Stereo Photo Series for Quantifying Natural Fuels

Volume VII: Oregon White Oak, California Deciduous Oak, and Mixed-Conifer With Shrub Types in the Western United States

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ABSTRACT

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Two series of single and stereo photographs display a range of natural conditions and fuel loadings in deciduous oak woodland and savannah ecosystems in Washington, Oregon, and California. An additional series of single and stereo photographs displays a range of natural conditions and fuel loadings in mixed-conifer with shrub ecosystems in southwestern Oregon. Each group of photos includes inventory data summarizing vegetation composition, structure, and loading; woody material loading and density by size class; forest floor depth and loading; and various site characteristics. The natural fuels photo series is designed to help land managers appraise fuel and vegetation conditions in natural settings.

Keywords: Woody material, biomass, fuel loading, natural fuels, western deciduous oaks, mixed-conifer, blue oak, *Quercus douglasii*, buckbrush, *Ceanothus cuneatus*, California black oak, *Quercus kelloggii*, California live oak, *Quercus agrifolia*, Douglas-fir, *Pseudotsuga menziesii*, Engelmann oak, *Quercus engelmannii*, greenleaf manzanita, *Arctostaphylos patula*, Jeffrey pine, *Pinus jeffreyi*, Oregon white oak, *Quercus garryana*, Pacific madrone, *Arbutus menziesii*, ponderosa pine, *Pinus ponderosa.*

COOPERATORS

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Contents

WHAT IS THE NATURAL FUELS PHOTO SERIES?

The first phase of the natural fuels photo series was a collection of six volumes, each representing a region of the United States. The second phase of the natural fuels photo series included new volumes (this volume) and supplemental series for existing volumes (volumes IIa, Va, and VIa). Volume I included sites in mixed-conifer, western juniper, sagebrush, and grassland ecosystem types in the interior Pacific Northwest. Volume II included sites in black spruce and white spruce ecosystem types in Alaska, and volume IIa included sites in hardwood ecosystems undergoing succession to spruce. Volume III included sites in lodgepole pine, quaking aspen, and gambel oak ecosystem types in the Rocky Mountains. Volume IV included sites in pinyon-juniper, sagebrush, and chaparral ecosystem types in the Southwest. Volume V included sites in red and white pine, northern tallgrass prairie, and mixed oak ecosystem types in the Midwest, and volume Va included sites in jack pine ecosystems. Volume VI included sites in longleaf pine, pocosin, and marsh grass ecosystem types in the Southeast, and volume VIa included sites in sand hill, sand pine scrub, and hardwoods with white pine ecosystem types.

Generally, sites include wide-angle and stereo-pair photographs supplemented with information on living and dead fuels, vegetation, and stand structure and composition within the area visible in the photographs (fig. 1). This volume (Volume VII) is a part of a second phase of the natural fuels photo series and includes sites in deciduous oak woodland and savannah, and mixed-conifer with shrub ecosystems in Washington, Oregon, and California. The sites in this volume provide a basis for appraising and describing woody material, vegetation, and stand conditions in many oak and mixed-conifer ecosystems throughout Washington, Oregon, and California.

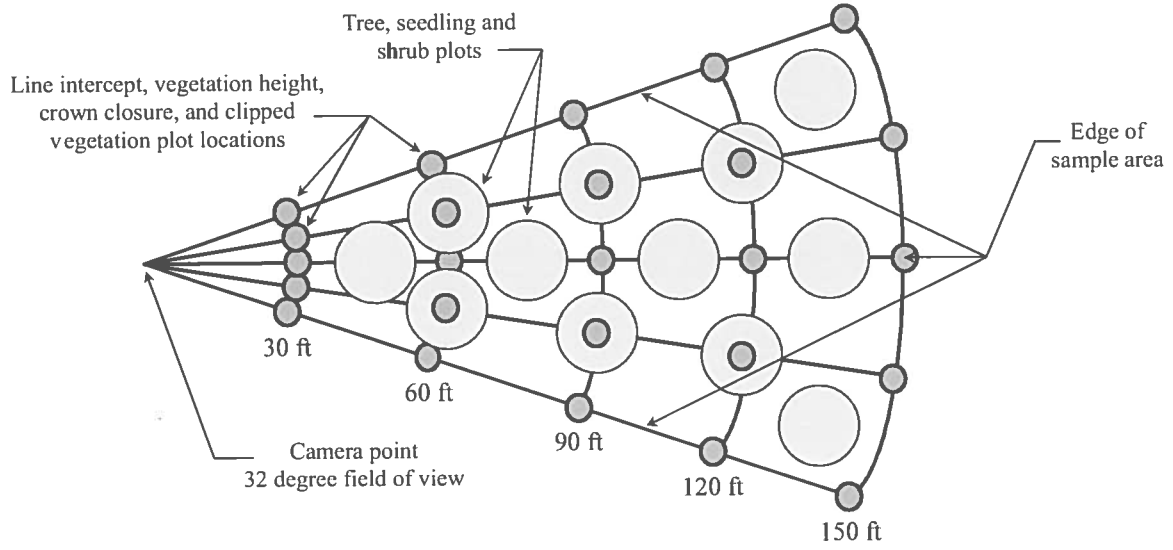

Figure 1--Photo series sample area layout. Forty random azimuth line transects (one at each point on the 30- and 150-foot arcs, and two at each point on the 60-, 90-, and 120-foot arcs) and 12 clipped vegetation plots (two to three per arc) were located within the sample area. Trees, shrubs and seedlings were inventoried on 12 systematically located sample plots.

Why is the Photo Series Needed?

These photo series are land management tools that can be used to assess landscapes through appraisal of living and dead woody material and vegetation (i.e., fuels) and stand characteristics. Once an assessment has been completed, stand treatment options, such as prescribed fire or harvesting, can be planned and implemented to better achieve desired effects while minimizing negative impacts on other resources.

The photo series has application in several branches of natural resource science and management. Inventory data such as these can be used as inputs for evaluating animal and insect habitat, nutrient cycling, and microclimate, for example. Fire managers will find these data useful for predicting fuel consumption, smoke production, fire behavior, and fire effects during wildfires and prescribed fires. In addition, the photo series can be used to appraise carbon sequestration, an important factor in predictions of future climate, and to link remotely sensed signatures to live and dead fuels on the ground.

Ground inventory procedures that directly measure site conditions (e.g., fuel loading and arrangement, vegetation structure and composition, etc.) exist for most ecosystem types and are useful when a high degree of accuracy is required. Ground inventory is time consuming and expensive, however. Photo series can be used to make quick, easy, and inexpensive determinations of fuel quantities and stand conditions when less precise estimates are acceptable.

How was the Photo Series Developed?

Sites photographed for the two oak series in this volume were selected to represent a range of conditions in deciduous oak woodland and savannah ecosystems in Washington, Oregon, and California. The Oregon white oak sites range from savannah to woodland types and are ordered by degree of crown closure. The deciduous oak sites in California show a range of savannah types and are also ordered by degree of crown closure. Sites photographed for the mixed-conifer with shrub series in this volume represent a range of shrub coverage, species composition, and shrub size conditions. The mixed-conifer with shrub series is ordered by amount of shrub coverage. Photographs were taken, and fuel loading, stand structure, and composition data were collected by using the procedures of Maxwell and Ward (1980) as a guide.

Photographs

Stereo-pair photographs are included in this guide. The three-dimensional image obtained by viewing the photographs with a stereoscope will improve the ability of the land manager to appraise natural fuel, vegetation, and stand structure conditions. A larger wide-angle photograph has been included for additional comparisons. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals to provide scale. The pole is 30 feet from the camera. The summary data relate to the field of view of the stereo-pair photographs but are based on measurements taken in the sample area only (see fig. 1). No sampling occurs in the foreground between the camera and the sign.

Photograph and Information Arrangement

The photographs and accompanying data summaries are presented as single sites organized into three series. Each site is arranged to occupy two facing pages. The upper page contains a wide-angle (50mm) photograph and general site and stand information, forest floor information, and, for the mixed-

conifer series, woody material loading and density by size class. The lower page includes the stereo-pair photographs and summaries of overstory structure and composition, understory vegetation structure and composition, and, for the oak series, dead and down woody material loading and density by size class.

Site and Stand Information

The camera point of each site was located with a global positioning system (GPS) receiver using the WGS-84 datum. Aspect and slope, where reported, were measured with a compass and clinometer, respectively. Ecological community classification (to the alliance or association level; NatureServe 2003), an indicator of current vegetation composition, was assigned for all oak sites. Plant association, based on the potential natural vegetation concept (Atzet et al. 1996), was assigned for all of the mixed-conifer with shrub sites. In addition, Society of American Foresters (SAF) cover type (Eyre 1980), an indicator of current vegetation composition was assigned for all sites. When available, the fire history of each Oregon white oak site was included, based on communications with local land managers.

Tree, seedling, and understory species (shrub, forb, and graminoid species) present at a site are listed in order of abundance.[1] The listing of understory species was not meant to be a complete vegetation inventory and may represent only a portion of the actual species richness of the sampled areas. Crown closure was measured with a spherical densiometer (four readings around each of 12 systematically located points), or with a forest densitometer (95 systematically located points). Tree and seedling composition and density were determined either by a total inventory of the sample area, or estimated by using twelve 0.005-acre circular plots; all trees less than 4.5 feet tall were considered seedlings.

For the mixed-conifer with shrub series, graminoid and forb heights were measured at 25 points located systematically throughout the sample area, and shrub height was calculated as an average of all shrubs measured in 12 systematically located 0.005-acre circular plots. Understory vegetation biomass was determined by sampling 12 square, clipped vegetation plots (10.76 square feet each) also located systematically throughout the sample area (fig. 1). All live and dead understory vegetation (except for *Amelanchier alnifolia*, *Arctostaphylos patula*, and *Ceanothus cuneatus*) within each square plot was clipped at ground level, separated, and returned to the laboratory for oven drying. Understory vegetation and other collected material were oven dried at a minimum of 158 °F for at least 48 hours before weighing and determination of area loading. The biomass of shrub species of large stature (i.e., *A. alnifolia*, *A. patula*, and *C. cuneatus*) was calculated by using site- and species-specific allometric equations and added to the biomass of all other shrub species determined from clipped vegetation plots.

Forest Floor Information

Litter and duff depth were calculated as the average of measurements taken every 5 feet between the 30- and 150-foot arcs of the three center transects for a total of 75 measurements (fig. 1). The depth of the litter and duff was calculated as an average of the depth only where litter or duff was encountered during sampling (null values, or points where litter or duff were absent, are not included in the average). Therefore, the depths reported for litter and duff are not unit-wide averages, and do not necessarily sum to total depth. Loading was calculated from bulk density values derived from field measurements or through collection of material in twelve 10.76 square foot plots.[2] Constancy, an indicator of how consistently

[1] A list of scientific and common species names used in this volume appears on page 8.
[2] Forest floor bulk density values used for each material type appear under "Notes to Users" for each series.

the various forest floor components occur in the sample area, is expressed as a percentage of the total number of measurements. The constancy of exposed mineral soil at each site is reported with the forest floor component constancies for the two oak series; in cases where the total forest floor and the mineral soil constancy do not sum to 100 percent, the remainder is grass-dominated surface material with no duff. The amount of exposed mineral soil at each site for the mixed-conifer with shrub series can be estimated by subtracting the constancy of the total forest floor from 100 percent.

Understory Vegetation

Understory species coverage was estimated by using line intercept transects (Canfield 1941). Where species-specific coverage is not reported, understory vegetation coverage was estimated by lifeform category (shrub, forb, or graminoid) by using the line intercept transects. Understory vegetation heights were measured at 25 points located systematically throughout the sample area. Understory vegetation biomass was determined by sampling 12 square, clipped vegetation plots (10.76 square feet each) also located systematically throughout the sample area (fig. 1). All live and dead understory vegetation within each square plot was clipped at ground level, separated, and returned to the laboratory for oven drying. Understory vegetation and other collected material were oven dried at a minimum of 158 °F for at least 48 hours before weighing and determination of area loading. At one site (CDO 07), shrub coverage and biomass were measured in twelve 0.005-acre circular plots. Biomass was calculated from a growth-form-based allometric equation (tall shrubs; Brown 1976).

Woody Material

Measurement techniques used for inventorying dead and down woody material were patterned after the planar intersect method outlined by Brown (1974) and described by Maxwell and Ward (1980). Forty transects of random azimuth starting at 25 systematically located points within the sample area were used to determine woody material loading and density (fig. 1). Woody material data are reported by size classes that correspond to timelag fuel classes used in fire behavior modeling (see, for example, Burgan and Rothermel 1984).[3] Woody material in 10-hour, and 100-hour-and-larger size classes was tallied on transects that were 10 feet and 30 feet long, respectively. The decay class and the actual diameter at the point of intersection were measured for all pieces >3 inches in diameter. All woody material ≤3 inches in diameter was considered sound. Woody material loading and woody material density were calculated from relationships that use number of pieces intersected and transect length (and wood specific gravity for loading) developed by Brown (1974) and Safranyik and Linton (1987), respectively. Woody material loading in the 1-hour size class (and the 10-hour and 100-hour size classes for many of the sites) was determined by collecting, oven drying, and weighing all pieces in twelve 10.76-square-foot plots. When woody material >3 inches in diameter was scarce, a total inventory within the sample area was conducted to determine loading and density estimates. Measurements were taken to determine log volume, and wood specific gravities were applied to the volume to calculate loading.

