

An Overview of Vegetation Communities and Common Plants of the Sampson Creek Preserve (Jackson County, Oregon)



for the Selberg Institute LLC
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by

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Cover photos: Top right - Landscape view of the preserve looking east into Sampson Creek canyon, the promontory of Buck Point in center foreground. Lower left - Black hawthorne (*Crataegus douglasii*), a relatively uncommon shrub found in riparian communities along Sampson Creek, Lower right - Towering Oregon white oak tree, representative of many old-growth oak stands on the preserve. All photos in this report taken by the author.

INTRODUCTION

The objective of this report is to describe the dominant vegetation patterns, plant communities and common vascular plant species that occur on the Sampson Creek Preserve (hereafter abbreviated as 'SCP' or 'preserve'). Originally a historic cattle ranch, the SCP was established in 2015 when 4,761 acres of private land in the Rogue Valley foothills southeast of Ashland, Oregon were acquired and placed into conservation management under the direction of the Selberg Institute LLC. The vision of the Selberg Institute is to protect and restore the biodiversity and ecosystem values of the preserves under its stewardship by applying science-based principles to land management, encouraging collaborative research activities, and providing for public enjoyment through educational programs and controlled access.

In working towards development of this mission, the Institute is in the initial stages of inventorying the many biological resources that exist on the Sampson Creek property. This report is likely one of the first of many written contributions to provide information on the area's flora and fauna that will help guide future land stewardship and research activities. Toward these ends, it is hoped that this qualitative overview of the vegetation communities and common plants on the preserve will serve as a useful resource to future researchers, managers and others interested in the plant life of this special place.

Plant community structure and composition on the SCP were evaluated via field surveys conducted during the spring and summer 2016. Traverses on foot were made at regular intervals across the property and used to qualitatively classify the vegetation into identifiable communities based on plant physiognomy, dominant species, landforms, disturbance history and other attributes. Based on this field assessment, a total of six primary vegetation types, most with several distinct subtypes or phases, were documented on the preserve and are described in the following sections:

I. GRASSLANDS AND MEADOWS

- a. Perennial/native
- b. Annual/non-native
- c. Forb-dominated dry meadows

II. SHRUBLANDS

- a. Evergreen sclerophyllous chaparral (*Arctostaphylos/Ceanothus/Arbutus*)
- b. Rosaceous chaparral (*Prunus/Amelanchier/Cercocarpus/Holodiscus*)
- c. Poison oak 'thickets' (*Toxicodendron diversilobum*)

III. OAK WOODLANDS AND FORESTS

- a. Oregon white oak (*Quercus garryana*)
- b. California black oak (*Quercus kelloggii*)

IV. MIXED CONIFER FORESTS

V. BROADLEAF RIPARIAN WOODLANDS AND SHRUBLANDS

VI. ROCK OUTCROPS AND BARRENS

Collectively, these six vegetation types on the SCP comprise a relatively intact, complete and rare cross-section of the native ecosystems that historically occupied the interior valleys and foothills of southwest Oregon, but which have since largely been lost to development.

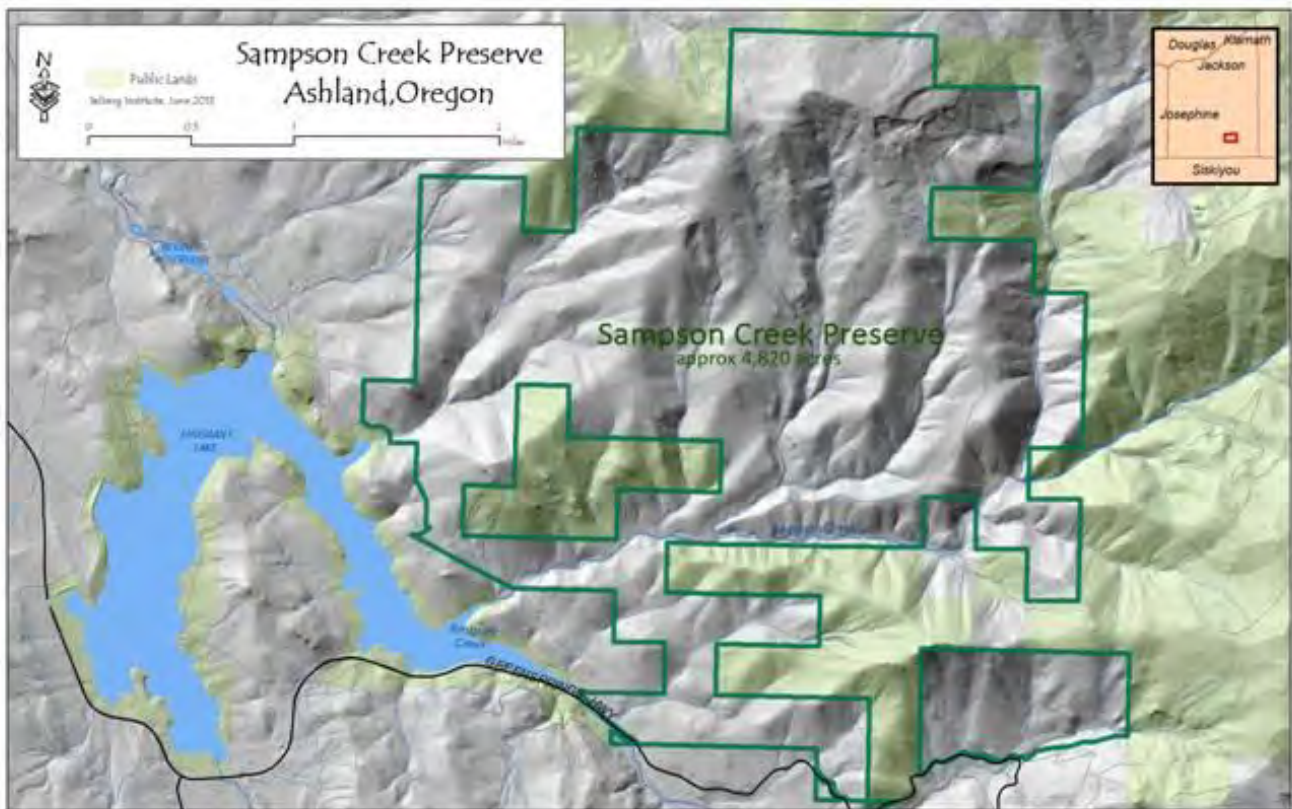


Figure 1. Shaded relief map of the Selberg Creek Preserve showing adjacent public lands (light green), in southeast Jackson County, Oregon.

The vascular plant lists that accompany each vegetation description include the most common and characteristic plant species. Each section also includes a series of photographs collected during field surveys that provide pictorial documentation as well as complement the written descriptions of primary community types and phases. The final section compares the plant communities described in this report with those that have been reported in other vegetation classifications in southwest Oregon and adjacent northern California. Information on geology, soils, climate, topography and other aspects of the physical environment is presented as a preface to help provide the ecological context for understanding Sampson Creek's vegetation and the forces that have shaped it to the present day.

THE PHYSICAL ENVIRONMENT

Location

The Sampson Creek Preserve is located in the foothills of the southern Oregon Cascades, 10-14 air miles southeast of the city of Ashland in Jackson County, Oregon (Figure 1). The preserve is comprised of two primary parcels -- the larger, contiguous Sampson Creek property (4,477 acres) and the Soda Gulch parcel (284 acres), located 1-2 miles south of the primary property and extending south to Oregon State Highway 66. Federal lands managed by the Bureau of Land Management, now part of the expanded Cascade-Siskiyou National Monument, abut the preserve at many points along its northern, eastern and southern boundaries. Unbroken continuity with similar habitats on adjacent federal lands provides important landscape connectivity, particularly with higher elevations of the Cascades located to the east (Frost 2015). The Emigrant Lake Recreation Area, managed by Jackson County, lies immediately west of the SCP.

Landscape Context

Within the context of the larger landscape, the Sampson Creek Preserve straddles the interface between two large and distinct ecoregions, the Siskiyou Mountains to the west and Southern Cascades to the east (see Figure 2). The recognized boundary or contact zone between these two ecoregions passes directly through the northern half of the preserve, essentially bisecting the main and west forks of upper Sampson Creek. The Eastern Siskiyou and Southern Cascades are characterized by major differences in geology, climate, terrain and biogeography. Both strongly influence the character of the vegetation and contribute to the outstanding conservation values of the SCP.

The Siskiyou Mountains -- in contrast to the predominantly younger, volcanic rocks of the Cascades -- are geologically very old, topographically complex and characterized by a Mediterranean climate with prolonged summer drought. The Oak Savannah Foothills subsection of the Siskiyou, in which the preserve is primarily located, occurs at lower elevations and supports a diverse vegetation mosaic of grasslands, chaparral, mixed hardwood/conifer woodlands and forests comprised of both northern Californian and Pacific Northwestern species. In contrast, the Southern Cascades are characterized by higher elevations and gentle to moderately sloping terrain. More abundant precipitation (including persistent winter snowpack), less severe summer drought and relatively deep volcanic soils in the southern Cascades tend to support montane conifer forests as the primary vegetation.

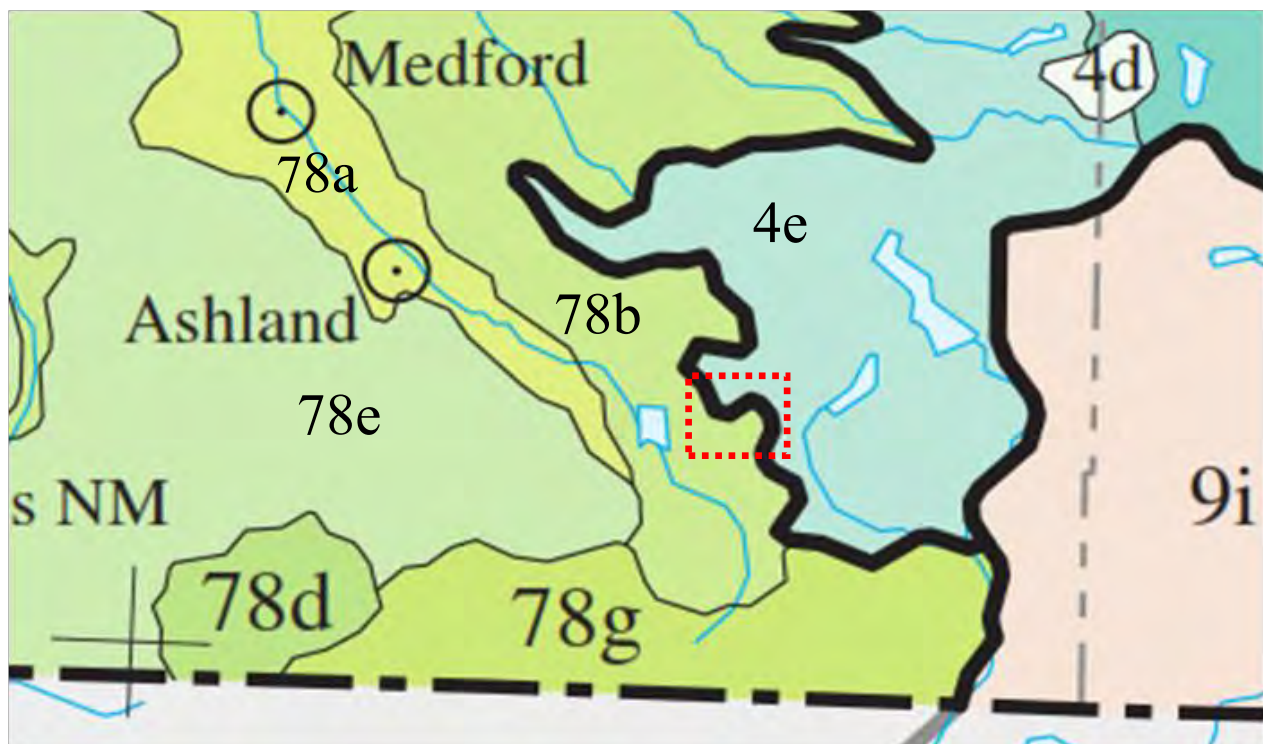


Figure 2. Map depicting terrestrial Level III ecoregions (heavy black lines) and Level IV ecosections (thin black lines) in the vicinity of the Sampson Creek Preserve (generally located within the dotted red rectangle). Ecoregions: yellow/green (78) = Siskiyou Mountains, dark green (4) = Southern Cascades, and light pink (9) = Eastern Cascades Slopes and Foothills. Ecosections: Rogue/Illinois Valleys (78a), Oak Savannah Foothills (78b), Serpentine Siskiyou (78d), Inland Siskiyou (78e), Klamath River Ridges (78g), Southern Cascades Subalpine(4d), Southern Cascades Montane Forest (4e), and Southern Cascades Slope (9i). Excerpted from Thorson et al. (2003).

The SCP exhibits outstanding conservation values in part because of its strategic location at the crossroads of the eastern Siskiyou Mountains and the Southern Cascade Range. Lands within the upper Bear Creek watershed, of which Sampson Creek is a part, were recognized in the 1994 Northwest Forest Plan as an important linkage or corridor for the movement of species and ecological processes between these two adjacent ecoregions (USDI BLM 2000). More recently, a number of studies have reinforced the ecological significance of the Cascade-Siskiyou "land bridge" for conserving the region's wide-ranging wildlife species and biodiversity (Belote et al. 2016, McRae et al. 2016, McQuire et al. 2016, Buttrick et al. 2015, Olson et al. 2012, Fields et al. 2010).

The preserve represents a significant contribution to landscape connectivity because it encompasses the full spectrum of habitats from valley grasslands to montane conifer forests, which in turn facilitates the flow of species along this elevational gradient (see Figure 3). The ecological connectivity function associated with the preserve was recently enhanced with the expansion of the Cascade-Siskiyou National Monument to include adjacent federal lands (USDI 2017). Maintaining this intact foothills-to-plateau connectivity also has significant climate change implications, as it creates more opportunities for plant and animal species to successfully shift their local distributions in response to a changing climate (Schmitz et al. 2015, Lawler et al. 2015, Cross et al. 2012).

Topography

Terrain across the preserve is mostly steep and complex, with frequent and dramatic changes in slope, aspect and elevation. These fine-scale topographic changes create strong gradients of soil depth, moisture and insolation across the landscape, which in turn are primary factors influencing the vegetation. The area's highly dissected, 'canyon-and-ridge' topography is a result of its transitional location between the gentle to moderately sloping highlands of the Cascades Plateau (to the east) and the floor of the upper Rogue Valley (west). Along this primary east-to-west transect, Sampson Creek descends precipitously in elevation more than 2,500' in only four linear miles.

Elevations on the preserve range from ~2,300' near the mouth of Sampson Creek not far from Emigrant Lake Reservoir, up to 5,177' at the summit of Tom Spring Mountain near the northern edge of the property. Within this relatively broad elevational range, the majority of lands occur between 2,700 and 3,700 feet. Other prominent landscape features within the SCP include Major Butte (3,376'), Buck Point (4,173'), and lying just east of the eastern boundary on BLM land, Round Mountain (4,762') and Green Springs Mountain (5,219').

Stream systems, both perennial and intermittent, follow the incised valleys between major ridges. The preserve is named after Sampson Creek, a perennial stream that is the area's primary watershed and drains southwest from the Cascades Plateau into Emigrant Lake. During the summer dry season, some reaches of Sampson Creek are reduced to an interrupted flow. Approximately 60% of the Sampson Creek watershed, as well as a large majority of the Cattle Creek watershed (northeast corner) and the lower reaches of Soda Creek (in the Soda Gulch parcel) are included within the SCP. In addition, a number of natural springs are scattered throughout the property, usually in valley bottom or lower slope positions.

Climate and Weather

Sampson Creek's Mediterranean climate is characterized by a warm, dry season from May to September, and a cool, wet season with extended cloudiness and frequent rain from November through March. Summers are hot and winters are relatively mild, with freezing daytime temperatures common at the higher elevations. The Bear Creek valley, of which Sampson Creek is

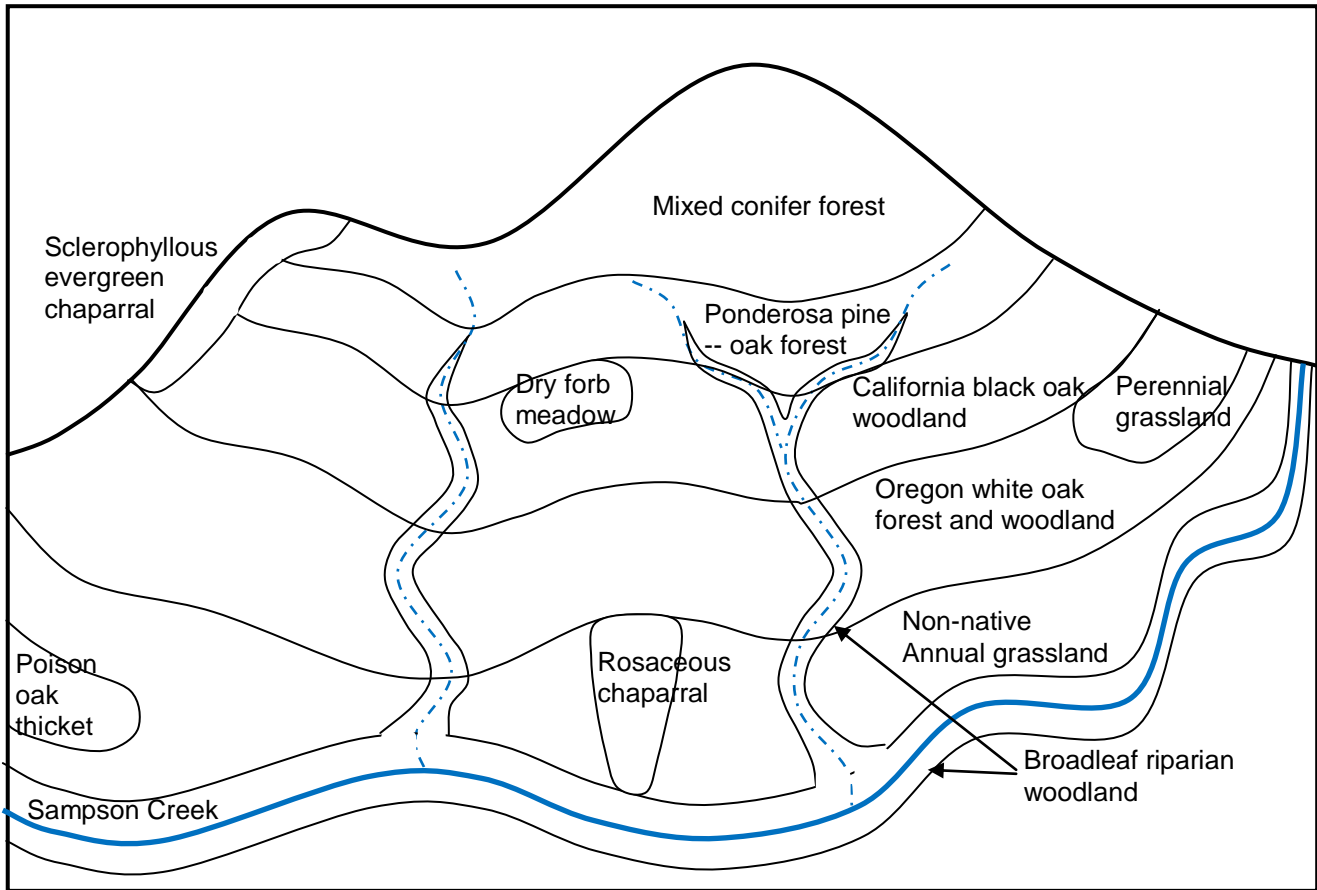


Figure 3. This schematic is a simplified representation of primary vegetation communities on the Sampson Creek Preserve as they are roughly distributed along an elevational transect extending from the valley bottom of Sampson Creek north to the summit of Tom Spring Mountain (5,177 feet), the highest point on the property.

a tributary, is the warmest and driest interior valley in western Oregon. For the period 1960- 2016, average annual rainfall totals for the three closest weather stations -- city of Ashland (1,724'), Green Springs Power Plant (2,440') and Howard Prairie Dam (4,570')-- are 19.43, 22.95 and 32.20 inches, respectively. Over 60% of the annual precipitation typically falls between November 1 and March 1, but month-to-month and year-to-year variability is high (range 10.22-30.33").

During winter months, the moist, westerly flow of air from the Pacific Ocean results in frequent storms of varying intensities, sometimes accompanied by high winds. Snow regularly falls and accumulates above 5,000', and below this elevation down to 3,500', a mix of snow and rain occurs. This mid-elevational band is referred to as the rain-on-snow or transient snow zone, because snow levels fluctuate throughout the winter in response to alternating warm and cold fronts. Below 3,500', most precipitation occurs as rain. During the summer months, stable high-pressure Pacific air masses bring clear skies and hot, dry conditions. Summer lightning storms occur occasionally and are the primary cause of wildfire ignitions.

