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Photo Series for Quantifying Natural Fuels

Volume XI: Eastern Oregon Sagebrush-Steppe and Spotted Owl Nesting Habitat in the Pacific Northwest

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ABSTRACT

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Three series of photographs display a range of natural conditions and fuel loadings for sagebrush-steppe types that are ecotonal with grasses, western juniper, and ponderosa pine in eastern Oregon, and one series of photographs displays a range of natural conditions and fuel loadings for northern spotted owl nesting habitat in forest types in Washington and 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, sagebrush-steppe, old-growth forest, greater sage-grouse, *Centrocercus urophasianus*, northern spotted owl, *Strix occidentalis caurina*, antelope bitterbrush, *Purshia tridentata*, big sagebrush, *Artemisia tridentata*, Douglas-fir, *Pseudotsuga menziesii*, grand fir, *Abies grandis*, Pacific silver fir, *Abies amabilis*, ponderosa pine, *Pinus ponderosa*, western hemlock, *Tsuga heterophylla*, western juniper, *Juniperus occidentalis*, western redcedar, *Thuja plicata*, white fir, *Abies concolor*.

COOPERATORS

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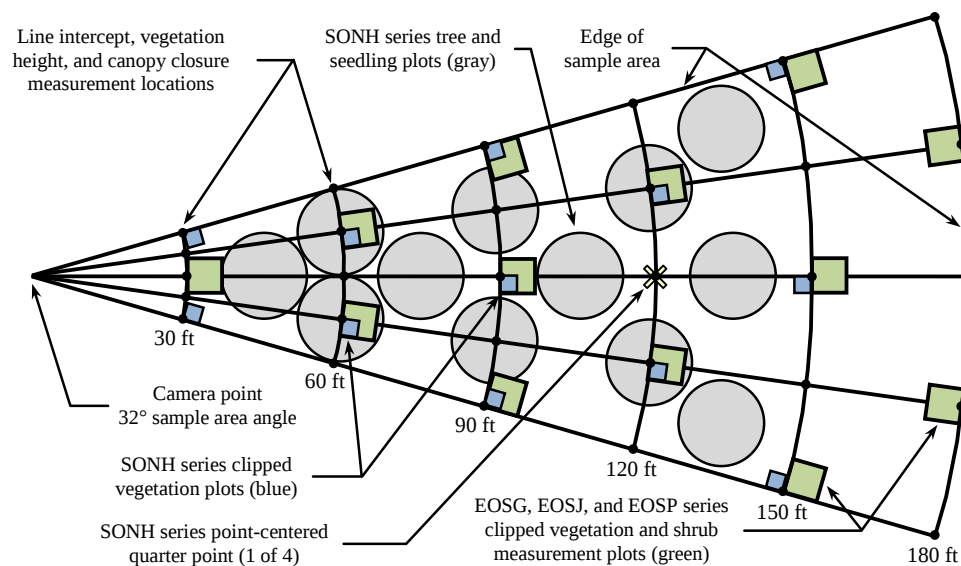
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WHAT IS THE NATURAL FUELS PHOTO SERIES?

The first phase of the natural fuels photo series was a collection of six volumes, each representing a region of the United States (Volumes I-VI). Additional phases included new volumes (Volumes VII-X, XII) and supplemental volumes (Volumes IIa, Va, VIa). Volume I included sites in mixed-conifer, western juniper, sagebrush, and grassland ecosystems in the interior Pacific Northwest. Volume II included sites in black and white spruce ecosystems 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 ecosystems in the Rocky Mountains. Volume IV included sites in pinyon-juniper, sagebrush, and chaparral ecosystems in the Southwest. Volume V included sites in red and white pine, northern tallgrass prairie, and mixed-oak ecosystems in the Midwest, and volume Va included sites in jack pine ecosystems. Volume VI included sites in longleaf pine, pocosin, and marsh grass ecosystems in the Southeast, volume VIa included sites in sand hill, sand pine scrub, and white pine-invaded hardwood ecosystems, and volume XII included sites in post-hurricane fuels. Volume VII included sites in Oregon white oak, California deciduous oak, and mixed conifer with shrub ecosystems in Washington, Oregon, and California. Volume VIII included sites in hardwood, pitch pine, and red spruce/balsam fir ecosystems in the Northeast. Volume IX included sites in oak/juniper ecosystems in Arizona and New Mexico. Volume X included sites in sagebrush with grass and ponderosa pine-juniper ecosystems in central Montana. An unnumbered volume included grassland, shrubland, woodland, and forest ecosystems in Hawaii.

Generally, sites include wide-angle and stereo-pair photographs (stereo-pair photographs are provided only for the spotted owl (*Strix occidentalis caurina*) nesting habitat series in this volume) supplemented with information on living and dead fuels and vegetation, and, where appropriate, stand structure and composition within the area visible in the photographs (fig. 1). This volume (volume XI) continues the natural fuels photo series and includes three series documenting sagebrush sites that are ecotonal with grasses, western juniper, and ponderosa pine in eastern Oregon that in some cases may represent habitat or potential habitat for the greater sage-grouse (*Centrocercus urophasianus*) and one series with sites indicative of northern spotted owl nesting habitat in forests in Washington and Oregon. The sites in this volume broaden the range of conditions presented in Volume I (Ottmar et al. 1998), Volume IV (Ottmar et al. 2000), and Volume X (Ottmar et al. 2007) and provide a basis for appraising and describing woody material, vegetation, and stand conditions in many sagebrush-steppe and forested ecosystems in Washington and Oregon.

