula* (greenleaf manzanita), *Arctostaphylos pungens* (pointleaf manzanita), *Ceanothus cordulatus* (whitethorn ceanothus), *Ceanothus diversifolius* (pinemat), *Ceanothus greggii* (desert ceanothus), *Ceanothus integerrimus* (deerbrush), *Ceanothus pinetorum* (Coville ceanothus), *Ceanothus sanguineus* (redstem ceanothus; in Oregon), *Ceanothus velutinus* (snowbrush ceanothus), *Cercocarpus intricatus* (litteleaf mountain mahogany), *Cercocarpus montanus* var. *glaber* (birchleaf mountain mahogany), *Chrysolepis sempervirens* (= *Castanopsis empervirens*; bush chinquapin), *Eriogonum fasciculatum* (Eastern Mojave buckwheat), *Garrya flavescens* (ashy siltassel), *Holodiscus discolor* (= *Holodiscus microphyllus*; oceanspray), *Prunus emarginata* (bitter cherry), *Prunus subcordata* (Klamath plum), *Prunus virginiana* (chokecherry), *Purshia stansburiana* (Stansbury cliffrose), *Quercus garryana* var. *breweri* (Brewer's oak), *Quercus turbinella* (Sonoran scrub oak), and *Rhus trilobata* (skunkbush sumac). Most of these chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds.

### California Annual and Perennial Grassland

This macrogroup is found in Mediterranean California from 30 to 3,600 feet (10 to 1,200 meters), with cool, wet winters and hot, dry summers, receiving on average 20 inches (50 centimeters; range 10 to 30 inches [25 to 100 centimeters]) of precipitation per year, mainly as winter rain. It is found with fine-textured soils, moist or even waterlogged in winter, but very dry in summer. Historically, these grasslands were common among oak savanna and woodland and probably experienced similar frequent fire regimes. Today they are limited to small relictual, remnant and restored stands. These communities are best represented on xeric to mesic ultramafic (a type of igneous rock) sites where alien annual grasses are less

well-adapted. Wet ultramafic sites may contain stands of *Muhlenbergia rigens* (deergrass) or *Leymus triticoides* (beardless wildrye). Characteristic plant species include a dominance by native, cool-season bunchgrasses *Nassella pulchra* (purple needlegrass), *Nassella cernua* (nodding needlegrass), *Nassella lepida* (foothill needlegrass), *Aristida* species (threeawn), *Agoseris heterophylla* (annual agoseris), *Elymus glaucus* (blue wildrye), *Leymus triticoides* (beardless wildrye), *Festuca californica* (California fescue), *Melica californica* (California melicgrass), and *Poa secunda* (= *Poa scabrella*; Sandberg bluegrass), and native forbs such as *Achyrachaena mollis* (blow wives), *Bloomeria crocea* (common goldenstar), *Triteleia ixioides* (= *Brodiaea lutea*; prettyface), *Chlorogalum pomeridianum* (wavyleaf soap plant), *Clarkia purpurea* (winecup clarkia), *Dodecatheon jeffreyi* (Sierra shootingstar), *Achillea millefolium* var. *borealis* (= *Achillea borealis*; boreal yarrow), and *Castilleja attenuata* (= *Orthocarpus attenuatis*; attenuate Indian paintbrush).

## California Ruderal Grassland and Meadow

This macrogroup encompasses the non-native-dominated annual grasslands found in California. They occur on the coastal plains, in the Central Valley, in the foothills and in disturbed rural and urban areas. California annual grassland is found on a wide variety of soils, sometimes in complex mosaics. Most are noncalcic Mollisols, medium to heavy texture, about 1.6 feet (0.5 meters) deep. Native graminoid and forb species can be present with low or insignificant cover. The overwhelming dominance of introduced species is undeniable. Non-native species make up 50 to 96 percent of the foliar cover. Dominant introduced graminoid species include *Avena fatua* (wild oat), *Bromus diandrus* (ripgut brome), *Bromus hordeaceus* (soft brome), *Bromus madritensis* (compact brome), *Lolium perenne* ssp. *multiflorum* (= *Lolium multiflorum*; Italian ryegrass), *Taeniatherum caput-medusae* (medusahead rye), and *Aegilops triuncialis* (barbed goatgrass). Introduced forb species include *Erodium botrys* (longbeak stork's bill), *Erodium cicutarium* (redstem stork's bill), *Medicago polymorpha* (burclover), *Geranium dissectum* (cutleaf geranium), *Hypochaeris glabra* (smooth cat's ear), and *Carduus pycnocephalus* (Italian plumeless thistle). There are many more species that can be dominant.

## Subtropical Desert Ecoregion

### Madrean Warm Montane Forest and Woodland

This woodland and forest group occurs in mountains and plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, Trans-Pecos Texas, southern New Mexico and Arizona, generally south of the Mogollon Rim. These forests and woodlands are composed of Madrean pines (*Pinus arizonica* [Arizona pine], *Pinus engelmannii* [Apache pine], *Pinus leiophylla* [Chihuahuan pine], *Pinus strobiformis* [Southwestern white pine]) or madrones (*Arbutus arizonica* [Arizona madrone], *Arbutus xalapensis* [Texas madrone]) and evergreen oaks (*Quercus arizonica* [Arizona white oak], *Quercus emoryi* [Emory oak], *Quercus gravesii* [Chisos red oak], *Quercus grisea* [gray oak], *Quercus hypoleucoides* [silverleaf oak], or *Quercus rugosa* [netleaf oak]) intermingled with patchy shrublands on most mid-elevation slopes 4,790 to 7,546 feet (1,460 to 2,300 meters). In northern stands, *Pinus ponderosa* dominates with Madrean oak species. This group also includes *Hesperocyperis arizonica* (Arizona cypress)-dominated stands with *Quercus hypoleucoides* or *Quercus rugosa* in the understory. Other tree species may include *Juniperus deppeana* (alligator juniper), *Juniperus flaccida* (drooping juniper), *Pinus cembroides* (Mexican pinyon), *Pinus discolor* (border pinyon), and *Pseudotsuga menziesii*. Subcanopy and shrub layers may include typical encinal (found in oak groves) and chaparral species, such as *Agave* spp. (agave), *Arctostaphylos pringlei* (Pringle manzanita), *Arctostaphylos pungens* (pointleaf manzanita), *Garrya wrightii* (Wright's silktassel), *Nolina* spp. (beargrass), and *Quercus turbinella*. Some stands have moderate cover of perennial graminoids, such as *Muhlenbergia emersleyi* (bullgrass), *Muhlenbergia longiligula* (longtongue muhly), *Muhlenbergia virescens* (screwleaf muhly), and *Schizachyrium cirratum* (Texas bluestem).