Geology and Soils

Geologically, the Sampson Creek Preserve situated within the Western Cascades province, and lies near the western edge of a large terrane (called the Roxy Formation) that is primarily composed of basalt and andesite (Smith et al. 1982). To the east at higher elevations are younger volcanic rocks of the High Cascades, primarily composed of ash, breccia and tuff. Overlapping the preserve on the

west are sedimentary deposits of sandstone and conglomerate that have accumulated on the lower foothills and floor of the Bear Creek valley (Payne Cliffs Formation). These primary geological formations are a result of the volcanic forces that have shaped the Cascade Range over the last 30+ million years.

During the Oligocene (35 million years ago) and early Miocene (25 million years ago) eras, broad shield volcanoes developed along the gently sloping highlands of the ancestral Cascades. Fluid basaltic lavas extruded from these shield cones during numerous volcanic eruptions reformed these highlands into a broad, moderately sloping mountain range. Repeated tectonic activity over the last 4-7 million years further uplifted the Cascades, and increased erosion downcut the western foothills into the steep and dissected land forms that exist today (Kienle et al. 1981). The most common exposed rock types on the preserve are andesite, breccia and tuff.

Consistent with the area's complex geology and terrain, soils within the SCP are heterogeneous and finely patterned. Soils developed from these Western Cascades parent materials are generally composed of weathered, volcanic clays. Some portions of the preserve have deep, well-developed soils, but most of the property is rocky with shallow to very shallow soil. The three primary soil groups identified for this area, in descending order of importance, are the Heppsie, McMullin and Carney Series (Johnson 1993). The primary differences have to do with the fineness of the clays, soil depth and productivity.

Heppsie soils are relatively deep, well-drained, and associated with hillslopes formed of colluvium weathered from tuff, breccia and andesite. Permeability is slow, runoff is rapid and risk of erosion is high. In comparison, McMullin Series soils are shallow (< 20" to bedrock), rocky, well-drained and formed in colluvium material derived from a range of igneous rocks. Permeability is moderate, runoff is slow or medium and erosion hazard is slight or moderate. Lastly, soils of the Carney Series are moderately shallow, well drained and formed in alluvium and colluvium weathered from tuff and breccia. They typically have a deep layer of clay or cobbly clay (20-40"), permeability is very slow, runoff is slow and erosion hazard is slight. For more detailed information on soils of the area, see Johnson (1993).

Vegetation Patterns and Land Use

The vegetation and flora within the Sampson Creek Preserve is extremely diverse, particularly for an area of this size. Fine-scale variations in topography, soil type, moisture availability and microclimate cause correspondingly rapid and dramatic changes in plant communities. Homogeneous patches of vegetation are relatively small, patterns are complex and adjacent community types are often starkly contrasting. Within very close proximity one can find dense stands of evergreen chaparral adjacent to deciduous riparian forest, Oregon white oak woodlands interspersed with open grasslands, and rocky barrens juxtaposed with California black oak and Douglas-fir forests (Figure 4). This fine-grained patterning of vegetation is aptly called a mosaic of plant communities, and is recognized as a hallmark of the greater Cascade-Siskiyou landscape (Frost 2016, 2012).

The existing patterns of vegetation within the SCP not only reflect wide variation in environmental conditions, but also a long history of human influence. A thorough discussion of human-caused changes to this landscape is beyond the scope of this report. However, several land management practices deserve to be mentioned here because they are necessary to understand current vegetation communities. For example, most conifer forests on the preserve were commercially logged by the



Figure 4. Landscape views illustrating the complex vegetation mosaic that occurs on much of the Sampson Creek Preserve, characterized by the fine-grained interweaving of grassland, shrubland, oak woodland and conifer forest communities across relatively steep and varied terrain. Top: Upper slopes of Tom Spring Mountain looking south towards Sampson Creek; Middle: Upper Sampson Creek Canyon; Bottom: South-facing slopes of Tom Spring Mountain.

previous landowners, most recently ~30 years ago. As a result, old-growth conifers, once common in these forested communities, are now rare. Fire suppression has dramatically reduced the ecological role of fire and impacted vegetation structure and composition in various ways (Frost & Sweeney 2001). Shade-tolerant and fire-susceptible tree species, such as Douglas-fir and incense cedar, have increased in abundance and can be seen invading oak stands and open meadows in portions of the preserve (see oak woodlands section for discussion of this issue).

The most pervasive changes to vegetation of the preserve can be attributed to livestock grazing. Widespread, year-round grazing of cattle and sheep in this area was initiated by early Euro-American settlers in the 1860's, and continued to varying degrees for ~150 years until creation of the preserve. Historic accounts of grazing practices in southwest Oregon suggest that numbers of livestock were often high and overgrazing was common, resulting in increased soil erosion and dramatic changes to the vegetation (Hosten et al. 2007, USDI BLM 2000, LaLande 1980). Most importantly, historic grazing is likely the primary factor responsible for the invasion and spread of many non-native plant species, including the annual European grasses, yellow star-thistle and other exotics that dominate large portions of Sampson Creek today (DiTomaso 2000, Belsky & Gelbard 2000).

I. GRASSLANDS AND MEADOWS

Grasslands cover an estimated 40% of the Sampson Creek Preserve, and are easily identified in the field by supporting little to no tree and shrub cover and dominance by a mix of graminoids and forbs. On the SCP, grasslands occur across all aspects and slopes, and at elevations ranging from 2,300 to ~4,500 feet. These habitats vary in composition along a continuum from those strongly dominated by exotic (primarily European) annual grasses to mixes of both native and exotic grasses, to dense stands of mostly native perennial bunchgrasses, as well as dry meadows and open oak savannahs all interspersed with varying cover and composition of forbs. Within this very broad vegetation type, three primary grassland communities can be identified, based on differences in species dominance and location: a) annual/non-native grasslands, b) perennial/native grasslands, and c) forb-dominated dry meadows. Each of these primary vegetation associations are described in more detail below.

Non-Native / Annual Grasslands

Grasslands dominated by annual, non-native grasses are today the most common vegetation type on the preserve. Although widely distributed, this community tends to be most abundant at lower elevations, on relatively gentle to moderate slopes, in valley bottom and lower slope positions, and in areas where livestock grazing and other forms of soil disturbance have been most intense. Historically, these habitats were dominated by a mix of native perennial bunchgrasses and forbs. Their contemporary dominance by non-native annual grasses, mostly of European origin, is largely an artifact of historic livestock grazing.

With roots that extend up to 18 feet, native bunchgrasses are able to tap into nutrients and water found deep in the soil, and so can remain green even into the hot, dry months of summer and early fall. Because of their higher water content and nutritional value, bunchgrasses are heavily favored by livestock over most forbs and non-native grasses. Once subject to grazing pressure, native



Figure 5. Examples of annual grasslands, most extensive in valley bottoms and on gentle to moderate slopes at low to mid-elevations, as well as other areas with a history of chronic disturbance due to livestock grazing. These communities are dominated by a mix of non-native annual grasses (including medusa-head, *Taeniatherum caput-medusae*; bottom photo) and non-native forbs such as yellow star-thistle (*Centaurea solstitialis*) and winter vetch (*Vicia villosa*; top inset photo).

perennials are much slower to recover than the more aggressive annuals, and therefore quickly decline in abundance. Grazing also greatly increases soil disturbance, which is necessary for many weedy species to become established (Belsky & Gelbard 2000). Through these mechanisms, the vast majority of native perennial grasslands that were once widespread in southwest Oregon and elsewhere across the Pacific states have been converted to non-native annuals (Davies 2011, Stromberg et al. 2007).

The species composition of annual grasslands on the SCP varies significantly depending on topographic position, grazing history, soil depth, moisture availability, oak canopy cover and other factors (Figure 5). The most common non-native annual grasses on the preserve include wild oats (*Avena* sp.), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), foxtail chess (*Bromus madritensis*), Japanese brome (*Bromus japonicus*), medusahead (*Elymus caput-medusae*), bulbous bluegrass (*Poa bulbosa*) and hedgehog dogtail (*Cynosurus echinatus*). Depending on individual environmental preferences, most sites are dominated by two or more of these species. Scattered shrubs, usually dog rose (*Rosa canina*) and poison oak (*Toxicodendron diversilobum*), are found in some annual grasslands but generally total less than ~10% cover.

In addition to the annual grasses, a number of non-native forbs of Eurasian origin -- including yellow star-thistle (*Centaurea solstitialis*), winter vetch (*Vicia villosa*), cut-leaved Geranium (*Geranium dissectum*), red clover (*Trifolium pratense*) and common hedge-parsley (*Torilis arvensis*) -- are now also widespread and abundant over relatively large areas of the preserve. Large stands of yellow star-thistle dominate south slopes and the more disturbed sites on gentle terrain. Where this plant forms dense infestations, it rapidly depletes soil moisture, thus preventing the establishment of other species (Enloe et al. 2004). It is suspected that populations of non-natives may be continuing to increase on the preserve and supplant natives, reducing plant diversity.

Even so, many native perennial grasses and forbs still occur scattered among the annual grasses at relatively low levels of cover and abundance. Based on observations made in the field, natives are more common within the annual grassland type in areas where scattered oak trees are present, topsoils are thin and rocky, and slopes are relatively steep. For reasons that are not totally understood, the presence of even a single oak tree often creates understory conditions that result in increased cover of native perennials (see related discussion in following section). Blue wild rye (*Elymus glaucus*), big squirreltail (*Elymus elymoides*) and Lemmon's needlegrass (*Stipa lemmonii*) are the native perennials observed to occur most commonly within the annual grassland type.

Native / Perennial Grasslands

A minor but significant portion of Sampson Creek's grasslands support many of the annual species described above, but remain dominated by native perennial bunchgrasses (e.g., more than 40% cover). These relatively small (< 3 acres), widely scattered sites tend to be found far away from water, along ridges and steep slopes, at moderate to high elevations, and in openings surrounded by dense shrubs or rock outcrops -- e.g. landscape attributes that are correlated with relatively low grazing intensity. These patches of native perennial grassland are remnants of a community type that once was widely distributed across the interior valleys and foothills of the Rogue Valley, but which is today very rare and imperiled.

Native perennial grasslands represent an endangered community type because less than 10% of their historical extent remains (Oregon Biodiversity Project 1998, Stromberg & Corbin 2007, ODFW

2016). According to Brock (2002), native grasslands "are now very rare in southwest Oregon" and current trends are continued decline both in terms of area and condition (Johnson & O'Neil 2001, ODFW 2016). Moreover, these grasslands are one of the most poorly protected vegetation types in the state, with less than 1% of their historical extent included in lands managed for conservation (Kagan et al. 1999, Johnson & O'Neil 2001). The increasing rarity and high degree of threat to remaining native grasslands across western Oregon underscores the significance of those that still occur on the SCP.

There are two phases or subtypes of perennial grass community that can be described on the preserve; the Oregon white oak savanna/grassland and the much more rare open grassland. The oak savanna type is by far the most common, where Oregon white oak trees are widely scattered over a dense understory of native perennial grasses and forbs. The contrast between large openings, where weedy annual species tend to dominate, and the native perennial cover under oaks is striking as well as unexplained (Brock 2002, Frost & Southworth 2011). It has been hypothesized that shade created by the oak canopy helps conserve soil moisture, or that the annual species cannot compete in shaded conditions, or that grazing livestock prefer the grass that grows away from the tannin-producing oaks (Roche et al. 2012, Southworth et al. 2012). Whatever the cause, it is clear that the presence of these oaks tends to tip the scales in favor of the native bunchgrasses and forbs over the exotic annuals.

In rare cases, an open grassland community phase dominated by native perennial grasses without any oak canopy can be found on the preserve. These relatively small remnants (generally less than two acres) were located on very steep slopes below ridges, surrounded by rocky cliffs, dense shrubs or in other landscape settings that largely prevented easy access by grazing livestock. Sites that meet this description were documented during field reconnaissance on the steep, south-facing slopes below Tom Spring Mountain, on west-facing slopes of the Upper Sampson Creek canyon below Round Mountain, and on the ridgeline separating 'Tributary I' and the Right Fork of Sampson Creek. Mixed perennial grassland remnants also occur on adjacent BLM land along the ridgeline leading to Buck Point (Figure 6).

In both the white oak savannah and open grassland subtypes, the most common perennial grasses include Roemer's fescue (*Festuca roemeri* ssp. *klamathensis*), Lemmon's needlegrass (*Stipa lemmonii*), western fescue (*Festuca occidentalis*), California oatgrass (*Danthonia californica*) and blue wild rye (*Elymus glaucus*). Where a scattered overstory of oaks is more developed, California brome (*Bromus carinatus*), woodland brome (*Bromus laevipes*) and California fescue (*Festuca californica*) tend to become more important. Native forbs are also well represented in these grass-dominated communities, and frequently include common biscuitroot (*Lomatium utriculatum*), blue dicks (*Dichelostemma capitatum*), Tolmie's pussy ears (*Calochortus tolmiei*), and golden iris (*Iris chrysophylla*), among many others.

Forb-Dominated Dry Meadows

A small subset of herbaceous communities on the preserve are dominated by forbs rather than graminoids, and are described here as a distinct vegetation subtype or phase called forb-dominated dry meadows. In comparison with annual and perennial grasslands, forb-dominated meadows primarily occur on shallow, rocky and well-drained soils that are more droughty than those associated with adjacent grasslands. The dry meadow sites encountered during field reconnaissance were relatively small (1-3 acres), located on upper hillslopes and ridges, south- to west-facing



Figure 6. Examples of native perennial grassland communities on the Sampson Creek Preserve, dominated by Roemer's Fescue (*Festuca roemeri* ssp, *klamathensis*; top) woodland brome (*Bromus carinatus*; middle) and Lemmon's needlegrass (*Stipa lemmonii*) / blue wild rye (*Elymus glaucus*; bottom).¹³

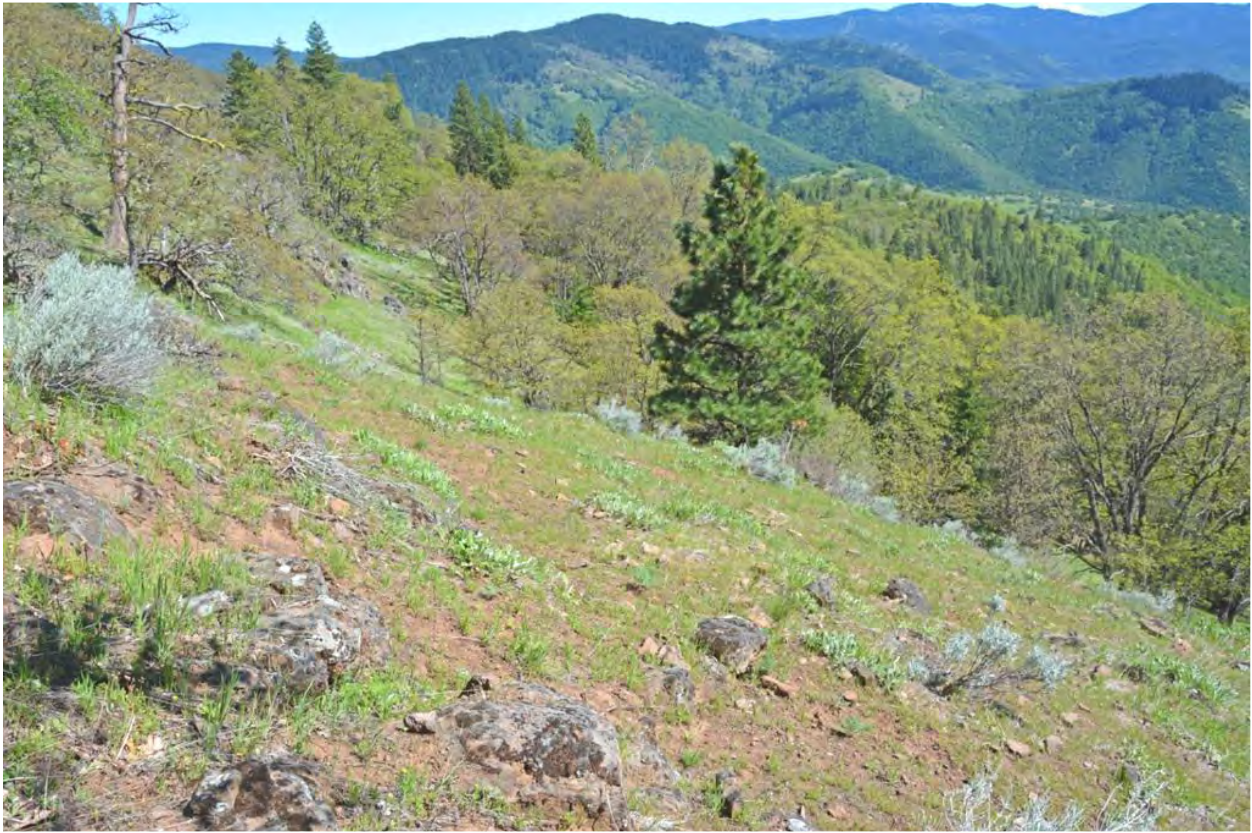


Figure 7. Examples of dry forb meadows on the Sampson Creek Preserve, typically found on ridges and upper slope positions with thin, rocky soils and relatively steep slopes. These communities are dominated by xeromorphic plant species with High Desert or "Eastside" affinities, such as rubber rabbitbrush (*Ericameria nauseosus*), buckwheat (*Eriogonum*) and biscuitroot (*Lomatium*) species.

aspects and relatively steep slopes, often occurring as isolated patches surrounded by a matrix of oak woodlands and/or chaparral (Figure 7).

The species composition of dry meadows varies greatly because of differences in soil, topography, microclimate and grazing history. Drought-tolerant forb species tend to be characteristic of this community type, such as California lomatium (*Lomatium californicum*), common yarrow (*Achillea millefolium*), woolly sunflower (*Eriophyllum lanatum*), varied-leaf phacelia (*Phacelia heterophylla*) and false dogbane (*Apocynum androsaemifolium*). A mix of both exotic annual and native perennial grasses may also be present but comprise the minority of herbaceous cover. Rubber rabbitbrush (*Ericameria nauseosus*) is the most important shrub associate. The cover of surface rock and/or bare ground is often conspicuous and generally higher than in either of the more common grassland community types described above.

II. SHRUBLANDS

Shrub-dominated vegetation is a relatively minor but important part of the vegetation mosaic on the SCP, in total covering roughly 10% of the property. Although broad generalizations are difficult, most shrubland communities occur here as relatively small patches (> 10 acres) at lower to mid-elevations, on relatively steep slopes and hillsides with thin, rocky soils -- e.g., areas that are generally too hot and dry to support tree growth. Beyond these broad environmental attributes, three distinct shrubland subtypes or phases have thus far been documented on the preserve: 1) sclerophyllous evergreen chaparral, 2) Rosaceous chaparral, and 3) poison oak thickets. Each of these are described in more detail below.

Sclerophyllous Evergreen Chaparral

Evergreen chaparral is characterized by a relatively tall (3-15 feet), dense canopy of mostly evergreen shrubs with sclerophyllous (hard, waxy, drought-tolerant) leaves. On the SCP, this community type occurs in relatively small patches (> 3 acres) and is associated with the harshest, driest sites -- steep, south-facing ridges and slopes with thin, rocky soils. Dominant shrub species, in order of decreasing importance, include wedgeleaf ceanothus (*Ceanothus cuneatus*), whiteleaf manzanita (*Arctostaphylos viscida*), Pacific madrone (in shrub form; *Arbutus menziesii*), Brewer's oak (*Quercus garryana* ssp. *breweri*), rubber rabbitbrush (*Ericameria nauseosus*) and Fremont's silk tassel (*Garrya fremontii*). The majority of these shrub species are fire-adapted, resprouting vigorously after burning and/or producing fire-resistant seeds.

Evergreen chaparral stands generally exhibit high cover, but community structure and species composition varies considerably from place to place (Figure 8). Variation in soil depth appears to be the primary factor determining shrub dominance between sites. For example, the rockiest areas tend to support more whiteleaf manzanita, Pacific madrone and silk tassel, while less rocky sites are more dominated by wedgeleaf ceanothus, Brewer's oak and rubber rabbitbrush (Brock 2002). On the preserve this shrubland type often intergrades with shrubby Oregon white oak stands -- for example in the upper Cattle Creek watershed and along the upper slopes and ridges of the West Fork Sampson Creek. Understory herbaceous cover varies inversely with density of the shrub canopy, and typically includes native grasses such as Roemer's fescue, Lemmon's needlegrass and blue wild rye. Occasional conifers (usually ponderosa pine) are sometimes widely scattered in the habitat.