Figure 1—Photo series sample area layout. The sample area extended 180 and 150 ft from the camera for the three sagebrush series and spotted owl nesting habitat series, respectively. Thirty random azimuth line transects (one to two per node) and 12 to 13 clipped vegetation plots (one to three per arc) were located within the sample area. Trees and seedlings were inventoried in the entire sample area when present for the three sagebrush series, or with 4 point-centered quarter points and 12 systematically located sample plots for spotted owl nesting habitat series. Shrubs were measured prior to harvesting in the clipped vegetation plots (sagebrush series only).



WHY IS THE PHOTO SERIES NEEDED?

The 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 habitat (a specific objective of this volume), 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 series in this volume were selected to represent a range of conditions in sagebrush-steppe ecosystems in eastern Oregon, and in forests indicative of northern spotted owl nesting habitat in Washington and Oregon. The sites are organized into four series: sagebrush with grass, sagebrush with juniper, sagebrush with ponderosa pine, and spotted owl nesting habitat. Each sagebrush series is organized by biophysical setting and successional stage as defined by the LANDFIRE Biophysical Setting Model descriptions (Rollins and Frame 2006). Sites in the spotted owl series are grouped by spotted owl province as designated by the Northwest Forest Plan, and province groupings are ordered generally along a gradient of decreasing annual precipitation. Furthermore, within provinces, sites are ordered along a moisture gradient from drier to wetter as indicated by the LANDFIRE Biophysical Setting Model descriptions. 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

A large, wide-angle photograph is included with all series to help land managers appraise natural fuel, vegetation, and stand structure conditions. Stereo-pair photographs are also included for the spotted owl nesting habitat series. The three-dimensional image obtained by viewing the photographs with a stereoscope will improve the ability of the land manager to make assessments in the field. The marker in all of the photographs is a 1-ft square, and the pole is painted in contrasting colors at 1-ft intervals to provide scale. The pole is 6-ft tall and 30 ft from the camera. The summary data relate to an area slightly narrower than the wide-angle view in the sagebrush series, and to the field of view of the stereo-pair photographs for the spotted owl nesting habitat series. Note that 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 four series. Each site in the sagebrush with grass series is shown on a single page, and each site in the sagebrush with juniper, sagebrush with ponderosa pine, and spotted owl nesting habitat series is arranged to

occupy two facing pages. The sagebrush with grass series includes general site information; summaries of vegetation composition and structure, and down woody material loading by size class; and structure and biomass data for selected shrub species. In the case of facing pages, the upper page contains a wide-angle photograph, general site and stand information, and forest floor information, where applicable. The lower page includes summaries of overstory structure and composition; understory vegetation structure and composition; downed woody material loading and density by size class. Structure and biomass data for selected shrub species is also included for the sagebrush with juniper and sagebrush with ponderosa pine series.

SITE AND STAND INFORMATION

The camera point of each site was located with a global positioning system receiver, and aspect and slope were measured with a compass and clinometer, respectively. Cover type (Society of American Foresters or Society for Range Management; Eyre 1980, Shiflet 1994) and biophysical setting, as defined by LANDFIRE (Rollins and Frame 2006), were assigned for all sites. In addition, ecological community classification (to the association level; NatureServe 2009) and spotted owl province, as designated in the Northwest Forest Plan (<http://www.reo.gov/gis/data/gisdata/phypro.htm>), were noted for the sagebrush and spotted owl nesting habitat sites, respectively. Juniper woodland successional stage (Miller et al. 2005) was noted for the sagebrush with juniper series. Shrub, forb, and graminoid species coverage, along with litter coverage and mineral soil exposure, were estimated by using line intercept transects (Canfield 1941). Species coverage is listed in order of abundance for the sagebrush series and in alphabetical order for the spotted owl nesting habitat series.¹ Where species-specific coverage is not reported, understory vegetation coverage was estimated by lifeform category (tall shrub, low shrub, forb, or graminoid) by using the line intercept transects. The listing of species was not meant to be a complete vegetation inventory and may represent only a portion of the species richness of the sampled areas.

For the series with a tree component, crown closure was measured with a forest densitometer (95 systematically located points). Tree and seedling composition and density for the sagebrush with juniper and sagebrush with ponderosa pine series were determined by a total inventory of the sample area; all trees less than 4.5-ft tall were considered seedlings. Seedling composition and density for the spotted owl nesting habitat series were measured on twelve 0.005-ac circular plots (fig. 1). Overstory tree (trees >4 in diameter at breast height; [d.b.h].²) composition was estimated by size classes by using the point-centered quarter method (Cottam and Curtis 1956) with four points arranged in a 132-ft grid centered on the area behind the sign in the photographs. Points were arranged so that all sampling occurred within the boundaries of the old-growth stand being characterized.

VEGETATION INFORMATION

Vegetation heights were measured at 25 to 30 points located systematically throughout the sample area. Vegetation biomass was determined by sampling 12 to 13 square, clipped vegetation plots (21.53 ft² each for herbaceous species and small-stature shrubs, and 43.06 ft² each for large-stature shrubs for the sagebrush-dominated series; 10.76 ft² each for all understory vegetation for the spotted owl nesting habitat series) located systematically throughout the sample area (fig. 1). All live and dead vegetation rooted within each square plot was clipped at ground level, separated, and returned to the laboratory for oven drying. Vegetation and other collected materials were oven dried at a minimum of 158 °F for at least 48 hours before weighing and determination of area loading.

¹ A list of scientific and common species names used in this volume appears on pages 7-8.

² D.b.h. is measured 4.5 ft above the ground.

FOREST FLOOR INFORMATION

Litter coverage, measured by using the line intercept method (Canfield 1941), is reported with site information for the three sagebrush series; litter loading was measured by collecting material in thirteen 21.53-ft² plots. For the spotted owl nesting habitat series, litter and duff depth were calculated as the average of measurements taken every 5 ft between the 30- and 150-ft arcs of the center transect (fig. 1). Litter and duff depth 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 are not unit-wide averages, and do not necessarily sum to total depth. Loading was calculated from depth and bulk density values derived from field measurements.³ Constancy, an indicator of how consistently the various forest floor components occur in the sample area, is expressed as a percentage of the total number of measurements.