### Warm Interior Chaparral

This macrogroup occurs prominently across central Arizona (Mogollon Rim) and western New Mexico, south into mountains in the northwestern Chihuahuan region and Madrean Occidentale in northern Mexico, and north into extreme southwestern Utah and southern Nevada. It also occurs in mountains in the Sonoran and western Mojave Deserts, and extends from northeast

Kern County, California, and south into Baja Norte, Mexico. Stands are found on foothills, xeric mountain slopes and canyons in hotter and drier habitats and often dominate along the mid-elevation transition zone between desert scrub and montane woodlands 3,281 to 7,218 feet (1,000 to 2,200 meters). Sites are often steep and rocky. Parent materials are varied and include basalt, diabases, gneiss, schist, shales, slates, sandstones, and more commonly, limestone and coarse-textured granitic substrates. The vegetation is characterized by a moderate to dense evergreen shrub layer dominated by sclerophyllous shrubs such as *Quercus turbinella* and *Ceanothus greggii*. Other common shrubs from the eastern portion of its range (Arizona and New Mexico) include *Quercus toumeyii* (Toumey oak), *Cercocarpus montanus* var. *paucidentatus* (hairy mountain mahogany), *Garrya wrightii*, *Purshia stansburiana*, *Rhus trilobata* (Tucker oak), with *Arctostaphylos pungens* and *Arctostaphylos pringlei* at higher elevations. In desert chaparral stands in the western part of the range, *Quercus john-tuckeri* (Tucker oak), *Quercus cornelius-mulleri* (Muller oak), *Quercus berberidifolia* (scrub oak), *Arctostaphylos patula*, *Arctostaphylos glauca* (bigberry manzanita), *Rhus ovate* (sugar sumac), *Cercocarpus montanus* var. *glaber*, *Garrya flavescens*, *Juniperus californica* (California juniper), and *Nolina parryi* (Parry's beargrass) characterize this shrubland.

### Chihuahuan Desert Scrub

This macrogroup typically occurs as invasive upland shrublands that are concentrated in the extensive desert grassland in foothills and piedmonts of the Chihuahuan Desert, extending into the Sky Island region to the west. Substrates are typically derived from alluvium, often gravelly without a well-developed argillic or calcic soil horizon that would limit infiltration and storage of winter precipitation in deeper soil layers. *Prosopis* spp. (mesquite) and other deep-rooted shrubs exploit this deep-soil moisture that is unavailable to grasses and cacti. Vegetation is typically dominated by *Prosopis glandulosa* (honey mesquite) or *Prosopis velutina* (velvet mesquite) and succulents. Other desert scrub species that can codominate include *Acacia neovernicosa* (viscid acacia), *Acacia constricta* (whitethorn acacia), *Juniperus monosperma* (oneseed juniper), or *Juniperus coahuilensis* (redberry juniper). *Larrea tridentata* (creosote bush) is typically absent or has low cover. Grass cover is typically low and composed of desert grasses such as *Dasyochloa pulchella* (= *Erioneuron pulchellum*; low woollygrass), *Muhlenbergia porteri* (bush muhly), *Muhlenbergia*

*setifolia* (curlyleaf muhly), and *Pleuraphis mutica* (tobosagrass).

### Southern Plains Scrub Woodland and Shrubland

This macrogroup ranges from the High Plains, Rolling Plains, and Red Bed Plains of Texas and Oklahoma, south into parts of the Edwards Plateau and Chihuahuan Desert regions of Texas. The open to closed canopy is dominated or codominated by *Prosopis glandulosa* var. *glandulosa* (honey mesquite). Associated species can include *Ziziphus obtusifolia* (lotebush), *Quercus fusiformis* (Texas live oak), *Sideroxylon lanuginosum* (gum bully), *Aloysia gratissima* (whitebrush), *Mahonia trifoliolata* (algerita), *Yucca glauca* (soapweed yucca), *Opuntia* spp. (pricklypear), *Acacia greggii* (catclaw acacia), *Mimosa* spp. (mimosa), *Rhus lanceolata* (prairie sumac), *Nassella leucotricha* (Texas wintergrass), *Bouteloua curtipendula* (sideoats grama), *Bouteloua gracilis* (blue grama), *Bouteloua hirsute* (hairy grama), *Buchloe dactyloides* (buffalograss), *Schizachyrium scoparium* (little bluestem), *Ruellia nudiflora* (Runyon's wild petunia), *Croton monanthogynus* (prairie tea), *Rhynchosia senna* (Texas snoutbean), and *Indigofera miniata* (coastal indigo).

### Subtropical Steppe Ecoregion

#### Rocky Mountain Two-Needle Pinyon-Juniper Woodland

These woodlands are composed of *Pinus edulis* (twoneedle pinyon), *Juniperus osteosperma* (Utah juniper), or *Juniperus monosperma*. *Pinus edulis* and/or *Juniperus osteosperma*-dominated woodlands occur on dry mountains and foothills of the Colorado Plateau region. *Juniperus monosperma*-dominated woodlands have an understory of perennial grasses such as *Bouteloua gracilis* and *Pleuraphis jamesii* (James' galleta) and other herbaceous species typical of the shortgrass prairie. These woodlands occur along the east and south foothill slopes of the southern Rocky Mountains and into the plains of southeastern Colorado and northern and central New Mexico. *Pinus edulis* and/or *Juniperus monosperma*-dominated woodlands exist on dry mountains and foothills in southern Colorado east of the Continental Divide, and in mountains and plateaus of northern and central New Mexico.