Figure 8. Examples of sclerophyllous evergreen chaparral on the Sampson Creek Preserve, primarily restricted to ridges and upper slope positions with thin, rocky soils on steep, south- and west-facing slopes below 3,500' elevation. Most common shrub species include whiteleaf manzanita (*Arctostaphylos viscida*), Pacific madrone (*Arbutus menziesii*), wedgeleaf ceanothus (*Ceanothus cuneatus*), Fremont's silk tassel (*Garrya fremontii*) and Brewer's oak (*Quercus garryana* var. *breweri*).¹⁶

Evergreen chaparral is much more common and widely distributed in northern California, approaching its northern distributional limit in southwest Oregon (Detling 1968, Franklin & Dyrness 1988, Sawyer et al. 2009). Within Jackson County, the extent of evergreen chaparral has declined in recent decades, mostly because of conversion to agriculture and residential development on private lands (Johnson & O'Neil 2002, ODFW 2016). It is still relatively common in the Siskiyou foothills above Ashland and in lower elevations of the Applegate River watershed, but much more rare in the Southern Cascades, approaching the eastern-most extension of its range on the Sampson Creek Preserve.

Rosaceous Chaparral

Relatively small, scattered areas within the SCP support a distinct shrubland community that has been widely referred to as “Rosaceous chaparral” or “Oregon White Oak/Rosaceous shrublands” (USDI BLM 2008, Brock 2002, Brock and Callagan 1999). It is a typical dry-site chaparral, but in contrast with the sclerophyllous evergreen type described above, is: 1) primarily composed of woody species in the Rose family that have soft, winter deciduous leaves -- especially Klamath plum (*Prunus subcordata*), birch leaf mountain mahogany (*Cercocarpus montanus*), western serviceberry (*Amelanchier alnifolia*), bitter cherry (*Prunus emarginata*) and ocean spray (*Holodiscus discolor*), and 2) found on sites with deeper/more developed soils (mostly in the McMullin Series) that are less xeric and rocky.

This shrubland community type is typically low to medium-statured (5-15 feet tall) with high cover in the tree/shrub layer (e.g., 75-100%). Most stands are dense and difficult to walk through, with occasional patches that are more open (Figure 9). Field observations suggest that Klamath plum is most often the dominant shrub and Oregon white oak is also usually present (often in shrub form) at a cover that can vary widely depending on soil depth. Additional shrub species can vary widely from site to site. The typical mix of annual grasses are often present in the understory along with dry-site forbs such as California lomatium (*Lomatium californicum*), honeysuckle (*Lonicera* sp.) and common yarrow (*Achillea millefolium*). Brock and Callagan (1999) have suggested that the existence of this plant community may be due to the lack of recent high-intensity fire, which historically may have replaced these fire-susceptible shrubs with grasses and forbs.

Rosaceous chaparral is a regionally endemic community type, occurring only in the eastern Siskiyou and in the Klamath River Ridges ecoregion to the south. Extensive stands can be found in the lower Scotch and Camp Creek watersheds of the Cascade-Siskiyou National Monument and further west, on dry-mesic sites in the Applegate Valley. On the preserve it is most commonly found on the lower and middle slopes of upper Sampson Creek canyon, and as widely scattered stands or as a dense understory within Oregon white oak woodlands on the north-facing slopes below Buck Point. It is possible that occurrences on the SCP may be approaching the northern-most extent of this highly localized and variable community type.

Poison-Oak 'Thickets'

As across much of southwest Oregon, poison-oak (*Toxicodendron diversilobum*) is a common and widely distributed woody shrub on the SCP, especially on more xeric sites below 4,000 feet elevation. It is a frequent associate within oak woodland and perennial grassland communities, but rarely dominant. Within the matrix of non-native/annual grasslands found primarily on the western half of the preserve, poison-oak occasionally forms dense shrubland patches or islands, especially on warm/dry sites. Because these patches are typically small (< 2 acres), they are loosely referred to here as 'thickets' (e.g. a small group of dense shrubs; Figure 9). Height of the poison-oak shrub

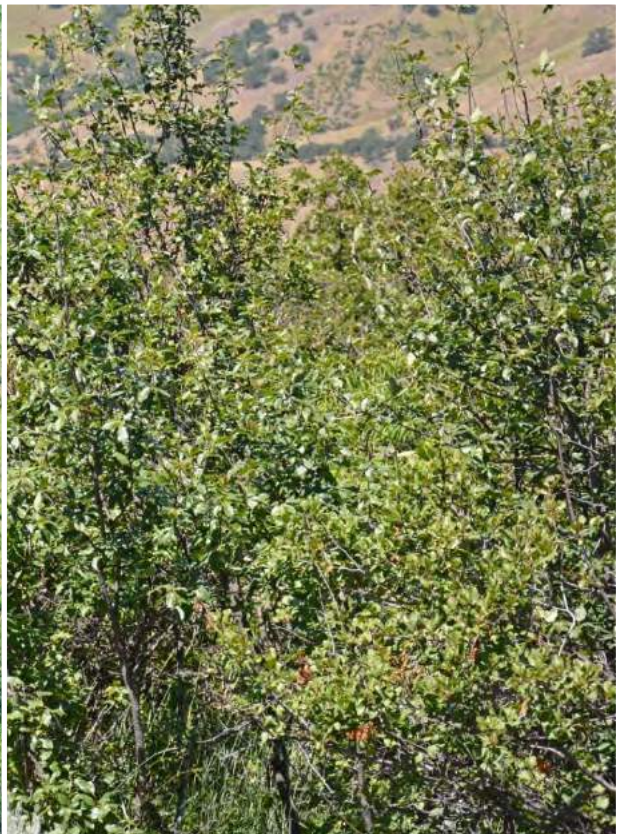


Figure 9. Deciduous shrubland types on the preserve dominated by Pacific poison-oak (*Toxicodendron diversilobum*; top) and a mix of woody species in the Rosaceae, commonly referred to as "Rosaceous chaparral" (bottom, landscape and closeup views). The most common shrubs in Rosaceous chaparral include Klamath plum (*Prunus subcordata*), Pacific serviceberry (*Amelanchier alnifolia*), birchleaf mountain mahogany (*Cercocarpus montanus*), bitter cherry (*Prunus emarginata*) and a shrubby form of Oregon white oak.

layer varies from 3 to 15 feet, with total shrub cover greater than 40%. Except for the dominance by *Toxicodendron*, species composition in this community subtype or phase is otherwise indistinguishable from the non-native/annual grasslands described earlier in this report.

The origin of these poison-oak thickets is most likely an artifact related to the history of chronic disturbance on the property, especially by grazing livestock. Poison-oak is generally less palatable to cattle than almost any other plant species found in open areas of the preserve, and was probably only grazed late in the season when other forage was no longer available. Ground disturbance and selective removal of surrounding herbaceous cover likely favors the growth and spread of this aggressive species. Even if seasonal cover of poison-oak is reduced by grazing or fire, this shrub benefits over time because of its ability to vigorously resprout from underground rhizomes after disturbance has removed top-growth. According to Franklin and Dyrness (1988), once poison-oak has replaced community associates on interior valley sites subjected to chronic grazing pressure, it can maintain dominance even after grazing is stopped.

III. OAK WOODLANDS AND FORESTS

Oak-dominated woodlands and forests are the hallmark vegetation type on the Sampson Creek Preserve, collectively occupying more than 40% of the property. Oaks serve as foundational or keystone species in these ecosystems in that they exert inordinate control on both community composition and ecological processes (Davis et al. 2016, Allen-Diaz et al. 2007). By modern convention, oak woodland is defined as vegetation with 10-60% oak tree canopy cover, with an herbaceous understory and scattered shrubs (Sawyer et al. 2009). While woodland community types are more common on the SCP, a large portion of oak-dominated habitats exhibit more than 60% tree canopy cover and are best described as oak forests. Oak woodlands and forests will be discussed together as part of this vegetation description.

Oak woodlands and forests occur on a wide variety of environmental settings on the preserve, principally between 2,500 and 4,500 feet elevation. They can be found in valley bottoms, on benches above incised canyons, hillslopes and on rocky outcrops or along ridgelines, on all aspects. Slopes range from gentle to steep. Patch sizes vary widely from small to very large, up to several hundred acres in size. At the landscape scale, oaks appear as the primary element in the preserve's complex vegetation mosaic, intermixing with stands of chaparral and grasslands on more xeric sites and conifers at higher elevations and on northerly aspects. Only a handful of tree species define and shape these communities, but this relatively simple structure belies the diversity within.

Oak-dominated ecosystems are known to support extraordinary biodiversity, including many species at-risk, and provide some of the most important wildlife habitat in Oregon and California (ODFW 2016, Tietje et al. 2005, Riegel et al. 1992, Pavlik et al. 1991). State-wide, more than a third of the total number of mammals, birds and other vertebrates use oak woodlands for breeding, foraging, or cover (Johnson & O'Neil 2001). Structural diversity associated with oaks -- particularly snags, cavities, and downed wood -- creates important microhabitats, and acorns provide a critical food resource for many wildlife. These communities also support thousands of native plant and invertebrate species that together create complex networks of interaction that have yet to be extensively studied (Davis et al. 2016). In total, the rich flora and fauna of oak woodlands, including those within the SCP, contribute considerably to recognition of the Cascade-Siskiyou landscape as a "biodiversity hotspot" (Frost 2016, USDI BLM 2008).



Figure 10. Photos illustrating the range of landscape patterns and stand densities in the Oregon white oak vegetation type, which vary on the Sampson Creek Preserve from open savannas (top) to woodlands (middle) to closed-canopy forests (bottom). White oak stand structure and tree density are correlated with changes in topography, aspect, elevation, soil type, disturbance history and other variables.

Structurally as well as compositionally, oak-dominated communities on the preserve are exceptionally diverse. Localized differences in topography (slope/aspect/elevation), soils, site productivity, microclimate and disturbance history give rise to a heterogeneous mosaic of oak woodland stand types that vary significantly across the landscape. Variations in tree density create a continuum from open-structured savannas to woodlands to closed-canopy forests (Figure 10). Other stand-level characteristics that shift from site to site, often over short distances, include tree species composition, canopy height, architectural form, overstory cover, tree age class distribution, and degree of understory development. The understory layers within the oak mosaic range from weedy (in more open areas) to primarily native, with large areas dominated by a variety of perennial bunchgrasses and forbs.

Although many woodlands include both Oregon white oak (*Quercus garryana*) or California black oak (*Quercus kelloggii*) in the tree canopy, most stands are strongly dominated by only one of these species. Field observations on the SCP suggest a general pattern where the relative proportion of California black oak increases with elevation and to a lesser degree, site productivity. As is true elsewhere in southwest Oregon, *Q. kelloggii* generally prefers sites with deeper organic soils, while *Q. garryana* woodlands tolerate, and are more commonly found on, moderately to excessively well-drained, thin and rocky soils (e.g., more xeric habitats; Riegel et al. 1992, Franklin & Dyrness 1988). The following sections describe the ecologically distinctive characteristics for each of these primary oak-dominated community types as they occur on the preserve.

Oregon White Oak (*Quercus garryana*) Woodlands and Forests

Oregon white oak communities on the SCP defy any single description and vary widely depending on localized differences in topography, soils, climate and disturbance history. The species is dominant across large areas, ranging from closed-canopy stands mixed with *Q. kelloggii* or other trees; as scattered single trees or monospecific groves in open savannas; and in dense dwarf or shrub-like patches shared with chaparral species. More xeric sites at lower elevations generally support savanna-type formations, whereas shrubby white oak patches are found on steep slopes, and closed-canopy forests are associated with more productive sites and greater moisture availability.

Relatively open woodlands on modal sites are dominated by a uniform canopy of Oregon white oak trees with single, erect trunks 20 to 60 feet tall, or up to 30 feet tall with multiple trunks. Based on the species' slow growth rate, larger individuals are estimated to be 200-300 years old. Stands composed of shorter-statured, multi-stemmed trees are a reflection of past disturbance history. Like many hardwoods, *Q. garryana* has the capacity to sprout from the root crown or bole, and sprouting is the species' primary method of regeneration after a wildfire or other top-killing disturbance event (Gilligan & Muir 2012). Oregon white oaks that originate from root crown sprouts are usually multi-stemmed, averaging between two and ten trunks per tree bole. These multi-stemmed, clonal white oak stands are extensive on the SCP; excellent examples can be found in upper Cattle Creek, the upper West Fork of Sampson Creek (west of Barron Mine site), and on north-facing slopes below Boone Ridge (Figure 11).

Other *Q. garryana* formations widely represented on the SCP include those dominated by "savanna-form" and "forest-form" tree architectures (Gould et al. 2011). Savanna-form trees are characterized by single-stemmed trunks with broad, spreading crowns and grow in savanna or open woodland settings. In contrast, forest-form tree crowns are narrow and tall with ascending branches and are primarily found in closed-canopy stands. A short, shrubby, and sometimes creeping growth form, commonly referred to as 'Brewer's oak' (*Q. garryana* var. *breweri*), is found in rocky habitats with

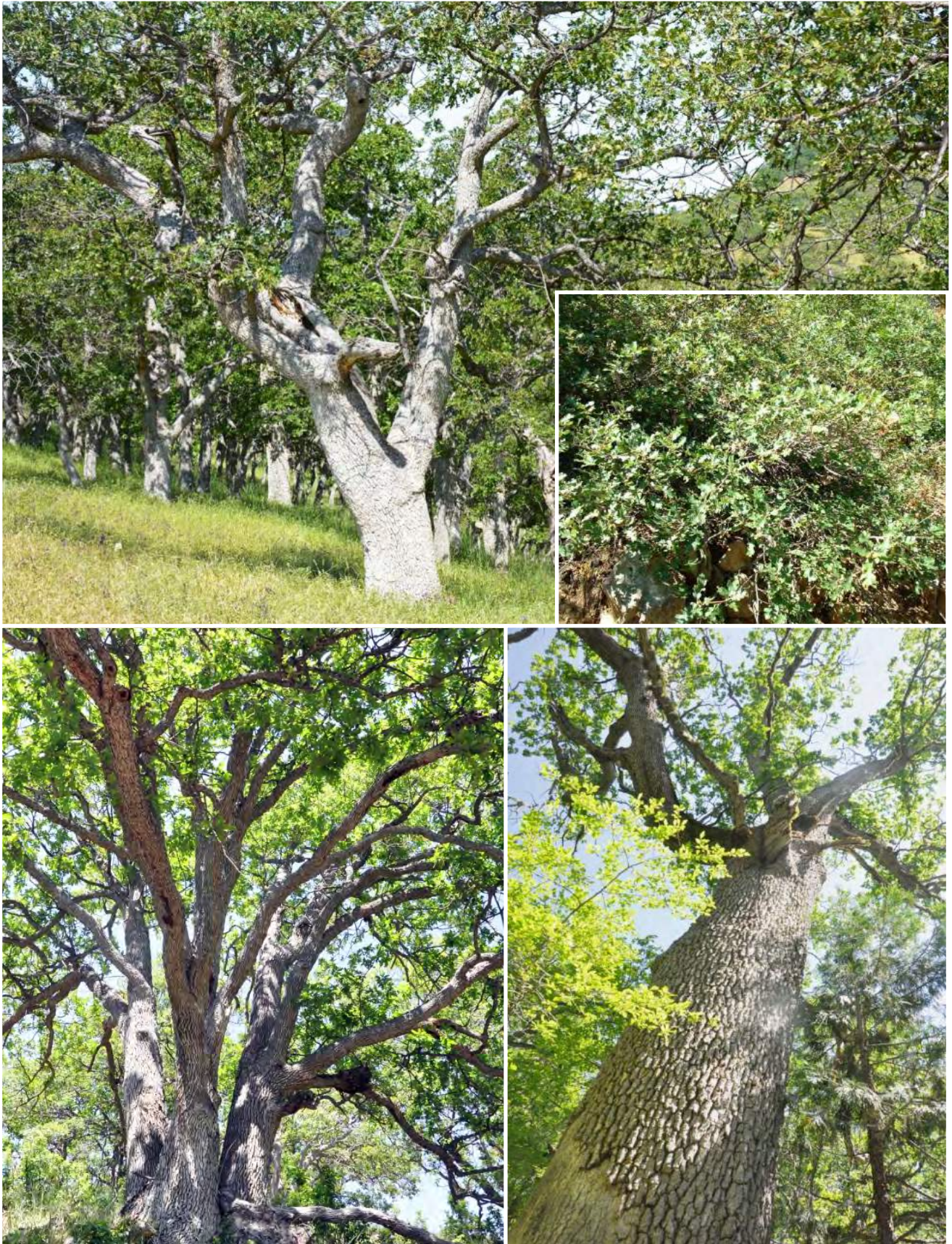


Figure 11. Oregon white oak (*Quercus garryana*) trees showing range of architectural forms that occur within vegetation communities on the Sampson Creek Preserve -- relatively open "savanna-form" stand, likely the most common white oak type on the preserve (top); shrubby form of brewer's oak (*Q. garryana* var. *breweri*, top right inset); multi-stemmed tree, a result of vegetative resprouting after disturbance (bottom left); and large "forest-form" individual in closed-canopy forest setting (bottom right).

shallow soils. It's equally possible this shrubby white oak may also be *Q. garryana* var. *semota*, which occurs in southwest Oregon on dry volcanic soils and is differentiated from var. *breweri* by having stellate leaf hairs with a larger number of rays (Rosatti & Tucker 2017).

In addition to California black oak, other tree species that can be present in the SCP's Oregon white oak communities include Pacific madrone, western juniper (*Juniperus occidentalis*), ponderosa pine and Douglas-fir -- the conifers appearing as scattered individuals on more mesic sites. While more study is needed, field observations suggest that reproduction and recruitment of younger trees, particularly for oaks, are poor in many *Q. garryana* stands of the preserve (Southworth 2016). Shrubs are common but usually at low density and cover. Common and characteristic shrub species include serviceberry (*Amelanchier alnifolia*), hollyleaf barberry (*Mahonia dictyota*), deer brush (*Ceanothus integerrimus*), Klamath plum (*Prunus subcordata*), osoberry (*Oemleria cerasiformis*) and common snowberry (*Symphoricarpos albus*).

The herbaceous understory is the locus of oak woodland plant diversity, and species richness is higher under oaks than in any other vegetation community on the SCP. The group of species represented in any particular white oak stand are governed to large degree by soil type and moisture, amount of canopy cover, and disturbance history. Some of the most common forb species include Pacific snakeroot (*Sanicula crassicaulis*), lamb's tongue ragwort (*Senecio integerrimus*), sweet cicely (*Osmorhiza heteroï*), common biscuitroot (*Lomatium utriculatum*), Tolmie's pussy ears (*Calochortus tolmiei*) and meadow death camas (*Zigadenus venenosus*). Essentially the same suite of native bunchgrasses as previously described under perennial grasslands are also found in white oak understories, forming a significant portion of the vegetative ground cover at many if not most sites.

Largely because of historic grazing, non-native annual grasses and forbs have become widely established in oak woodland understories. Annual grass cover varies from site to site but is often high or dominant at lower elevations, on more gentle slopes and especially in openings or savannas with relatively low (e.g. >25%) oak canopy cover. Oak canopies appear to create understory light, soil moisture and nutrient conditions that are less favorable for weedy annuals than adjacent grasslands (see discussion of oak cover and annual vs. perennial grasses on page 11). The herb layer also includes many non-native forb species, some of which are invasive and widespread (e.g. yellow starthistle, winter vetch). Other non-natives, such as red-stemmed filaree (*Erodium cicutarium*), common plantain (*Plantago major*), and yellow salisfy (*Tragopogon dubius*), are ubiquitous but less noxious. For a list of plant species most commonly associated with Oregon white oak woodlands, see Appendix A.

The inclusion of extensive, high-quality Oregon white oak ecosystems within the SCP represents a significant contribution to regional conservation. Oregon white oak woodlands have declined dramatically since Euro-American settlement, and are now formally recognized as a habitat of special concern throughout the species' range (Wells 2010). Widespread loss has been a result of conversion to agriculture, residential development, livestock grazing, fire exclusion and non-native species invasions (ODFW 2016). Throughout Oregon and the Rogue Basin in particular, the vast majority of oak-dominated habitats are in private ownership (Schindel et al. 2013, Kagan et al. 1999) and very few areas are currently managed for biodiversity values (Johnson & O'Neil 2001). Protection and effective stewardship of the preserve's relatively intact white oak ecosystems will help ensure the persistence of this iconic natural community and the many species that rely upon it.

California Black Oak Woodlands

Although considerably less abundant than Oregon white oak, woodlands dominated by California black oak (*Quercus kelloggii*) are an important and well-represented community type on the Sampson Creek Preserve. Extensive groves and stands are mostly located between 3,000 and 4,500 feet elevation, on sites with moderate slopes and relatively deep, well-drained soils (Figure 12). At their lower elevational limit and on shallow soils, *Q. kelloggii* woodlands grade into white oak woodlands and grasslands. In stands where the two oak species co-dominate, *Q. garryana* often exhibits the shorter, multi-stemmed tree structure associated with stump sprouting. Upslope and on northerly aspects, black oaks intermix with conifers -- especially ponderosa pine and Douglas-fir -- to form transitional oak/conifer stands (sometimes included with ponderosa pine community types; e.g. Atzet et al. 1996).