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).⁴ Woody material in 1-, 10-, and 100-hour-and-larger size classes was tallied on transects that were 5, 10, and 30 ft long, respectively. The decay class and the actual diameter at the point of intersection were measured for all pieces >3 in in diameter. All woody material less than or equal to 3 in 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 in the sagebrush with grass series was measured by collecting all 1-, 10-, and 100-hour pieces in thirteen 21.53-ft² plots nested within the larger clipped vegetation plots. Collected woody material was oven dried at a minimum of 158 °F for at least 48 hours before weighing and determination of area loading.

SAPLINGS AND TREES

Overstory tree and sapling (i.e., trees ≤4 in d.b.h.) composition and density were determined by a total inventory of the sample area for the sagebrush with juniper and sagebrush with ponderosa pine series. Composition and density of overstory trees and saplings were determined by using the point-centered quarter method (Cottam and Curtis 1956) with four points arranged in a 132-ft grid centered on the area behind the sign in the photographs and twelve 0.005-ac circular plots (fig. 1), respectively, for the spotted owl nesting habitat series. Values in Warde and Petranks (1981) were used to correct for cases in which trees in a particular size class were not present in one or more quadrants at a point-centered quarter sample point. Tree measurement data were summarized by d.b.h. size class and by tree status (all, live, or dead). 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. For the sagebrush with juniper and sagebrush with ponderosa pine series, live crown mass (branchwood and foliage) was calculated from species- and size-specific allometric equations (Brown 1978, Gholz 1980).

³ Forest floor bulk density values used for each material type appear under “Notes to Users.”

⁴ 1-, 10-, 100-, and 1,000-hour timelag fuels are defined as woody material ≤0.25 in, 0.26 to 1.0 in, 1.1 to 3.0 in, and >3.0 in in diameter, respectively.

SELECTED SHRUB SPECIES

Individual plants of all encountered in the sagebrush series were measured in systematically located plots (fig. 1). The density and percentage of all stems that were dead is based on the number of plants rooted in thirteen 43.06-ft² plots. 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). Height is given as the average and maximum height of all sampled individuals of a given species. Live and dead shrubs and live and dead branches of live shrubs were separated following harvesting; live and dead material was further separated into size classes (foliage and ≤1-in-diameter branches and stems, and >1-in-diameter branches and stems). Depending on the abundance of the shrub layer, separated shrub material was either oven dried and weighed to determine loading, or weighed while still wet in the field and subsampled to determine moisture content. Adjustment to an oven-dry basis for each size class and status was made for each plot by multiplying the field (wet) weight by the ratio of oven-dry weight:wet weight of moisture subsamples from that plot.

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, 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).

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

- Observe each fuel and vegetation characteristic (e.g., 1.1- to 3.0-in 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 characteristic of interest.

The total biomass or stand condition can then be calculated by summing the estimates. If the site being inventoried has areas with obvious differences in composition, structure, or condition, the user should make separate determinations for each area and then weight and sum the characteristics for the whole site.

Characteristics not distinguishable in the photographs are litter or forest floor depth, loading, and bulk density. 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 original (Albini 1976) or 40 new (Scott and Burgan 2005) fire behavior fuel models are very general and broadly applied. Each photo series encompasses a wider range of conditions, and individual sites represent fuel characteristics at greater resolution than can be gained by using fuel models; consequently, we chose not to assign one of these existing fuel models 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.

SPECIES LIST

Scientific and common species names are from U.S. Department of Agriculture, Natural Resources Conservation Service (2012). Note that *Quercus chrysolepis* was inventoried as both a tree and a shrub.