## Great Plains Shortgrass Prairie and Shrubland

The shortgrass prairie in this macrogroup is dominated by the shortgrasses *Bouteloua gracilis* and *Buchloe dactyloides*. Shrublands in this macrogroup are dominated by *Prosopis glandulosa*. The shortgrass prairies occur on flat to rolling uplands. The surface soil may be sandy loam, loam, silt loam, or loamy clay. The subsoil is often finer than the surface soil. The shortgrass prairies are characterized by a moderate to dense sod of short grasses with scattered mid grasses and forbs. The foliage of these species is 3 to 7 inches (7 to 19 centimeters) tall, while the flowering stalks of *Bouteloua gracilis* may reach 18 inches (45 centimeters). The mid grasses are usually stunted by the arid conditions and often do not exceed 2.3 feet (0.7 meters). Other short graminoids found in this community are *Bouteloua hirsute* (hairy grama), *Carex duriuscula* (needleleaf sedge), *Carex inops* ssp. *heliophila* (sun sedge), and *Carex filifolia* (threadleaf sedge; in Nebraska). Several mid grasses occur regularly, such as *Aristida purpurea* (purple threeawn), *Bouteloua curtipendula*, *Pascopyrum smithii* (western wheatgrass), *Schizachyrium scoparium*, *Elymus elymoides* (squirreltail), *Sporobolus cryptandrus* (spike dropseed), *Hesperostipa comata* (= *Stipa comata*; needle and thread), and *Vulpia octoflora* (sixweeks fescue). Forbs, such as *Astragalus* spp. (milkweed), *Gaura coccinea* (scarlet beeblossom), *Machaeranthera pinnatifida* var. *pinnatifida* (lacy tansyaster), *Opuntia polyacantha* (plains pricklypear), *Plantago patagonica* (woolly plantain), *Psoraleidium tenuiflorum* (slimflower scurfpea), *Ratibida columnifera* (upright prairie coneflower), and *Sphaeralcea coccinea* (scarlet globemallow), are common throughout the shortgrass prairies.

## Apacherian-Chihuahuan Semi-Desert Grassland and Steppe

This macrogroup occurs in the northern Chihuahuan Desert and adjacent Sky Islands and Sonoran Desert, extending into limited areas of the southern Great Plains on alluvial flats, loamy plains, and basins sometimes extending up into lower piedmont slopes and broad mesas. Included in this macrogroup are the mesic grasslands that occur in relatively small depressions or swales and along drainages that receive runoff from adjacent areas. Occupying low topographic positions, these sites generally have deep, fine-textured soils that are neutral to slightly or moderately

saline/alkaline. Vegetation is characterized by a moderately dense to dense graminoid layer of perennial grasses that is typically dominated by *Pleuraphis mutica* or with *Bouteloua eriopoda* (black grama) codominant (more historically) or *Bouteloua gracilis* on broad alluvial plains and flats. In mesic swales and depressions and along drainages, *Sporobolus airoides* (alkali sacaton), *Sporobolus wrightii* (big sacaton), and *Pleuraphis mutica* (tobosa swales) dominate, sometimes with other mesic graminoids such as *Pascopyrum smithii* or *Panicum obtusum* (vine mesquite). *Sporobolus airoides* is more common in alkaline soils and along drainages. In degraded stands, *Scleropogon brevifolius* (burrograss), *Dasyochloa pulchella*, or *Aristida* spp. may co-dominate. *Pleuraphis jamesii* can become important in northern stands and *Bouteloua gracilis* in the Great Plains and on degraded stands. Scattered shrub or succulent species can be present, especially on degraded sites and along drainages and in depressions.

## Warm Interior Chaparral

This macrogroup occurs prominently across central Arizona (Mogollon Rim) and western New Mexico, south into mountains in the northwestern Chihuahuan region and Madrea Occidentale in northern Mexico, and north into extreme southwestern Utah and southern Nevada. It also occurs in mountains in the Sonoran and western Mojave Deserts, and extends from northeast Kern County, California, and south into Baja Norte, Mexico. Stands are found on foothills, xeric mountain slopes and canyons in hotter and drier habitats and often dominate along the mid-elevation transition zone between desert scrub and montane woodlands 3,281 to 7,218 feet (1,000 to 2,200 meters). Sites are often steep and rocky. Parent materials are varied and include basalt, diabases, gneiss, schist, shales, slates, sandstones, and more commonly, limestone and coarse-textured granitic substrates. The vegetation is characterized by a moderate to dense evergreen shrub layer dominated by sclerophyllous shrubs such as *Quercus turbinella* and *Ceanothus greggii*. Other common shrubs from the eastern portion of its range (Arizona and New Mexico) include *Quercus toumeyi*, *Cercocarpus montanus* var. *paucidentatus*, *Garrya wrightii*, *Purshia stansburiana*, *Rhus trilobata*, with *Arctostaphylos pungens* and *Arctostaphylos pringlei* at higher elevations. In desert chaparral stands in the western part of the range, *Quercus john-tuckeri*, *Quercus cornelius-mulleri*, *Quercus berberidifolia*, *Arctostaphylos patula*, *Arctostaphylos glauca*, *Rhus ovata*, *Cercocarpus montanus* var. *glaber*

(=*Cercocarpus betuloides*), *Garrya flavescens*, *Juniperus californica*, and *Nolina parryi* characterize this shrubland.

### Chihuahuan Desert Scrub

This macrogroup typically occurs as invasive upland shrublands that are concentrated in the extensive desert grassland in foothills and piedmonts of the Chihuahuan Desert, extending into the Sky Island region to the west. Substrates are typically derived from alluvium, often gravelly without a well-developed argillic or calcic soil horizon that would limit infiltration and storage of winter precipitation in deeper soil layers. *Prosopis* spp. and other deep-rooted shrubs exploit this deep-soil moisture that is unavailable to grasses and cacti. Vegetation is typically dominated by *Prosopis glandulosa* or *Prosopis velutina* and succulents. Other desert scrub species that can codominate include *Acacia neovermicosa*, *Acacia constricta*, *Juniperus monosperma*, or *Juniperus coahuilensis*. *Larrea tridentata* is typically absent or has low cover. Grass cover is typically low and composed of desert grasses such as *Dasyochloa pulchella* (= *Erioneuron pulchellum*), *Muhlenbergia porteri*, *Muhlenbergia setifolia*, and *Pleuraphis mutica*.