Saplings and Trees

Overstory tree and sapling composition and density were determined either by a total inventory of the sample area, or were estimated by using twelve 0.005-acre circular plots located systematically throughout the sample area (fig. 1). Tree measurement data were summarized by diameter

[3] 1-, 10-, 100- and 1000-hour timelag fuels are defined as woody material ≤0.25 inch, 0.26-1.0 inch, 1.1-3.0 inches, and >3.0 inches in diameter, respectively.

at breast height (d.b.h.)[4] size class and by tree status (live, dead, or all trees for the two oak series). The two or three most abundant tree species for each size class are listed with their relative density. Height to crown base (reported as ladder fuel height in previous photo series volumes) was defined as the height of the lowest, continuous live or dead branch material of the tree canopy, and height to live crown was defined as the height of the lowest continuous live branches of the tree canopy. Live crown mass (branchwood and foliage) was calculated from species- and size-specific allometric equations (Brown 1978, Snell 1979, Snell and Little 1983) for the mixed-conifer with shrub series. Crown mass equations for *Quercus kelloggii*, *Pinus ponderosa* and *Thuja plicata* were substituted for *Quercus garryana*, *Pinus lambertiana*, and *Calocedrus decurrens*, respectively.

Shrub Dimensions and Biomass

Individual plants of all large shrub species that dominated the mixed-conifer with shrub sites (i.e., *Amelanchier alnifolia, Arctostaphylos patula,* and *Ceanothus cuneatus*) were measured in circular plots, or if shrub density was low, in the entire sample area. The density and percentage of all stems that were dead is based on the number of plants rooted in twelve 0.005-acre circular plots (or in the entire sample area if shrub density was low). Crown area was calculated from crown breadth (i.e., the average of the maximum crown diameter, and the widest point perpendicular to the maximum crown diameter). Basal diameter (or basal area of multistemmed plants) was measured above the root collar. The average and maximum height of all sampled individuals of a given species is also reported.

Allometric equations were developed from *Arctostaphylos patula* and *Ceanothus cuneatus* plants growing on several of the sites sampled for the mixed-conifer with shrub series (Wright et al. unpublished data)[5]. Twenty-five live *A. patula* and *C. cuneatus* plants representing a range of sizes were measured, harvested, and separated into live and dead foliage, ≤0.25 inch, 0.26-1.0 inch, >1.0 inch diameter stem and branch material. All separated material was oven dried and weighed in the laboratory. Separate equations to predict the biomass of live and dead foliage, and live and dead woody material by size class for each species were developed to best estimate shrub loading. *Amelanchier alnifolia* biomass was estimated from equations and size class relationships in Brown (1976).

The biomass of each foliage and woody material size category was computed for all measured plants to determine area loading in each category for each species. The "Other species" category includes the large shrub species *Amelanchier alnifolia*, and smaller shrub species whose biomass was estimated in the clipped vegetation plots (primarily *Toxicodendron diversilobum*, *Symphoricarpos* spp., *Mahonia aquifolium*, *Rosa* spp., and *Lonicera* spp.).

Using the Photo Series

The natural fuels photo series is a tool for quickly and inexpensively evaluating a variety of fuel and vegetation conditions. Because of its ease of use, however, care must be taken when evaluating field sites to compare only with photo series sites that are appropriate matches. It is acceptable, however, to use the data from more than one site from the photo series when evaluating a site in the field (e.g., woody material loading from one site in the photo series and tree density from another site in the photo series to best match the conditions of a given field site).

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[4]D.b.h. is measured 4.5 feet above the ground.

[5]Data on file at the U.S. Department of Agriculture, Forest Service, Pacific Wildland Fire Sciences Laboratory, Seattle, WA.

Make a visual inventory of the site by observing fuel and stand conditions within the field of view and comparing them with the stereo-pair photographs as follows, remembering that the data tables relate to the area behind the sign in the stereo-pair photographs:

- Observe each characteristic for a specific size class of woody material on the ground (e.g., 3.1 to 9.0-inch woody material loading).
- Select a photo series site (or sites) that nearly matches (or brackets) the observed characteristics.
- Obtain the quantitative value for the characteristic being estimated from the data summary accompanying the selected photo series site, or interpolate a value between sites.
- Repeat these steps for each size class or stand characteristic of interest.

The total loading or stand condition can then be calculated by summing the estimates. If the site being inventoried has areas with obvious differences in woody material or stand conditions, the user should make separate determinations for each area and then weight and cumulate the loading for the whole site.

Characteristics not distinguishable in the photographs are forest floor depth, loading, and bulk density, and proportions of sound and rotten woody material. If values for these characteristics are desired in the inventory, they must be derived from independent sampling or observations.

The 20 National Fire-Danger Rating System fuel models (Burgan 1988, Deeming et al. 1977) and the 13 fire behavior fuel models (Albini 1976) are very general in content and broadly applied; consequently, we chose not to assign one of these existing fuel models or types to individual sites in this photo series. The photo series was designed to provide sufficient fuel and vegetation data from which managers could generate their own customized fuel models or types.

METRIC CONVERSIONS

1 inch (in) = 2.54 centimeters	1 pound (lb) = 0.4536 kilogram	1 ton/acre = 0.2242 kilogram/square meter
1 foot (ft) = 0.3048 meter	1 ton = 907.2 kilograms	1 ton/acre = 2,241.7023 kilograms/hectare
1 square foot = 0.0929 square meter	(Degrees Fahrenheit - 32) × (5/9) = Degrees Celsius	1 ton·acre^{-1}·inch^{-1} = 8.8256 kilograms/cubic meter
1 acre (ac) = 4,046.9 square meters	1 pound/acre (lb/ac) = 1.1209 kilogram/hectare	1 ton·acre^{-1}·inch^{-1} = 8825.6 grams/cubic meter
1 acre = 0.4047 hectare	1 pound/acre = 1.1209 E-04 kilograms/square meter	1 ton·acre^{-1}·inch^{-1} = 8.8256E-03 grams/cubic centimeter

Species List

Scientific and common species names are from NRCS (2002) and Pojar and MacKinnon (1994).

Scientific Name	Common Name
Trees:	
Arbutus menziesii Pursh	Pacific madrone
Calocedrus decurrens (Torr.) Florin	Incense cedar
Crataegus spp.	Hawthorn
Malus spp.	Apple
Pinus jeffreyi Grev. & Balf.	Jeffrey pine
Pinus lambertiana Dougl.	Sugar pine
Pinus ponderosa (P.& C.) Lawson	Ponderosa pine
Pinus sabiniana Dougl. ex Dougl.	California foothill pine or gray pine
Prunus spp.	Cherry
Prunus emarginata (Dougl. ex Hook.) D. Dietr.	Bitter cherry
Prunus virginiana L.	Chokecherry
Pseudotsuga menziesii (Mirbel) Franco	Douglas-fir
Pyrus communis L.	Common pear
Quercus agrifolia Née	California live oak or coast live oak
Quercus douglasii Hook. & Arn.	Blue oak
Quercus engelmannii Greene	Engelmann oak
Quercus garryana Dougl. ex Hook.	Oregon white oak
Quercus kelloggii Newberry	California black oak
Thuja plicata Donn ex D. Don	Western red cedar
Shrubs:	
Amelanchier alnifolia (Nutt.) Nutt. ex M. Roemer	Saskatoon serviceberry
Arctostaphylos patula Greene	Greenleaf manzanita
Artemisia tridentata Nutt.	Big sagebrush
Ceanothus cuneatus (Hook.) Nutt.	Buckbrush
Ceanothus integerrimus Hook. & Arn.	Deerbrush
Chrysothamnus spp.	Rabbitbrush
Crataegus douglasii Lindl.	Black hawthorn
Crataegus monogyna Jacq.	Common hawthorn
Cytisus scoparius (L.) Link	Scotchbroom
Lonicera spp.	Honeysuckle
Mahonia aquifolium (Pursh) Nutt.	Tall Oregon-grape
Opuntia spp.	Pricklypear
Rosa spp.	Rose

Scientific Name	Common Name
Shrubs:	
Rosa nutkana K. Presl	Nootka rose
Rubus discolor Weihe & Nees	Himalayan blackberry
Symphoricarpos spp.	Snowberry
Symphoricarpos albus (L.) Blake	Common snowberry
Symphoricarpos mollis Nutt.	Creeping snowberry
Toxicodendron diversilobum (Torr.&Gray) Greene (formerly *Rhus diversiloba*)	Pacific poison oak
Vaccinium spp.	Blueberry
Forbs and Graminoids:	
Aspidotis densa (Brack.) Lellinger	Indian's dream fern
Asteraceae	Aster
Campanula spp.	Bellflower
Carex inops Bailey	Long-stolon sedge
Cirsium spp.	Thistle
Cirsium vulgare (Savi) Ten.	Bull thistle
Cotyledon orbiculata L.	Pig's ear
Cynosurus echinatus L.	Hedgehog dogtail
Elymus glaucus Buckl.	Blue wildrye
Festuca idahoensis Elmer	Idaho fescue
Fragaria spp.	Strawberry
Fragaria vesca L.	Woodland strawberry
Fragaria virginiana Duchesne	Virginia strawberry
Galium spp.	Bedstraw
Galium ambiguum W. Wight	Yolla Bolly bedstraw
Hieracium spp.	Hawkweed
Hypericum spp.	St. Johnswort
Iris spp.	Iris
Lupinus spp.	Lupine
Phacelia spp.	Phacelia
Pteridium aquilinum (L.) Kuhn	Western brackenfern
Stellaria media (L.) Vill.	Common chickweed
Symphyotrichum hallii (Gray) Nesom	Hall's aster
Taraxacum officinale G.H.Weber ex Wiggers	Common dandelion
Vicia spp.	Vetch

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OREGON WHITE OAK PHOTO SERIES

A SERIES OF 10 SITES
WO 01 THROUGH WO 10

NOTES TO USERS:

1. Sites are ordered by increasing percentage of crown closure.
2. A list of scientific and common species names can be found on page 8.
3. Photographs were taken in September 2001 and September 2002. Sampling was performed in September and October 2001, and September 2002.
4. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals. The pole is 30 feet from the camera.
5. Bulk density values used for calculating forest floor loading from depth:

Surface material type	Bulk density	Duff type	Bulk density
	$tons \cdot acre^{-1} \cdot inch^{-1}$		$tons \cdot acre^{-1} \cdot inch^{-1}$
Oregon white oak	3.24	Oregon white oak	6.39
Moss	2.84	Moss	12.10
		Grass	6.39
		Bark slough	15.42

6. Forest floor and woody material loading are reported in tons per acre, and understory biomass is reported in pounds per acre. Trace coverage of understory species, percentage of seedling stems, or woody material loading is indicated either as "trace" or as "t."
7. A distinction is made between rotten and sound woody material for pieces larger than 3 inches in diameter.
8. Depth values reported for surface material, duff, and total forest floor are not unit-wide averages (null values, or points where litter or duff were absent, are not included in average), and, as such, the total forest floor depth is not the sum of surface material and duff depths.

WO 01 OREGON WHITE OAK

SITE AND STAND INFORMATION

Site location: N 44° 25' 09.36" W 123° 19' 46.65"
Elevation: 360 ft Aspect: ESE Slope: 12%

Association: Oregon white oak savanna
SAF cover type: Oregon white oak

Fire history: Unknown

Trees (% of stems): *Quercus garryana* (100)
Crown closure: 12%

Seedlings (% of stems): *Quercus garryana* (65), *Malus* spp. (30), *Prunus emarginata* (5)
Density: 144/ac

Understory (% cover): *Rubus discolor* (3), *Toxicodendron diversilobum* (1), *Cirsium vulgare* (t), *Rosa nutkana* (t), *Crataegus douglasii* (t)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	0.9	0.6	21
Duff	0.1	0.0	1
Total forest floor	0.9	0.6	21
Mineral soil			1

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	--	--	*Quercus garryana* (100)	--	*Quercus garryana* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	0	0	29	0	29
Live	0	0	29	0	29
Dead	0	0	0	0	0
Avg d.b.h. (in)	--	--	12.4	--	12.4
Live	--	--	12.4	--	12.4
Dead	--	--	--	--	--
Avg height (ft)	--	--	37	--	37
Live	--	--	37	--	37
Dead	--	--	--	--	--
Avg height to crown base (ft)	--	--	1	--	1
Live	--	--	1	--	1
Dead	--	--	--	--	--
Avg height to live crown (ft)	--	--	4	--	4

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Rubus discolor* (3)	*Cirsium vulgare* (t)	--
Second most common species (% cover)	*Toxicodendron diversilobum* (1)	--	--
Coverage (percent)	4	trace	100
Avg height (ft)	1.6	0.8	1.7
Biomass (lbs/ac)	99	33	1,185

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.0	0.0	0.0	--	--	--
0.26 - 1.0	0.1	0.0	0.1	--	--	--
1.1 - 3.0	0.0	0.0	0.0	--	--	--
3.1 - 9.0	0.0	0.0	0.0	0	0	0
> 9.0	0.0	0.0	0.0	0	0	0
Total	0.1	0.0	0.1	0	0	0

WO 02 OREGON WHITE OAK

SITE AND STAND INFORMATION

Site location: N 47° 01' 40.89" W 122° 37' 12.60"
Elevation: 280 ft Aspect: -- Slope: 0%

Association: Oregon white oak savanna
SAF cover type: Oregon white oak

Fire history: Frequent (site located within Fort Lewis impact area); last burn was approximately 2 months before photo

Trees (% of stems): *Quercus garryana* (100)
Crown closure: 30%

Seedlings (% of stems): None
Density: 0/ac

Understory (% cover): cryptogams (35), graminoids (15) *Campanula* spp. (1), *Taraxacum officinale* (1), Asteraceae (1), *Stellaria media* (t), *Pteridium aquilinum* (t), *Fragaria* spp. (t)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	0.3	0.6	63
Duff	--	0.0	0
Total forest floor	0.3	0.6	63
Mineral soil			33