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
TREES:		SHRUBS:	
<i>Abies amabilis</i> (Douglas ex Loudon) Douglas ex Forbes	Pacific silver fir	<i>Arctostaphylos nevadensis</i> A. Gray	Pinemat manzanita
<i>Abies concolor</i> (Gord. & Glend.) Lindl. ex Hildebr.	White fir	<i>Artemisia arbuscula</i> Nutt.	Little sagebrush
<i>Abies grandis</i> (Douglas ex D. Don) Lindl.	Grand fir	<i>Artemisia tridentata</i> Nutt.	Big sagebrush
<i>Abies magnifica</i> A. Murray bis	California red fir	<i>Artemisia tridentata</i> Nutt. ssp. <i>vaseyana</i> (Rydb.) Beetle	Mountain big sagebrush
<i>Acer circinatum</i> Pursh	Vine maple	<i>Artemisia tridentata</i> Nutt. ssp. <i>wyomingensis</i> Beetle & Young	Wyoming big sagebrush
<i>Acer macrophyllum</i> Pursh	Big leaf maple	<i>Chimaphila menziesii</i> (R. Br. ex D. Don) Spreng.	Little prince's pine
<i>Alnus rubra</i> Bong.	Red alder	<i>Chimaphila umbellata</i> (L.) W. Bartram	Pipsissewa
<i>Arbutus menziesii</i> Pursh	Pacific madrone	<i>Chrysolepis chrysophylla</i> (Douglas ex Hook.) Hjelmqvist	Giant chinquapin
<i>Calocedrus decurrens</i> (Torr.) Florin	Incense cedar	<i>Chrysothamnus viscidiflorus</i> (Hook.) Nutt.	Yellow rabbitbrush
<i>Chamaecyparis lawsoniana</i> (A. Murray bis) Parl.	Port Orford cedar	<i>Gaultheria ovatifolia</i> A. Gray	Western teaberry
<i>Chrysolepis chrysophylla</i> (Douglas ex Hook.) Hjelmqvist	Giant chinquapin	<i>Gaultheria shallon</i> Pursh	Salal
<i>Cornus nuttallii</i> Audubon ex Torr. & A. Gray	Pacific dogwood	<i>Holodiscus discolor</i> (Pursh) Maxim.	Oceanspray
<i>Juniperus occidentalis</i> Hook.	Western juniper	<i>Leptodactylon pungens</i> Torr. ex Nutt.	Granite prickly phlox
<i>Lithocarpus densiflorus</i> (Hook. & Arn.) Rehder	Tanoak	<i>Mahonia aquifolium</i> (Pursh) Nutt.	Hollyleaved barberry
<i>Pinus contorta</i> Douglas ex Loudon	Lodgepole pine	<i>Mahonia nervosa</i> (Pursh) Nutt.	Cascade barberry
<i>Pinus lambertiana</i> Douglas	Sugar pine	<i>Mahonia repens</i> (Lindl.) G. Don	Creeping barberry
<i>Pinus monticola</i> Douglas ex D. Don	Western white pine	<i>Oplopanax horridus</i> (Sm.) Miq.	Devilsclub
<i>Pinus ponderosa</i> Lawson and C. Lawson	Ponderosa pine	<i>Purshia tridentata</i> (Pursh) DC.	Antelope bitterbrush
<i>Pseudotsuga menziesii</i> (Mirb.) Franco	Douglas-fir	<i>Rhododendron macrophyllum</i> D. Don ex G. Don	Pacific rhododendron
<i>Quercus</i> spp.	Oak	<i>Ribes</i> spp.	Currant
<i>Quercus chrysolepis</i> Liebm.	Canyon live oak	<i>Ribes sanguineum</i> Pursh	Redflower currant
<i>Quercus kelloggii</i> Newberry	California black oak	<i>Rosa gymnocarpa</i> Nutt.	Dwarf rose
<i>Taxus brevifolia</i> Nutt.	Pacific yew	<i>Rubus nivalis</i> Douglas ex Hook.	Snow raspberry
<i>Thuja plicata</i> Donn ex D. Don	Western redcedar	<i>Rubus ursinus</i> Cham. & Schltdl.	California blackberry
<i>Tsuga heterophylla</i> (Raf.) Sarg.	Western hemlock	<i>Symphoricarpos albus</i> (L.) S.F. Blake	Common snowberry
<i>Tsuga mertensiana</i> (Bong.) Carrière	Mountain hemlock	<i>Symphoricarpos longiflorus</i> A. Gray	Desert snowberry
<i>Umbellularia californica</i> (Hook. & Arn.) Nutt.	California laurel		

SCIENTIFIC NAME**SHRUBS (CONTINUED):**

Symphoricarpos mollis Nutt.
Toxicodendron diversilobum (Torr. & A. Gray)
 Greene
Vaccinium spp.
Vaccinium alaskaense Howell
Vaccinium membranaceum Douglas ex Torr.
Vaccinium ovatum Pursh
Vaccinium parvifolium Sm.

GRASSES:

Achnatherum hymenoides
 (Roem. & Schult.) Barkworth
Achnatherum thurberianum (Piper)
 Barkworth
Agropyron cristatum (L.) Gaertn.
Bromus tectorum L.
Calamagrostis rubescens Buckley
Carex spp.
Elymus elymoides (Raf.) Swezey
Festuca spp.
Festuca idahoensis Elmer
Hesperostipa comata (Trin. &
 Rupr.) Barkworth
Koeleria macrantha (Ledeb.) Schult.
Pseudoroegneria spicata (Pursh) Á. Löve
Taeniatherum caput-medusae (L.) Nevski

COMMON NAME

Creeping snowberry
 Pacific poison oak

 Blueberry
 Alaska blueberry
 Thinleaf huckleberry
 California huckleberry
 Red huckleberry

Indian ricegrass

 Thurber's needlegrass

 Crested wheatgrass
 Cheatgrass
 Pinegrass
 Sedge
 Squirreltail
 Fescue
 Idaho fescue
 Needle and thread

 Prairie Junegrass
 Bluebunch wheatgrass
 Medusahead

SCIENTIFIC NAME**FORBS:**

Achlys triphylla (Sm.) DC.
Adenocaulon bicolor Hook.
Antennaria spp. Gaertn.
Apocynum androsaemifolium L.
Arnica latifolia Bong.
Astragalus spp.
Clintonia uniflora (Menzies ex
 Schult. & Schult. f.) Kunth
Fragaria vesca L.
Galium triflorum Michx.
Goodyera oblongifolia Raf.
Lupinus spp.
Maianthemum racemosum (L.) Link
Maianthemum stellatum (L.) Link
Polypodium glycyrrhiza D.C. Eaton
Polystichum munitum (Kaulf.) C. Presl
Prosartes hookeri Torr. var. *hookeri*
Pteridium aquilinum (L.) Kuhn
Pyrola spp.
Pyrola picta Sm.
Tragopogon dubius Scop.
Trientalis borealis Raf.
Trillium ovatum Pursh
Vancouveria hexandra (Hook.) C. Morren & Decne.
Vicia spp.
Xerophyllum tenax (Pursh) Nutt.