### Southern Plains Scrub Woodland and Shrubland

This macrogroup ranges from the High Plains, Rolling Plains, and Red Bed Plains of Texas and Oklahoma, south into parts of the Edwards Plateau and Chihuahuan Desert regions of Texas. The open to closed canopy is dominated or codominated by *Prosopis glandulosa* var. *glandulosa*. Associated species can include *Ziziphus obtusifolia*, *Quercus fusiformis*, *Sideroxylon lanuginosum*, *Aloisia gratissima*, *Mahonia trifoliolata*, *Yucca glauca*, *Opuntia* spp., *Acacia greggii*, *Mimosa* spp., *Rhus lanceolata*, *Nassella leucotricha*, *Bouteloua curtipendula*, *Bouteloua gracilis*, *Bouteloua hirsuta*, *Buchloe dactyloides*, *Schizachyrium scoparium*, *Ruellia nudiflora*, *Croton monanthogynus*, *Rhynchosia senna*, and *Indigofera miniata*.

## Temperate Desert Ecoregion

### Northern Rocky Mountain Lower Montane and Foothill Forest

This macrogroup consists of *Pinus ponderosa* woodlands and “wooded steppes”, located in the foothills of the northern 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 wooded steppes occur at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests, typically on warm, dry, exposed sites. These woodlands and wooded steppes receive winter and spring rains, and thus have a greater spring “green-up” compared with the drier woodlands in the central Rockies. However, sites are often too droughty to support a closed tree canopy. Elevations range from less than 1,640 feet (500 meters) in British Columbia to 5,249 feet (1,600 meters) 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. These woodlands and wooded steppes generally occur 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.

The *Pinus ponderosa* woodlands have a shrubby or grassy understory, whereas the *Pinus ponderosa* wooded steppes have widely spaced, scattered *Pinus ponderosa* trees over generally shrubby but sparse understories. The woodlands are generally fire-maintained, whereas the wooded steppes are often too dry and with vegetation too widely spaced to be able to carry fire. *Pinus ponderosa* var. *ponderosa* is the predominant conifer; *Pseudotsuga menziesii* or *Pinus flexilis* (limber pine) can be present in the tree canopy but are usually absent. The understory can be shrubby, with *Artemisia tridentata* (big sagebrush), *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Cercocarpus ledifolius* (curl-leaf mountain mahogany), *Physocarpus malvaceus* (mallow ninebark), *Purshia tridentata* (antelope bitterbrush), *Symphoricarpos oreophilus* (mountain snowberry) or *Symphoricarpos albus* (common snowberry), *Amelanchier alnifolia*

(Saskatoon serviceberry), and *Rosa* spp. (rose) being common species. In transition areas with sagebrush steppe, *Purshia tridentata*, *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush), *Artemisia tridentata* ssp. *tridentata* (basin big sagebrush), and *Artemisia tripartita* (threetip sagebrush) can be common in fire-protected sites such as rocky areas. Deciduous shrubs, such as *Physocarpus malvaceus*, *Symphoricarpos albus*, or *Spiraea betulifolia* (white spirea), can be abundant in more northerly sites or more moist climates. Herbaceous vegetation in the wooded steppes is predominantly fire-resistant grasses and forbs that resprout after surface fires; shrubs, understory trees and downed logs are uncommon. The wooded steppes support grasses such as *Pseudoroegneria spicata* (bluebunch wheatgrass), *Hesperostipa* spp. (needle and thread), *Achnatherum* spp. (needlegrass), dry *Carex* (sedge) species (*Carex inops* [long-stolon sedge]), *Elymus elymoides*, *Festuca idahoensis* (Idaho fescue), or *Festuca campestris* (rough fescue).

### **Southern Rocky Mountain Lower Montane Forest**

These forests are dominated by *Pinus ponderosa*, either solely or mixed with *Pseudotsuga menziesii*, *Pinus edulis*, *Pinus contorta*, *Populus tremuloides* (quaking aspen), and *Juniperus* spp. (juniper). Ponderosa pine forests with a mixture of other tree species have a typically shrubby understory composed of *Artemisia nova* (black sagebrush), *Artemisia tridentata*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Cercocarpus montanus*, *Purshia stansburiana*, *Purshia tridentata*, *Quercus gambelii* (Gambel oak), *Symphoricarpos* spp., *Prunus virginiana*, *Amelanchier alnifolia*, and *Rosa* spp. Common grasses in the understory include *Pseudoroegneria spicata*, *Pascopyrum smithii*, and species of *Hesperostipa*, *Achnatherum*, *Festuca*, *Muhlenbergia*, and *Bouteloua*. Ponderosa pine forests dominated solely by ponderosa pine have a grass-dominated understory composed of *Festuca arizonica* (Arizona fescue), *Muhlenbergia virescens*, *Pseudoroegneria spicata*, *Andropogon gerardii* (big bluestem), *Schizachyrium scoparium*, *Festuca idahoensis*, *Piptatherum micranthum* (littleseed ricegrass), and *Bouteloua gracilis*.

### **Intermountain Singleleaf Pinyon-Western Juniper Woodland**

These woodlands are composed of *Pinus monophylla* (singleleaf pinyon), *Juniperus osteosperma*, or *Juniperus occidentalis* (western juniper). Woodlands composed of scattered *Juniperus osteosperma* trees exist on dry foothills and sandsheets of the Colorado Plateau and eastern Great Basin. *Juniperus osteosperma* woodlands have an understory dominated by grasses such as *Bouteloua gracilis*, *Hesperostipa comata*, and *Pleuraphis jamesii*. Woodlands dominated by *Pinus monophylla* form an open to dense tree layer, often with the wider ranging *Juniperus osteosperma*. These woodlands exist on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada. Woodlands dominated by *Juniperus occidentalis* are largely restricted to the Columbia Plateau region and *Pinus monophylla* is not present.

### **Rocky Mountain Two-Needle Pinyon-Juniper Woodland**

These woodlands are composed of *Pinus edulis*, *Juniperus osteosperma*, or *Juniperus monosperma*. *Pinus edulis* and/or *Juniperus osteosperma*-dominated woodlands occur on dry mountains and foothills of the Colorado Plateau region. *Juniperus monosperma*-dominated woodlands have an understory of perennial grasses such as *Bouteloua gracilis* and *Pleuraphis jamesii* and other herbaceous species typical of the shortgrass prairie. These woodlands occur along the east and south foothill slopes of the southern Rocky Mountains and into the plains of southeastern Colorado and northern and central New Mexico. *Pinus edulis* and/or *Juniperus monosperma*-dominated woodlands exist on dry mountains and foothills in southern Colorado east of the Continental Divide, and in mountains and plateaus of northern and central New Mexico.