Mature California black oaks on the SCP generally attain heights of 40 to 90 feet and diameters of 30 to 60+ inches. Large, open-grown trees are estimated to be up to several hundred years old and can be identified by broad crowns with multiple stems that fork repeatedly (McDonald 1969; Figure 12). In more closed-canopy stands, black oaks develop narrow, thin crowns on straight, clear boles. Tall conifers, when present, typically emerge above the black oaks to form a two-tiered canopy structure. Where *Q. kelloggii* is occasionally found on more shallow or rocky soils on the preserve, it tends toward a more stunted growth form.

Shrub cover under California black oaks is generally sparse to patchy, with common associates including deerbrush (*Ceanothus integerrimus*), serviceberry (*Amelanchier alnifolia*), Klamath plum (*Prunus subcordata*) and common snowberry (*Symphoricarpos mollis*). Understory herbaceous cover is often high and species-rich, especially in moderately open stands. Most of the forb and grass species found under California black oaks on the preserve are the same as those described previously for Oregon white oak woodlands and forests (see Appendix A). In comparison with white oak stands, *Q. kelloggii* woodlands tend to be more mesic, which is likely reflected in the composition of the understory flora.

Fire plays a very important role in creating vegetation structure and composition in this vegetation community. In the past, most woodlands dominated by *Q. kelloggii* experienced frequent, low-severity fires that selectively killed fire-susceptible species and maintained open conditions that favored oaks (Frost & Sweeney 2000). Mature California black oaks are relatively fire-resistant, and even if damaged or top-killed, they have the ability to resprout and thereby retain dominance (Fryer 2007). In addition to natural ignitions, many historic fires were set by Native Americans, who relied on black oak acorns as a preferred food resource and used fire to promote the dominance of black oaks over other species (Anderson 2006, LaLande & Pullen 1999). As a result of fire suppression, many researchers have documented the widespread invasion of conifers into black oak communities (UCANRS 2015, Kauffman & Martin 1987).

Conifer encroachment has been recognized as a significant and ongoing threat to oak forests in southwest Oregon, as well as in adjacent regions (Cocking et al. 2015, 2012a). Conifers (usually Douglas-fir seedlings) that become established in the understory eventually pierce through and overtop the oak canopy, leading to oak mortality and conversion to Douglas-fir forest. The result of this shift in dominance from oaks to conifers is significantly less diversity and habitat value for wildlife (Devine et al. 2013, Barnhart et al. 1996). In the Cascade-Siskiyou landscape, such type conversions have probably been more common in California black oak as opposed to white oak

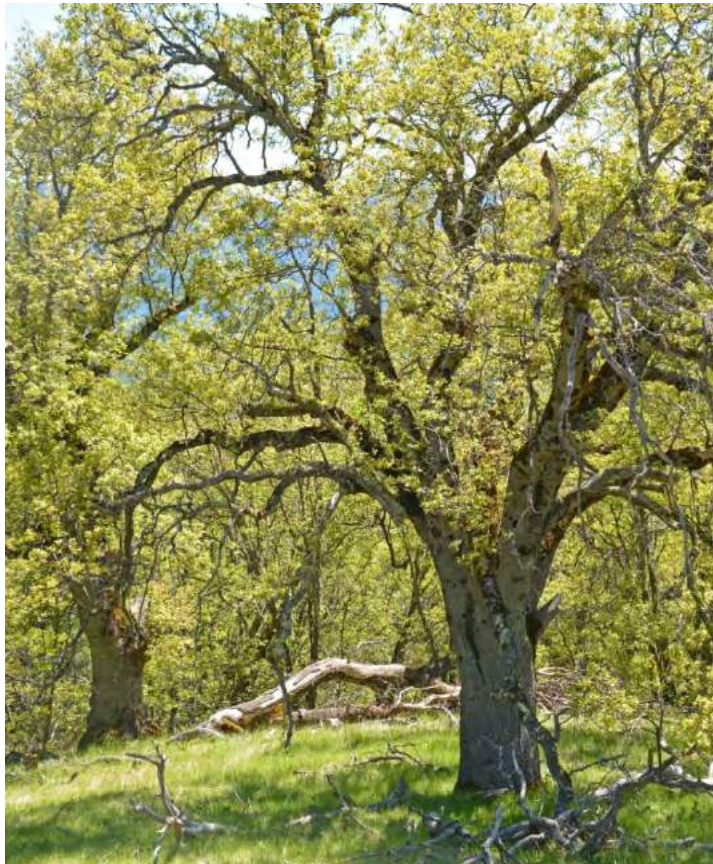


Figure 12. Representative examples of California black oak woodlands on the Sampson Creek Preserve, generally found between 3,500 - 4,500' elevation, just below and intergrading with the mixed conifer zone (top). Stands on more productive sites often include large, old-growth trees that attain heights of 50-80' and 3+ feet in diameter.



Figure 13. Stands of California black oak showing understory invasion by conifers (mostly Douglas-fir) on the upper south-facing slopes of Tom Spring Mountain. Historically, frequent fires largely prevented the establishment of fire-intolerant trees in these communities. With sufficient time in the absence of fire or active management, the black oak overstory will likely be overtopped by Douglas-fir and lost due to competition, a dynamic that has dramatically reduced the extent of oak habitats throughout western Oregon and the Pacific states.

stands, because the latter species tends to prefer xeric, low-productivity sites that are less conducive to conifers.

Field reconnaissance identified a number of areas where conifer encroachment is occurring in oak woodlands on the SCP, including many of the extensive black oak groves on the upper slopes of Tom Spring Mountain (Figure 13). However, at most sites observed, the majority of conifers are in the sapling stage and have not yet reached the height of the oak canopy. Careful, selective conifer removal is recommended as a way to prevent overtopping and eventual loss of these valuable and increasingly rare *Q. kelloggii* stands (Cocking et al. 2012a, Devine et al. 2007). In places where conifer encroachment is minimal, small-scale, low-intensity prescribed fires would likely improve regeneration of California black oak from seed, and help maintain abundance of these majestic trees on the preserve into the future (Cocking et al. 2012b).

IV. MIXED CONIFER FORESTS

Conifer forests occupy approximately 10% of the preserve, mostly occurring above ~4,500 feet and at slightly lower elevations in smaller patches on more mesic sites. Higher elevations are correlated with increased moisture, cooler temperatures and a less severe summer dry season, which tips the competitive advantage in favor of conifers over oaks and other hardwoods. The most extensive areas of this vegetation on the SCP are found around the upper slopes of 5,177' Tom Spring Mountain. More isolated stands are located in the upper Sampson Creek canyon (T39S R2E Section 13), the headwaters of West Fork Sampson Creek below Boone Ridge (NW quarter of T39S R2E Section 24), and on the steep, north-facing slopes below Buck Point. These forests represent the transition to montane vegetation and plant species that are more closely associated with the Cascade Range than the Klamath-Siskiyou ecoregion to the west.

Overstory tree species composition varies from stand to stand depending on soil type and depth, topography (slope/elevation/aspect), disturbance history and other variables (Figure 14). Primary species, in order of decreasing importance, include Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), incense cedar (*Calocedrus decurrens*), white fir (*Abies concolor*) and sugar pine (*Pinus lambertiana*). Bigleaf maple (*Acer macrophyllum*), Oregon white and California black oaks are found in small clumps or as scattered individuals. Conifer overstory cover ranges from a completely closed canopy (dense) to less than 50% crown cover (open).

Species composition and stand structures within the preserve have been strongly influenced by past logging history, as evidenced by the numerous, large-diameter stumps that can be found throughout most conifer stands. The specific history of logging on the SCP is not documented, but the degree of decomposition in stumps suggests the most recent tree removal operations occurred 30-40 years ago. Previous to logging, most of these forests likely exhibited classic late-successional or old-growth structures, including numerous large-diameter trees, complex canopies and well-developed, open understories. Few old-growth conifers remain today, except on isolated or inaccessible sites. The largest cohort of overstory trees in existing stands are mostly between 16-24" diameter and estimated at 80-120 years old.

Understory cover of shrubs and herbaceous species varies from very sparse in closed-canopy stands to dense in more open areas. More mesic sites, such as those on the north and east slopes of Tom Spring Mountain, often support diverse understories with well-developed shrub and herb layers.



Figure 14. Examples of conifer forests on the Sampson Creek Preserve, ranging from open-canopied ponderosa pine stands (top left) to dense Douglas-fir (bottom) and mixed *Pseudotsuga-Abies-Pinus* types (top right) at higher elevations and on north aspects. Due to past logging history, the majority of overstory trees are less than 21" diameter and estimated at 80-120 years old. Depending on stand characteristics, understory shrub and herb layers vary from sparse to well-developed.

Selective removal of canopy trees in some stands has led to growth release and development of a very dense, almost impenetrable shrub layer. Common and characteristic species include oceanspray (*Holodiscus discolor*), serviceberry (*Amelanchier alnifolia*), creeping snowberry (*Symphoricarpos mollis*), red-flowered currant (*Ribes sanguineum*) and pinemat manzanita (*Arctostaphylos nevadensis*). American trail plant (*Adenocaulon bicolor*), white hawkweed (*Hieracium albiflorum*), northern sanicle (*Osmorhiza graveolens*), thimbleberry (*Rubus parviflorus*) and small bedstraw (*Gallium triflorum*) are some of the most common forbs. Grass cover ranges from very sparse to abundant in more xeric, open stands.

Sampson Creek's mixed conifer forests have been defined in various ways by other vegetation classifications. More coarse-scale approaches refer to this vegetation type as "dry Douglas-fir" (Franklin & Dyrness 1988; O'Neil & Johnson 2001). At a finer level of dichotomy, Atzet et al. (1996), stratified the dry Douglas-fir series into a number of different plant associations based on abundance of understory species. Of these, the most likely to occur within the SCP include Douglas-fir-ponderosa pine/poison oak; Douglas-fir-incense cedar/dwarf Oregon grape; and Douglas-fir-white fir/creeping snowberry. Kagan & Caicco (1996) refer to forests of this area as "Siskiyou-Sierra mixed conifer", suggesting they are essentially a local variation of the montane mixed conifer forests from the Sierra Nevada in California. Irrespective of how they are described, these mixed conifer communities add an important element of diversity to the preserve, as well as create habitat continuity with forested ecosystems of the Cascades Plateau located on adjacent public lands.

V. BROADLEAF RIPARIAN WOODLANDS AND SHRUBLANDS

Riparian woodlands are plant communities dominated by trees and woody shrubs that are dependent on the existence of perennial, intermittent, or ephemeral surface or subsurface water. Areas immediately adjacent to streams and creeks support vegetation that strongly contrasts with surrounding uplands because of abundant soil moisture as well as differences in topography, microclimate, soil characteristics and disturbance regimes. Though riparian areas occupy a small proportion of the Sampson Creek Preserve, they are generally the most productive sites and are essential to maintaining ecosystem function and biodiversity (Gregory et al. 1991, Naiman et al. 1993). Most importantly, riparian woodlands are critical for protecting water quality, provide habitat for numerous riparian-dependent species, and act as effective movement corridors for terrestrial wildlife (Olson et al. 2007, FEMAT 1993).

On the SCP, riparian habitats vary from alluvial broadleaf woodlands associated with year-round water flows to narrow corridors or "stringers" that range from intermittent (e.g. seasonal) to ephemeral (e.g. primarily following precipitation events). The most well-developed, contiguous stands are found along the mainstem of Sampson Creek, as well as the lower reaches of Cattle and Soda Creeks. Community structure and composition along these primary streams are dynamic as a result of frequent disturbance from flooding. Several sites along lower Sampson and Cattle Creeks on more gentle terrain appear to have been significantly altered or reduced as a result of chronic grazing and adjacent road construction. Subsurface water likely persists into the dry season along the preserve's many intermittent and ephemeral drainages and exerts a less dramatic, more localized influence on the vegetation. Perennial springs and small ponds that dot the preserve also support small-scale patches of riparian vegetation.



Figure 15. Examples of broadleaf riparian vegetation on the Sampson Creek Preserve, ranging from dense, shrub-dominated stands on intermittent tributaries (top right), to open short-statured woodlands (top left) to tall, multi-storied forests along lower Sampson Creek (bottom). Dominant woody species include black cottonwood (*Populus balsamifera* var. *trichocarpa*), white alder (*Alnus rhombifolia*), Oregon ash (*Fraxinus latifolia*), bigleaf maple (*Acer macrophyllum*), several willows (*Salix*) and a high diversity of shrubs.

Due to local variation in environmental attributes, vegetation structure within riparian communities varies considerably and defies any single description (Figure 15). Most woodlands located along Sampson Creek and lower Cattle Creek support an intermittent to continuous canopy of broadleaved, winter-deciduous trees and tall shrubs. The width of riparian corridors is most strongly influenced by topography. Along steep, canyon-like stream reaches, the riparian vegetation is narrow and less developed, with fewer canopy trees. In floodplains, terraces and more gentle terrain, the overstory tends to be more dense and ranges from 30-60 feet in height. Characteristic species include white alder (*Alnus rhombifolia*), black cottonwood (*Populus balsamifera* var. *trichocarpa*), bigleaf maple (*Acer macrophyllum*), narrowleaf willow (*Salix exigua*), Pacific willow (*Salix lucida* ssp. *lasiandra*), and Oregon ash (*Fraxinus latifolia*). Oaks and conifers from adjacent uplands often appear as scattered individuals.

"Stringers" of riparian vegetation are also found in the numerous draws that follow both intermittent and seasonal tributaries, but compared with the mainstem of Sampson Creek, the plant community is patchy, less developed and more dominated by deciduous shrubs than trees. The shrub layer varies from continuous and dense to sparse or intermittent. The most common and characteristic shrub species, in order of decreasing importance, include mock orange (*Philadelphus lewisii*), western chokecherry (*Prunus virginiana*), black hawthorn (*Crataegus douglasii*), Douglas' sagewort (*Artemisia douglasiana*), bitter cherry (*Prunus emarginata*) and Douglas' spiraea (*Spiraea douglasii*). On transitional or marginal riparian sites, woody plants associated with adjacent uplands gradually replace riparian-obligate species.

The herbaceous layer within riparian woodlands is variable and ranges from dense to sparse or grassy, the latter being more common in the numerous intermittent or seasonal oak-canopied drainages that flow into the preserve's perennial streams. More productive woodlands along Sampson Creek are characterized by relatively high herbaceous cover and diversity, including many characteristic riparian species such as field horsetail (*Equisetum arvense*), common monkeyflower (*Mimulus guttatus*), nettle-leaf horsemint (*Agastache urticifolia*), rough hedge-nettle (*Stachys rigida*), and sedges (*Carex* spp.). Non-native forbs, such as moth mullein (*Verbascum blattaria*) yellow sweet clover (*Melilotus officinalis*) and curly dock (*Rumex crispus*) are also common.

VI. ROCK OUTCROPS AND BARRENS

Rock outcrops and barrens can generally be described as areas of exposed surface rock, cobbles and thin/gravelly soils that support sparse vegetative cover. Within the SCP, rock outcrops are common landscape features, often spatially isolated from each other and appearing as small inclusions of exposed bedrock (less than 4 acres, usually smaller) or cobbly soil within a matrix of contrasting vegetation. They can be found on all topographic settings and elevations, but most commonly occur on steep hillslopes or ridgelines. Areas of the preserve with abundant rocky habitats include the steep north-facing slopes of Buck Point, numerous cliff bands around Tom Spring Mountain, steep canyon walls in upper Sampson Creek, and the rocky side ridges that descend south from Major Butte. The uniqueness of these habitats results in entirely different plant communities compared with adjacent areas, increasing overall species richness and vegetation diversity.

Outcrops and barrens represent the most xeric natural community type that occurs on the preserve, characterized by warm and extremely dry microclimates during the summer, with little to no topsoil to hold moisture. Plants that live in these settings are strongly drought-adapted, able to find sufficient moisture and nutrients by sending roots into rock crevices or other areas where soil

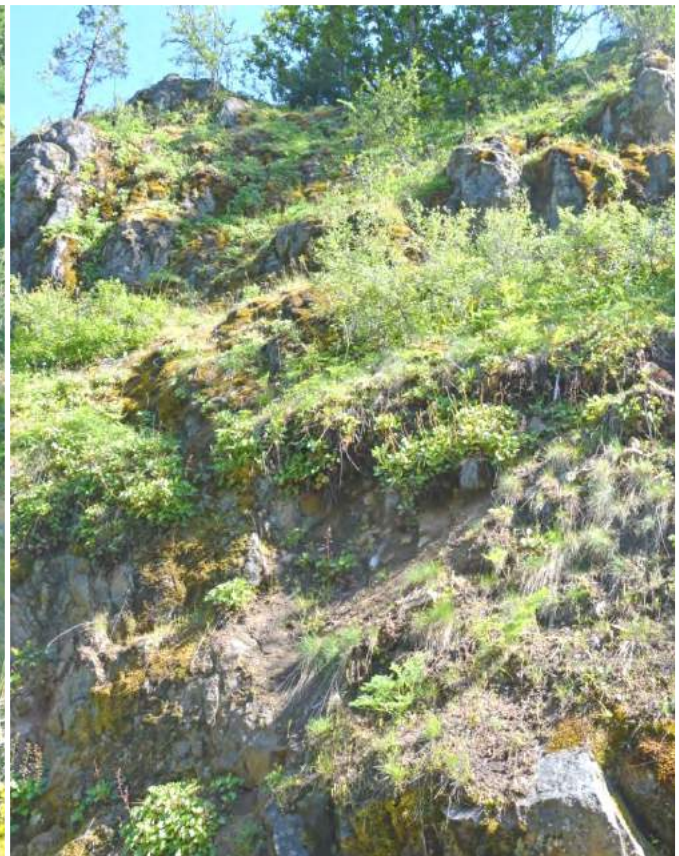
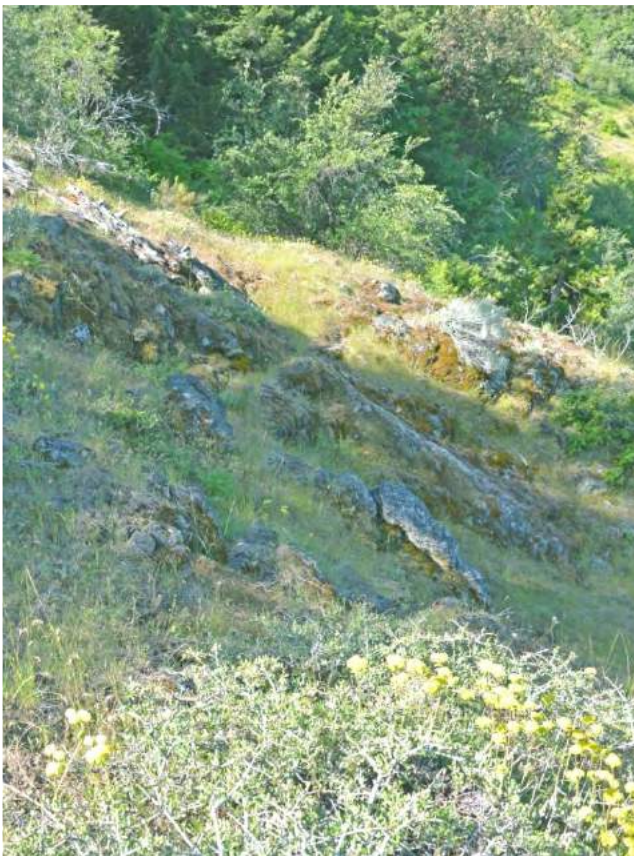


Figure 16. Examples of vegetation communities associated with rocky outcrops and barrens on the Sampson Creek Preserve. Common species include birchleaf mountain mahogany (*Cercocarpus betuloides*), sulfur-flower buckwheat (*Eriogonum umbellatum*), woolly sunflower (*Eriophyllum lanatum*), rock penstemon (*Penstemon deustus*) and a number of other xeromorphic, drought-tolerant forbs.

accumulation allows growth. The most exposed rock surfaces experience extreme daily fluctuations in temperature and are primarily inhabited by lichens and mosses. Within larger rocky features, a mosaic of microhabitats can occur -- steep slopes, small terraced ledges, overhangs, and cracks or crevices -- which contribute to the plant diversity that these habitats support.