COMMON NAME

Sweet after death
 American trailplant
 Pussytoes
 Spreading dogbane
 Broadleaf arnica
 Milkvetch
 Bride's bonnet

 Woodland strawberry
 Fragrant bedstraw
 Western rattlesnake plantain
 Lupine
 Feathery false lily of the valley
 Starry false lily of the valley
 Licorice fern
 Western swordfern
 Drops-of-gold
 Western bracken fern
 Wintergreen
 Whiteveined wintergreen
 Yellow salsify
 Starflower
 Pacific trillium
 White insideout flower
 Vetch
 Common beargrass

METRIC CONVERSIONS

1 inch (in) = 2.54 centimeters (cm)
1 foot (ft) = 0.3048 meter (m)
1 square foot (ft²) = 0.0929 square meter (m²)
1 acre (ac) = 4046.9 square meters (m²)
1 acre (ac) = 0.4047 hectare (ha)
1 pound (lb) = 0.4536 kilogram (kg)
1 ton = 907.2 kilograms (kg)
(Degrees Fahrenheit – 32) × (5/9) = Degrees Celsius

1 pound/acre (lb/ac) = 1.1209 E-04 kilograms/square meter (kg/m²)
1 pound/acre (lb/ac) = 1.1209 kilograms/hectare (kg/ha)
1 ton/acre (ton/ac) = 0.2242 kilogram/square meter (kg/m²)
1 ton/acre (ton/ac) = 2241.7023 kilograms/hectare (kg/ha)
1 ton·acre⁻¹·inch⁻¹ (ton·ac⁻¹·in⁻¹) = 8.8256E-03 grams/cubic centimeter (g/cm³)
1 ton·acre⁻¹·inch⁻¹ (ton·ac⁻¹·in⁻¹) = 8825.6 grams/cubic meter (g/m³)
1 ton·acre⁻¹·inch⁻¹ (ton·ac⁻¹·in⁻¹) = 8.8256 kilograms/cubic meter (kg/m³)

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EASTERN OREGON
SAGEBRUSH WITH GRASS
PHOTO SERIES
A SERIES OF 12 SITES
EOSG 01 THROUGH EOSG 12

NOTES TO USERS:

1. Sites are grouped by biophysical setting and ordered by successional stage as defined by the LANDFIRE Biophysical Settings Model descriptions (Rollins and Frame 2006). Figure 2, however, shows how sites would be arranged in order of increasing surface fuel loading (i.e., standing live and dead vegetation, litter, and dead and down woody fuels).
2. A list of scientific and common species names can be found on pages 7-8.
3. Photographs were taken in July 2008. Sampling was performed in July and August 2008.
4. The year of sampling (2008) was considered an “above average” growing year for grasses and other herbaceous vegetation.
5. The marker in these photographs is a 1-ft square, and the pole is painted in contrasting colors at 1-ft intervals. The pole is 30 ft from the camera and is 6-ft tall. Note that no sampling occurs in the foreground between the camera and the sign.
6. Litter and woody material loading are reported in tons per acre; vegetation loading is reported in pounds per acre.
7. Trace coverage, constancy, loading, or biomass is indicated either as “trace” or “t.” The designation of “na” indicates cases where data are missing or “not available.”
8. This series predominantly covers a range of biophysical settings for *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush), *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush), and *Artemisia arbuscula* (low sagebrush). Also included in this series are two sites (EOSG 01, EOSG 02) dominated by the invasive annual grass *Taeniatherum caput-medusae* (medusahead); and two sites (EOSG 03, EOSG 04) dominated by the naturalized perennial grass *Agropyron cristatum* (crested wheatgrass).

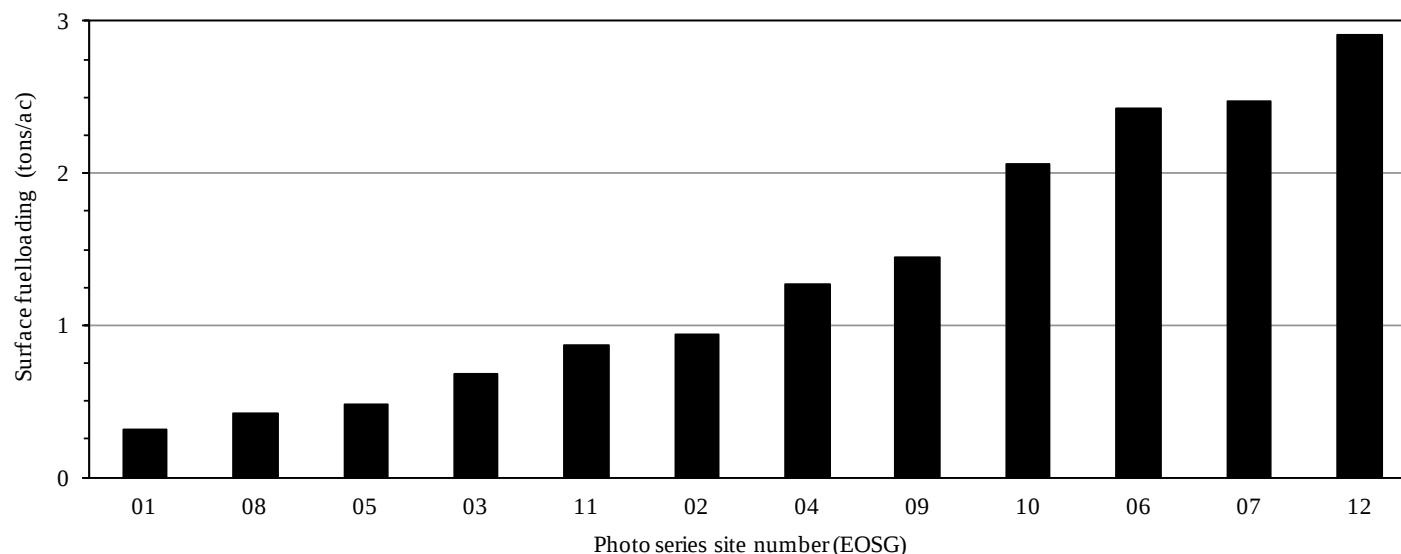


Figure 2—Eastern Oregon sagebrush with grass photo series (EOSG) in order of increasing surface fuel loading.