### **Northern Rocky Mountain-Vancouverian Montane and Foothill Grassland and Shrubland**

This macrogroup is composed of shrublands in the lower montane and foothill regions around the Columbia Basin and north and east into the Northern Rockies, and dry grasslands occurring in the canyons and valleys of the northern Great Basin and Columbia Basin, particularly along the Snake River canyon, the

## MACROGROUP DESCRIPTIONS

---

lower foothill slopes of the Blue Mountains, and along the main stem of the Columbia River in eastern Washington.

The shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands, usually on steep slopes of canyons on all aspects. *Rhus glabra* (smooth sumac), *Amelanchier alnifolia*, *Prunus emarginata*, *Prunus virginiana*, *Rosa* spp., *Symphoricarpos oreophilus*, and *Holodiscus discolor* are the most common dominant shrubs, occurring alone or in any combination. Occurrences in central and eastern Wyoming can include *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush) and *Cercocarpus montanus*, but neither of these 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. *Festuca idahoensis*, *Festuca campestris*, *Calamagrostis rubescens* (pinegrass), *Carex geyeri* (Geyer's sedge), *Aristida purpurea*, *Koeleria macrantha* (prairie junegrass), *Pseudoroegneria spicata*, and *Poa secunda* are the most important grasses. *Geum triflorum* (old man's whiskers), *Potentilla gracilis* (slender cinquefoil), *Lomatium triternatum* (nineleaf biscuitroot), *Balsamorhiza sagittata* (arrowleaf balsamroot), and species of *Eriogonum* (buckwheat), *Phlox* (phlox), and *Erigeron* (fleabane) are important forbs.

The grasslands are found on steep open slopes, from 300 to 5,000 feet (90 to 1,525 meters). Soils are derived from residuum and have patchy, thin, wind-blown surface deposits. Slope failures are common occurrences. The grasslands are dominated by patchy graminoid cover, cacti, and some forbs. *Aristida purpurea* var. *longiseta* (Fendler threeawn), *Sporobolus cryptandrus*, *Poa secunda*, *Pseudoroegneria spicata*, *Festuca idahoensis*, and *Opuntia polyacantha* are common species. Deciduous shrubs *Rhus glabra*, *Symphoricarpos* spp., *Physocarpus malvaceus*, *Holodiscus discolor*, and *Ribes* spp. (gooseberry) are infrequent native species that can increase with fire exclusion.

### **Southern Rocky Mountain Montane Grassland and Shrubland**

This macrogroup is composed of shrublands dominated by *Amelanchier utahensis* (Utah serviceberry), *Cercocarpus montanus*, or *Quercus gambelii*. Stands dominated by one or another of these shrubs often intergrade with each other. This macrogroup is found

in the mountains, plateaus, foothills, and canyon slopes of the southern Rocky Mountains and Colorado Plateau, and on outcrops and canyon slopes in the western Great Plains. It ranges from the southern and central Great Plains, southwest to southern New Mexico, extending north into Wyoming, and west into the Intermountain West region. These shrublands occur between 4,921 and 9,514 feet (1,500 and 2,900 meters) and are usually associated with exposed sites, rocky substrates, and dry conditions, which limit tree growth. Where *Cercocarpus montanus* dominates pure stands in parts of Wyoming and Colorado, *Quercus gambelii* is absent. *Quercus gambelii* is typically dominant on the more mesic and higher elevation sites from 6,562 to 9,514 feet (2,000 to 2,900 meters). On stands where *Quercus gambelii* is dominant, other vegetation typically includes *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Cercocarpus montanus*, *Prunus virginiana*, *Purshia stansburiana*, *Purshia tridentata*, *Robinia neomexicana* (New Mexico locust), *Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius* (mountain snowberry). On stands where *Cercocarpus montanus* is dominant, other vegetation typically includes *Amelanchier utahensis*, *Purshia tridentata*, *Rhus trilobata*, *Ribes cereum* (wax currant), *Symphoricarpos oreophilus*, or *Yucca glauca*. Grasses are represented by species of *Muhlenbergia* (muhly), *Bouteloua*, *Hesperostipa*, and *Pseudoroegneria spicata*.

### **Great Basin and Intermountain Dry Shrubland and Grassland**

This macrogroup consists of shrubland-steppe and grasslands. The shrubland-steppe 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. These shrubland-steppes can either be shrub-dominated, dwarf shrub-dominated, or grass dominated with a sparse shrub layer. Common shrubs include *Atriplex canescens* (fourwing saltbush), *Eriogonum corymbosum* (crispleaf buckwheat), *Ericameria nauseosa* (rubber rabbitbrush), *Ephedra viridis* (Mormon tea), *Ephedra torreyana* (Torrey's jointfir), *Krascheninnikovia lanata* (winterfat), *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Tetradymia canescens* (spineless horsebrush), and *Gutierrezia sarothrae* (broom snakeweed). Herbaceous species include *Pleuraphis jamesii*, *Bromus tectorum*

(cheatgrass), *Achnatherum hymenoides* (Indian ricegrass), *Aristida purpurea*, and *Hesperostipa comata*.

The grasslands are semi-arid to arid and are located throughout the intermountain western U.S. They occur on sites over an elevational range of about 3,609 to 10,794 feet (1,100 to 3,290 meters) in most of the range, and 1,148 to 1,394 feet (350 to 425 meters) in the Columbia Basin on a variety of landforms, including swales, playas, mesas, alluvial flats, and plains. These grasslands constitute a matrix over large areas of intermountain basins, and also can occur as large patches in mosaics with semi-desert shrublands. Substrates are often well-drained sandy or loam soils derived from sedimentary parent materials, but are quite variable and can include fine-textured soils derived from igneous and metamorphic rocks. The dominant perennial bunchgrasses and shrubs of these grasslands are all drought-resistant plants. Dominant or codominant species are *Achnatherum hymenoides*, *Achnatherum lettermanii* (Letterman's needlegrass), *Achnatherum nelsonii* (Columbia needlegrass), *Achnatherum speciosum* (desert needlegrass), *Bouteloua eriopoda*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, *Poa cusickii* (Cusick's bluegrass), *Poa secunda*, and *Pseudoroegneria spicata*. Scattered shrubs and dwarf-shrubs often are present, especially *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex* spp. (saltbush), *Coleogyne* spp. (coleogyne), *Ephedra* spp. (jointfir), *Gutierrezia sarothrae*, and *Krascheninnikovia lanata*, which are the typical dominant species of adjacent shrublands.

### Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe

This macrogroup consists of shrublands and shrub-steppe that is widely distributed from the Great Basin, Columbia River Basin, Colorado Plateau, northern Rocky Mountains, and northwestern Great Plains, as far east as the Dakotas, at elevations as low as 1,640 feet (500 meters) in the northwestern Great Plains to 8,202 feet (2,500 meters) in the Rocky Mountains and Colorado Plateau. This macrogroup 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, whereas those with steeper slopes have shallow to moderately deep soils. Climate ranges from arid in the western Great Basin to subhumid in the

northern Great Plains and Rocky Mountains, with much of the precipitation falling primarily as snow. The amount and reliability of growing-season moisture increase eastward and with increasing elevation. 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* (Nevada jointfir), *Ephedra viridis*, *Ericameria nauseosa*, or *Sarcobatus vermiculatus* (greasewood). Other common shrubs include *Artemisia frigida* (prairie sagewort), *Atriplex confertifolia* (shadscale saltbush), *Atriplex gardneri* (Gardner's saltbush), *Chrysothamnus* spp. (rabbitbrush), *Ericameria* spp. (rabbitbrush), *Grayia spinosa* (spiny hopsage), *Krascheninnikovia lanata*, *Peraphyllum ramosissimum* (wild crab apple), *Prunus virginiana*, *Purshia tridentata*, *Symphoricarpos longiflorus* (desert snowberry), and *Tetradymia* spp. (horsebrush). The herbaceous layer can be sparse to strongly dominated by graminoids including *Achnatherum hymenoides*, *Achnatherum lettermanii*, *Achnatherum pinetorum* (pine needlegrass), *Achnatherum thurberianum* (Thurber's needlegrass), *Bouteloua gracilis*, *Bromus tectorum*, *Carex filifolia*, *Elymus albicans* (Montana wheatgrass), *Elymus elymoides*, *Elymus lanceolatus* (thickspike wheatgrass), *Festuca idahoensis*, *Hesperostipa comata*, *Leymus ambiguous* (Colorado wildrye), *Pleuraphis jamesii*, *Poa fendleriana* (muttongrass), *Poa secunda*, *Pseudoroegneria spicata*, *Sporobolus airoides*, and *Sporobolus cryptandrus*.

## Temperate Steppe Ecoregion

### Northern Rocky Mountain Lower Montane and Foothill Forest

This macrogroup consists of *Pinus ponderosa* woodlands and "wooded steppes," located in the foothills of the northern Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and Eastern Cascades into southern interior British Columbia, and east across Idaho into the eastern foothills of the Montana Rockies. These woodlands and wooded steppes occur at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests, typically on warm, dry, exposed sites. These woodlands and wooded steppes receive winter and spring rains, and thus have a greater spring "green-up" compared with the drier woodlands in the central Rockies. However, sites are often too droughty to

support a closed tree canopy. Elevations range from less than 1,640 feet (500 meters) in British Columbia to 5,249 feet (1,600 meters) 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. These woodlands and wooded steppes generally occur 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.

The *Pinus ponderosa* woodlands have a shrubby or grassy understory, whereas the *Pinus ponderosa* wooded steppes have widely spaced, scattered *Pinus ponderosa* trees over generally shrubby but sparse understories. The woodlands are generally fire-maintained, whereas the wooded steppes are often too dry and with vegetation too widely spaced to be able to carry fire. *Pinus ponderosa* var. *ponderosa* is the predominant conifer; *Pseudotsuga menziesii* or *Pinus flexilis* can 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. being common species. In transition areas with sagebrush steppe, *Purshia tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tridentata* ssp. *tridentata*, and *Artemisia tripartita* can 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 wooded steppes is predominantly fire-resistant grasses and forbs that resprout after surface fires; shrubs, understory trees and downed logs are uncommon. The wooded steppes support grasses such as *Pseudoroegneria spicata*, *Hesperostipa* spp., *Achnatherum* spp., dry *Carex* species (*Carex inops*), *Elymus elymoides*, *Festuca idahoensis*, or *Festuca campestris*.

Also included are *Pinus ponderosa* woodlands that occur along the eastern face of the Rocky Mountains and into the Great Plains. These woodlands are variable, 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 greater. They occur primarily on gentle to steep

slopes along escarpments, buttes, canyons, rock outcrops or ravines and can grade into surrounding mixed grass prairie. Soils typically range from well-drained loamy sands to sandy loams formed in colluvium, weathered sandstone, limestone, scoria, or eolian sand. These woodlands are primarily dominated by *Pinus ponderosa* but can include a sparse to relatively dense understory of *Juniperus scopulorum* (Rocky Mountain juniper), *Thuja occidentalis* (arborvitae), or *Cercocarpus* species (mountain mahogany) with just a few scattered trees. Deciduous trees are an important component in some areas (western Dakotas, Black Hills) and are sometimes codominant with *Pinus ponderosa*, including *Fraxinus pennsylvanica* (green ash), *Betula papyrifera* (paper birch), *Quercus macrocarpa* (bur oak), *Ulmus Americana* (American elm), *Acer negundo* (boxelder), and *Populus tremuloides*. Important or common shrub species with *Pinus ponderosa* can include *Arctostaphylos uva-ursi*, *Mahonia repens* (creeping barberry), *Yucca glauca*, *Symphoricarpos* spp., *Prunus virginiana*, *Juniperus communis*, *Juniperus horizontalis* (creeping juniper), *Amelanchier alnifolia*, *Rhus trilobata*, and *Physocarpus monogynus* (mountain ninebark). The herbaceous understory can range from sparse to a dense layer with species typifying the surrounding mixed grass prairie, with mixed grass species common such as *Andropogon gerardii*, *Bouteloua curtipendula*, *Carex inops* ssp. *heliophila*, *Carex filifolia*, *Danthonia intermedia* (timber oatgrass), *Koeleria macrantha*, *Nassella viridula* (green needlegrass), *Oryzopsis asperifolia* (roughleaf ricegrass), *Pascopyrum smithii*, *Piptatherum micranthum*, and *Schizachyrium scoparium*.