The vegetation of rock outcrop communities is highly variable and can be dominated by lichens, mosses, graminoids, forbs or shrubs. Vascular plant cover is usually sparse to patchy, with cover dependent on the amount of fracturing in bedrock surfaces and accumulation of soil in crevices and depressions to allow plant establishment (Figure 16). Woody plants regularly occur in areas of deeper soil and often dominate sites where pockets of soil are more prevalent. Common shrubs in the preserve's rocky habitats are often the same species that dominate sclerophyllous evergreen chaparral -- whiteleaf manzanita, wedgeleaf ceanothus, birchleaf mountain mahogany and rubber rabbitbrush. Even in shrub-dominated sites, soil depths are much less than in adjacent plant communities.

The herbaceous flora associated with rock outcrops on the SCP is often diverse and more distinctive, containing many xeromorphic species that are either absent or uncommon in adjacent vegetation. A number of species are members of genera that are more closely associated with the Eastern Cascades or Great Basin ecoregions, including fernleaf biscuitroot (*Lomatium dissectum*), giant-seed biscuitroot (*L. macrocarpum*), barestem buckwheat (*Eriogonum nudum*) and arrow-leaved buckwheat (*E. compositum* var. *compositum*). Other characteristic taxa, including rock penstemon (*Penstemon deustus*), wormleaf stonecrop (*Sedum stenopetalum*), small-flowered alumroot (*Heuchera micrantha*) and one-sided bluegrass (*Poa secunda*), appear to be largely restricted to this community type. Additional surveys and characterization of the preserve's rocky habitats will undoubtedly reveal important differences between sites and many additional species.

VII. CROSSWALK TO OTHER VEGETATION DESCRIPTIONS

Because the vegetation communities described for the SCP have not been formally derived through field sampling and quantitative analysis, it may be helpful to crosswalk the community types in this document with other more widely recognized vegetation classification systems. A number of different frameworks have been formulated over the last 15 years that cover southwest Oregon and adjacent California, each based on differing data, methods and goals. The vegetation units created in these systems vary and can include: descriptions of vegetation associated with ecological units or wildlife habitats; emphasis on floristic composition; or emphasis on units recognizable with satellite imagery or aerial photographs.

Three classifications that are commonly used locally include Sawyer et al. (2009), Johnson & O'Neil (2001) and the U.S. National Vegetation Classification System (Comer et al. 2003). The first two of these frameworks focus on comparable geographic scales and present standardized classifications of primary wildlife habitats in Oregon (Johnson & O'Neil 2001) and floristically-based vegetation communities in California (Sawyer et al. 2009). The wildlife-habitat relationships schema of Johnson & O'Neil (2001) was developed primarily to classify and predict habitat value for vertebrate animals. This effort described 27 terrestrial wildlife habitat types by grouping existing vegetation communities into relatively broad classes based on the similarity of wildlife use. These classes were mapped at a scale of 1:100,000 [1 cm² on the map, 100 ha on the ground, with a minimum polygon size of 240 acres] by interpreting satellite imagery, conducting field verifications and merging ancillary data from several sources (Kiilsgaard & Barrett 1999).

The state-wide classification developed in a Manual of California Vegetation (MCV) by Sawyer et al. (2009) reflects a comprehensive synthesis of all available information on vegetation across the state. The principal vegetation unit in this system is called an “Alliance” (or series), which is a floristically defined, existing vegetation type identified by its dominant and/or characteristic species. Characteristic species are those other than dominants that are most informative in differentiating ecological groupings of vegetation types. Fine-scale vegetation maps in many parts of California have adopted this classification system, but as of yet no mapping efforts near the Oregon border have been conducted. However, given the close proximity of the SCP to California, almost all of the vegetation types that occur on the preserve are included and described within the MCV framework.

The last of three classification systems included in this crosswalk, the National Vegetation Classification System (NVCS) includes detailed descriptions for all vegetation community types across the continental United States using a hierarchical framework developed by NatureServe (NatureServe 2008, Comer et al. 2003). NVCS employs a nested system of seven higher-order levels or ranks, of which one of the two lower, more detailed levels is referred to as 'Ecological Systems'. Ecological systems are defined as “groups of plant community types that tend to co-occur within landscapes with similar ecological processes, substrates and/or environmental gradients” (NatureServe 2008). They are intended to provide a mid- to local-scale classification unit that is readily mappable and identifiable in the field. The nomenclature for each ecological system includes three primary components that communicate regional distribution (e.g., Mediterranean California), vegetation physiognomy (forest, shrubland, etc.) and plant community composition.

Table 1 presents the results of crosswalking the three classification systems discussed above with the vegetation communities of the Sampson Creek Preserve. In many cases, the relatively broad vegetation types described in this document are subdivided into several different communities in other classifications. This is particularly true when crosswalking to the NVCS and MCV classifications, which distinguish vegetation units based on dominant and characteristic species assemblages. For example, mixed conifer forests described in this document as a single vegetation type are stratified into four, three and five different subclasses, respectively. These finer scale distinctions likely exist on the SCP, but are difficult to accurately describe without quantitative data on compositional differences between stands. Overall, the wildlife habitats types of Johnson & O'Neil (2001) are most similar to the vegetation associations described in this report, likely because they similarly represent groupings of finer-scale plant communities.

In 2010, the Oregon Biodiversity Information Center completed a relatively fine-scale (1:24,000) state-wide vegetation map that is linked to the ecological systems classification of the NVCS (Grossman et al. 2008). For the purposes of this report, these data were used to construct a map that depicts the distribution of NVCS ecological systems across the SCP (Figure 17). While requiring further refinement and field verification, this map generally reflects the diverse vegetation patterns described in this overview, and may serve as an initial starting point for developing an accurate, fine-scale vegetation map for the preserve that can satisfy multiple objectives. Converting the spatial data covering the preserve into tabular form allows determination of the relative abundance for each vegetation type according to the ecological system framework within SCP boundaries; the most common NVCS ecological system by vegetation class appear in bolded text in Table 1. Descriptions for these ecological systems, excerpted from NatureServe (2008), are attached to this document as Appendix B.

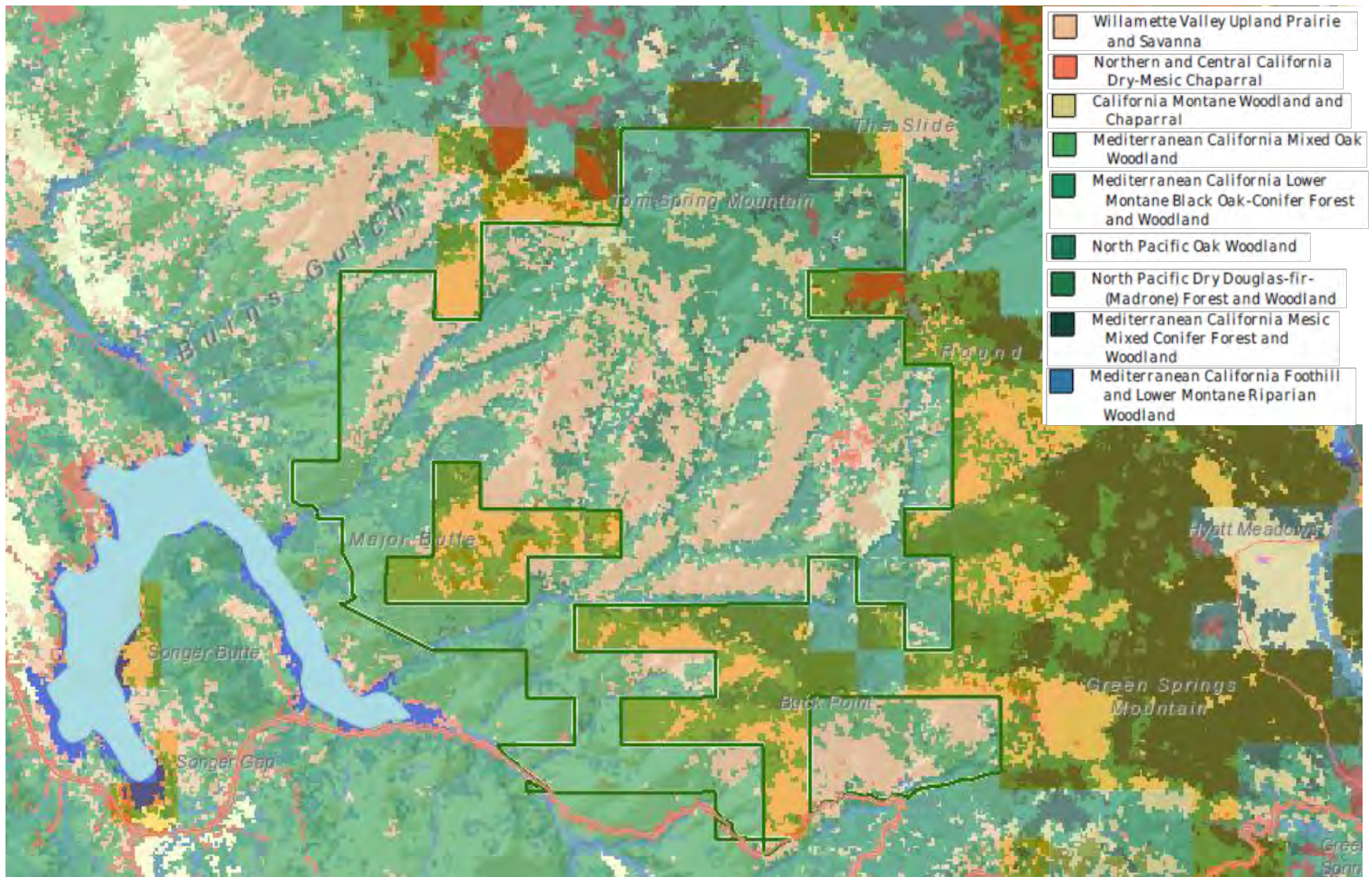


Figure 17. Map of NVCS ecological systems (from NatureServe 2008) in and around the Sampson Creek Preserve in Jackson County, southwest Oregon. Dominant vegetation types that occur in the SCP are included in the legend, nearby BLM lands are masked in light orange. Summary descriptions for NVCS ecological systems are included as Appendix B.

Table 1. Proposed crosswalk of three different classification systems with vegetation communities described for the Sampson Creek Preserve. Where multiple NVCS ecological systems occur within a vegetation class, spatial analysis indicates bolded types are the most common on the preserve.

SAMPSON CREEK PRESERVE (This document)	OR/WA WILDLIFE HABITAT TYPES (Johnson & O'Neil 2001)	NATIONAL VEGETATION CLASSIFICATION SYSTEM (NVCS) (Comer et al. 2003)	A MANUAL OF CALIFORNIA VEGETATION (MCV) (Sawyer et al. 2009)
GRASSLANDS AND MEADOWS			
Non-Native / Annual Grasslands	Non-Native Grasslands	Introduced Upland Vegetation - Annual Grassland	Wild oats grasslands Annual brome grasslands Mediterranean grass grasslands Annual dogtail grasslands Yellow star-thistle fields
Native / Perennial Grasslands	Westside Grasslands	Willamette Valley Upland Prairie and Savanna North Pacific Montane Grassland	Foothill needle grass grasslands California oat grass prairie Idaho fescue grassland
Forb-Dominated Dry Meadows	Westside Montane Grasslands and Meadows	North Pacific Montane Grassland	Rubber rabbitbrush scrub (?)
SHRUBLANDS			
Sclerophyllous Evergreen Chaparral	Ceanothus-manzanita shrublands/chaparral	California Montane Woodland and Chaparral Northern and Central California Dry-Mesic Chaparral	Whiteleaf manzanita chaparral Wedgeleaf ceanothus chaparral
Rosaceous Chaparral	Moist Deciduous Shrubland	North Pacific Montane Shrubland	Birch leaf mountain mahogany chaparral Ocean spray brush Bitter cherry thickets
Poison Oak Thickets	Not described	Not described	Not described
OAK WOODLANDS AND FORESTS			
Oregon White Oak	Westside Oak Forest and Woodlands	North Pacific Oak Woodland Mediterranean California Mixed Oak Woodland North Pacific Lowland Mixed Hardwood-Conifer Forest and Woodland	Oregon white oak woodland Brewer oak scrub
California Black Oak	Westside Oak Forest and Woodlands	Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland East Cascades Oak-Ponderosa Pine Forest and Woodland	California black oak forest

CONIFER FORESTS			
Mixed Conifer Forests	Westside Dry Douglas-Fir Forest Ponderosa Pine Forests and Woodlands Siskiyou Mixed Conifer Forest Westside Montane Mixed Conifer Forest	Mediterranean California Mesic Mixed Conifer Forest and Woodland Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland North Pacific Dry Douglas-fir (Madrone) Forest and Woodland	Ponderosa pine forest Ponderosa pine-Douglas-fir forest Douglas-fir forest Mixed conifer forest White fir-Douglas-fir forest
RIPARIAN WOODLANDS AND SHRUBLANDS			
Broadleaf Riparian Woodlands and Shrublands	Western Valley Riparian Woodland	Mediterranean California Foothill and Lower Montane Riparian Woodland North Pacific Lowland Riparian Woodland and Shrubland North Pacific Montane Riparian Woodland and Shrubland	Black cottonwood forest White alder groves Oregon ash groves Sandbar willow thickets Arroyo willow thickets
ROCK / SPARSELY VEGETATED			
Rock Outcrops and Barrens	Rocky Cliffs and Canyons	Klamath-Siskiyou Cliff and Outcrop North Pacific Montane Massive Bedrock, Cliff and Talus North Pacific Active Volcanic Rock and Cinder Land	Not described

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APPENDIX A -- Dominant and characteristic vascular plant species for each of the six primary vegetation types that occur on the Sampson Creek Preserve, Jackson County, Oregon: 1) grasslands, 2) shrublands, 3) oak woodlands and forests, 4) mixed conifer forests, 5) riparian woodlands and shrublands, and 6) rock outcrops and barrens. For each vegetation type, plant species are qualitatively identified as dominant (**), frequent (*) and common associates (unmarked). A solid circle preceding a plant name indicates a non-native, introduced species. [LIST] indicates species formally included on the state noxious weed list by the Oregon Department of Agriculture.

1. GRASSLANDS

Non-Native / Annual Grassland Type

PLANT SPECIES	COMMON NAME
Shrubs	
• <i>Rosa canina</i>	DOG ROSE
<i>Toxicodendron diversilobum</i> *	POISON-OAK
Graminoids	
• <i>Arrhenatherum elatius</i>	TALL OATGRASS
• <i>Avena barbata</i> *	SLENDER WILD OAT
• <i>Avena fatua</i> **	WILD OAT
• <i>Bromus diandrus</i> **	RIPGUT BROME
• <i>Bromus hordeaceus</i> **	SOFT CHESS
• <i>Bromus japonicus</i> **	JAPANESE BROME
• <i>Bromus madritensis</i> *	FOXTAIL CHESS
• <i>Bromus sterilis</i>	POVERTY BROME
• <i>Cynosurus echinatus</i> *	HEDGEHOG DOGTAIL
• <i>Dactylis glomeratus</i>	ORCHARD GRASS
<i>Elymus elymoides</i>	SQUIRRELTAIL
<i>Elymus glaucus</i> **	BLUE WILD-RYE
• <i>Hordeum brachyantherum</i>	MEADOW BARLEY
• <i>Phleum pratense</i>	CULTIVATED TIMOTHY
• <i>Poa bulbosa</i> *	BULBOUS BLUEGRASS
<i>Stipa lemmonii</i>	LEMMON'S NEEDLEGRASS
• <i>Taeniatherum caput-medusae</i> ** [LIST]	MEDUSA-HEAD RYE
<i>Vulpia microstachys</i>	SMALL FESCUE
• <i>Vulpia myuros</i> *	RATTAIL FESCUE
Forbs	
<i>Agoseris heterophylla</i>	ANNUAL HAWKWEED
<i>Amsinckia intermedia</i> *	COMMON FIDDLENECK
• <i>Barbarea orthoceras</i>	AMERICAN WINTER CRESS
<i>Brodiaea elegans</i>	ELEGANT BRODIAEA
<i>Calochortus tolmiei</i> *	TOLMIE'S PUSSY EARS
• <i>Centaurea solstitialis</i> ** [LIST]	YELLOW STAR THISTLE
• <i>Crepis capillaris</i>	SMOOTH HAWK'S BEARD
<i>Cryptantha intermedia</i>	INTERMEDIATE CRYPTANTHA

<i>Daucus pusillus</i>	RATTLESNAKE-WEED
<i>Dichelostemma capitatum</i> *	BLUE DICKS
• <i>Dipsacus fullonum</i>	FULLER'S TEASEL
• <i>Erodium cicutarium</i>	RED-STEMMED FILAREE
<i>Galium aparine</i>	CLEAVERS
• <i>Geranium dissectum</i> *	CUT-LEAVED GERANIUM
• <i>Hypochaeris radicata</i>	HAIRY CAT'S-EAR
• <i>Lactuca serriola</i>	PRICKLY LETTUCE
• <i>Lepidium campestre</i>	ENGLISH PEPPER-GRASS
<i>Lupinus microcarpus var. densiflorus</i>	CHICK LUPINE
<i>Madia gracilis</i>	SLENDER TARWEED
• <i>Medicago polymorpha</i>	BUR-CLOVER
<i>Micropus californicus</i>	SLENDER COTTONWEED
• <i>Plantago major</i>	COMMON PLANTAIN
<i>Ranunculus occidentalis</i> *	WESTERN BUTTERCUP
• <i>Rumex acetosella</i>	SHEEP SORREL
<i>Thysanocarpus curvipes</i>	HAIRY FRINGE POD
• <i>Torilis arvensis</i> *	COMMON HEDGE-PARSLEY
• <i>Tragopogon dubius</i>	YELLOW SALSIFY
• <i>Trifolium arvense</i>	RABBIT'S FOOT CLOVER
• <i>Trifolium pratense</i> **	RED CLOVER
<i>Uropappus lindleyi</i>	SILVER PUFFS
• <i>Vicia villosa ssp. varia</i> **	WINTER VETCH

Native / Perennial Grassland Type

PLANT SPECIES	COMMON NAME
Shrubs	
<i>Quercus garryana var. breweri</i> *	BREWER'S WHITE OAK
<i>Toxicodendron diversilobum</i>	POISON-OAK
Graminoids	
<i>Bromus carinatus</i> **	CALIFORNIA BROME
• <i>Bromus hordeaceus</i>	SOFT CHESS
• <i>Bromus japonicus</i>	JAPANESE BROME
<i>Bromus laevipes</i> *	WOODLAND BROME
<i>Danthonia californica</i> *	CALIFORNIA OATGRASS
<i>Danthonia unispicata</i>	ONE-SPIKE OATGRASS
<i>Elymus elymoides</i>	SQUIRRELTAIL
<i>Elymus glaucus</i> **	BLUE WILD RYE
<i>Festuca californica</i> *	CALIFORNIA FESCUE
<i>Festuca occidentalis</i>	WESTERN FESCUE
<i>Festuca roemeri ssp. klamathensis</i> **	ROEMER'S FESCUE
<i>Festuca rubra</i>	RED CREEPING FESCUE
<i>Juncus confusus</i>	COLORADO RUSH
<i>Koeleria macrantha</i>	JUNEGRASS

• <i>Poa bulbosa</i> *	BULBOUS BLUEGRASS
• <i>Poa pratensis</i>	KENTUCKY BLUEGRASS
<i>Pseudoregneria spicata</i>	BLUEBUNCH WHEATGRASS
<i>Stipa lemmonii</i> **	LEMMON'S NEEDLEGRASS
<i>Vulpia microstachys</i>	SMALL FESCUE
Forbs	
<i>Achillea millefolium</i> *	COMMON YARROW
<i>Agoseris grandiflora</i>	BIGFLOWER AGOSERIS
<i>Balsamorhiza sagittata</i>	WESTERN BALSAMROOT
<i>Blepharipappus scaber</i> *	ROUGH EYELASH WEED
<i>Calochortus tolmiei</i>	TOLMIE'S PUSSY EARS
<i>Clarkia rhomboidea</i>	TONGUE CLARKIA
<i>Dichelostemma capitatum</i> *	BLUE DICKS
<i>Epilobium brachycarpum</i> *	TALL ANNUAL WILLOWHERB
<i>Galium aparine</i>	CLEAVERS
<i>Iris chrysophylla</i>	GOLDEN IRIS
<i>Lomatium utriculatum</i>	COMMON LOMATIUM
<i>Ranunculus occidentalis</i> *	WESTERN BUTTERCUP
<i>Sanicula crassicaulis</i> *	PACIFIC SNAKEROOT
• <i>Vicia villosa ssp. varia</i> *	WINTER VETCH

2. **SHRUBLANDS** (postscript numbers refer to affinity with the three shrubland subtypes described in the text; 1-sclerophyllous evergreen chaparral, 2-Rosaceous chaparral and 3-poison oak thickets)