SITE INFORMATION

Site location: N 44° 16' 10.4" W 117° 14' 18.1"
Elevation: 2,580 ft Aspect: 170° Slope: 4%

Plant association: Invasive annual grassland
Cover type: Invasive annual grassland
Biophysical setting: Inter-Mountain Basins Big Sagebrush Steppe

Litter loading: 0.00 tons/ac
Litter coverage: 0%
Mineral soil exposure: 11%

Species (% cover): *Taeniatherum caput-medusae* (61), *Tragopogon dubius* (3), *Achnatherum thurberianum* (1), *Bromus tectorum* (t), *Hesperostipa comata* (t)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	0	3	62
Avg height (ft)	--	0.9	0.5
Biomass (lbs/ac)	0	115	502

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	0.00	--	0.00
0.26 - 1.0	0.00	--	0.00
>1.0	0.00	--	0.00
Total	0.00	0.00	0.00

SELECTED SHRUB SPECIES

[illegible]

EOSG 02 EASTERN OREGON SAGEBRUSH WITH GRASS



SITE INFORMATION

Site location: N 44° 15' 16.1" W 117° 20' 36.2"
 Elevation: 3,210 ft Aspect: 30° Slope: 19%

Plant association: Invasive annual grassland
 Cover type: Invasive annual grassland
 Biophysical setting: Inter-Mountain Basins Big Sagebrush Steppe

Litter loading: 0.01 tons/ac
 Litter coverage: trace
 Mineral soil exposure: 4%

Species (% cover): *Taeniatherum caput-medusae* (27), *Artemisia tridentata* (4),
Chrysothamnus viscidiflorus (2), *Achnatherum thurberianum* (2),
Hesperostipa comata (1), *Bromus tectorum* (t), *Elymus elymoides* (t)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	7	2	30
Avg height (ft)	2.0	1.0	0.9
Biomass (lbs/ac)	1,542	29	278

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	0.00	--	0.00
0.26 - 1.0	0.00	--	0.00
>1.0	0.00	--	0.00
Total	0.00	0.00	0.00

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Artemisia tridentata</i>	934	17	1.8	3.7	2.0	3.7	1,092	0	343	0	1,435
<i>Chrysothamnus viscidiflorus</i>	156	0	2.1	3.5	1.6	2.0	107	0	0	0	107



SITE INFORMATION

Site location: N 42° 26' 26.6" W 119° 15' 13.7"
Elevation: 4,985 ft Aspect: 60° Slope: 1%

Plant association: *Artemisia tridentata* ssp. *wyomingensis*/
Pseudoroegneria spicata shrubland

Cover type: Crested wheatgrass (SRM 614)

Biophysical setting: Inter-Mountain Basins Big Sagebrush Shrubland

Litter loading: 0.02 tons/ac

Litter coverage: 14%

Mineral soil exposure: 51%

Species (% cover): *Agropyron cristatum* (12), *Bromus tectorum* (1), *Elymus elymoides* (t), *Astragalus* spp. (t), *Achnatherum thurberianum* (t)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	0	1	13
Avg height (ft)	--	1.4	1.6
Biomass (lbs/ac)	0	4	1,324

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	0.00	--	0.00
0.26 - 1.0	0.00	--	0.00
>1.0	0.00	--	0.00
Total	0.00	0.00	0.00

SELECTED SHRUB SPECIES

[illegible]

EOSG 04 EASTERN OREGON SAGEBRUSH WITH GRASS



SITE INFORMATION

Site location: N 44° 16' 22.9" W 117° 13' 11.9"
 Elevation: 2,200 ft Aspect: 160° Slope: 2%

Plant association: *Artemisia tridentata* ssp. *wyomingensis*/
Pseudoroegneria spicata shrubland

Cover type: Crested wheatgrass (SRM 614)

Biophysical setting: Inter-Mountain Basins Big Sagebrush Steppe

Litter loading: trace

Litter coverage: trace

Mineral soil exposure: 23%

Species (% cover): *Agropyron cristatum* (8), *Artemisia tridentata* (7),
Achnatherum thurberianum (1), *Purshia tridentata* (1), *Hesperostipa*
comata (1), *Bromus tectorum* (t), *Festuca idahoensis* (t)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	8	trace	10
Avg height (ft)	2.1	1.1	1.8
Biomass (lbs/ac)	2,023	6	491

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	0.00	--	0.00
0.26 - 1.0	0.02	--	0.02
>1.0	0.00	--	0.00
Total	0.02	0.00	0.02

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Artemisia tridentata</i>	1,686	40	1.8	3.3	1.5	2.4	1,036	339	648	0	2,023
<i>Purshia tridentata</i>	na	na	na	na	na	na	trace	0	trace	0	trace

**SITE INFORMATION**

Site location: N 42° 58' 09.3" W 119° 54' 29.5"
 Elevation: 5,300 ft Aspect: 33° Slope: 3%

Plant association: *Artemisia arbuscula*/*Achnatherum thurberianum* shrubland
 Cover type: Low sagebrush (SRM 406)
 Biophysical setting: Columbia Plateau Low Sagebrush Steppe – A

Litter loading: 0.04 tons/ac
 Litter coverage: 11%
 Mineral soil exposure: 24%

Species (% cover): *Bromus tectorum* (24), *Achnatherum thurberianum* (5),
Pseudoroegneria spicata (2), *Chrysothamnus viscidiflorus* (1), *Elymus*
elymoides (1), *Koeleria macrantha* (1), *Festuca idahoensis* (t),
Hesperostipa comata (t)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	1	4	33
Avg height (ft)	1.4	1.3	1.1
Biomass (lbs/ac)	67	82	714

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	trace	--	trace
0.26 - 1.0	0.01	--	0.01
>1.0	0.00	--	0.00
Total	0.01	0.00	0.01