### **Southern Rocky Mountain Lower Montane Forest**

These forests are dominated by *Pinus ponderosa*, either solely or mixed with *Pseudotsuga menziesii*, *Pinus edulis*, *Pinus contorta*, *Populus tremuloides*, and *Juniperus* spp. Ponderosa pine forests with a mixture of other tree species have a typically shrubby understory composed of *Artemisia nova*, *Artemisia tridentata*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Cercocarpus montanus*, *Purshia stansburiana*, *Purshia tridentata*, *Quercus gambelii*, *Symphoricarpos* spp., *Prunus virginiana*, *Amelanchier alnifolia*, and *Rosa* spp. Common grasses in the understory include *Pseudoroegneria spicata*, *Pascopyrum smithii*, and species of *Hesperostipa*, *Achnatherum*, *Festuca*, *Muhlenbergia*, and *Bouteloua*. Ponderosa pine forests dominated solely by ponderosa pine have a grass-

dominated understory composed of *Festuca arizonica*, *Muhlenbergia virescens*, *Pseudoroegneria spicata*, *Andropogon gerardii*, *Schizachyrium scoparium*, *Festuca idahoensis*, *Piptatherum micranthum*, and *Bouteloua gracilis*.

### **Intermountain Singleleaf Pinyon- Western Juniper Woodland**

These woodlands are composed of *Pinus monophylla*, *Juniperus osteosperma*, or *Juniperus occidentalis*. Woodlands composed of scattered *Juniperus osteosperma* trees exist on dry foothills and sandsheets of the Colorado Plateau and eastern Great Basin. *Juniperus osteosperma* woodlands have an understory dominated by grasses such as *Bouteloua gracilis*, *Hesperostipa comata*, and *Pleuraphis jamesii*. Woodlands dominated by *Pinus monophylla* form an open to dense tree layer, often with the wider ranging *Juniperus osteosperma*. These woodlands exist on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada. Woodlands dominated by *Juniperus occidentalis* are largely restricted to the Columbia Plateau region and *Pinus monophylla* is not present.

### **Rocky Mountain Two-Needle Pinyon- Juniper Woodland**

These woodlands are composed of *Pinus edulis*, *Juniperus osteosperma*, or *Juniperus monosperma*. *Pinus edulis* and/or *Juniperus osteosperma*-dominated woodlands occur on dry mountains and foothills of the Colorado Plateau region. *Juniperus monosperma*-dominated woodlands have an understory of perennial grasses such as *Bouteloua gracilis* and *Pleuraphis jamesii* and other herbaceous species typical of the shortgrass prairie. These woodlands occur along the east and south foothill slopes of the southern Rocky Mountains and into the plains of southeastern Colorado and northern and central New Mexico. *Pinus edulis* and/or *Juniperus monosperma*-dominated woodlands exist on dry mountains and foothills in southern Colorado east of the Continental Divide, and in mountains and plateaus of northern and central New Mexico.

### **Northern Rocky Mountain- Vancouverian Montane and Foothill Grassland and Shrubland**

This macrogroup is composed of shrublands in the lower montane and foothill regions around the Columbia Basin and north and east into the Northern Rockies, and various types of grasslands. The grasslands are geographically extensive in this ecoregion, with one type of grassland being a dry grassland occurring in the canyons and valleys of the northern Great Basin and Columbia Basin particularly along the Snake River canyon, the lower foothill slopes of the Blue Mountains, and along the main stem of the Columbia River in eastern Washington, another grassland type commonly referred to as the Palouse Prairie in the Blue Mountains of Oregon and north into the Okanagan and Fraser Plateaus of British Columbia and the Canadian Rockies, and another grassland type located in the mountains and large valleys of northwestern Wyoming and western Montana, and east into the central Montana mountain “islands” foothills and the Rocky Mountain Front and Big and Little Belt Ranges.

The shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands, usually on steep slopes of canyons on all aspects. *Rhus glabra*, *Amelanchier alnifolia*, *Prunus emarginata*, *Prunus virginiana*, *Rosa* spp., *Symphoricarpos oreophilus*, and *Holodiscus discolor* are the most common dominant shrubs, occurring alone or in any combination. Occurrences in central and eastern Wyoming can include *Artemisia tridentata* ssp. *vaseyana* and *Cercocarpus montanus*, but neither of these 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. *Festuca idahoensis*, *Festuca campestris*, *Calamagrostis rubescens*, *Carex geyeri*, *Aristida purpurea*, *Koeleria macrantha*, *Pseudoroegneria spicata*, and *Poa secunda* are the most important grasses. *Geum triflorum*, *Potentilla gracilis*, *Lomatium triternatum*, *Balsamorhiza sagittata*, and species of *Eriogonum*, *Phlox*, and *Erigeron* are important forbs.

The dry grasslands are found on steep open slopes, from 300 to 5,000 feet (90 to 1,525 meters). Soils are derived from residuum and have patchy, thin, wind-blown surface deposits. Slope failures are common occurrences. The grasslands are dominated by patchy

graminoid cover, cacti, and some forbs. *Aristida purpurea* var. *longiseta*, *Sporobolus cryptandrus*, *Poa secunda*, *Pseudoroegneria spicata*, *Festuca idahoensis*, and *Opuntia polyacantha* are common species. Deciduous shrubs *Rhus glabra*, *Symphoricarpos* spp., *Physocarpus malvaceus*, *Holodiscus discolor*, and *Ribes* spp. are infrequent native species that can increase with fire exclusion. The Palouse Prairie grasslands are found on rolling topography composed of loess hills and plains lying over basalt plains. The climate of these grasslands has warm to hot, dry summers and cool, wet winters. Annual precipitation is high, ranging between 15 and 30 inches (38 and 76 centimeters). Soils are typically deep, well-developed, and old. The remaining grasslands outside of the Palouse Prairie area are influenced by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. In the eastern portion of the range in Montana, winter precipitation is replaced by a large spring peak in precipitation. Elevations range from 984 to 5,413 feet (300 to 1,650 meters), 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) they have been converted to grassland-dominated areas. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline, often with a biological soil crust. The most important species are cool-season perennial bunch grasses and forbs (greater than 25 percent cover), sometimes with a sparse (less than 10 percent 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. Forb diversity is typically high in both mesic and dry aspects of these grasslands.