PLANT SPECIES	COMMON NAME
Shrubs	
<i>Amelanchier alnifolia</i> * 2	PACIFIC SERVICEBERRY
<i>Arbutus menziesii</i> 1	PACIFIC MADRONE
<i>Arctostaphylos viscida</i> ** 1	WHITELEAF MANZANITA
<i>Ceanothus cuneatus</i> ** 1	WEDGELEAF CEANOTHUS
<i>Cercocarpus montanus</i> * 2	BIRCH LEAF MTN. MAHOGANY
<i>Ericameria nauseosus</i> * 1	RUBBER RABBITBRUSH
<i>Garrya fremontii</i> 1	FREMONT'S SILK TASSEL
<i>Holodiscus discolor</i> 2	OCEAN SPRAY
<i>Prunus emarginata</i> 2	BITTER CHERRY
<i>Prunus subcordata</i> ** 2	KLAMATH PLUM
<i>Quercus garryana ssp. breweri</i> * 1,2	BREWER'S OAK
<i>Toxicodendron diversilobum</i> ** 1,3	POISON-OAK
Graminoids	NO CHARACTERISTIC TAXA
Forbs	NO CHARACTERISTIC TAXA

3. **OAK WOODLANDS AND FORESTS** (includes both *Q. garryana* and *Q. kelloggii* types)

PLANT SPECIES	COMMON NAME
Trees	
<i>Arbutus menziesii</i>	PACIFIC MADRONE

<i>Juniperus occidentalis</i> var. <i>occidentalis</i>	WESTERN JUNIPER
<i>Quercus garryana</i> var. <i>garryana</i> **	OREGON WHITE OAK
<i>Quercus kelloggii</i> **	CALIFORNIA BLACK OAK
Shrubs	
<i>Amelanchier alnifolia</i> *	PACIFIC SERVICEBERRY
<i>Ceanothus integerrimus</i>	DEERBRUSH, WILD LILAC
<i>Mahonia dictyota</i> *	HOLLYLEAF BARBERRY
<i>Oemleria cerasiformis</i>	OSOBERRY
<i>Prunus subcordata</i>	KLAMATH PLUM
<i>Quercus garryana</i> var. <i>breweri</i> *	BREWER'S WHITE OAK
<i>Symphoricarpos albus</i> **	COMMON SNOWBERRY
Graminoids	
<i>Bromus carinatus</i> **	CALIFORNIA BROME
<i>Bromus laevipes</i> *	WOODLAND BROME
<i>Carex multicaulis</i>	MANY-STEM SEDGE
<i>Danthonia californica</i> *	CALIFORNIA OATGRASS
<i>Danthonia unispicata</i>	ONE-SPIKE OATGRASS
<i>Elymus glaucus</i> *	BLUE WILD RYE
<i>Festuca californica</i> *	CALIFORNIA FESCUE
<i>Festuca occidentalis</i>	WESTERN FESCUE
<i>Festuca roemerii</i> ssp. <i>klamathensis</i> **	ROEMER'S FESCUE
<i>Koeleria macrantha</i>	JUNEGRASS
• <i>Poa bulbosa</i> *	BULBOUS BLUEGRASS
• <i>Poa pratensis</i>	KENTUCKY BLUEGRASS
<i>Stipa lemmonii</i> **	LEMMON'S NEEDLEGRASS
Forbs	
<i>Achillea millefolium</i> *	COMMON YARROW
<i>Agoseris grandiflora</i>	BIGFLOWER AGOSERIS
<i>Balsamorhiza sagittata</i> *	WESTERN BALSAMROOT
<i>Calochortus tolmiei</i> **	TOLMIE'S PUSSY EARS
<i>Castilleja attenuata</i>	VALLEY TASSELS
<i>Cirsium ciliolatum</i>	ASHLAND THISTLE
<i>Clarkia rhomboidea</i> *	TONGUE CLARKIA
<i>Collinsia parviflora</i>	SMALL-FLOWER BLUE-EYED MARY
<i>Collomia grandiflora</i>	GRAND COLLOMIA
<i>Crepis occidentalis</i>	WESTERN HAWK'S-BEARD
<i>Cynoglossum grande</i> *	PACIFIC HOUND'S TONGUE
<i>Dichelostemma congestum</i> *	OOKOW
<i>Eriophyllum lanatum</i>	WOOLY SUNFLOWER
<i>Erythronium hendersonii</i>	HENDERSON'S FAWN LILY
<i>Fragaria vesca</i>	WOODLAND STRAWBERRY
<i>Frasera albicaulis</i>	WHITE-STEMMED FRASERA
<i>Fritillaria affinis</i>	CHECKER LILY
<i>Iris chrysophylla</i> *	GOLDEN IRIS
<i>Lathyrus nevadensis</i>	NEVADA PEA
<i>Lithophragma parviflorum</i>	SMALL-FLOWER WOODLAND STAR

<i>Lomatium nudicaule</i>	BARESTEM BISCUITROOT
<i>Lomatium triternatum</i>	NINE-LEAF BISCUITROOT
<i>Lomatium utriculatum</i> *	COMMON LOMATIUM
<i>Lupinus polyphyllus</i>	LARGE-LEAF LUPINE
<i>Marah oreganus</i> *	WILD CUCUMBER, MANROOT
<i>Osmorhiza heteroi</i> *	SWEET CICELY
<i>Phacelia heterophylla</i>	VARIED-LEAF PHACELIA
<i>Plectritis congesta</i>	SHORT-SPURRED PLECTRITUS
<i>Potentilla glandulosa</i>	STICKY CINQUEFOIL
<i>Ranunculus uncinatus</i> *	WOODLAND BUTTERCUP
<i>Sanicula crassicaulis</i> **	PACIFIC SNAKEROOT
<i>Senecio integerrimus</i> *	LAMBS-TONGUE RAGWORT
<i>Silene campanulata</i>	CAMPANULATE CATCH-FLY
<i>Sisyrinchium bellum</i>	WESTERN BLUE-EYED GRASS
<i>Trifolium longipes</i>	LONG-STALKED CLOVER
<i>Trifolium macrocephalum</i>	LARGE-HEADED CLOVER
<i>Triteleia hyacinthina</i>	WHITE BRODIAEA
<i>Vicia americana</i> var. <i>americana</i>	AMERICAN VETCH
• <i>Vicia villosa</i> ssp. <i>varia</i> **	WINTER VETCH
<i>Viola glabella</i> *	STREAM VIOLET
<i>Wyethia angustifolia</i>	NARROW-LEAF MULE'S EAR
<i>Zigadenus venenosus</i> *	MEADOW DEATH CAMAS

4. MIXED CONIFER FORESTS

PLANT SPECIES	COMMON NAME
Trees	
<i>Abies concolor</i> *	WHITE FIR
<i>Calocedrus decurrens</i> *	INCENSE CEDAR
<i>Pinus lambertiana</i>	SUGAR PINE
<i>Pinus ponderosa</i> *	PONDEROSA PINE
<i>Pseudotsuga menziesii</i> **	DOUGLAS-FIR
<i>Quercus garryana</i> (and var. <i>breweri</i>)	OREGON WHITE OAK
<i>Quercus kelloggii</i> *	CALIFORNIA BLACK OAK
<i>Salix scouleriana</i>	SCOULER'S WILLOW
Shrubs	
<i>Arctostaphylos nevadensis</i>	PINEMAT MANZANITA
<i>Ribes sanguineum</i>	RED-FLOWERED CURRANT
<i>Rosa gymnocarpa</i> *	DWARF WOOD ROSE
<i>Symphoricarpos mollis</i> **	CREEPING SNOWBERRY
Graminoids	NO CHARACTERISTIC TAXA
Forbs	
<i>Adenocaulon bicolor</i> *	AMERICAN TRAIL PLANT
<i>Anemone deltoidea</i>	COLUMBIAN WINDFLOWER
<i>Aquilegia formosa</i>	WESTERN COLUMBINE
<i>Arnica cordifolia</i>	HEART-LEAF ARNICA

<i>Calypso bulbosa</i>	FAIRY SLIPPER ORCHID
<i>Campanula scouleri</i>	PALE BELLFLOWER, HAREBELL
<i>Corallorhiza maculata</i>	SPOTTED CORALROOT
<i>Disporum hookeri</i>	OREGON FAIRY BELL
<i>Erythronium klamathense</i>	KLAMATH FAWN LILY
<i>Galium triflorum*</i>	SMALL BEDSTRAW
<i>Hieracium albiflorum*</i>	WHITE HAWKWEED
<i>Hydrophyllum occidentale</i>	CALIFORNIA WATERLEAF
<i>Lomatium triternatum</i>	NINELEAF BISCUITROOT
<i>Maianthemum racemosum</i>	FALSE LILY OF THE VALLEY
<i>Montia parviflora</i>	SMALLFLOWER MINER'S LETTUCE
<i>Osmorhiza occidentalis*</i>	WESTERN SWEET ROOT
<i>Piperia unalascensis</i>	SLENDER-SPIKE REIN ORCHID
<i>Polygala cornuta</i>	SIERRA MILKWORT
<i>Pyrola picta</i>	WHITE-VEIN WINTERGREEN
<i>Rubus parviflorus*</i>	THIMBLEBERRY
<i>Sanicula graveolens*</i>	NORTHERN SANICLE
<i>Trientalis borealis var. latifolia</i>	STARFLOWER
<i>Trillium albidum</i>	GIANT WHITE WAKE-ROBIN
<i>Trillium ovatum</i>	WESTERN TRILLIUM
<i>Vicia americana var. americana*</i>	AMERICAN VETCH
<i>Viola sheltonii</i>	SHELTON'S VIOLET

5. RIPARIAN WOODLANDS AND SHRUBLANDS

PLANT SPECIES	COMMON NAME
Trees	
<i>Acer macrophyllum</i>	BIGLEAF MAPLE
<i>Alnus rhombifolia**</i>	WHITE ALDER
<i>Fraxinus latifolia*</i>	OREGON ASH
<i>Populus balsamifera var. trichocarpa**</i>	BLACK COTTONWOOD
<i>Salix exigua*</i>	NARROWLEAF WILLOW
<i>Salix lucida ssp. lasiandra*</i>	PACIFIC WILLOW
Shrubs	
<i>Artemisia douglasiana*</i>	DOUGLAS' SAGEWORT
<i>Ceanothus integerrimus</i>	DEERBRUSH, WILD LILAC
<i>Crataegus douglasii*</i>	BLACK HAWTHORNE
<i>Philadelphus lewisii**</i>	MOCK ORANGE
<i>Prunus emarginata</i>	BITTER CHERRY
<i>Prunus virginiana*</i>	WESTERN CHOKECHERRY
<i>Rhamnus purshiana</i>	CASCARA
• <i>Rosa eglanteria*</i>	SWEET BRIER
<i>Rubus leucodermis</i>	WHITE-BARK RASPBERRY
<i>Sambucus nigra ssp. cerulea*</i>	BLUE ELDERBERRY
Graminoids	
<i>Carex</i> sp.	SEDGE SPECIES

<i>Glyceria elata</i>	TALL MANNAGRASS
Forbs	
<i>Agastache urticifolia</i>	NETTLE-LEAF HORSEMINT
<i>Calystegia occidentalis</i>	FALSE BINDWEED
<i>Equisetum arvense</i> *	FIELD HORSETAIL
<i>Equisetum hyemale</i>	SCOURING RUSH HORSETAIL
<i>Heracleum maximum</i>	COMMON COW PARSNIP
<i>Lotus pinnatus</i>	MEADOW BIRD'S-FOOT TREFOIL
• <i>Melilotus officinalis</i>	YELLOW SWEET CLOVER
<i>Mimulus guttatus</i>	COMMON MONKEY FLOWER
• <i>Rumex crispus</i> *	CURLY DOCK
<i>Stachys rigida</i> *	ROUGH HEDGE-NETTLE
• <i>Verbascum blattaria</i> *	MOTH MULLEIN
<i>Vitis californica</i>	CALIFORNIA WILD GRAPE


6. ROCK OUTCROPS AND BARRENS


PLANT SPECIES	COMMON NAME
Shrubs	
<i>Arbutus menziesii</i>	PACIFIC MADRONE
<i>Arctostaphylos viscida</i> *	WHITELEAF MANZANITA
<i>Ceanothus cuneatus</i> **	WEDGELEAF CEANOTHUS
<i>Cercocarpus montanus</i> *	BIRCH LEAF MTN. MAHOGANY
<i>Ericameria nauseosus</i> **	RUBBER RABBITBRUSH
<i>Holodiscus discolor</i>	OCEAN SPRAY
<i>Prunus subcordata</i>	KLAMATH PLUM
Graminoids	
<i>Elymus multisetus</i>	BIG SQUIRRELTAIL
<i>Melica subulata</i>	ALASKA ONIONGRASS
<i>Poa secunda</i>	ONE-SIDED BLUEGRASS
Forbs	
<i>Allium sp. (A. tolmiei?)</i>	TOLMIE'S ONION
<i>Apocynum androsaemifolium</i> *	FALSE DOGBANE
<i>Boykinia major</i>	MOUNTAIN BROOKFOAM
<i>Castilleja pruinosa</i> *	FROSTED INDIAN PAINTBRUSH
<i>Cheilanthes gracillima</i> *	LACE LIP FERN
<i>Delphinium nuttalianum</i>	TWO-LOBED MEADOW LARKSPUR
<i>Epilobium minutum</i> *	CHAPARRAL WILLOW-HERB
<i>Erigeron inornatus</i>	UNADORNED FLEABANE
<i>Eriogonum compositum var. compositum</i> *	ARROW-LEAVED BUCKWHEAT
<i>Eriogonum nudum</i>	BARESTEM BUCKWHEAT
<i>Eriogonum umbellatum</i> *	SULFUR-FLOWER BUCKWHEAT
<i>Eriophyllum lanatum</i> *	WOOLY SUNFLOWER
<i>Erysimum capitatum</i>	SAND DUNE WALLFLOWER
<i>Heuchera micrantha</i> *	SMALL-FLOWERED ALUM ROOT
<i>Lomatium californicum</i>	CALIFORNIA LOMATIUM

<i>Lomatium dissectum</i> *	FERNLEAF BISCUITROOT
<i>Lomatium macrocarpum</i> *	GIANT-SEED BISCUITROOT
<i>Lonicera ciliosa</i>	ORANGE HONEYSUCKLE
<i>Lonicera hispidula</i>	PINK HAIRY HONEYSUCKLE
<i>Lupinus lepidus</i>	DWARF LUPINE
<i>Penstemon deustus</i> *	ROCK PENSTEMON
<i>Phacelia hastata</i> *	SILVERLEAF PHACELIA
<i>Polystichum imbricans</i>	NARROW-LEAVED SWORD FERN
<i>Sedum stenopetalum</i>	WORMLEAF STONECROP

APPENDIX B - DESCRIPTIONS FOR NVCS ECOLOGICAL SYSTEMS THAT OCCUR ON THE SAMPSON CREEK PRESERVE (excerpted from NatureServe 2008).

I. GRASSLANDS

<p>Scientific Name: Willamette Valley Upland Prairie and Savanna Unique Identifier: CES204.858 Classification Confidence: 1 - Strong</p>	 Search for Images on Google
<p>Summary: This grassland system is endemic to the Puget Trough and Willamette Valley. It formed a complex mosaic of varying patch sizes with wet prairies and riparian forests over much of the Willamette Valley during the pre-European settlement era. In parts of the Puget Trough, it occurred as large patches in more forested landscapes, usually associated with deep, coarse outwash deposits. Historically, it also occurred as large patches on glacially associated soils of variable texture in localized portions of the Georgia Basin in both Washington and British Columbia. It occurs on well-drained deep soils and was maintained historically by frequent anthropogenic burning. Landforms are usually flat, rolling, or gently sloping, and often part of extensive plains. Dominant vegetation is perennial bunchgrasses, especially <i>Festuca roemerii</i> (= <i>Festuca idahoensis</i> var. <i>roemerii</i>) and, to a lesser degree, <i>Danthonia californica</i>, with abundant and diverse forbs. Scattered deciduous (<i>Quercus garryana</i>) and/or coniferous (<i>Pseudotsuga menziesii</i>, <i>Pinus ponderosa</i>) trees are rarely found now, but such savannas historically covered about one-third of the total acreage. In the absence of disturbance, many of them have succeeded to forest and others continue to do so.</p>	
Component Associations	
Association Unique ID	Association Name
CEGL001598	<i>Danthonia californica</i> Valley Grassland Herbaceous Vegetation
CEGL001608	<i>Festuca roemerii</i> - <i>Sericocarpus rigidus</i> Herbaceous Vegetation
CEGL001714	<i>Quercus garryana</i> / <i>Festuca</i> (<i>roemerii</i> , <i>rubra</i>) Wooded Herbaceous Vegetation
CEGL001744	<i>Elymus caninus</i> - <i>Festuca roemerii</i> - (<i>Koeleria macrantha</i>) Herbaceous Vegetation
CEGL003348	<i>Pinus ponderosa</i> / <i>Carex inops</i> - <i>Festuca roemerii</i> Woodland

<p>Scientific Name: North Pacific Montane Grassland Unique Identifier: CES204.100</p>	 Search for Images on Google
<p>Summary: This ecological system includes open dry meadows and grasslands on the west side of the Cascades Range and northern Sierra Nevada. They occur in montane elevations up to 3500 m (10,600</p>	

feet). Soils tend to be deeper and more well-drained than the surrounding forest soils. Soils can resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well-drained. Dominant species include *Elymus* spp., *Festuca idahoensis*, and *Nassella cernua*. These large-patch grasslands are intermixed with matrix stands of red fir, lodgepole pine, and dry-mesic mixed conifer forests and woodlands.

Classification Comments: Upon review, Washington Heritage ecologists determined this system does not occur in Washington. Review in November 2008 suggests this ecological system should be lumped with Mediterranean California Subalpine Meadow (CES206.940) and that system be redefined to include the small patches of dry montane grasslands found in the Sierras and southern Cascades. For now, we've retained this as a system pending further review and comment from California ecologists.

II. SHRUBLANDS

Scientific Name: California Montane Woodland and Chaparral

Unique Identifier: CES206.925

Classification Confidence: 2 - Moderate

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Summary: This ecological system includes chaparral or open shrubby woodlands found among montane forests above 1500 m (4550 feet) elevation from the southern Cascades of Oregon to the Peninsular Ranges of California into Baja California, Mexico, where much annual precipitation occurs as snow. These are often locations with steep, exposed slopes with rocky and/or shallow soils, often glaciated. Stands are not found in the foothills but rather occur commonly above 1524 m (5000 feet) in elevation. These are mosaics of woodlands with chaparral understories, shrub-dominated chaparral, or short-lived chaparral with conifer species invading, if good seed source is available. Shrubs will often have higher densities than the trees, which are more limited due to the rocky/thin soils. These can also be short-duration chaparrals in previously forested areas that have experienced crown fires. Trees tend to have a scattered open canopy or can be clustered, over a usually continuous dense shrub layer. Trees can include *Pinus jeffreyi*, *Abies concolor*, *Abies magnifica*, *Pinus monticola*, *Pinus lambertiana*, *Pinus coulteri*, *Pinus attenuata*, *Cupressus forbesii*, *Cupressus arizonica* ssp. *stephensonii*, and *Cupressus arizonica* ssp. *nevadensis* (= *Cupressus nevadensis*). Typical sclerophyllous chaparral shrubs include *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Arctostaphylos glandulosa*, *Ceanothus cordulatus*, *Ceanothus diversifolius*, *Ceanothus pinetorum*, *Ceanothus velutinus*, and *Chrysolepis sempervirens* (= *Castanopsis sempervirens*). Some stands can be dominated by winter deciduous shrubs, such as *Prunus emarginata*, *Prunus subcordata* and *Ceanothus sanguineus* (in Oregon), *Prunus virginiana*, *Ceanothus integerrimus*, *Holodiscus discolor* (= *Holodiscus microphyllus*), and *Quercus garryana* var. *breweri*. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Occurrences of this system likely shift across montane forested landscapes with catastrophic fire events.

Classification Comments: Two phases are recognized: first, early-seral and post-fire shrub fields with 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 vaccinifolia*, *Arctostaphylos patula*, *Chrysolepis sempervirens*). This treatment combines "interior closed-cone conifer" woodlands (obligate fire-reproducing species) with montane chaparral and may need to be revisited.