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Chrysothamnus viscidiflorus</i>	253	0	1.6	2.1	1.7	2.5	67	0	0	0	67

EOSG 06 EASTERN OREGON SAGEBRUSH WITH GRASS



SITE INFORMATION

Site location: N 42° 55' 34.1" W 119° 57' 49.6"
 Elevation: 5,600 ft Aspect: 266° Slope: 7%

Plant association: *Artemisia arbuscula*/Achnatherum thurberianum shrubland

Cover type: Low sagebrush (SRM 406)

Biophysical setting: Columbia Plateau Low Sagebrush Steppe – B

Litter loading: 0.02 tons/ac

Litter coverage: 2%

Mineral soil exposure: 22%

Species (% cover): *Artemisia arbuscula* (18), *Achnatherum thurberianum* (5),
Pseudoroegneria spicata (1), *Bromus tectorum* (1), *Koeleria macrantha* (1),
Elymus elymoides (1), *Lupinus* spp. (1)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	18	1	9
Avg height (ft)	1.3	0.3	0.9
Biomass (lbs/ac)	4,538	8	106

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	trace	--	trace
0.26 - 1.0	0.08	--	0.08
>1.0	0.00	--	0.00
Total	0.08	0.00	0.08

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Artemisia arbuscula</i>	7,082	21	1.2	1.5	1.1	2.0	2,880	318	1,263	77	4,538



SITE INFORMATION

Site location: N 42° 58' 16.6" W 119° 54' 47.1"
 Elevation: 5,330 ft Aspect: 33° Slope: 3%

Plant association: *Artemisia arbuscula*/*Achnatherum thurberianum* shrubland
 Cover type: Low sagebrush (SRM 406)
 Biophysical setting: Columbia Plateau Low Sagebrush Steppe – C

Litter loading: 0.02 tons/ac
 Litter coverage: 3%
 Mineral soil exposure: 28%

Species (% cover): *Artemisia arbuscula* (23), *Antennaria* spp. (8),
Achnatherum thurberianum (4), *Koeleria macrantha* (2), *Elymus elymoides* (1),
Bromus tectorum (1), *Pseudoroegneria spicata* (t), *Agropyron cristatum* (1),
Chrysothamnus viscidiflorus (1), *Leptodactylon pungens* (t), *Lupinus* spp. (t)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	24	8	9
Avg height (ft)	1.3	0.9	1.2
Biomass (lbs/ac)	4,677	18	208

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	0.00	--	0.00
0.26 - 1.0	trace	--	trace
>1.0	0.00	--	0.00
Total	trace	0.00	trace

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Artemisia arbuscula</i>	7,005	16	1.4	2.8	1.1	2.3	3,585	0	792	0	4,377
<i>Chrysothamnus viscidiflorus</i>	1,090	0	1.3	1.6	1.3	1.6	300	0	0	0	300
<i>Leptodactylon pungens</i>	trace	0	na	na	na	na	trace	0	0	0	trace

EOSG 08 EASTERN OREGON SAGEBRUSH WITH GRASS



SITE INFORMATION

Site location: N 42° 21' 11.3" W 119° 24' 29.8"
 Elevation: 5,480 ft Aspect: 280° Slope: 3%
 Plant association: *Artemisia tridentata* ssp. *wyomingensis*/*Hesperostipa comata* shrubland
 Cover type: Wyoming big sagebrush (SRM 403)
 Biophysical setting: Inter-Mountain Basins Big Sagebrush Steppe – A
 Litter loading: 0.02 tons/ac
 Litter coverage: 7%
 Mineral soil exposure: 37%
 Species (% cover): *Achnatherum thurberianum* (8), *Bromus tectorum* (2), *Achnatherum hymenoides* (2), *Elymus elymoides* (1), *Astragalus* spp. (t), *Chrysothamnus viscidiflorus* (t)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	trace	2	13
Avg height (ft)	1.5	1.5	1.3
Biomass (lbs/ac)	trace	36	707

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	trace	--	trace
0.26 - 1.0	0.03	--	0.03
>1.0	0.00	--	0.00
Total	0.03	0.00	0.03

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Chrysothamnus viscidiflorus</i>	trace	0	na	na	na	na	trace	0	0	0	trace



SITE INFORMATION

Site location: N 42° 19' 46.3" W 119° 24' 36.2"
 Elevation: 5,580 ft Aspect: 294° Slope: 4%

Plant association: *Artemisia tridentata* ssp. *wyomingensis*/*Hesperostipa comata* shrubland

Cover type: Wyoming big sagebrush (SRM 403)

Biophysical setting: Inter-Mountain Basins Big Sagebrush Steppe – B

Litter loading: trace

Litter coverage: 1%

Mineral soil exposure: 44%

Species (% cover): *Artemisia tridentata* ssp. *wyomingensis* (11), *Antennaria* spp. (4), *Achnatherum thurberianum* (4), *Leptodactylon pungens* (3), *Chrysothamnus viscidiflorus* (2), *Pseudoroegneria spicata* (1), *Elymus elymoides* (t)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	16	4	5
Avg height (ft)	1.3	0.3	1.4
Biomass (lbs/ac)	2,701	87	90

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	0.00	--	0.00
0.26 - 1.0	0.01	--	0.01
>1.0	0.00	--	0.00
Total	0.01	0.00	0.01

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Artemisia tridentata</i>	2,957	13	1.2	1.4	0.9	2.2	1,228	363	354	98	2,043
<i>Chrysothamnus viscidiflorus</i>	3,269	0	0.9	0.7	0.6	1.1	331	0	0	0	331
<i>Leptodactylon pungens</i>	3,891	0	0.5	0.2	0.2	0.7	327	0	0	0	327