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	--	--	*Quercus garryana* (100)	--	*Quercus garryana* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	0	0	29	0	29
Live	0	0	29	0	29
Dead	0	0	0	0	0
Avg d.b.h. (in)	--	--	13.1	--	13.1
Live	--	--	13.1	--	13.1
Dead	--	--	--	--	--
Avg height (ft)	--	--	49	--	49
Live	--	--	49	--	49
Dead	--	--	--	--	--
Avg height to crown base (ft)	--	--	3	--	3
Live	--	--	3	--	3
Dead	--	--	--	--	--
Avg height to live crown (ft)	--	--	16	--	16

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	--	*Campanula* spp. (1)	--
Second most common species (% cover)	--	*Taraxacum officinale* (1)	--
Coverage (percent)	0	4	15
Avg height (ft)	--	0.1	0.3
Biomass (lbs/ac)	0	80	137

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.1	0.0	0.1	--	--	--
0.26 - 1.0	0.1	0.0	0.1	--	--	--
1.1 - 3.0	0.0	0.0	0.0	--	--	--
3.1 - 9.0	0.0	0.0	0.0	0	0	0
> 9.0	0.0	0.0	0.0	0	0	0
Total	0.2	0.0	0.2	0	0	0

WO 03 OREGON WHITE OAK

SITE AND STAND INFORMATION

Site location: N 46° 17' 04.04" W 120° 45' 31.25"
Elevation: 1,600 ft Aspect: ESE Slope: 5%

Association: Oregon white oak/blue wild rye Woodland
SAF cover type: Oregon white oak

Fire history: Unknown

Trees (% of stems): *Quercus garryana* (100)
Crown closure: 30%

Seedlings (% of stems): *Quercus garryana* (100)
Density: 650/ac

Understory (% cover): graminoids (12), *Artemisia tridentata* (1)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	0.9	1.9	68
Duff	0.4	0.0	1
Total forest floor	0.9	1.9	68
Mineral soil			19

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Quercus garryana* (100)	*Quercus garryana* (100)	*Quercus garryana* (100)	--	*Quercus garryana* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	36	7	36	0	43
Live	36	7	36	0	43
Dead	0	0	0	0	0
Avg d.b.h. (in)	1.5	8.2	10.3	--	10.0
Live	1.5	8.2	10.3	--	10.0
Dead	--	--	--	--	--
Avg height (ft)	10	28	26	--	26
Live	10	28	26	--	26
Dead	--	--	--	--	--
Avg height to crown base (ft)	0	0	1	--	1
Live	0	0	1	--	1
Dead	--	--	--	--	--
Avg height to live crown (ft)	1	0	2	--	2

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Artemisia tridentata* (1)	--	--
Second most common species (% cover)	--	--	--
Coverage (percent)	1	trace	12
Avg height (ft)	2.3	na	0.8
Biomass (lbs/ac)	98	4	94

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.2	0.0	0.2	--	--	--
0.26 - 1.0	0.2	0.0	0.2	--	--	--
1.1 - 3.0	0.1	0.0	0.1	--	--	--
3.1 - 9.0	0.0	0.0	0.0	0	0	0
> 9.0	0.0	0.0	0.0	0	0	0
Total	0.5	0.0	0.5	0	0	0

WO 04 OREGON WHITE OAK

SITE AND STAND INFORMATION

Site location: N 44° 25' 11.08" W 123° 19' 47.72"
Elevation: 390 ft Aspect: SE Slope: 18%

Association: Oregon white oak savanna
SAF cover type: Oregon white oak

Fire history: Unknown

Trees (% of stems): *Quercus garryana* (73), *Pyrus communis* (27)
Crown closure: 30%

Seedlings (% of stems): *Quercus garryana* (39), *Malus* spp. (36), *Pyrus communis* (21), *Prunus emarginata* (4)
Density: 202/ac

Understory (% cover): graminoids (91), Asteraceae (3), *Fragaria virginiana* (1), *Symphyotrichum hallii* (1), *Hypericum* spp. (1), *Cirsium vulgare* (t), *Crataegus douglasii* (t), *Rosa nutkana* (t), *Lupinus* spp. (t)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	1.0	1.6	51
Duff	0.2	0.1	5
Total forest floor	1.0	1.7	51
Mineral soil			8

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Pyrus communis* (75)	*Quercus garryana* (100)	*Quercus garryana* (100)	--	*Quercus garryana* (100)
Second most common species (percent of stems)	*Quercus garryana* (25)	--	--	--	--
Tree density (stems/ac)	29	14	36	0	51
Live	22	14	36	0	51
Dead	7	0	0	0	0
Avg d.b.h. (in)	2.1	7.2	10.4	--	9.5
Live	2.1	7.2	10.4	--	9.5
Dead	2.0	--	--	--	--
Avg height (ft)	11	31	31	--	31
Live	12	31	31	--	31
Dead	8	--	--	--	--
Avg height to crown base (ft)	4	2	2	--	2
Live	4	2	2	--	2
Dead	3	--	--	--	--
Avg height to live crown (ft)	7	7	6	--	6

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Crataegus douglasii* (t)	Asteraceae (3)	--
Second most common species (% cover)	*Rosa nutkana* (t)	*Fragaria virginiana* (1)	--
Coverage (percent)	trace	7	91
Avg height (ft)	1.5	0.6	1.5
Biomass (lbs/ac)	21	34	980

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.1	0.0	0.1	--	--	--
0.26 - 1.0	0.0	0.0	0.0	--	--	--
1.1 - 3.0	0.0	0.0	0.0	--	--	--
3.1 - 9.0	0.0	0.0	0.0	0	0	0
> 9.0	0.0	0.0	0.0	0	0	0
Total	0.1	0.0	0.1	0	0	0

WO 05 OREGON WHITE OAK

SITE AND STAND INFORMATION

Site location: N 44° 25' 11.07" W 123° 18'43.74"
Elevation: 360 ft Aspect: E Slope: 13%

Association: Oregon white oak savanna
SAF cover type: Oregon white oak

Fire history: Unknown

Trees (% of stems): *Quercus garryana* (100)
Crown closure: 41%

Seedlings (% of stems): *Quercus garryana* (100)
Density: 303/ac

Understory (% cover): graminoids (100), *Fragaria virginiana* (3), *Rosa* spp. (3), *Hypericum* spp. (t), *Symphoricarpos albus* (t), *Toxicodendron diversilobum* (t), *Crataegus monogyna* (t)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	0.9	2.2	72
Duff	0.4	0.1	3
Total forest floor	1.0	2.3	72
Mineral soil			3

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Quercus garryana* (100)	*Quercus garryana* (100)	*Quercus garryana* (100)	--	*Quercus garryana* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	43	72	36	0	108
Live	36	72	36	0	108
Dead	7	0	0	0	0
Avg d.b.h. (in)	2.4	7.4	12.1	--	9.0
Live	2.7	7.4	12.1	--	9.0
Dead	1.2	--	--	--	--
Avg height (ft)	13	29	37	--	32
Live	14	29	37	--	32
Dead	8	--	--	--	--
Avg height to crown base (ft)	3	2	1	--	2
Live	3	2	1	--	2
Dead	1	--	--	--	--
Avg height to live crown (ft)	4	6	6	--	6

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Rosa* spp. (3)	*Fragaria virginiana* (3)	--
Second most common species (% cover)	*Symphoricarpos albus* (t)	*Hypericum* spp. (t)	--
Coverage (percent)	3	4	100
Avg height (ft)	1.4	1.2	1.8
Biomass (lbs/ac)	23	14	1,079

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.1	0.0	0.1	--	--	--
0.26 - 1.0	0.0	0.0	0.0	--	--	--
1.1 - 3.0	0.0	0.0	0.0	--	--	--
3.1 - 9.0	0.0	0.0	0.0	0	0	0
> 9.0	0.0	0.0	0.0	0	0	0
Total	0.1	0.0	0.1	0	0	0

WO 06 OREGON WHITE OAK

SITE AND STAND INFORMATION

Site location: N 47° 03' 37.61" W 122° 30' 29.14"
Elevation: 15 ft Aspect: -- Slope: 0%

Alliance: Oregon white oak woodland
SAF cover type: Oregon white oak

Fire history: Last burn was 2.5 years before photos

Trees (% of stems): *Quercus garryana* (96), *Prunus* spp. (2), *Crataegus* spp. (2)
Crown closure: 50%

Seedlings (% of stems): *Quercus garryana* (98), *Pseudotsuga menziesii* (2)
Density: 368/ac

Understory (% cover): graminoids (70), *Cytisus scoparius* (55), Asteraceae (10), *Vaccinium* spp. (7), *Mahonia aquifolium* (4), *Symphoricarpos albus* (3), *Rubus discolor* (1)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	1.0	2.2	67
Duff	0.6	3.5	85
Total forest floor	1.3	5.7	95
Mineral soil			0

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Quercus garryana* (90)	*Quercus garryana* (100)	*Quercus garryana* (100)	--	*Quercus garryana* (100)
Second most common species (percent of stems)	*Prunus* spp. (5)	--	--	--	--
Tree density (stems/ac)	144	246	7	0	253
Live	50	246	7	0	253
Dead	94	0	0	0	0
Avg d.b.h. (in)	2.0	5.6	10.1	--	5.7
Live	2.5	5.6	10.1	--	5.7
Dead	1.7	--	--	--	--
Avg height (ft)	9	23	36	--	24
Live	14	23	36	--	24
Dead	7	--	--	--	--
Avg height to crown base (ft)	4	7	6	--	7
Live	6	7	6	--	7
Dead	2	--	--	--	--
Avg height to live crown (ft)	6	9	11	--	9

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Cytisus scoparius* (55)	Asteraceae (10)	--
Second most common species (% cover)	*Vaccinium* spp. (7)	--	--
Coverage (percent)	69	11	70
Avg height (ft)	2.7	0.6	1.3
Biomass (lbs/ac)	2,676	375	1,210

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.1	0.0	0.1	--	--	--
0.26 - 1.0	0.3	0.0	0.3	--	--	--
1.1 - 3.0	0.0	0.0	0.0	--	--	--
3.1 - 9.0	0.1	0.0	0.1	7	0	7
> 9.0	0.0	0.0	0.0	0	0	0
Total	0.5	0.0	0.5	7	0	7

WO 07 OREGON WHITE OAK

SITE AND STAND INFORMATION

Site location: N 46° 17' 12.72" W 120° 45' 03.69"
Elevation: 1,540 ft Aspect: NNW Slope: 20%

Association: Oregon white oak/blue wild rye woodland
SAF cover type: Oregon white oak

Fire history: Unknown

Trees (% of stems): *Quercus garryana* (100)
Crown closure: 74%

Seedlings (% of stems): *Quercus garryana* (100)
Density: 7,464/ac

Understory (% cover): graminoids (7)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	2.4	6.4	85
Duff	1.0	3.4	56
Total forest floor	3.0	9.8	87
Mineral soil			4

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Quercus garryana* (100)	*Quercus garryana* (100)	*Quercus garryana* (100)	--	*Quercus garryana* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	470	448	43	0	491
Live	282	332	29	0	361
Dead	188	116	14	0	130
Avg d.b.h. (in)	2.2	6.0	9.9	--	6.3
Live	2.3	6.1	10.1	--	6.5
Dead	2.2	5.6	9.6	--	6.1
Avg height (ft)	9	16	22	--	17
Live	11	18	26	--	19
Dead	6	10	14	--	10
Avg height to crown base (ft)	2	4	4	--	4
Live	2	4	4	--	4
Dead	2	2	--	--	2
Avg height to live crown (ft)	4	7	8	--	7

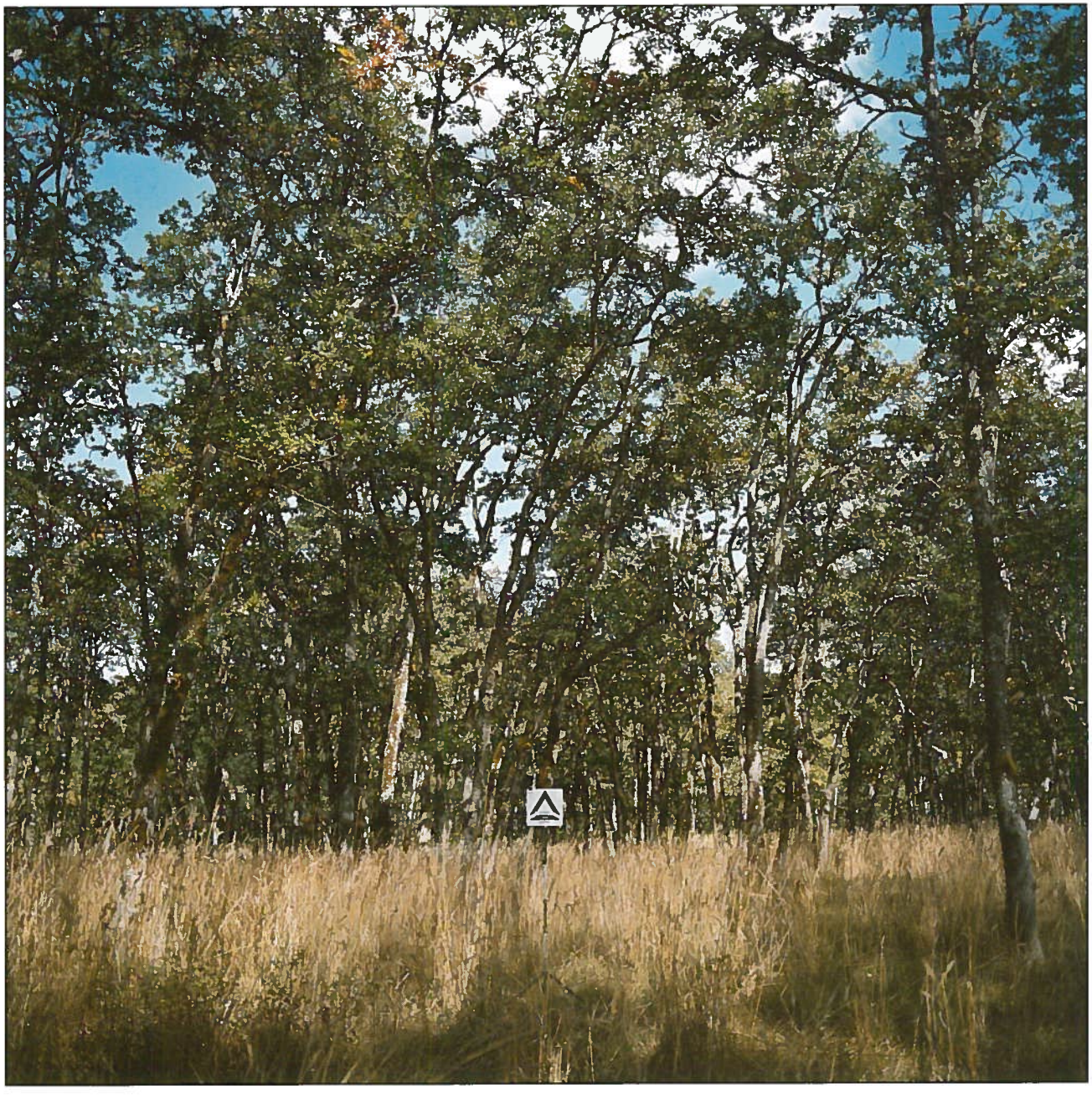
Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	--	--	--
Second most common species (% cover)	--	--	--
Coverage (percent)	trace	6	7
Avg height (ft)	1.4	0.8	0.4
Biomass (lbs/ac)	trace	98	145