Component Associations	
Association Unique ID	Association Name
CEGL003023	<i>Ceanothus cordulatus</i> Shrubland
CEGL003039	<i>Chrysolepis sempervirens</i> Shrubland
CEGL003129	<i>Holodiscus discolor</i> / <i>Sedum obtusatum</i> ssp. <i>boreale</i> - <i>Cryptogramma acrostichoides</i> Shrubland
CEGL003130	<i>Holodiscus discolor</i> - <i>Sambucus racemosa</i> Shrubland
CEGL005817	<i>Arctostaphylos viscida</i> Sierran Chaparral Shrubland
CEGL005820	<i>Arctostaphylos patula</i> Sierran Chaparral Shrubland
CEGL005821	<i>Ceanothus cordulatus</i> / Sparse Understory Sierran Shrubland
CEGL005822	<i>Prunus emarginata</i> Sierran Chaparral Shrubland
CEGL008695	<i>Chrysolepis sempervirens</i> / Sparse Understory Sierran Shrubland

Scientific Name: Northern and Central California
 Dry-Mesic Chaparral
Unique Identifier: CES206.931
Classification Confidence: 2 - Moderate



Summary: This ecological system includes chaparral typically located inland from maritime chaparral up to 1500 m (4550 feet) elevation in central and northern California through the northern end of the Central Valley and north into Oregon. This system includes extensive areas on coarse-grained soils with annual precipitation up to 75 cm (winter rain but not snow). Adjacent fine-textured soils support savanna under similar climatic regimes. These areas have supported extensive stand-replacing wildfires. This system is made up of a mixture of mostly obligate seeders. Characteristic species include *Adenostoma fasciculatum*, *Ceanothus cuneatus*, *Arctostaphylos viscida*, *Arctostaphylos manzanita*, *Arctostaphylos glauca*, *Arctostaphylos glandulosa*, *Arctostaphylos stanfordiana*, *Fremontodendron californicum*, *Malacothamnus fasciculatus*, *Dendromecon rigida*, and *Pickeringia montana*. Common shrubs in Oregon include *Arctostaphylos viscida*, *Cercocarpus montanus* var. *glaber*, and *Ceanothus cordulatus*. Fire regimes are intense, stand-replacing crown fires. Scattered and young trees may occur, such as *Pinus ponderosa*, *Pinus sabiniana*, *Pseudotsuga menziesii*, and *Quercus wislizeni*.

Component Associations	
Association Unique ID	Association Name

CEGL003008	<i>Arctostaphylos glauca</i> Shrubland
CEGL003025	<i>Ceanothus cuneatus</i> Shrubland
CEGL003158	<i>Ceanothus cuneatus</i> / Poaceae Shrubland
CEGL003176	<i>Adenostoma fasciculatum</i> - <i>Arctostaphylos glandulosa</i> - <i>Ceanothus jepsonii</i> / <i>Calamagrostis ophitidis</i> Shrubland
CEGL003177	<i>Adenostoma fasciculatum</i> - <i>Arctostaphylos glandulosa</i> - <i>Quercus wislizeni</i> Shrubland
CEGL003178	<i>Adenostoma fasciculatum</i> - <i>Diplacus aurantiacus</i> Shrubland
CEGL003180	<i>Arctostaphylos glandulosa</i> - <i>Quercus wislizeni</i> Shrubland
CEGL003468	<i>Adenostoma fasciculatum</i> - <i>Ceanothus cuneatus</i> Sierran Chaparral Shrubland
CEGL005816	<i>Adenostoma fasciculatum</i> Sierran Chaparral Shrubland
CEGL005817	<i>Arctostaphylos viscida</i> Sierran Chaparral Shrubland

Scientific Name: North Pacific Montane Shrubland

Unique Identifier: CES204.087



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Summary: This system occurs as small to large patches scattered throughout the North Pacific region, but it is largely absent from the windward sides of the coastal mountains where fires are rare due to very wet climates. It is defined as long-lived seral shrublands that persist for several decades or more after major wildfires, or smaller patches of shrubland on dry sites that are marginal for tree growth and that have typically also experienced fire. This system occurs on ridgetops and upper to middle mountain slopes and is more common on sunny southern aspects. It occurs from about 152 m (500 feet) elevation up to the lower limits of subalpine parkland. Vegetation is mostly deciduous broadleaf shrubs, sometimes mixed with shrub-statured trees or sparse evergreen needleleaf trees. It can also be dominated by evergreen shrubs, especially *Xerophyllum tenax* (usually considered a forb). Species composition is highly variable; some of most common species include *Acer circinatum*, *Arctostaphylos nevadensis*, *Acer glabrum*, *Vaccinium membranaceum*, *Ceanothus velutinus*, *Holodiscus discolor*, *Shepherdia canadensis*, *Sorbus* spp., and *Rubus parviflorus*. On the west side of the Cascades, *Gaultheria shallon* is an important dominant.

Component Associations

Association Unique ID	Association Name
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CEGL001066	<i>Amelanchier alnifolia</i> / <i>Xerophyllum tenax</i> Herbaceous Vegetation
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CEGL001127	<i>Rubus parviflorus</i> / <i>Chamerion angustifolium</i> - <i>Heracleum maximum</i> Shrubland
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CEGL003291	<i>Acer circinatum</i> / <i>Athyrium filix-femina</i> - <i>Tolmiea menziesii</i> Shrubland
CEGL003439	<i>Xerophyllum tenax</i> - <i>Sanguisorba officinalis</i> Herbaceous Vegetation
CEGL005891	<i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Shrubland

III. OAK WOODLANDS AND FORESTS

Scientific Name: North Pacific Oak Woodland

Unique Identifier: CES204.852

Classification Confidence: 1 - Strong



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Summary: This ecological system is limited to the southern portions of the North Pacific region. It occurs primarily in the Puget Trough and Willamette Valley but trickles down into the Klamath ecoregion and into California. This system 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 type is clearly large patch in nature. In the Puget Lowland and Georgia Basin, this system 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 system is strongly associated with a pre-European settlement, low-severity fire regime. 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*. This system merges into Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923) on sites that support more conifer cover, and into Mediterranean California Mixed Oak Woodland (CES206.909) in the southern portion of its distribution. This system is borderline between small patch and large patch in its dynamics.

Classification Comments: East of the Cascade Crest is a different system dominated by Oregon white oak (i.e., East Cascades Oak-Ponderosa Pine Forest and Woodland (CES204.085)). While *Quercus garryana* does occur in California, it is uncertain that this system (a Garry oak-dominated woodland) does not occur that far south. Garry oak in California may be mostly shrubby form around the edges of balds or else mixed into woodlands dominated by other species; this needs further review.

Similar Ecological Systems

Unique Identifier	Name
CES206.909	Mediterranean California Mixed Oak Woodland

Component Associations

Association Unique ID	Association Name

CEGL000548	<i>Quercus garryana</i> / <i>Carex inops</i> - <i>Camassia quamash</i> Woodland
CEGL000930	<i>Quercus garryana</i> / <i>Ceanothus cuneatus</i> / <i>Festuca idahoensis</i> Woodland
CEGL000932	<i>Quercus garryana</i> / <i>Toxicodendron diversilobum</i> / <i>Elymus glaucus</i> Woodland
CEGL003353	<i>Quercus garryana</i> / <i>Symphoricarpos albus</i> / <i>Polystichum munitum</i> Forest
CEGL003354	<i>Quercus garryana</i> / <i>Viburnum ellipticum</i> - <i>Toxicodendron diversilobum</i> Woodland
CEGL003355	<i>Pseudotsuga menziesii</i> - <i>Quercus garryana</i> / <i>Melica subulata</i> Forest
CEGL003358	<i>Quercus garryana</i> / <i>Symphoricarpos albus</i> / <i>Carex inops</i> Woodland

Scientific Name: Mediterranean California Mixed Oak Woodland

Unique Identifier: CES206.909

Classification Confidence: 2 - Moderate



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Summary: This ecological system is found throughout the Sierra Nevada and Coast Range foothills and lower montane elevations from 600-1600 m (1800-4850 feet) on steep, rocky slopes where snow and cold temperatures occur. Fire frequency and intensity drive composition of this system, with *Quercus chrysolepis* dominant with less frequent fires. With frequent annual burning (at lower elevations and on warmer sites), this system is an open to dense woodland of large oaks with well-developed grassy understories of native perennial bunchgrass. 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 and *Quercus garryana* var. *breweri* often codominant in the northwestern Coast Ranges as well as portions of the Sierra Nevada. *Quercus chrysolepis* becomes dominant with less frequent fires (but in Oregon this species is not important and occurs in a different system, either Mediterranean California Mixed Evergreen Forest (CES206.919) or Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916)). The perennial bunchgrass component includes *Festuca idahoensis*, *Festuca californica*, *Elymus glaucus*, and *Danthonia californica* (close to the coast). A variety of native forbs also occur. Other characteristic species include *Toxicodendron diversilobum*, *Juniperus occidentalis*, and *Ceanothus cuneatus*. This system is similar to North Pacific Oak Woodland (CES204.852) but does not include a conifer component, and *Quercus garryana* is not the only oak.

Similar Ecological Systems

Unique Identifier	Name
CES204.852	North Pacific Oak Woodland

Component Associations

Association Unique ID	Association Name
CEGL000931	<i>Quercus garryana</i> - <i>Quercus kelloggii</i> / <i>Toxicodendron diversilobum</i> Woodland

CEGL008601	<i>Quercus chrysolepis</i> / <i>Arctostaphylos patula</i> Forest
CEGL008602	<i>Quercus chrysolepis</i> / <i>Arctostaphylos viscida</i> Forest
CEGL008603	<i>Quercus chrysolepis</i> / <i>Dryopteris arguta</i> Forest
CEGL008604	<i>Quercus chrysolepis</i> - <i>Umbellularia californica</i> Forest
CEGL008617	<i>Quercus kelloggii</i> / <i>Arctostaphylos patula</i> Forest
CEGL008618	<i>Quercus kelloggii</i> - <i>Calocedrus decurrens</i> Forest
CEGL008619	<i>Quercus kelloggii</i> / <i>Arctostaphylos mewukka</i> - <i>Chamaebatia foliolosa</i> Forest

Scientific Name: Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland
Unique Identifier: CES206.923
Classification Confidence: 2 - Moderate



Summary: This ecological system is found throughout California's middle and inner North Coast Ranges, as well as the southern and eastern Klamath Mountains from 600-1600 m (1800-4850 feet) elevation, and the lower slopes of the western Sierra Nevada. It occurs in valleys and lower slopes on a variety of parent materials, including granitics, metamorphic and Franciscan metasedimentary parent material and deep, well-developed soils. It is characterized by woodlands or forests of *Pinus ponderosa* with one or more oaks, including *Quercus kelloggii*, *Quercus garryana*, *Quercus wislizeni*, or *Quercus chrysolepis*. *Pseudotsuga menziesii* may co-occur with *Pinus ponderosa*, particularly in the North Coast Ranges and Klamath Mountains. On most sites, the oaks are dominant, forming a dense subcanopy under a more open canopy of the conifers. On many sites, *Quercus kelloggii* is the dominant; in late-seral stands on more mesic sites, conifers such as *Pinus ponderosa* or *Pseudotsuga menziesii* will form a persistent emergent canopy over the oak. Stands may have shrubby understories (in the Klamath Mountains and Sierra Nevada) and, more rarely, grassy understories (in North Coast Ranges). Common shrubs include *Arctostaphylos viscida*, *Arctostaphylos manzanita*, *Ceanothus integerrimus*, and *Toxicodendron diversilobum*. Grasses can include *Festuca californica*, *Festuca idahoensis*, and *Melica* spp. Historical fire in this system was likely high frequency but of low intensity. Conifer species, such as *Pseudotsuga menziesii*, become more abundant with wildfire suppression.

Classification Comments: The floristic and geographic transition from this system to North Pacific Oak Woodland (CES204.852) needs to be further detailed. This system generally has lower tree species richness in the canopy and a lower canopy density than Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916), although the oaks can form a dense subcanopy in the mixed conifer system.

Similar Ecological Systems

Unique Identifier	Name
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CES206.919	Mediterranean California Mixed Evergreen Forest
CES206.936	California Lower Montane Blue Oak-Foothill Pine Woodland and Savanna
Component Associations	
Association Unique ID	Association Name
CEGL008674	<i>Pinus ponderosa</i> - <i>Calocedrus decurrens</i> - <i>Quercus chrysolepis</i> / <i>Chamaebatia foliolosa</i> Forest
CEGL008694	<i>Pinus ponderosa</i> - <i>Quercus kelloggii</i> / <i>Arctostaphylos viscida</i> Woodland

Scientific Name: East Cascades Oak-Ponderosa Pine Forest and Woodland

Unique Identifier: CES204.085

Classification Confidence: 2 - Moderate



Summary: This narrowly restricted ecological system 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. Most occurrences of this system 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 system. Clonal *Quercus garryana* can create dense patches across a grassy landscape or can dominate open woodlands or 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 system 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.

Classification Comments: Mapping this system presents a typical scale problem. Areas of pure ponderosa pine are found directly adjacent to oak stands. This system is a matrix type with stands of *Pinus ponderosa*, *Quercus garryana*, *Pinus ponderosa* - (*Pseudotsuga menziesii*) - *Quercus garryana*; still need to get a mapping protocol and concept to distinguish *Pseudotsuga menziesii* with *Quercus garryana* patches in the east gorge White Salmon. The Little White Salmon drainage near Augspurgen Mountain is the transition area between North Pacific Oak Woodland (CES204.852) and this system (Dog Mountain is the westernmost in Washington).

Similar Ecological Systems

Unique Identifier	Name
CES206.918	California Montane Jeffrey Pine-(Ponderosa Pine) Woodland

Component Associations

Association Unique ID	Association Name
CEGL000274	<i>Abies grandis</i> / <i>Holodiscus discolor</i> Forest
CEGL000434	<i>Pseudotsuga menziesii</i> / <i>Festuca occidentalis</i> Forest
CEGL000549	<i>Quercus garryana</i> / <i>Carex geyeri</i> Woodland
CEGL000550	<i>Quercus garryana</i> / <i>Elymus glaucus</i> Woodland
CEGL000551	<i>Quercus garryana</i> / <i>Festuca idahoensis</i> Woodland
CEGL000552	<i>Quercus garryana</i> / <i>Pseudoroegneria spicata</i> Woodland
CEGL000553	<i>Quercus garryana</i> / <i>Symphoricarpos albus</i> Woodland
CEGL000881	<i>Pinus ponderosa</i> - <i>Quercus garryana</i> / <i>Balsamorhiza sagittata</i> Woodland
CEGL000882	<i>Pinus ponderosa</i> - <i>Quercus garryana</i> / <i>Carex geyeri</i> Woodland
CEGL000883	<i>Pinus ponderosa</i> - <i>Quercus garryana</i> / <i>Purshia tridentata</i> Woodland
CEGL000884	<i>Pinus ponderosa</i> - <i>Quercus garryana</i> / <i>Symphoricarpos albus</i> Woodland

IV. MIXED CONIFER FORESTS

Scientific Name: Mediterranean California Mesic Mixed Conifer Forest and Woodland
Unique Identifier: CES206.915
Classification Confidence: 2 - Moderate



Summary: This ecological system occurs in cool ravines and north-facing slopes (typically with 100-150 cm annual precipitation; 50% as snow). It is found from 800-1000 m (2400-3000 feet) elevation in the

Sierra Nevada and 1250-2200 m (3800-6700 feet) in the Klamath Mountains. The most characteristically co-occurring conifers are *Abies concolor* var. *lowiana*, *Calocedrus decurrens*, and *Pinus lambertiana*. *Pinus jeffreyi*, *Pinus ponderosa*, and *Pseudotsuga menziesii* occur frequently but are not dominant. In limited locations in the central Sierra Nevada, *Sequoiadendron giganteum* dominates, usually with *Abies concolor*, and at the highest elevations also with *Abies magnifica*. *Acer macrophyllum* is common in lower elevation mesic pockets; *Chrysolepis chrysophylla* also occurs in the western Klamaths. Common understory species include *Corylus cornuta*, *Cornus nuttallii*, and at higher elevations *Chrysolepis sempervirens*. In areas of recent fire or other disturbance, *Arctostaphylos patula*, *Ceanothus integerrimus*, *Ceanothus cordulatus*, *Ceanothus parvifolius*, and *Ribes* spp. are more common. Fire of highly variable patch size and return interval maintains the structure of these woodlands.

Classification Comments: The presence of *Abies concolor* with other conifers is a strong indicator for this system in central California's Coast and Transverse ranges.

Similar Ecological Systems

Unique Identifier	Name
CES204.101	Sierran-Intermontane Desert Western White Pine-White Fir Woodland
CES206.916	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland

Component Associations

Association Unique ID	Association Name
CEGL000014	<i>Abies concolor</i> - <i>Pinus ponderosa</i> / <i>Amelanchier alnifolia</i> Forest
CEGL003155	<i>Abies concolor</i> - <i>Pinus lambertiana</i> - <i>Pinus jeffreyi</i> / Sparse Understory Forest
CEGL008607	<i>Sequoiadendron giganteum</i> - <i>Pinus lambertiana</i> / <i>Cornus nuttallii</i> Forest
CEGL008608	<i>Abies concolor</i> / <i>Ceanothus cordulatus</i> Forest
CEGL008630	<i>Pinus jeffreyi</i> - <i>Abies concolor</i> Woodland
CEGL008632	<i>Pinus jeffreyi</i> - <i>Abies magnifica</i> Woodland
CEGL008675	<i>Abies concolor</i> - <i>Calocedrus decurrens</i> - <i>Pinus lambertiana</i> / <i>Chrysolepis sempervirens</i> / <i>Carex multicaulis</i> Forest
CEGL008676	<i>Abies concolor</i> - <i>Pinus lambertiana</i> - <i>Calocedrus decurrens</i> / <i>Symphoricarpos mollis</i> / <i>Kelloggia galioides</i> Forest
CEGL008677	<i>Abies concolor</i> - <i>Calocedrus decurrens</i> - <i>Pinus lambertiana</i> / <i>Cornus nuttallii</i> / <i>Corylus cornuta</i> var. <i>californica</i> Forest
CEGL008678	<i>Abies concolor</i> - <i>Calocedrus decurrens</i> - <i>Pinus lambertiana</i> / <i>Adenocaulon bicolor</i>

	Forest
CEGL008679	<i>Abies concolor</i> - <i>Pinus lambertiana</i> Forest
CEGL008680	<i>Abies concolor</i> - <i>Pinus lambertiana</i> / <i>Maianthemum racemosum</i> - <i>Prosartes hookeri</i> Forest

Scientific Name: Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland

Unique Identifier: CES206.916

Classification Confidence: 2 - Moderate



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Summary: These mixed-conifer forests, always with at least two conifer species codominating, occur on all aspects in lower montane zones (600-1800 m elevation in northern California; 1200-2150 m in southern California). This system occurs in a variety of topo-edaphic positions, such as upper slopes at higher elevations, canyon sideslopes, ridgetops, and south- and west-facing slopes which burn relatively frequently. Often, several conifer species co-occur in individual stands. *Pseudotsuga menziesii*, *Pinus ponderosa*, and *Calocedrus decurrens* are the most common conifers. Other conifers that can occasionally be present include *Pinus jeffreyi*, *Pinus attenuata*, and *Pinus lambertiana* (not as common in this as in Mediterranean California Mesic Mixed Conifer Forest and Woodland (CES206.915)). Common subcanopy trees include *Quercus chrysolepis* and *Quercus kelloggii*. *Arbutus menziesii* and *Lithocarpus densiflorus* may be common with the oaks in northern areas. *Pseudotsuga macrocarpa* and *Pinus coulteri* can be present but are not dominant species in this system in the Transverse Ranges of southern California. Codominant *Abies concolor* - *Calocedrus decurrens* communities in southern California are also included in this system. In the Transverse Ranges, where Great Basin and Mojavean elements are transitioning into the montane zones, *Juniperus californica* and *Pinus monophylla* can be mixed with the other conifers. Understories are variable, except in the Sierra Nevada, where in some stands there can be dense understory mats of *Chamaebatia foliolosa* (and other low, spreading shrubs) which foster relatively high-frequency, low-intensity surface fires. In Oregon, shrubs such as *Holodiscus discolor*, *Toxicodendron rydbergii*, *Mahonia nervosa*, *Mahonia aquifolium*, and *Symphoricarpos mollis* are common in addition to graminoids such as *Festuca californica*, *Elymus glaucus*, and *Danthonia californica*. In the north, where *Calocedrus decurrens* and *Pinus ponderosa* drop out, this system shifts to North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland (CES204.845).

Classification Comments: This forest is more dense, with a greater richness of canopy tree species than Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923).