### **Southern Rocky Mountain Montane Grassland and Shrubland**

This macrogroup is composed of shrublands dominated by *Amelanchier utahensis*, *Cercocarpus montanus*, or *Quercus gambelii*. Stands dominated by one or another of these shrubs often intergrade with each other. This macrogroup is found in the mountains, plateaus, foothills, and canyon slopes of the southern Rocky Mountains and Colorado Plateau, and on outcrops and canyon slopes in the western Great Plains. It ranges from the southern and central Great Plains, southwest

to southern New Mexico, extending north into Wyoming, and west into the Intermountain West region. These shrublands occur between 4,921 and 9,514 feet (1,500 and 2,900 meters) and are usually associated with exposed sites, rocky substrates, and dry conditions, which limit tree growth. Where *Cercocarpus montanus* dominates pure stands in parts of Wyoming and Colorado, *Quercus gambelii* is absent. *Quercus gambelii* is typically dominant on the more mesic and higher elevation sites from 6,562 to 9,514 feet (2,000 to 2,900 meters). On stands where *Quercus gambelii* is dominant, other vegetation typically includes *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Cercocarpus montanus*, *Prunus virginiana*, *Purshia stansburiana*, *Purshia tridentata*, *Robinia neomexicana*, *Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*. On stands where *Cercocarpus montanus* is dominant, other vegetation typically includes *Amelanchier utahensis*, *Purshia tridentata*, *Rhus trilobata*, *Ribes cereum*, *Symphoricarpos oreophilus*, or *Yucca glauca*. Grasses are represented by species of *Muhlenbergia*, *Bouteloua*, *Hesperostipa*, and *Pseudoroegneria spicata*.

### **Great Plains Shortgrass Prairie and Shrubland**

The shortgrass prairie in this macrogroup is dominated by the shortgrasses *Bouteloua gracilis* and *Buchloe dactyloides*. Shrublands in this macrogroup are dominated by *Prosopis glandulosa*. The shortgrass prairies occur on flat to rolling uplands. The surface soil may be sandy loam, loam, silt loam, or loamy clay. The subsoil is often finer than the surface soil. The shortgrass prairies are characterized by a moderate to dense sod of short grasses with scattered mid grasses and forbs. The foliage of these species is 3 to 7 inches (7 to 19 centimeters) tall, while the flowering stalks of *Bouteloua gracilis* may reach 18 inches (45 centimeters). The mid grasses are usually stunted by the arid conditions and often do not exceed 2.3 feet (0.7 meters). Other short graminoids found in this community are *Bouteloua hirsuta*, *Carex duriuscula*, *Carex inops* ssp. *heliophila*, and *Carex filifolia* (in Nebraska). Several mid grasses occur regularly, such as *Aristida purpurea*, *Bouteloua curtipendula*, *Pascopyrum smithii*, *Schizachyrium scoparium*, *Elymus elymoides*, *Sporobolus cryptandrus*, *Hesperostipa comata*, and *Vulpia octoflora*. Forbs, such as *Astragalus* spp., *Gaura coccinea*, *Machaeranthera pinnatifida* var. *pinnatifida*, *Opuntia polyacantha*, *Plantago patagonica*, *Psoraleidium tenuiflorum*,

*Ratibida columnifera*, and *Sphaeralcea coccinea*, are common throughout the shortgrass prairies.

## Great Plains Mixedgrass Prairie and Shrubland

This macrogroup consists of mesic and dry mixed grass prairies, which extend from Kansas and New Mexico north through western Nebraska and eastern Colorado, northward through Wyoming and the western Dakotas into eastern and central Montana, west to the Rocky Mountain Front Range in Montana and Wyoming. The mesic mixed grass prairies are a mixture of mostly mixed grass prairie with some tallgrass prairie, on mostly moderate to gentle slopes, usually at the base of foothill slopes (for example the hogbacks of the Rocky Mountain Front Range, where it typically occurs as a relatively narrow elevational band between montane woodlands and shrublands and the shortgrass steppe). It also occurs east on the Front Range piedmont alongside the Chalk Bluffs near the Colorado-Wyoming border, out into the Great Plains on the Palmer Divide in Colorado, and on piedmont slopes below mesas and foothills in northeastern New Mexico. Soil texture is the defining environmental descriptor; soils are primarily mesic, fine and medium textured, and do not include sands, sandy soils, or sandy loams. Graminoids typically comprise the greatest amount of canopy cover and include *Pascopyrum smithii*, *Nassella viridula*, *Andropogon gerardii*, and *Festuca idahoensis* (in Montana). Other

species include *Schizachyrium scoparium*, *Muhlenbergia montana* (mountain muhly), *Sporobolus cryptandrus*, *Sorghastrum nutans* (Indiangrass), *Pseudoroegneria spicata*, *Bouteloua gracilis*, and *Bouteloua curtipendula*. Shrub species such as *Symphoricarpos* spp., *Artemisia frigida*, and *Artemisia cana* (silver sagebrush) also can occur. With intensive grazing, cool-season exotic species such as *Poa pratensis* (Kentucky bluegrass), *Bromus inermis* (smooth brome), and *Bromus japonicus* (Japanese brome) can increase in dominance. Shrub species such as *Juniperus virginiana* (eastern redcedar) can also increase in dominance with fire suppression.

The dry mixed grass prairies occur on flat to rolling topography with deep, sandy loam to loam, coarse-textured soils. The vegetation is dominated by moderate to moderately dense medium-tall grasses and scattered shrubs. Dominant species include *Hesperostipa comata*, *Carex inops* ssp. *heliophila*, and *Carex filifolia*. *Calamovilfa longifolia* (prairie sandreed) is often found with high cover values on sandier soils, and *Koeleria macrantha* cover increases on degraded sites. Other common species include *Hesperostipa neomexicana* (New Mexico feathergrass), *Hesperostipa curtisetata* (shortbristle needle and thread), and *Schizachyrium scoparium*. Common woody species include *Dasiphora fruticosa* spp. *floribunda* (shrubby cinquefoil), *Rhus trilobata*, and *Juniperus horizontalis*.