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	0.0	0.4	--	--	--
0.26 - 1.0	1.0	0.0	1.0	--	--	--
1.1 - 3.0	1.4	0.0	1.4	--	--	--
3.1 - 9.0	2.2	0.1	2.3	88	5	93
> 9.0	0.0	0.0	0.0	0	0	0
Total	5.0	0.1	5.1	88	5	93

WO 08 OREGON WHITE OAK



SITE AND STAND INFORMATION

Site location: N 47° 02' 08.35" W 122° 39' 35.08"
Elevation: 240 ft Aspect: -- Slope: 0%

Association: Oregon white oak/common snowberry/ long-stolon sedge woodland
SAF cover type: Oregon white oak

Fire history: Site typically burns 1 or 2 times per year (site located on edge of Fort Lewis impact area); last burn was 2 years before photos

Trees (% of stems): *Quercus garryana* (100)
Crown closure: 75%

Seedlings (% of stems): None
Density: 0/ac

Understory (% cover): graminoids (66), *Symphoricarpos albus* (13), Asteraceae (1), *Cytisus scoparius* (t), cryptogams (t)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	1.4	4.4	95
Duff	--	0.0	0
Total forest floor	1.4	4.4	95
Mineral soil			5

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	--	*Quercus garryana* (100)	*Quercus garryana* (100)	--	*Quercus garryana* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	0	137	188	0	325
Live	0	101	188	0	289
Dead	0	36	0	0	36
Avg d.b.h. (in)	--	7.1	11.2	--	9.5
Live	--	7.7	11.2	--	10.0
Dead	--	5.4	--	--	5.4
Avg height (ft)	--	30	55	--	44
Live	--	34	55	--	47
Dead	--	19	--	--	19
Avg height to crown base (ft)	--	18	31	--	26
Live	--	18	31	--	26
Dead	--	20	--	--	20
Avg height to live crown (ft)	--	18	31	--	27

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Symphoricarpos albus* (13)	Asteraceae (1)	--
Second most common species (% cover)	*Cytisus scoparius* (t)	--	--
Coverage (percent)	13	3	66
Avg height (ft)	0.8	0.7	1.2
Biomass (lbs/ac)	194	69	1,687

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.2	0.0	0.2	--	--	--
0.26 - 1.0	0.2	0.0	0.2	--	--	--
1.1 - 3.0	0.1	0.0	0.1	--	--	--
3.1 - 9.0	0.5	0.0	0.5	29	0	29
> 9.0	0.0	0.0	0.0	0	0	0
Total	1.0	0.0	1.0	29	0	29

WO 09 OREGON WHITE OAK

SITE AND STAND INFORMATION

Site location: N 47° 04' 12.77" W 122° 30' 24.03"
Elevation: 355 ft Aspect: -- Slope: 0%

Alliance: Oregon white oak woodland
SAF cover type: Oregon white oak

Fire history: Last burn was 1 year before photos

Trees (% of stems): *Quercus garryana* (100)
Crown closure: 84%

Seedlings (% of stems): *Quercus garryana* (63), *Prunus* spp. (37)
Density: 412/ac

Understory (% cover): graminoids (99), *Symphoricarpos albus* (2), *Vicia* spp. (1), *Cytisus scoparius* (1), *Taraxacum officinale* (t), *Mahonia aquifolium* (t)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	0.4	0.8	57
Duff	0.7	3.9	88
Total forest floor	0.9	4.7	96
Mineral soil			3

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	--	*Quercus garryana* (100)	*Quercus garryana* (100)	*Quercus garryana* (100)	*Quercus garryana* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	0	7	29	43	79
Live	0	7	29	43	79
Dead	0	0	0	0	0
Avg d.b.h. (in)	--	8.8	12.4	17.4	14.8
Live	--	8.8	12.4	17.4	14.8
Dead	--	--	--	--	--
Avg height (ft)	--	36	55	58	55
Live	--	36	55	58	55
Dead	--	--	--	--	--
Avg height to crown base (ft)	--	19	28	26	26
Live	--	19	28	26	26
Dead	--	--	--	--	--
Avg height to live crown (ft)	--	19	29	26	26

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Symphoricarpos albus* (2)	*Vicia* spp. (1)	--
Second most common species (% cover)	*Cytisus scoparius* (1)	*Taraxacum officinale* (t)	--
Coverage (percent)	2	1	99
Avg height (ft)	1.2	0.3	0.6
Biomass (lbs/ac)	829	7	2,064

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.2	0.0	0.2	--	--	--
0.26 - 1.0	0.1	0.0	0.1	--	--	--
1.1 - 3.0	0.6	0.0	0.6	--	--	--
3.1 - 9.0	0.1	0.0	0.1	22	14	36
> 9.0	0.0	0.0	0.0	0	0	0
Total	1.0	0.0	1.0	22	14	36

WO 10 OREGON WHITE OAK

SITE AND STAND INFORMATION

Site location: N 46° 17' 04.56" W 120° 45' 28.95"
Elevation: 1,635 ft Aspect: SE Slope: 9%

Association: Oregon white oak/blue wild rye woodland
SAF cover type: Oregon white oak

Fire history: Unknown

Trees (% of stems): *Quercus garryana* (84), *Prunus virginiana* (16)
Crown closure: 90%

Seedlings (% of stems): *Quercus garryana* (97), *Prunus virginiana* (3)
Density: 14,223/ac

Understory (% cover): graminoids (9), *Symphoricarpos albus* (5)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	2.5	7.7	100
Duff	0.8	4.7	91
Total forest floor	3.3	12.4	100
Mineral soil			0

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Quercus garryana* (69)	*Quercus garryana* (100)	*Quercus garryana* (100)	*Quercus garryana* (100)	*Quercus garryana* (100)
Second most common species (percent of stems)	*Prunus virginiana* (31)	--	--	--	--
Tree density (stems/ac)	354	231	50	36	317
Live	260	224	43	36	303
Dead	94	7	7	0	14
Avg d.b.h. (in)	2.0	5.8	13.5	17.8	8.4
Live	1.8	5.8	13.6	17.8	8.3
Dead	2.6	5.6	12.9	--	9.3
Avg height (ft)	12	33	40	44	36
Live	12	34	41	44	36
Dead	10	6	40	--	23
Avg height to crown base (ft)	2	4	2	2	3
Live	2	4	3	2	4
Dead	2	0	0	--	0
Avg height to live crown (ft)	3	9	11	14	10

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Symphoricarpos albus* (5)	--	--
Second most common species (% cover)	--	--	--
Coverage (percent)	5	trace	9
Avg height (ft)	1.7	na	0.4
Biomass (lbs/ac)	115	83	128

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.6	0.0	0.6	--	--	--
0.26 - 1.0	1.4	0.0	1.4	--	--	--
1.1 - 3.0	1.3	0.0	1.3	--	--	--
3.1 - 9.0	0.9	0.0	0.9	29	0	29
> 9.0	0.0	0.0	0.0	0	0	0
Total	4.2	0.0	4.2	29	0	29

California Deciduous Oak Photo Series

A Series of 9 Sites
CDO 01 through CDO 09

NOTES TO USERS:

1. Sites are ordered by increasing percentage of crown closure.
2. A list of scientific and common species names can be found on page 8.
3. Photographs were taken in October 2000. Sampling was performed in October and November 2000.
4. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals. The pole is 30 feet from the camera.
5. Forest floor loading was determined through collection of surface material and duff in twelve 10.76-square-foot plots.
6. Forest floor and woody material loading are reported in tons per acre, and understory biomass is reported in pounds per acre. Trace coverage of understory species, percentage of seedling stems, or woody material loading is indicated either as "trace" or as "t."
7. A distinction is made between rotten and sound woody material for pieces larger than 3 inches in diameter.
8. Depth values reported for surface material, duff, and total forest floor are not unit-wide averages (null values, or points where litter or duff were absent, are not included in average), and, as such, the total forest floor depth is not the sum of surface material and duff depths.

CDO 01 California Deciduous Oak

Site and Stand Information

Site location: N 36° 23' 23.33" W 121° 32' 54.30"
Elevation: 1,880 ft

Alliance: Blue oak woodland
SAF cover type: Blue oak-gray pine

Trees (% of stems): *Quercus douglasii* (100)
Crown closure: 8%

Seedlings (% of stems): *Quercus douglasii* (100)
Density: 22/ac

Understory (% cover): graminoids (78)

Forest Floor Information

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	0.4	0.7	15
Duff	0.4	0.6	31
Total forest floor	0.4	1.3	40
Mineral soil			23

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	--	*Quercus douglasii* (100)	*Quercus douglasii* (100)	--	*Quercus douglasii* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	0	7	7	0	14
Live	0	7	7	0	14
Dead	0	0	0	0	0
Avg d.b.h. (in)	--	8.3	13.2	--	10.8
Live	--	8.3	13.2	--	10.8
Dead	--	--	--	--	--
Avg height (ft)	--	23	24	--	24
Live	--	23	24	--	24
Dead	--	--	--	--	--
Avg height to crown base (ft)	--	6	5	--	6
Live	--	6	5	--	6
Dead	--	--	--	--	--
Avg height to live crown (ft)	--	6	5	--	6

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	--	--	--
Second most common species (% cover)	--	--	--
Coverage (percent)	0	3	78
Avg height (ft)	--	0.1	0.8
Biomass (lbs/ac)	0	37	1,223

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.1	0.0	0.1	--	--	--
0.26 - 1.0	0.3	0.0	0.3	--	--	--
1.1 - 3.0	0.1	0.0	0.1	--	--	--
3.1 - 9.0	0.0	0.0	0.0	0	0	0
> 9.0	0.0	0.0	0.0	0	0	0
Total	0.5	0.0	0.5	0	0	0

CDO 02 CALIFORNIA DECIDUOUS OAK

SITE AND STAND INFORMATION

Site location: N 34° 43' 35.15" W 118° 41' 32.78"
Elevation: 5,345 ft

Alliance: Black oak forest
SAF cover type: California black oak

Trees (% of stems): *Quercus kelloggii* (100)
Crown closure: 31%

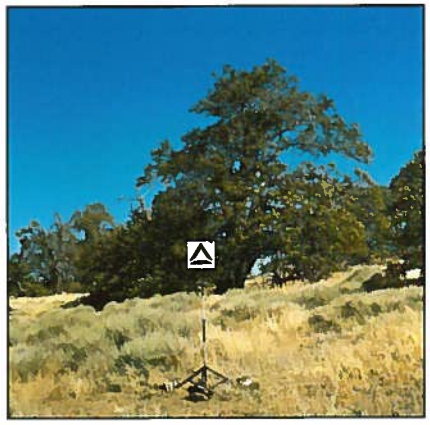
Seedlings (% of stems): *Quercus kelloggii* (100)
Density: 22/ac

Understory (% cover): graminoids (53), *Chrysothamnus* spp. (23)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	1.2	1.2	29
Duff	0.9	0.4	75
Total Forest Floor	1.3	1.6	79
Mineral Soil			11

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.



Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Quercus kelloggii* (100)	*Quercus kelloggii* (100)	*Quercus kelloggii* (100)	*Quercus kelloggii* (100)	*Quercus kelloggii* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	51	7	29	29	65
Live	51	7	29	29	65
Dead	0	0	0	0	0
Avg d.b.h. (in)	1.9	4.7	13.3	23.5	16.9
Live	1.9	4.7	13.3	23.5	16.9
Dead	--	--	--	--	--
Avg height (ft)	7	16	27	27	26
Live	7	16	27	27	26
Dead	--	--	--	--	--
Avg height to crown base (ft)	2	1	1	2	1
Live	2	1	1	2	1
Dead	--	--	--	--	--
Avg height to live crown (ft)	2	1	1	2	1

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Chrysothamnus* spp. (23)	--	--
Second most common species (% cover)	--	--	--
Coverage (percent)	24	15	53
Avg height (ft)	1.5	0.3	0.9
Biomass (lbs/ac)	3,533	263	661

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	0.0	0.3	--	--	--
0.26 - 1.0	0.2	0.0	0.2	--	--	--
1.1 - 3.0	0.1	0.0	0.1	--	--	--
3.1 - 9.0	1.3	0.1	1.4	123	14	137
> 9.0	0.0	0.0	0.0	0	0	0
Total	1.9	0.1	2.0	123	14	137

CDO 03 California Deciduous Oak

Site and Stand Information

Site location: N 36° 23' 14.70" W 121° 33' 12.25"
Elevation: 1,785 ft

Alliance: Blue oak woodland
SAF cover type: Blue oak-gray pine

Trees (% of stems): *Quercus douglasii* (100)
Crown closure: 55%

Seedlings (% of stems): None
Density: 0/ac

Understory (% cover): graminoids (77), *Cotyledon orbiculata* (4)

Forest Floor Information

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	0.7	2.1	43
Duff	0.4	0.8	61
Total Forest Floor	0.8	2.8	72
Mineral Soil			9

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	--	*Quercus douglasii* (100)	*Quercus douglasii* (100)	*Quercus douglasii* (100)	*Quercus douglasii* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	0	188	51	14	253
Live	0	188	51	14	253
Dead	0	0	0	0	0
Avg d.b.h. (in)	--	6.7	10.7	19.2	8.2
Live	--	6.7	10.7	19.2	8.2
Dead	--	--	--	--	--
Avg height (ft)	--	27	30	28	28
Live	--	27	30	28	28
Dead	--	--	--	--	--
Avg height to crown base (ft)	--	11	13	7	11
Live	--	11	13	7	11
Dead	--	--	--	--	--
Avg height to live crown (ft)	--	16	15	7	15

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	--	*Cotyledon orbiculata* (4)	--
Second most common species (% cover)	--	--	--
Coverage (percent)	0	5	77
Avg height (ft)	--	0.2	0.5
Biomass (lbs/ac)	0	47	819

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.2	0.0	0.2	--	--	--
0.26 - 1.0	0.2	0.0	0.2	--	--	--
1.1 - 3.0	0.0	0.0	0.0	--	--	--
3.1 - 9.0	0.5	0.1	0.6	72	29	101
> 9.0	0.0	0.0	0.0	0	0	0
Total	0.9	0.1	1.0	72	29	101

CDO 04 California Deciduous Oak

Site and Stand Information

Site location: N 32° 49' 35.95" W 116° 37' 07.42"
Elevation: 3,465 ft

Alliance: Engelmann oak woodland
SAF cover type: California coast live oak

Trees (% of stems): *Quercus engelmannii* (57), *Quercus agrifolia* (43)
Crown closure: 59%

Seedlings (% of stems): *Quercus agrifolia* (86), *Quercus engelmannii* (14)
Density: 1,863/ac

Understory (% cover): graminoids (21), *Rosa* spp. (1), *Galium* spp. (t), *Symphoricarpos* spp. (t)

Forest Floor Information

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	0.8	3.5	64
Duff	0.5	1.1	25
Total Forest Floor	1.0	4.6	65
Mineral Soil			28

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Quercus agrifolia* (67)	--	*Quercus engelmannii* (100)	*Quercus agrifolia* (100)	*Quercus engelmannii* (75)
Second most common species (percent of stems)	*Quercus engelmannii* (33)	--	--	--	*Quercus agrifolia* (25)
Tree density (stems/ac)	22	0	22	7	29
Live	22	0	22	7	29
Dead	0	0	0	0	0
Avg d.b.h. (in)	0.5	--	14.1	37.8	20.0
Live	0.5	--	14.1	37.8	20.0
Dead	--	--	--	--	--
Avg height (ft)	7	--	37	47	39
Live	7	--	37	47	39
Dead	--	--	--	--	--
Avg height to crown base (ft)	0	--	5	2	4
Live	0	--	5	2	4
Dead	--	--	--	-	--
Avg height to live crown (ft)	0	--	6	2	5

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Rosa* spp. (1)	*Galium* spp. (t)	--
Second most common species (% cover)	*Symphoricarpos* spp. (t)	--	--
Coverage (percent)	10	14	21
Avg height (ft)	1.4	0.7	0.5
Biomass (lbs/ac)	284	89	160

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	0.0	0.3	--	--	--
0.26 - 1.0	0.5	0.0	0.5	--	--	--
1.1 - 3.0	0.6	0.0	0.6	--	--	--
3.1 - 9.0	0.7	0.1	0.8	19	5	24
> 9.0	0.0	0.0	0.0	0	0	0
Total	2.1	0.1	2.2	19	5	24

CDO 05 California Deciduous Oak

Site and Stand Information

Site location: N 33° 01' 24.46" W 116° 41' 19.46"
Elevation: 2,100 ft

Alliance: Engelmann oak woodland
SAF cover type: California coast live oak

Trees (% of stems): *Quercus engelmannii* (100)
Crown closure: 63%

Seedlings (% of stems): none
Density: 0/ac

Understory (% cover): graminoids (87), *Toxicodendron diversilobum* (2), *Cirsium* spp. (1)

Forest Floor Information

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	0.8	3.6	36
Duff	0.5	0.3	64
Total Forest Floor	0.8	3.9	76
Mineral Soil			8

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	--	--	--	*Quercus engelmannii* (100)	*Quercus engelmannii* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	0	0	0	29	29
Live	0	0	0	29	29
Dead	0	0	0	0	0
Avg d.b.h. (in)	--	--	--	27.7	27.7
Live	--	--	--	27.7	27.7
Dead	--	--	--	--	--
Avg height (ft)	--	--	--	47	47
Live	--	--	--	47	47
Dead	--	--	--	--	--
Avg height to crown base (ft)	--	--	--	5	5
Live	--	--	--	5	5
Dead	--	--	--	--	--
Avg height to live crown (ft)	--	--	--	5	5

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Toxicodendron diversilobum* (2)	*Cirsium* spp. (1)	--
Second most common species (% cover)	--	--	--
Coverage (percent)	2	1	87
Avg height (ft)	na	1.3	1.4
Biomass (lbs/ac)	trace	53	1,615

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	0.0	0.4	--	--	--
0.26 - 1.0	0.6	0.0	0.6	--	--	--
1.1 - 3.0	0.6	0.0	0.6	--	--	--
3.1 - 9.0	0.0	trace	trace	0	7	7
> 9.0	2.1	0.0	2.1	22	0	22
Total	3.7	trace	3.7	22	7	29

CDO 06 CALIFORNIA DECIDUOUS OAK

SITE AND STAND INFORMATION

Site location: N 32° 52' 59.45" W 116° 25' 39.02"
Elevation: 5,760 ft

Alliance: Black oak forest
SAF cover type: California black oak

Trees (% of stems): *Quercus kelloggii* (100)
Crown closure: 69%

Seedlings (% of stems): *Quercus kelloggii* (100)
Density: 672/ac

Understory (% cover): graminoids (12)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	1.1	1.8	77
Duff	0.5	0.3	57
Total Forest Floor	1.4	2.1	81
Mineral Soil			19

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Quercus kelloggii* (100)	*Quercus kelloggii* (100)	-	*Quercus kelloggii* (100)	*Quercus kelloggii* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	7	7	0	58	65
Live	7	7	0	58	65
Dead	0	0	0	0	0
Avg d.b.h. (in)	1.8	6.0	--	21.1	19.4
Live	1.8	6.0	--	21.1	19.4
Dead	--	--	--	--	--
Avg height (ft)	10	18	--	52	48
Live	10	18	--	52	48
Dead	--	--	--	--	--
Avg height to crown base (ft)	5	5	--	8	8
Live	5	5	--	8	8
Dead	--	--	--	--	--
Avg height to live crown (ft)	5	5	--	8	8

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	--	--	--
Second most common species (% cover)	--	--	--
Coverage (percent)	1	3	12
Avg height (ft)	na	0.9	0.8
Biomass (lbs/ac)	171	73	103

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	0.0	0.3	--	--	--
0.26 - 1.0	0.4	0.0	0.4	--	--	--
1.1 - 3.0	0.9	0.0	0.9	--	--	--
3.1 - 9.0	1.5	0.7	2.2	54	19	73
> 9.0	0.0	0.0	0.0	0	0	0
Total	3.1	0.7	3.8	54	19	73

CDO 07 CALIFORNIA DECIDUOUS OAK

SITE AND STAND INFORMATION

Site location: N 36° 22' 27.56" W 121° 33' 54.39"
Elevation: 1,945 ft

Alliance: Coast live oak woodland
SAF cover type: California coast live oak

Trees (% of stems): *Arbutus menziesii* (45), *Quercus agrifolia* (41), *Quercus douglasii* (14)
Crown closure: 71%

Seedlings (% of stems): *Quercus agrifolia* (75), *Quercus douglasii* (18), *Arbutus menziesii* (7)
Density: 1,090/ac

Understory (% cover): graminoids (45), *Toxicodendron diversilobum* (9), *Cotyledon orbiculata* (6), *Opuntia* spp. (3)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	0.9	1.4	81
Duff	0.7	0.8	59
Total Forest Floor	1.3	2.2	88
Mineral Soil			3

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Arbutus menziesii* (56)	*Quercus agrifolia* (100)	--	*Quercus douglasii* (100)	*Quercus douglasii* (75)
Second most common species (percent of stems)	*Quercus agrifolia* (44)	--	--	--	*Quercus agrifolia* (25)
Tree density (stems/ac)	130	7	0	22	29
Live	130	7	0	22	29
Dead	0	0	0	0	0
Avg d.b.h. (in)	0.7	5.1	--	26.7	21.3
Live	0.7	5.1	--	26.7	21.3
Dead	--	--	--	--	--
Avg height (ft)	8	21	--	46	40
Live	8	21	--	46	40
Dead	--	--	--	--	--
Avg height to crown base (ft)	1	3	--	4	4
Live	1	3	--	4	4
Dead	--	--	--	--	--
Avg height to live crown (ft)	1	3	--	6	5

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Toxicodendron diversilobum* (9)	*Cotyledon orbiculata* (6)	--
Second most common species (% cover)	*Opuntia* spp. (3)	--	--
Coverage (percent)	12	10	45
Avg height (ft)	4.6	0.9	0.8
Biomass (lbs/ac)	**na**	295	673

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.2	0.0	0.2	--	--	--
0.26 - 1.0	0.3	0.0	0.3	--	--	--
1.1 - 3.0	0.1	0.0	0.1	--	--	--
3.1 - 9.0	0.0	0.1	0.1	0	10	10
> 9.0	0.0	0.0	0.0	0	0	0
Total	0.6	0.1	0.7	0	10	10

CDO 08 CALIFORNIA DECIDUOUS OAK

SITE AND STAND INFORMATION

Site location: N 34° 43' 34.54" W 118° 41' 10.35"
Elevation: 5,355 ft

Alliance: Black oak forest
SAF cover type: California black oak

Trees (% of stems): *Quercus kelloggii* (100)
Crown closure: 87%

Seedlings (% of stems): *Quercus kelloggii* (100)
Density: 246/ac

Understory (% cover): graminoids (94)

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	1.2	2.3	61
Duff	0.7	0.8	88
Total Forest Floor	1.5	3.1	95
Mineral Soil			1

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	--	*Quercus kelloggii* (100)	*Quercus kelloggii* (100)	*Quercus kelloggii* (100)	*Quercus kelloggii* (100)
Second most common species (percent of stems)	--	--	--	--	--
Tree density (stems/ac)	0	7	14	80	101
Live	0	0	14	80	94
Dead	0	7	0	0	7
Avg d.b.h. (in)	--	8.5	13.5	21.2	19.2
Live	--	--	13.5	21.2	20.0
Dead	--	8.5	--	--	8.5
Avg height (ft)	--	17	49	54	51
Live	--	--	49	54	53
Dead	--	17	--	--	17
Avg height to crown base (ft)	--	3	6	10	9
Live	--	--	6	10	9
Dead	--	3	--	--	3
Avg height to live crown (ft)	--	--	6	10	9

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	--	--	--
Second most common species (% cover)	--	--	--
Coverage (percent)	0	trace	94
Avg height (ft)	--	0.4	1.0
Biomass (lbs/ac)	0	1	1,304

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	0.0	0.4	--	--	--
0.26 - 1.0	0.5	0.0	0.5	--	--	--
1.1 - 3.0	0.0	0.0	0.0	--	--	--
3.1 - 9.0	0.5	0.1	0.6	36	7	43
> 9.0	0.0	0.0	0.0	0	0	0
Total	1.4	0.1	1.5	36	7	43

CDO 09 California Deciduous Oak

Site and Stand Information

Site location: N 32° 49' 38.30" W 116° 37' 09.44"
Elevation: 3,420 ft

Alliance: Engelmann oak woodland
SAF cover type: California coast live oak

Trees (% of stems): *Quercus agrifolia* (63), *Quercus engelmannii* (37)
Crown closure: 96%

Seedlings (% of stems): *Quercus agrifolia* (53), *Quercus engelmannii* (46), *Pseudotsuga menziesii* (1)
Density: 975/ac

Understory (% cover): *Symphoricarpos* spp. (20), graminoids (t), *Amelanchier alnifolia* (t)

Forest Floor Information

	Depth (in)	Loading (tons/ac)	Constancy* (percent)
Litter	1.4	4.9	87
Duff	0.5	2.7	59
Total Forest Floor	1.7	7.6	87
Mineral Soil			13

*If the sum of total forest floor constancy and mineral soil constancy is less than 100, then the remainder is the constancy of a grass-dominated surface material with no duff.