Similar Ecological Systems

Unique Identifier	Name
CES204.101	Sierran-Intermontane Desert Western White Pine-White Fir Woodland
CES204.845	North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland
CES206.915	Mediterranean California Mesic Mixed Conifer Forest and Woodland

CES206.918	California Montane Jeffrey Pine-(Ponderosa Pine) Woodland
Component Associations	
Association Unique ID	Association Name
CEGL000010	<i>Abies concolor</i> / <i>Amelanchier alnifolia</i> / <i>Anemone deltoidea</i> Forest
CEGL000014	<i>Abies concolor</i> - <i>Pinus ponderosa</i> / <i>Amelanchier alnifolia</i> Forest
CEGL000065	<i>Pinus lambertiana</i> - <i>Pinus ponderosa</i> - <i>Pseudotsuga menziesii</i> / <i>Festuca californica</i> Forest
CEGL005813	<i>Pseudotsuga menziesii</i> - <i>Abies concolor</i> - <i>Calocedrus decurrens</i> Forest
CEGL005814	<i>Pseudotsuga menziesii</i> - <i>Quercus chrysolepis</i> Forest
CEGL008672	<i>Pinus ponderosa</i> - <i>Calocedrus decurrens</i> / <i>Chamaebatia foliolosa</i> Forest
CEGL008673	<i>Pinus ponderosa</i> - <i>Calocedrus decurrens</i> - <i>Quercus kelloggii</i> Forest
CEGL008674	<i>Pinus ponderosa</i> - <i>Calocedrus decurrens</i> - <i>Quercus chrysolepis</i> / <i>Chamaebatia foliolosa</i> Forest
CEGL008684	<i>Pseudotsuga menziesii</i> - <i>Pinus ponderosa</i> - <i>Calocedrus decurrens</i> Forest
CEGL008694	<i>Pinus ponderosa</i> - <i>Quercus kelloggii</i> / <i>Arctostaphylos viscida</i> Woodland

Scientific Name: North Pacific Dry Douglas-fir-
(Madrone) Forest and Woodland
Unique Identifier: CES204.845
Classification Confidence: 1 - Strong



Summary: This ecological system is most common in the Puget Trough - Willamette Valley ecoregion of Oregon and Washington but also occurs in adjacent ecoregions. It occupies small patches associated with dry sites or larger areas in prairie landscapes. This system historically had moderate- to low-severity fires moderately frequently. Historically, these communities were either part of larger forested landscapes or occupied sheltered topographic positions in prairie-dominated landscapes. They now also occur on some sites that formerly supported prairies or tall shrublands (*Corylus cornuta*) with scattered trees. In the mountains, this type occurs locally on dry sites within dry to mesic (for the coastal areas) climates up to about 1220 m (4000 feet) elevation. This is a forest or woodland primarily dominated by the long-lived conifer *Pseudotsuga menziesii*. The broadleaf evergreen *Arbutus menziesii*, the short-lived conifer *Pinus contorta*, the broadleaf deciduous *Acer macrophyllum*, and the shade-tolerant conifer *Abies grandis* are local dominant or codominant species. These sites are too dry and warm or have been too frequently and extensively burned for anything more than small amounts of *Tsuga heterophylla* or *Thuja plicata* to be present as regeneration. *Arbutus menziesii* dominance is favored by high-severity fires on sites where it occurs, and *Pseudotsuga menziesii* can be locally eliminated by logging and hot fire or repeated high-

severity fires. *Calocedrus decurrens* is absent. *Abies grandis* can be an important subcanopy or sapling tree, especially in and around the Willamette Valley and in the driest portions of the Georgia Basin (Coastal Douglas-fir Zone).

Classification Comments: Originally named Dry Douglas-fir and Madrone Forest and Woodland, its name was changed as many areas occur without madrone. However, note that the description states we can have madrone stands with no Douglas-fir; these are less common than the former.

Similar Ecological Systems

Unique Identifier	Name
CES206.916	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland

Component Associations

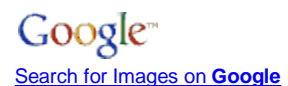
Association Unique ID	Association Name
CEGL000150	<i>Pinus contorta</i> var. <i>contorta</i> / <i>Gaultheria shallon</i> Forest
CEGL000421	<i>Pseudotsuga menziesii</i> - <i>Arbutus menziesii</i> / <i>Gaultheria shallon</i> Forest
CEGL000422	<i>Pseudotsuga menziesii</i> - <i>Arbutus menziesii</i> / <i>Vicia americana</i> Forest
CEGL000456	<i>Pseudotsuga menziesii</i> / <i>Rosa gymnocarpa</i> - <i>Holodiscus discolor</i> Forest
CEGL000460	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> - <i>Holodiscus discolor</i> Forest
CEGL000927	<i>Arbutus menziesii</i> - <i>Pseudotsuga menziesii</i> - <i>Quercus</i> spp. / <i>Toxicodendron diversilobum</i> Woodland
CEGL002616	<i>Pseudotsuga menziesii</i> / <i>Corylus cornuta</i> / <i>Polystichum munitum</i> Forest
CEGL003350	<i>Pseudotsuga menziesii</i> - <i>Abies grandis</i> / <i>Symphoricarpos albus</i> / <i>Melica subulata</i> Forest
CEGL003375	<i>Pinus contorta</i> var. <i>contorta</i> - <i>Pseudotsuga menziesii</i> / <i>Cladina</i> spp. Forest

V. RIPARIAN WOODLANDS AND SHRUBLANDS

Scientific Name: Mediterranean California Foothill and Lower Montane Riparian Woodland and Shrubland

Unique Identifier: CES206.944

Classification Confidence: 2 - Moderate



Summary: This system is found throughout Mediterranean California within a broad elevation range from

near sea level up to 300 m (900 feet) in the Coast Ranges and inland to 1500 m (4545 feet). This system often occurs as a mosaic of multiple communities that are tree-dominated with a diverse shrub component and open shrublands. This system includes open channels and bare alluvial bars as well. The variety of plant associations connected to this system reflects elevation, stream gradient, floodplain width, and flooding events. Dominant trees and shrubs may include *Alnus rhombifolia*, *Acer negundo*, *Alnus rubra* (in Coast Ranges), *Populus fremontii*, *Salix laevigata*, *Salix gooddingii*, *Pseudotsuga menziesii*, *Platanus racemosa*, *Quercus agrifolia*, and *Acer macrophyllum* (in central and south coast). Dominant shrubs include *Salix exigua* and *Salix lasiolepis*. Exotic trees *Ailanthus altissima*, *Eucalyptus* spp., and herbs such as *Arundo donax* occur. These are disturbance-driven systems that require flooding, scour and deposition for germination and maintenance.

Classification Comments: It is unclear if riparian woodlands and shrublands occur in the upper montane and subalpine regions of the Sierras and possibly the Transverse Ranges, and if they do, if they are significantly different in composition to be distinguished as an ecological system. Some literature indicates that, if they do occur, the woodlands at least are not at all common. For now, there is no "subalpine-upper montane Sierran riparian" system described. Lower elevation (low montane and foothill) riparian systems on the east side of the Sierras are treated in Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045).

Scientific Name: North Pacific Lowland Riparian Forest and Shrubland

Unique Identifier: CES204.869

Classification Confidence: 2 - Moderate



Summary: Lowland riparian systems occur throughout the Pacific Northwest. They are the 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 and tall shrublands 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 sitchensis*, *Salix lucida* ssp. *lasiandra*, *Cornus sericea*, and *Fraxinus latifolia*. Conifers tend to increase with succession in the absence of major disturbance. Conifer-dominated types are relatively uncommon and not well-described; *Abies grandis*, *Picea sitchensis*, and *Thuja plicata* are important. Riverine flooding and the succession that occurs after major flooding events are the major natural processes that drive this system. Very early-successional stages can be sparsely vegetated or dominated by herbaceous vegetation.

Classification Comments: This system is driven by snowmelt and rainfall hydrology. It differs from Alaskan Pacific Maritime Floodplain Forest and Shrubland (CES204.154) by the presence of mature black cottonwood gallery forests, and generally narrow linear deciduous riparian forests and shrublands. The Alaskan type includes glacier melt-driven hydrology, which results in very wide riverine habitats with fewer mature deciduous forests, as well as non-glacial rivers common on the island archipelago, but also on the mainland, which are narrower and are mostly dominated by Sitka spruce with and without the codominance of black cottonwood.

Similar Ecological Systems

Unique Identifier	Name

CES204.154	Alaskan Pacific Maritime Floodplain Forest and Shrubland
Component Associations	
Association Unique ID	Association Name
CEGL000400	<i>Picea sitchensis</i> / <i>Carex obnupta</i> - <i>Lysichiton americanus</i> Forest
CEGL000497	<i>Tsuga heterophylla</i> - (<i>Thuja plicata</i>) / <i>Oplopanax horridus</i> / <i>Polystichum munitum</i> Forest
CEGL000517	<i>Acer macrophyllum</i> - <i>Pseudotsuga menziesii</i> / <i>Corylus cornuta</i> / <i>Hydrophyllum tenuipes</i> Forest
CEGL000519	<i>Abies grandis</i> - <i>Acer macrophyllum</i> / <i>Symphoricarpos albus</i> Forest
CEGL000560	<i>Acer macrophyllum</i> / <i>Acer circinatum</i> Forest
CEGL000561	<i>Acer macrophyllum</i> / <i>Rubus spectabilis</i> Forest
CEGL000577	<i>Populus tremuloides</i> / <i>Carex pellita</i> Forest
CEGL000639	<i>Alnus rubra</i> / <i>Rubus spectabilis</i> Forest
CEGL000640	<i>Fraxinus latifolia</i> / <i>Carex obnupta</i> Forest
CEGL000641	<i>Fraxinus latifolia</i> - <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Symphoricarpos albus</i> Forest
CEGL000667	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Alnus incana</i> Forest
CEGL000668	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Alnus rhombifolia</i> Forest
CEGL000672	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Cornus sericea</i> Forest
CEGL000674	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Fraxinus latifolia</i> Forest
CEGL000677	<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
CEGL000949	<i>Salix lucida</i> ssp. <i>lasiandra</i> / <i>Salix fluviatilis</i> Woodland
CEGL001212	<i>Salix geyeriana</i> - <i>Salix lemmonii</i> / <i>Carex aquatilis</i> var. <i>dives</i> Shrubland
CEGL001213	<i>Salix geyeriana</i> - <i>Salix eriocephala</i> Shrubland
CEGL001939	<i>Corydalis scouleri</i> Herbaceous Vegetation

CEGL003254	<i>Picea sitchensis</i> / <i>Alnus viridis</i> ssp. <i>sinuata</i> Woodland
CEGL003256	<i>Picea sitchensis</i> / <i>Oplopanax horridus</i> - <i>Rubus spectabilis</i> Forest
CEGL003283	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Rubus spectabilis</i> Woodland
CEGL003284	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Oplopanax horridus</i> Woodland
CEGL003291	<i>Acer circinatum</i> / <i>Athyrium filix-femina</i> - <i>Tolmiea menziesii</i> Shrubland
CEGL003292	<i>Cornus sericea</i> - <i>Salix</i> (<i>hookeriana</i> , <i>sitchensis</i>) Shrubland
CEGL003293	<i>Alnus</i> (<i>incana</i> , <i>viridis</i> ssp. <i>sinuata</i>) / <i>Lysichiton americanus</i> - <i>Oenanthe sarmentosa</i> Shrubland
CEGL003296	<i>Salix sitchensis</i> / <i>Equisetum arvense</i> - <i>Petasites frigidus</i> Shrubland
CEGL003297	<i>Acer macrophyllum</i> / <i>Carex deweyana</i> Forest
CEGL003298	<i>Alnus rubra</i> / <i>Acer circinatum</i> / <i>Claytonia sibirica</i> Forest
CEGL003299	<i>Quercus garryana</i> - (<i>Fraxinus latifolia</i>) / <i>Symphoricarpos albus</i> Forest
CEGL003314	<i>Equisetum arvense</i> Herbaceous Vegetation
CEGL003362	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Alnus rubra</i> / <i>Symphoricarpos albus</i> Forest
CEGL003363	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Acer macrophyllum</i> / <i>Symphoricarpos albus</i> Forest
CEGL003364	<i>Fraxinus latifolia</i> - <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Corylus cornuta</i> - <i>Physocarpus capitatus</i> Forest
CEGL003365	<i>Fraxinus latifolia</i> / <i>Carex deweyana</i> - <i>Urtica dioica</i> Forest
CEGL003389	<i>Alnus rubra</i> / <i>Rubus spectabilis</i> / <i>Carex obnupta</i> - <i>Lysichiton americanus</i> Forest
CEGL003390	<i>Fraxinus latifolia</i> - (<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>) / <i>Cornus sericea</i> Forest
CEGL003393	<i>Fraxinus latifolia</i> / <i>Symphoricarpos albus</i> Forest
CEGL003394	<i>Acer macrophyllum</i> - <i>Pseudotsuga menziesii</i> / <i>Acer circinatum</i> / <i>Polystichum munitum</i> Forest
CEGL003395	<i>Acer macrophyllum</i> / <i>Rubus ursinus</i> Forest
CEGL003396	<i>Acer macrophyllum</i> / <i>Symphoricarpos albus</i> / <i>Urtica dioica</i> ssp. <i>gracilis</i> Forest
CEGL003397	<i>Acer macrophyllum</i> / <i>Urtica dioica</i> ssp. <i>gracilis</i> Forest

CEGL003398	<i>Alnus rubra</i> / <i>Elymus glaucus</i> Forest
CEGL003399	<i>Alnus rubra</i> / <i>Oplopanax horridus</i> - <i>Rubus spectabilis</i> Forest
CEGL003400	<i>Alnus rubra</i> / <i>Oxalis (oregana, trilliifolia)</i> Forest
CEGL003401	<i>Alnus rubra</i> / <i>Petasites frigidus</i> Forest
CEGL003402	<i>Alnus rubra</i> / <i>Rubus parviflorus</i> Forest
CEGL003403	<i>Alnus rubra</i> / <i>Stachys chamissonis</i> var. <i>cooleyae</i> - <i>Tolmiea menziesii</i> Forest
CEGL003404	<i>Fraxinus latifolia</i> - <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Acer circinatum</i> Forest
CEGL003405	<i>Fraxinus latifolia</i> - <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Rubus spectabilis</i> Forest
CEGL003406	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Acer macrophyllum</i> / <i>Equisetum hyemale</i> Forest
CEGL003407	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Alnus rubra</i> / <i>Rubus spectabilis</i> Forest
CEGL003408	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Cornus sericea</i> / <i>Impatiens capensis</i> Forest
CEGL003409	<i>Salix lucida</i> ssp. <i>lasiandra</i> / <i>Urtica dioica</i> ssp. <i>gracilis</i> Woodland
CEGL003418	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Picea sitchensis</i> - (<i>Acer macrophyllum</i>) / <i>Oxalis oregana</i> Forest
CEGL003425	<i>Deschampsia caespitosa</i> - <i>Artemisia lindleyana</i> Herbaceous Vegetation
CEGL005301	<i>Cornus sericea</i> Pacific Shrubland

Scientific Name: North Pacific Montane Riparian

Woodland and Shrubland

Unique Identifier: CES204.866

Classification Confidence: 2 - Moderate



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Summary: This ecological system occurs throughout mountainous areas of the Pacific Northwest coast, both on the mainland and on larger islands. 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. Surrounding habitats include subalpine parklands and montane forests. In Washington, they are defined as occurring primarily above the *Tsuga heterophylla* zone, i.e., beginning at or near the lower boundary of the *Abies amabilis* zone. Dominant species include *Pinus contorta* var. *murrayana*, *Populus balsamifera* ssp. *trichocarpa*, *Abies concolor*, *Abies magnifica*, *Populus tremuloides*, *Alnus incana* ssp. *tenuifolia* (= *Alnus tenuifolia*), *Alnus viridis* ssp. *crispa* (= *Alnus crispa*), *Alnus viridis* ssp. *sinuata* (= *Alnus sinuata*), *Alnus rubra*, *Rubus spectabilis*, *Ribes bracteosum*, *Oplopanax horridus*, *Acer circinatum*, and several *Salix* species. In western Washington,

major species are *Alnus viridis ssp. sinuata*, *Acer circinatum*, *Salix*, *Oplopanax horridus*, *Alnus rubra*, *Petasites frigidus*, *Rubus spectabilis*, and *Ribes bracteosum*. This is a disturbance-driven system that requires flooding, scour and deposition for germination and maintenance. It occurs on streambanks where the vegetation is significantly different than surrounding forests, usually because of its shrubby or deciduous character.

Classification Comments: Riparian and floodplain woodlands and shrublands in Alaska have been placed into a different system. Still need to determine where the Alaskan type grades into this one, and whether British Columbian riparian systems should be placed here or in the new Alaskan system.

Similar Ecological Systems

Unique Identifier	Name
CES204.154	Alaskan Pacific Maritime Floodplain Forest and Shrubland

Component Associations

Association Unique ID	Association Name
CEGL001079	<i>Betula glandulosa</i> / <i>Carex utriculata</i> Shrubland
CEGL001141	<i>Alnus incana</i> Shrubland
CEGL001145	<i>Alnus incana</i> / <i>Cornus sericea</i> Shrubland
CEGL001146	<i>Alnus incana</i> / <i>Equisetum arvense</i> Shrubland
CEGL001147	<i>Alnus incana</i> / Mesic Forbs Shrubland
CEGL001152	<i>Alnus incana</i> / <i>Spiraea douglasii</i> Shrubland
CEGL001153	<i>Alnus incana</i> / <i>Symphoricarpos albus</i> Shrubland
CEGL001156	<i>Alnus viridis ssp. sinuata</i> / <i>Athyrium filix-femina</i> - <i>Cinna latifolia</i> Shrubland
CEGL001157	<i>Alnus viridis ssp. sinuata</i> / <i>Oplopanax horridus</i> Shrubland
CEGL001176	<i>Salix (boothii, geyeriana)</i> / <i>Carex aquatilis</i> Shrubland
CEGL001178	<i>Salix boothii</i> / <i>Carex utriculata</i> Shrubland
CEGL001185	<i>Salix boothii</i> - <i>Salix geyeriana</i> / <i>Carex angustata</i> Shrubland
CEGL001186	<i>Salix boothii</i> - <i>Salix lemmonii</i> Shrubland
CEGL001189	<i>Salix commutata</i> / <i>Carex scopulorum</i> Shrubland
CEGL002607	<i>Salix boothii</i> - <i>Salix eastwoodiae</i> / <i>Carex nigricans</i> Shrubland

CEGL002628	<i>Alnus incana</i> / <i>Athyrium filix-femina</i> Shrubland
CEGL002631	<i>Salix drummondiana</i> / <i>Carex utriculata</i> Shrubland
CEGL003296	<i>Salix sitchensis</i> / <i>Equisetum arvense</i> - <i>Petasites frigidus</i> Shrubland

VI. ROCK OUTCROPS AND BARRENS

Scientific Name: Klamath-Siskiyou Cliff and Outcrop

Unique Identifier: CES206.902

Classification Confidence: 2 - Moderate



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Summary: Found from foothill to subalpine elevations of the Klamath Range, these are barren and sparsely vegetated landscapes (<10% plant cover) of steep cliff faces, bald ridgetops and shoulder outcrops, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock. Vegetative cover is dominated by forbs, grasses, mosses, or lichens. This also includes unstable scree and talus slopes typically occurring below cliff faces. Scattered vegetation may include *Pseudotsuga menziesii* and *Acer macrophyllum* along with herbaceous and nonvascular species such as *Achnatherum lemmonii* (= *Stipa lemmonii*), *Achnatherum occidentale* (= *Stipa occidentalis*), *Elymus elymoides* (= *Sitanion hystrix*), *Sedum oregonense*, and *Racomitrium ericoides* (= *Racomitrium canescens* var. *ericoides*). Soil development is limited as is herbaceous cover.

Scientific Name: North Pacific Montane Massive

Bedrock, Cliff and Talus

Unique Identifier: CES204.093

Classification Confidence: 2 - Moderate



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Summary: This ecological system is found from foothill to subalpine elevations and includes barren and sparsely vegetated landscapes (generally <10% vascular plant cover) of steep cliff faces, narrow canyons, and larger rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus that typically occur below cliff faces. 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 probably has a significant component on nonvascular species, and 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 includes *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%.

Classification Comments: This system was distinguished from montane cliffs and barrens in the Rockies based on a change in floristic division and the apparent abundance of nonvascular cover on rocks compared to drier divisions. It also includes cliffs, barrens and rock outcrops in coastal southeastern

Alaska, if they are not covered with snow and ice.

Scientific Name: North Pacific Active Volcanic Rock
and Cinder Land

Unique Identifier: CES204.092

Classification Confidence: 2 - Moderate



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Summary: This ecological system includes active volcanic landscapes dominated by ash, pyroclastic deposits, lava, landslides and other exposed bare mineral and rock. Periodic eruptions and earthquakes are the primary processes maintaining a primarily barren environment. Decades of inactivity slowly provide opportunity for development of other systems, such as North American Glacier and Ice Field (CES100.728) or North Pacific Wooded Volcanic Flowage (CES204.883), or primary successional stages of surrounding vegetated systems to develop.

Classification Comments: Mount St. Helens is the prototype. Barren volcanic landscapes on the Alaska Peninsula and Aleutian Islands have been placed into Aleutian Volcanic Rock and Talus (CES105.308).

Similar Ecological Systems

Unique Identifier	Name
CES105.308	Aleutian Volcanic Rock and Talus