Saplings and Trees

	Size class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percent of stems)	*Quercus agrifolia* (67)	*Quercus agrifolia* (80)	*Quercus engelmannii* (60)	*Quercus agrifolia* (75)	*Quercus agrifolia* (63)
Second most common species (percent of stems)	*Quercus engelmannii* (33)	*Quercus engelmannii* (20)	*Quercus agrifolia* (40)	*Quercus engelmannii* (25)	*Quercus engelmannii* (37)
Tree density (stems/ac)	22	72	72	29	173
Live	22	72	72	29	173
Dead	0	0	0	0	0
Avg d.b.h. (in)	2.0	6.7	11.9	26.6	12.2
Live	2.0	6.7	11.9	26.6	12.2
Dead	--	--	--	--	--
Avg height (ft)	9	27	42	51	37
Live	9	27	42	51	37
Dead	--	--	--	--	--
Avg height to crown base (ft)	4	4	6	7	5
Live	4	4	6	7	5
Dead	--	--	--	--	--
Avg height to live crown (ft)	4	6	8	8	7

Understory Vegetation

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	*Symphoricarpos* spp. (20)	--	--
Second most common species (% cover)	*Amelanchier alnifolia* (t)	--	--
Coverage (percent)	20	1	trace
Avg height (ft)	1.9	0.6	0.6
Biomass (lbs/ac)	717	13	13

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.5	0.0	0.5	--	--	--
0.26 - 1.0	0.8	0.0	0.8	--	--	--
1.1 - 3.0	1.2	0.0	1.2	--	--	--
3.1 - 9.0	0.2	0.0	0.2	10	0	10
> 9.0	0.0	0.0	0.0	0	0	0
Total	2.7	0.0	2.7	10	0	10

MIXED-CONIFER WITH SHRUB PHOTO SERIES

A SERIES OF 11 SITES
MCS 01 THROUGH MCS 11

NOTES TO USERS:

1. Sites are ordered by increasing percentage of shrub coverage.
2. A list of scientific and common species names can be found on page 8.
3. Photographs were taken in August 1999 and September 2000. Sampling was performed in October 1999 and 2000.
4. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals. The pole is 30 feet from the camera. In addition, some sites have a reference height (in feet) on a small sign located near the middle of the photograph.
5. Forest floor loading was determined through collection of surface material and duff in twelve 10.76-square-foot plots.
6. All loadings are reported in tons per acre. Trace coverage of understory species or forest floor loading is indicated either as "trace" or as "t."
7. A distinction is made between rotten and sound woody material for pieces larger than 3 inches in diameter.
8. Depth values reported for surface material, duff, and total forest floor are not unit-wide averages (null values, or points where litter or duff are absent, are not included in average), and, as such, the total forest floor depth is not the sum of surface material and duff depths.

MCS 01 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 15' 45.43" W 123° 03' 53.47"
Elevation: 2,160 ft Aspect: W Slope: 15%

Plant association: Oregon white oak-Douglas-fir/ poison oak

SAF cover type: Oregon white oak

Trees (% of stems): *Arbutus menziesii* (38), *Pseudotsuga menziesii* (27), *Quercus garryana* (26), *Pinus ponderosa* (9)
Crown closure: 76%

Seedlings (% of stems): *Quercus garryana* (73), *Pinus ponderosa* (12), *Pseudotsuga menziesii* (8), *Arbutus menziesii* (6), *Quercus kelloggii* (1)
Density: 3,184/ac

Understory (% cover): *Lonicera* spp. (5), *Toxicodendron diversilobum* (3), *Arctostaphylos patula* (1), *Mahonia aquifolium* (t)

	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	1.0	12	0.17
Forb	1.0	4	0.08
Shrub	3.7	9	0.43

WOODY MATERIAL

Diameter (in)	Loading in tons/ac (Density in pieces/ac)		
	Sound	Rotten	Total
≤ 0.25	0.26	0.00	0.26
0.26 - 1.0	0.74	0.00	0.74
1.1 - 3.0	1.90	0.00	1.90
> 3.0	5.01 (146)	2.39 (68)	7.40 (214)
Total	7.91	2.39	10.30

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	1.4	1.42	97
Duff	1.4	4.33	81
Total	2.5	5.75	97

Saplings and Trees

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	*Arbutus menziesii* (47)	*Arbutus menziesii* (48)	*Pseudotsuga menziesii* (42)	*Pinus ponderosa* (50)	*Arbutus menziesii* (35)
Other species (percentage of stems)	*Pseudotsuga menziesii* (33)	*Quercus garryana* (32)	*Arbutus menziesii* (25)	*Quercus garryana* (33)	*Quercus garryana* (30)
	Quercus garryana (13)	*Pseudotsuga menziesii* (20)	*Quercus garryana* (25)	*Pseudotsuga menziesii* (17)	*Pseudotsuga menziesii* (26)
Tree density (stems/ac)	108	181	87	43	311
Dead (percentage of plants)	27	24	42	33	30
Avg d.b.h. (in)	2.6	6.5	12.4	19.7	10.0
Avg height (ft)	14.6	27.0	34.2	65.2	34.5
Avg height to crown base (ft)	5.0	10.9	17.6	29.2	16.0
Avg height to live crown (ft)	4.7	11.1	18.7	27.5	15.4
Live crown mass (tons/ac)	0.37	4.48	6.68	10.52	21.68

Shrub Biomass

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	0.01	0.00	0.01	0.02
≤ 0.25"	0.01	0.00	0.03	0.04
0.26 - 1.0"	0.03	0.00	0.00	0.03
> 1.0"	0.18	0.00	0.00	0.18
Dead: Foliage	< 0.01	0.00	0.00	< 0.01
≤ 0.25"	0.06	0.00	0.00	0.06
0.26 - 1.0"	0.09	0.00	0.00	0.09
> 1.0"	0.01	0.00	0.00	0.01
All: Foliage	0.01	0.00	0.01	0.02
≤ 0.25"	0.07	0.00	0.03	0.10
0.26 - 1.0"	0.12	0.00	0.00	0.12
> 1.0"	0.19	0.00	0.00	0.19
Grand Total	0.39	0.00	0.04	0.43

Shrub Dimensions

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	51	43	3.3	14.0	3.9	3.7	7.5
Ceanothus cuneatus	0	--	--	--	--	--	--
Other species	na	na	na	na	na	na	na

MCS 02 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 32' 42.96" W 123° 22' 23.95"
Elevation: 1,190 ft Aspect: NW Slope: < 5%

Plant association: Oregon white oak-Douglas-fir/ poison oak
SAF cover type: Pacific ponderosa pine-Douglas-fir

Trees (% of stems): *Arbutus menziesii* (48), *Pseudotsuga menziesii* (28), *Quercus garryana* (9), *Pinus ponderosa* (6), *Quercus kelloggii* (6), *Pinus lambertiana* (3)
Crown closure: 93%

Seedlings (% of stems): *Quercus kelloggii* (81), *Quercus garryana* (17), *Pseudotsuga menziesii* (1), *Calocedrus decurrens* (1)
Density: 2,331/ac

Understory (% cover): *Symphoricarpos mollis* (17), *Toxicodendron diversilobum* (2)

	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	na	trace	0.01
Forb	na	trace	< 0.01
Shrub	0.6	19	0.20

WOODY MATERIAL

Diameter (in)	Loading in tons/ac (Density in pieces/ac)		
	Sound	Rotten	Total
≤ 0.25	0.19	0.00	0.19
0.26 - 1.0	0.81	0.00	0.81
1.1 - 3.0	1.53	0.00	1.53
> 3.0	0.41 (19)	0.08 (10)	0.49 (29)
Total	2.94	0.08	3.02

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	1.2	3.61	99
Duff	1.2	2.22	64
Total	1.9	5.83	100

Saplings and Trees

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	*Arbutus menziesii* (55)	*Pseudotsuga menziesii* (38)	*Arbutus menziesii* (100)	*Arbutus menziesii* (40)	*Arbutus menziesii* (40)
Other species (percentage of stems)	*Pseudotsuga menziesii* (30)	*Arbutus menziesii* (25)	--	*Pinus ponderosa* (20)	*Pseudotsuga menziesii* (27)
	Quercus garryana (10)	*Pinus ponderosa* (13)	--	*Pinus lambertiana* (20)	*Pinus ponderosa* (13)
Tree density (stems/ac)	335	134	34	84	252
Dead (percentage of plants)	20	0	0	0	0
Avg d.b.h. (in)	1.8	6.7	12.1	17.5	11.0
Avg height (ft)	13.5	42.6	50.0	66.8	51.7
Avg height to crown base (ft)	3.8	9.7	14.0	17.2	13.0
Avg height to live crown (ft)	6.3	18.1	27.0	30.4	23.8
Live crown mass (tons/ac)	0.80	4.34	4.45	20.98	29.77

Shrub Biomass

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	0.00	0.00	0.05	0.05
≤ 0.25"	0.00	0.00	0.15	0.15
0.26 - 1.0"	0.00	0.00	0.00	0.00
> 1.0"	0.00	0.00	0.00	0.00
Dead: Foliage	0.00	0.00	0.00	0.00
≤ 0.25"	0.00	0.00	0.00	0.00
0.26 - 1.0"	0.00	0.00	0.00	0.00
> 1.0"	0.00	0.00	0.00	0.00
All: Foliage	0.00	0.00	0.05	0.05
≤ 0.25"	0.00	0.00	0.15	0.15
0.26 - 1.0"	0.00	0.00	0.00	0.00
> 1.0"	0.00	0.00	0.00	0.00
Grand Total	0.00	0.00	0.20	0.20

Shrub Dimensions

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	0	--	--	--	--	--	--
Ceanothus cuneatus	0	--	--	--	--	--	--
Other species	na	na	na	na	na	0.6	1.5

MCS 03 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 05' 47.95" W 123° 38' 19.56"
Elevation: 1,520 ft Aspect: WNW Slope: 21%

Plant association: Jeffrey pine/Idaho fescue
SAF cover type: Jeffrey pine

Trees (% of stems): *Pinus jeffreyi* (83), *Arbutus menziesii* (17)
Crown closure: 43%

Seedlings (% of stems): *Arbutus menziesii* (100)
Density: 17/ac

Understory (% cover): *Arctostaphylos patula* (15), *Amelanchier alnifolia* (3), *Ceanothus cuneatus* (1)

	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	0.6	64	0.59
Forb	0.6	3	0.01
Shrub	4.7	19	3.11

WOODY MATERIAL

	Loading in tons/ac (Density in pieces/ac)		
Diameter (in)	Sound	Rotten	Total
≤ 0.25	0.05	0.00	0.05
0.26 - 1.0	1.04	0.00	1.04
1.1 - 3.0	0.10	0.00	0.10
> 3.0	0.00 (0)	0.00 (0)	0.00 (0)
Total	1.19	0.00	1.19

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	0.7	2.18	92
Duff	0.6	3.08	60
Total	1.1	5.26	92

Saplings and Trees

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	--	*Pinus jeffreyi* (50)	*Pinus jeffreyi* (100)	*Pinus jeffreyi* (100)	*Pinus jeffreyi* (83)
Other species (percentage of stems)	--	*Arbutus menziesii* (50)	--	--	*Arbutus menziesii* (17)
	--	--	--	--	--
Tree density (stems/ac)	0	14	7	22	43
Dead (percentage of plants)	--	0	0	0	0
Avg d.b.h. (in)	--	6.6	10.2	24.4	16.1
Avg height (ft)	--	30.5	58.0	92.0	65.8
Avg height to crown base (ft)	--	8.5	18.0	18.3	15.0
Avg height to live crown (ft)	--	9.5	43.0	19.0	19.8
Live crown mass (tons/ac)	0.00	0.50	0.58	10.84	11.92

Shrub Biomass

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	0.15	< 0.01	0.02	0.17
≤ 0.25"	0.12	0.01	0.04	0.17
0.26 - 1.0"	0.44	< 0.01	0.01	0.45
> 1.0"	1.64	0.00	0.00	1.64
Dead: Foliage	0.03	0.00	0.00	0.03
≤ 0.25"	0.26	0.01	0.00	0.27
0.26 - 1.0"	0.38	< 0.01	0.00	0.38
> 1.0"	< 0.01	< 0.01	0.00	<0.01
All: Foliage	0.18	< 0.01	0.02	0.20
≤ 0.25"	0.38	0.02	0.04	0.44
0.26 - 1.0"	0.82	< 0.01	0.01	0.83
> 1.0"	1.64	< 0.01	0.00	1.64
Grand Total	3.02	0.02	0.07	3.11

Shrub Dimensions

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	168	20	7.8	53.6	4.9	7.5	14.3
Ceanothus cuneatus	84	20	2.0	4.0	1.2	2.7	4.2
Other species	168	0	2.5	5.3	0.5	3.0	5.0

MCS 04 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 05' 48.58" W 123° 38' 19.27"
Elevation: 1,510 ft Aspect: WNW Slope: 27%

Plant association: Jeffrey pine/buckbrush/Idaho fescue
SAF cover type: Jeffrey pine

Trees (% of stems): *Pinus jeffreyi* (0; in vicinity but not rooted in sample area)
Crown closure: 12%

Seedlings (% of stems): None
Density: 0/ac

Understory (% cover): *Ceanothus cuneatus* (22), *Amelanchier alnifolia* (1), *Phacelia* spp. (t), *Aspidotis densa* (t)

	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	0.7	21	0.36
Forb	0.6	8	0.03
Shrub	4.2	23	2.07

WOODY MATERIAL

Diameter (in)	Loading in tons/ac (Density in pieces/ac)		
	Sound	Rotten	Total
≤ 0.25	0.09	0.00	0.09
0.26 - 1.0	0.40	0.00	0.40
1.1 - 3.0	0.28	0.00	0.28
> 3.0	0.00 (0)	0.00 (0)	0.00 (0)
Total	0.77	0.00	0.77

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	0.6	0.96	50
Duff	0.5	trace	10
Total	0.7	0.96	50

Saplings and Trees

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	--	--	--	--	--
Other species (percentage of stems)	--	--	--	--	--
	--	--	--	--	--
Tree density (stems/ac)	0	0	0	0	0
Dead (percentage of plants)	--	--	--	--	--
Avg d.b.h. (in)	--	--	--	--	--
Avg height (ft)	--	--	--	--	--
Avg height to crown base (ft)	--	--	--	--	--
Avg height to live crown (ft)	--	--	--	--	--
Live crown mass (tons/ac)	0.00	0.00	0.00	0.00	0.00

Shrub Biomass

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	0.00	0.11	0.03	0.14
≤ 0.25"	0.00	0.53	0.09	0.62
0.26 - 1.0"	0.00	0.55	0.13	0.68
> 1.0"	0.00	0.09	0.10	0.19
Dead: Foliage	0.00	< 0.01	0.00	< 0.01
≤ 0.25"	0.03	0.17	0.00	0.20
0.26 - 1.0"	0.04	0.15	0.00	0.19
> 1.0"	0.05	< 0.01	0.00	0.05
All: Foliage	0.00	0.11	0.03	0.14
≤ 0.25"	0.03	0.70	0.09	0.82
0.26 - 1.0"	0.04	0.70	0.13	0.87
> 1.0"	0.05	0.09	0.10	0.24
Grand Total	0.12	1.60	0.35	2.07

Shrub Dimensions

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	17	100	--	--	5.5	4.2	4.2
Ceanothus cuneatus	855	10	4.4	16.9	2.8	4.1	6.5
Other species	34	0	4.5	13.6	2.8	5.9	8.8

MCS 05 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 31' 59.83" W 122° 40' 48.53"
Elevation: 3,020 ft Aspect: SW Slope: < 5%

Plant association: Ponderosa pine-California black oak
SAF cover type: Oregon white oak

Trees (% of stems): *Pinus ponderosa* (55), *Quercus garryana* (41), *Pseudotsuga menziesii* (4)
Crown closure: 30%

Seedlings (% of stems): *Quercus garryana* (88), *Pinus ponderosa* (9), *Quercus kelloggii* (2), *Pseudotsuga menziesii* (1)
Density: 3,036/ac

Understory (% cover): *Ceanothus cuneatus* (12), *Arctostaphylos patula* (11), *Mahonia aquifolium* (1), *Cynosurus echinatus* (na)

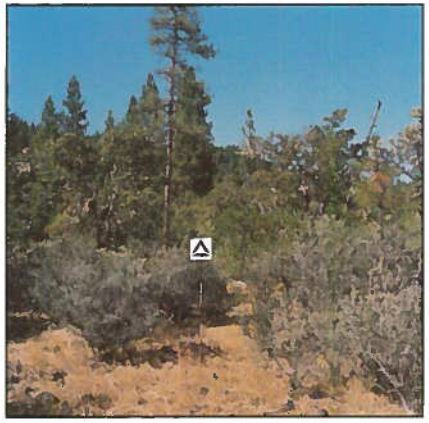
	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	0.6	31	0.14
Forb	0.3	4	0.02
Shrub	3.2	24	5.01

WOODY MATERIAL

	Loading in tons/ac (Density in pieces/ac)		
Diameter (in)	Sound	Rotten	Total
≤ 0.25	0.20	0.00	0.20
0.26 - 1.0	0.41	0.00	0.41
1.1 - 3.0	0.74	0.00	0.74
> 3.0	1.13 (29)	0.95 (10)	2.08 (39)
Total	2.48	0.95	3.43

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	0.8	0.95	79
Duff	0.4	0.05	29
Total	1.0	1.00	79



Saplings and Trees

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	*Pinus ponderosa* (63)	*Quercus garryana* (89)	*Pinus ponderosa* (34)	--	*Quercus garryana* (75)
Other species (percentage of stems)	*Quercus garryana* (34)	*Pinus ponderosa* (11)	*Quercus garryana* (33)	--	*Pinus ponderosa* (17)
	Pseudotsuga menziesii (3)	--	*Pseudotsuga menziesii* (33)	--	*Pseudotsuga menziesii* (8)
Tree density (stems/ac)	462	65	22	0	87
Dead (percentage of plants)	2	11	33	--	17
Avg d.b.h. (in)	1.2	5.9	12.9	--	7.6
Avg height (ft)	7.5	20.0	38.3	--	24.6
Avg height to crown base (ft)	1.9	4.1	21.0	--	7.5
Avg height to live crown (ft)	2.4	5.1	24.0	--	8.9
Live crown mass (tons/ac)	0.58	1.07	2.36	0.00	3.43

Shrub Biomass

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	0.13	0.05	< 0.01	0.18
≤ 0.25"	0.13	0.27	< 0.01	0.40
0.26 - 1.0"	0.47	0.39	0.00	0.86
> 1.0"	2.68	0.07	0.00	2.75
Dead: Foliage	0.02	< 0.01	0.00	0.02
≤ 0.25"	0.29	0.08	0.00	0.37
0.26 - 1.0"	0.37	0.03	0.00	0.40
> 1.0"	0.03	< 0.01	0.00	0.03
All: Foliage	0.15	0.05	< 0.01	0.20
≤ 0.25"	0.42	0.35	< 0.01	0.77
0.26 - 1.0"	0.84	0.42	0.00	1.26
> 1.0"	2.71	0.07	0.00	2.78
Grand Total	4.12	0.89	< 0.01	5.01

Shrub Dimensions

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	184	18	6.2	41.5	5.1	9.0	10.7
Ceanothus cuneatus	1,392	2	1.6	4.2	1.2	2.4	8.7
Other species	na	na	na	na	na	na	na

MCS 06 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 15' 46.11" W 123° 03' 58.10"
Elevation: 2,080 ft Aspect: WSW Slope: 5%

Plant association: Oregon white oak-Douglas-fir/ poison oak
SAF cover type: Oregon white oak

Trees (% of stems): *Quercus garryana* (97), *Arbutus menziesii* (3)
Crown closure: 45%

Seedlings (% of stems): *Quercus garryana* (95), *Pinus ponderosa* (2), *Pseudotsuga menziesii* (2), *Arbutus menziesii* (1)
Density: 1,581/ac

Understory (% cover): *Arctostaphylos patula* (23), *Lonicera* spp. (1)

	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	0.8	28	0.15
Forb	1.1	3	< 0.01
Shrub	12.0	25	8.03

WOODY MATERIAL

	Loading in tons/ac (Density in pieces/ac)		
Diameter (in)	Sound	Rotten	Total
≤ 0.25	0.22	0.00	0.22
0.26 - 1.0	0.17	0.00	0.17
1.1 - 3.0	0.44	0.00	0.44
> 3.0	1.57 (44)	0.88 (49)	2.45 (93)
Total	2.40	0.88	3.28

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	0.9	1.16	97
Duff	0.7	1.71	85
Total	1.5	2.87	100

Saplings and Trees

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	*Quercus garryana* (100)	*Quercus garryana* (96)	*Quercus garryana* (100)	--	*Quercus garryana* (97)
Other species (percentage of stems)	--	*Arbutus menziesii* (4)	--	--	*Arbutus menziesii* (3)
	--	--	--	--	--
Tree density (stems/ac)	7	188	51	0	239
Dead (percentage of plants)	100	4	14	--	6
Avg d.b.h. (in)	4.0	6.8	10.8	--	7.6
Avg height (ft)	11.0	19.1	26.4	--	20.7
Avg height to crown base (ft)	--	6.8	6.8	--	6.8
Avg height to live crown (ft)	--	8.8	9.0	--	8.8
Live crown mass (tons/ac)	0.00	6.36	4.76	0.00	11.12

Shrub Biomass

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	0.23	0.00	0.01	0.24
≤ 0.25"	0.22	0.00	0.01	0.23
0.26 - 1.0"	0.83	0.00	0.00	0.83
> 1.0"	4.47	0.00	0.00	4.47
Dead: Foliage	0.04	0.00	0.00	0.04
≤ 0.25"	0.31	0.00	0.00	0.31
0.26 - 1.0"	0.81	0.00	0.00	0.81
> 1.0"	1.10	0.00	0.00	1.10
All: Foliage	0.27	0.00	0.01	0.28
≤ 0.25"	0.53	0.00	0.01	0.54
0.26 - 1.0"	1.64	0.00	0.00	1.64
> 1.0"	5.57	0.00	0.00	5.57
Grand Total	8.01	0.00	0.02	8.03

Shrub Dimensions

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	116	38	12.8	163.8	6.4	12.0	18.0
Ceanothus cuneatus	0	--	--	--	--	--	--
Other species	na	na	na	na	na	na	na

MCS 07 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 40' 12.63" W 122° 50' 54.54"
Elevation: 2,060 ft Aspect: SE Slope: 15%

Plant association: Ponderosa pine-Douglas-fir
SAF cover type: Pacific ponderosa pine-Douglas-fir

Trees (% of stems): *Quercus garryana* (61), *Pinus ponderosa* (21), *Pseudotsuga menziesii* (9), *Arbutus menziesii* (6), *Calocedrus decurrens* (3)
Crown closure: 36%

Seedlings (% of stems): *Quercus garryana* (82), *Quercus kelloggii* (11), *Pseudotsuga menziesii* (4), *Pinus ponderosa* (2), *Arbutus menziesii* (1)
Density: 1,795/ac

Understory (% cover): *Arctostaphylos patula* (21), *Ceanothus integerrimus* (8), *Lonicera* spp. (4), *Fragaria vesca* (2), *Toxicodendron diversilobum* (1)

	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	0.7	9	0.06
Forb	0.3	4	0.04
Shrub	7.4	34	11.37

WOODY MATERIAL

Diameter (in)	Loading in tons/ac (Density in pieces/ac)		
	Sound	Rotten	Total
≤ 0.25	0.16	0.00	0.16
0.26 - 1.0	0.36	0.00	0.36
1.1 - 3.0	0.86	0.00	0.86
> 3.0	1.36 (63)	0.33 (29)	1.69 (92)
Total	2.74	0.33	3.07

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	0.9	1.18	95
Duff	1.0	3.00	84
Total	1.7	4.18	96

Saplings and Trees

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	*Quercus garryana* (69)	*Quercus garryana* (57)	*Pinus ponderosa* (67)	--	*Quercus garryana* (53)
Other species (percentage of stems)	*Pinus ponderosa* (13)	*Pinus ponderosa* (21)	*Quercus garryana* (33)	--	*Pinus ponderosa* (29)
	Pseudotsuga menziesii (13)	*Arbutus menziesii* (7)	--	--	*Arbutus menziesii* (6)
Tree density (stems/ac)	268	235	50	0	285
Dead (percentage of plants)	13	14	0	--	12
Avg d.b.h. (in)	2.9	6.0	12.5	--	7.1
Avg height (ft)	12.8	23.1	46.7	--	27.2
Avg height to crown base (ft)	5.2	6.8	17.0	--	8.6
Avg height to live crown (ft)	5.7	8.0	17.0	--	9.8
Live crown mass (tons/ac)	1.21	4.80	6.55	0.00	11.35

Shrub Biomass

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	0.29	0.00	0.08	0.37
≤ 0.25"	0.29	0.00	0.26	0.54
0.26 - 1.0"	1.07	0.00	0.00	1.07
> 1.0"	8.16	0.00	0.00	8.16
Dead: Foliage	0.05	0.00	0.00	0.05
≤ 0.25"	0.58	0.00	0.00	0.58
0.26 - 1.0"	0.46	0.00	0.00	0.46
> 1.0"	0.13	0.00	0.00	0.13
All: Foliage	0.34	0.00	0.08	0.42
≤ 0.25"	0.87	0.00	0.26	1.13
0.26 - 1.0"	1.53	0.00	0.00	1.53
> 1.0"	8.29	0.00	0.00	8.29
Grand Total	11.03	0.00	0.34	11.37

Shrub Dimensions

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	386	9	6.6	40.2	4.7	7.4	16.3
Ceanothus cuneatus	0	--	--	--	--	--	--
Other species	na	na	na	na	na	na	na

MCS 08 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 32' 00.84" W 123° 25' 36.82"
Elevation: 970 ft Aspect: SW Slope: < 5%

Plant association: Ponderosa pine-California black oak
SAF cover type: Pacific ponderosa pine

Trees (% of stems): *Quercus kelloggii* (46), *Pinus ponderosa* (36), *Quercus garryana* (6), *Pseudotsuga menziesii* (5), *Arbutus menziesii* (4), *Calocedrus decurrens* (2), *Pinus lambertiana* (1)
Crown closure: 56%

Seedlings (% of stems): *Pinus ponderosa* (78), *Quercus kelloggii* (13), *Quercus garryana* (8), *Calocedrus decurrens* (1), *Pinus lambertiana* (t)
Density: 4,277/ac

Understory (% cover): *Arctostaphylos patula* (40), *Cynosurus echinatus* (7), *Symphoricarpos mollis* (5), *Ceanothus cuneatus* (2), *Galium ambiguum* (1)

	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	0.8	7	0.01
Forb	0.5	1	0.01
Shrub	4.9	47	4.41

WOODY MATERIAL

Diameter (in)	Loading in tons/ac (Density in pieces/ac)		
	Sound	Rotten	Total
≤ 0.25	0.11	0.00	0.11
0.26 - 1.0	1.86	0.00	1.86
1.1 - 3.0	4.77	0.00	4.77
> 3.0	0.94 (49)	0.24 (19)	1.18 (68)
Total	7.68	0.24	7.92

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	0.9	5.65	98
Duff	1.0	4.52	71
Total	1.6	10.17	98

Saplings and Trees

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	*Quercus kelloggii* (43)	*Quercus kelloggii* (62)	--	*Pinus ponderosa* (100)	*Quercus kelloggii* (57)
Other species (percentage of stems)	*Pinus ponderosa* (40)	*Pinus ponderosa* (14)	--	--	*Pinus ponderosa* (22)
	Quercus garryana (6)	*Arbutus menziesii* (10)	--	--	*Arbutus menziesii* (9)
Tree density (stems/ac)	607	152	0	14	166
Dead (percentage of plants)	1	0	--	0	0
Avg d.b.h. (in)	1.5	5.3	--	26.5	7.1
Avg height (ft)	10.5	24.8	--	135.5	34.4
Avg height to crown base (ft)	2.8	3.8	--	45.5	7.4
Avg height to live crown (ft)	3.5	6.8	--	45.5	10.1
Live crown mass (tons/ac)	1.11	2.92	0.00	8.48	11.40

Shrub Biomass

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	0.40	0.01	0.01	0.42
≤ 0.25"	0.36	0.05	0.03	0.44
0.26 - 1.0"	1.23	0.01	0.01	1.25
> 1.0"	0.43	< 0.01	0.00	0.43
Dead: Foliage	0.08	< 0.01	0.00	0.08
≤ 0.25"	0.52	< 0.01	0.00	0.52
0.26 - 1.0"	0.54	< 0.01	0.00	0.54
> 1.0"	0.73	< 0.01	0.00	0.73
All: Foliage	0.48	0.01	0.01	0.50
≤ 0.25"	0.88	0.05	0.03	0.96
0.26 - 1.0"	1.77	0.01	0.01	1.79
> 1.0"	1.16	< 0.01	0.00	1.16
Grand Total	4.29	0.07	0.05	4.41

Shrub Dimensions

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	2,398	10	2.9	8.5	1.6	4.9	9.2
Ceanothus cuneatus	184	9	2.0	4.2	0.7	4.7	9.0
Other species	17	0	1.4	1.5	1.2	1.4	1.4

MCS 09 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 36' 09.14" W 122° 36' 55.71"
Elevation: 2,340 ft Aspect: WNW Slope: < 5%

Plant association: Jeffrey pine/buckbrush/Idaho fescue
SAF cover type: Jeffrey pine

Trees (% of stems): *Quercus garryana* (80), *Pinus jeffreyi* (20)
Crown closure: 11%

Seedlings (% of stems): *Prunus* spp. (69), *Quercus garryana* (31)
Density: 218/ac

Understory (% cover): *Ceanothus cuneatus* (49), *Lonicera* spp. (1), *Toxicodendron diversilobum* (t)

	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	0.6	24	0.16
Forb	1.1	4	0.03
Shrub	4.0	50	3.47

WOODY MATERIAL

Diameter (in)	Loading in tons/ac (Density in pieces/ac)		
	Sound	Rotten	Total
≤ 0.25	0.38	0.00	0.38
0.26 - 1.0	0.42	0.00	0.42
1.1 - 3.0	0.00	0.00	0.00
> 3.0	0.00 (0)	0.00 (0)	0.00 (0)
Total	0.80	0.00	0.80

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	0.6	0.84	68
Duff	0.6	0.20	27
Total	0.8	1.04	68

Saplings and Trees

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	*Quercus garryana* (100)	--	*Pinus jeffreyi* (100)	--	*Pinus jeffreyi* (100)
Other species (percentage of stems)	--	--	--	--	--
	--	--	--	--	--
Tree density (stems/ac)	29	0	7	0	7
Dead (percentage of plants)	0	--	0	--	0
Avg d.b.h. (in)	2.6	--	15.6	--	15.6
Avg height (ft)	9.8	--	55.0	--	55.0
Avg height to crown base (ft)	2.0	--	5.0	--	5.0
Avg height to live crown (ft)	2.5	--	5.0	--	5.0
Live crown mass (tons/ac)	0.13	0.00	1.41	0.00	1.41

Shrub Biomass

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	0.00	0.19	< 0.01	0.19
≤ 0.25"	0.00	1.07	< 0.01	1.07
0.26 - 1.0"	0.00	1.43	0.00	1.43
> 1.0"	0.00	0.27	0.00	0.27
Dead: Foliage	0.00	0.01	0.00	0.01
≤ 0.25"	0.00	0.32	0.00	0.32
0.26 - 1.0"	0.00	0.19	0.00	0.19
> 1.0"	0.00	< 0.01	0.00	< 0.01
All: Foliage	0.00	0.20	< 0.01	0.20
≤ 0.25"	0.00	1.39	< 0.01	1.39
0.26 - 1.0"	0.00	1.62	0.00	1.62
> 1.0"	0.00	0.27	0.00	0.27
Grand Total	0.00	3.48	< 0.01	3.48

Shrub Dimensions

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	0	--	--	--	--	--	--
Ceanothus cuneatus	1,979	3	3.4	12.2	2.4	4.0	7.5
Other species	na	na	na	na	na	na	na

MCS 10 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 05' 50.59" W 123° 38' 30.15"
Elevation: 1,430 ft Aspect: W Slope: < 5%

Plant association: Jeffrey pine/buckbrush/Idaho fescue
SAF cover type: Jeffrey pine

Trees (% of stems): *Pinus jeffreyi* (100)
Crown closure: 7%

Seedlings (% of stems): *Pinus jeffreyi* (90), *Quercus garryana* (10)
Density: 168/ac

Understory (% cover): *Ceanothus cuneatus* (70), *Amelanchier alnifolia* (6), *Fragaria vesca* (1), *Toxicodendron diversilobum* (1), *Arctostaphylos patula* (t), *Rosa* spp. (t)

	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	0.4	30	0.21
Forb	0.7	2	0.05
Shrub	3.5	77	3.57

WOODY MATERIAL

Diameter (in)	Loading in tons/ac (Density in pieces/ac)		
	Sound	Rotten	Total
≤ 0.25	0.33	0.00	0.33
0.26 - 1.0	0.06	0.00	0.06
1.1 - 3.0	0.00	0.00	0.00
> 3.0	0.00 (0)	0.00 (0)	0.00 (0)
Total	0.39	0.00	0.39

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	0.4	1.71	85
Duff	0.3	0.69	25
Total	0.5	2.40	85

SAPLINGS AND TREES

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	*Pinus jeffreyi* (100)	--	--	--	--
Other species (percentage of stems)	--	--	--	--	--
	--	--	--	--	--
Tree density (stems/ac)	36	0	0	0	0
Dead (percentage of plants)	0	--	--	--	--
Avg d.b.h. (in)	1.7	--	--	--	--
Avg height (ft)	9.0	--	--	--	--
Avg height to crown base (ft)	0.6	--	--	--	--
Avg height to live crown (ft)	0.6	--	--	--	--
Live crown mass (tons/ac)	0.08	0.00	0.00	0.00	0.00

SHRUB BIOMASS

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	0.01	0.21	< 0.01	0.22
≤ 0.25"	0.01	1.24	< 0.01	1.25
0.26 - 1.0"	0.04	1.15	< 0.01	1.19
> 1.0"	0.01	0.23	0.00	0.24
Dead: Foliage	< 0.01	0.01	0.00	0.01
≤ 0.25"	0.01	0.32	0.00	0.33
0.26 - 1.0"	< 0.01	0.31	0.00	0.31
> 1.0"	< 0.01	0.02	0.00	0.02
All: Foliage	0.01	0.22	< 0.01	0.23
≤ 0.25"	0.02	1.56	< 0.01	1.58
0.26 - 1.0"	0.04	1.46	< 0.01	1.50
> 1.0"	0.01	0.25	0.00	0.26
Grand Total	0.08	3.49	< 0.01	3.57

SHRUB DIMENSIONS

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	201	8	2.0	3.7	1.0	2.7	3.7
Ceanothus cuneatus	2,868	5	2.8	9.3	1.6	3.6	13.7
Other species	17	0	2.4	4.5	0.8	7.0	7.0

MCS 11 MIXED-CONIFER WITH SHRUB

SITE AND STAND INFORMATION

Site location: N 42° 27' 50.55" W 123° 24' 18.76"
Elevation: 1,010 ft Aspect: WNW Slope: < 5%

Plant association: Ponderosa pine-California black oak
SAF cover type: Pacific ponderosa pine

Trees (% of stems): *Pinus ponderosa* (79), *Arbutus menziesii* (7), *Quercus garryana* (7), *Quercus kelloggii* (7)
Crown closure: 16%

Seedlings (% of stems): *Quercus kelloggii* (93), *Arbutus menziesii* (7)
Density: 235/ac

Understory (% cover): *Arctostaphylos patula* (81), *Ceanothus cuneatus* (1), *Toxicodendron diversilobum* (1), *Galium ambiguum* (t)

	Height (ft)	Coverage (%)	Biomass (tons/ac)
Graminoid	0.5	1	0.17
Forb	0.9	trace	< 0.01
Shrub	8.2	83	19.73

WOODY MATERIAL

Diameter (in)	Loading in tons/ac (Density in pieces/ac)		
	Sound	Rotten	Total
≤ 0.25	0.16	0.00	0.16
0.26 - 1.0	0.11	0.00	0.11
1.1 - 3.0	0.00	0.00	0.00
> 3.0	0.00 (0)	0.00 (0)	0.00 (0)
Total	0.27	0.00	0.27

FOREST FLOOR

	Depth (in)	Loading (tons/ac)	Constancy (%)
Litter	0.8	4.04	95
Duff	0.7	0.80	55
Total	1.2	4.84	95

Saplings and Trees

	Size Class (diameter at breast height)				
	Saplings (≤ 4")	4 - 9"	9 - 16"	> 16"	> 4"
Most common species (percentage of stems)	*Pinus ponderosa* (75)	*Pinus ponderosa* (80)	*Pinus ponderosa* (100)	--	*Pinus ponderosa* (88)
Other species (percentage of stems)	*Quercus garryana* (10)	*Arbutus menziesii* (20)	--	--	*Arbutus menziesii* (12)
	Quercus kelloggii (10)	--	--	--	--
Tree density (stems/ac)	144	36	22	0	58
Dead (percentage of plants)	0	0	0	--	0
Avg d.b.h. (in)	1.9	5.6	10.7	--	7.5
Avg height (ft)	11.7	21.2	40.0	--	28.3
Avg height to crown base (ft)	5.4	4.0	2.0	--	3.3
Avg height to live crown (ft)	5.6	5.4	5.7	--	5.5
Live crown mass (tons/ac)	0.36	0.90	1.94	0.00	2.84

Shrub Biomass

	Loading (tons/ac)			
	A. patula	*C. cuneatus*	Other species	Total
Live: Foliage	1.14	0.01	< 0.01	1.15
≤ 0.25"	1.07	0.05	< 0.01	1.12
0.26 - 1.0"	3.83	0.01	< 0.01	3.84
> 1.0"	9.73	< 0.01	0.00	9.73
Dead: Foliage	0.21	< 0.01	0.00	0.21
≤ 0.25"	1.55	0.01	0.00	1.56
0.26 - 1.0"	1.79	< 0.01	0.00	1.79
> 1.0"	0.33	< 0.01	0.00	0.33
All: Foliage	1.35	0.01	< 0.01	1.36
≤ 0.25"	2.62	0.06	< 0.01	2.68
0.26 - 1.0"	5.62	0.01	< 0.01	5.63
> 1.0"	10.06	< 0.01	0.00	10.06
Grand Total	19.65	0.08	< 0.01	19.73

Shrub Dimensions

	Density (plants/ac)	Dead (percentage of plants)	Avg crown breadth (ft)	Avg crown area (ft^2)	Avg basal diameter (in)	Avg height (ft)	Max height (ft)
Arctostaphylos patula	1,929	17	5.9	33.4	3.5	8.3	13.2
Ceanothus cuneatus	101	50	4.1	13.9	0.9	7.5	9.8
Other species	17	0	4.6	15.7	0.4	6.3	6.3

Ottmar, Roger D.; Vihnanek, Robert E.; Wright, Clinton S.; Olson, Diana L. 2004. Stereo photo series for quantifying natural fuels. Volume VII: Oregon white oak, California deciduous oak, and mixed-conifer with shrub types in the Western United States. PMS 839. Boise, ID: National Wildfire Coordinating Group, National Interagency Fire Center. 75 p.

Two series of single and stereo photographs display a range of natural conditions and fuel loadings in deciduous oak woodland and savannah ecosystems in Washington, Oregon, and California. An additional series of single and stereo photographs displays a range of natural conditions and fuel loadings in mixed-conifer with shrub ecosystems in southwestern Oregon. Each group of photos includes inventory information summarizing vegetation composition, structure and loading, woody material loading and density by size class, forest floor depth and loading, and various site characteristics. The natural fuels photo series is designed to help land managers appraise fuel and vegetation conditions in natural settings.

Keywords: Woody material, biomass, fuel loading, natural fuels, western deciduous oaks, mixed-conifer, blue oak, *Quercus douglasii*, buckbrush, *Ceanothus cuneatus*, California black oak, *Quercus kelloggii*, California live oak, *Quercus agrifolia*, Douglas-fir, *Pseudotsuga menziesii*, Engelmann oak, *Quercus engelmannii*, greenleaf manzanita, *Arctostaphylos patula*, Jeffrey pine, *Pinus jeffreyi*, Oregon white oak, *Quercus garryana*, Pacific madrone, *Arbutus menziesii*, ponderosa pine, *Pinus ponderosa*.