EOSG 10 EASTERN OREGON SAGEBRUSH WITH GRASS



SITE INFORMATION

Site location: N 42° 22' 07.4" W 119° 24' 02.3"
 Elevation: 5,460 ft Aspect: 274° Slope: 4%

Plant association: *Artemisia tridentata* ssp. *wyomingensis*/*Hesperostipa comata* shrubland

Cover type: Wyoming big sagebrush (SRM 403)

Biophysical setting: Inter-Mountain Basins Big Sagebrush Steppe – C

Litter loading: trace

Litter coverage: trace

Mineral soil exposure: 57%

Species (% cover): *Artemisia tridentata* ssp. *wyomingensis* (10), *Hesperostipa comata* (3), *Achnatherum thurberianum* (2), *Chrysothamnus viscidiflorus* (1), *Leptodactylon pungens* (1), *Elymus elymoides* (1)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	11	trace	5
Avg height (ft)	1.7	0.7	1.5
Biomass (lbs/ac)	3,755	9	239

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	trace	--	trace
0.26 - 1.0	0.06	--	0.06
>1.0	0.00	--	0.00
Total	0.06	0.00	0.06

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Artemisia tridentata</i>	1,634	14	1.5	2.5	1.5	3.1	920	869	936	532	3,257
<i>Chrysothamnus viscidiflorus</i>	856	0	0.6	0.5	0.7	1.7	442	0	0	0	442
<i>Leptodactylon pungens</i>	1,557	0	0.5	0.2	0.5	0.9	56	0	0	0	56



SITE INFORMATION

Site location: N 42° 21' 51.7" W 119° 21' 12.7"
 Elevation: 5,960 ft Aspect: 93° Slope: 9%

Plant association: *Artemisia tridentata* ssp. *vaseyana*/*Pseudoroegneria spicata* shrubland

Cover type: Mountain big sagebrush (SRM 402)

Biophysical setting: Inter-Mountain Basins Montane Sagebrush Steppe – A

Litter loading: 0.02 tons/ac

Litter coverage: 5%

Mineral soil exposure: 12%

Species (% cover): *Chrysothamnus viscidiflorus* (12), *Achnatherum thurberianum* (6), *Elymus elymoides* (2), *Bromus tectorum* (2), *Pseudoroegneria spicata* (1), *Symphoricarpos longiflorus* (1), *Artemisia tridentata* ssp. *vaseyana* (1)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	13	1	11
Avg height (ft)	1.3	1.0	1.5
Biomass (lbs/ac)	1,032	31	580

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	trace	--	trace
0.26 - 1.0	0.03	--	0.03
>1.0	0.00	--	0.00
Total	0.03	0.00	0.03

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Chrysothamnus viscidiflorus</i>	4,281	2	1.2	1.1	1.2	2.1	808	0	220	0	1,028
<i>Symphoricarpos longiflorus</i>	78	0	1.2	1	1.6	1.6	13	0	0	0	13
<i>Artemisia tridentata</i>	trace	0	na	na	na	na	trace	0	0	0	trace

EOSG 12 EASTERN OREGON SAGEBRUSH WITH GRASS



SITE INFORMATION

Site location: N 42° 19' 02.8" W 119° 21' 02.4"
 Elevation: 5,995 ft Aspect: 180° Slope: 3%

Plant association: *Artemisia tridentata* ssp. *vaseyana*/*Pseudoroegneria spicata* shrubland

Cover type: Mountain big sagebrush (SRM 402)

Biophysical setting: Inter-Mountain Basins Montane Sagebrush Steppe - C

Litter loading: 0.03 tons/ac

Litter coverage: 2%

Mineral soil exposure: 43%

Species (% cover): *Artemisia tridentata* ssp. *vaseyana* (15), *Achnatherum thurberianum* (5), *Chrysothamnus viscidiflorus* (3), *Lupinus* spp. (1), *Koeleria macrantha* (t), *Elymus elymoides* (t), *Leptodactylon pungens* (t)

VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Coverage (%)	18	1	5
Avg height (ft)	1.9	0.3	1.2
Biomass (lbs/ac)	4,837	68	155

WOODY MATERIAL

Diameter (in)	Loading in tons/ac		
	Sound	Rotten	Total
≤0.25	0.01	--	0.01
0.26 - 1.0	0.34	--	0.34
>1.0	0.00	--	0.00
Total	0.35	0.00	0.35

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Artemisia tridentata</i>	4,981	16	1.3	1.6	1.7	3.2	2,554	372	957	108	4,532
<i>Chrysothamnus viscidiflorus</i>	3,191	0	0.7	0.5	1.1	2.0	264	0	0	0	264
<i>Leptodactylon pungens</i>	467	0	0.3	0.1	0.1	0.1	41	0	0	0	41

EASTERN OREGON
SAGEBRUSH WITH JUNIPER
PHOTO SERIES
A SERIES OF 3 SITES
EOSJ 01 THROUGH EOSJ 03

NOTES TO USERS:

1. Sites are grouped by biophysical setting and ordered by successional stage as defined by the LANDFIRE Biophysical Settings Model descriptions (Rollins and Frame 2006). Figure 3, however, shows that site order would be the same if arranged in order of increasing surface fuel loading (i.e., standing live and dead vegetation except for trees, litter, and dead and down woody fuels).
2. A list of scientific and common species names can be found on pages 7-8.
3. Photographs were taken in July 2008. Sampling was performed in July and August 2008.
4. The year of sampling (2008) was considered an “above average” growing year for grasses and other herbaceous vegetation.
5. The marker in these photographs is a 1-ft square, and the pole is painted in contrasting colors at 1-ft intervals. The pole is 30 ft from the camera and is 6-ft tall. Note that no sampling occurs in the foreground between the camera and the sign.
6. Litter and moss depth were measured at 75 systematically located points within the sample area for EOSJ03. Average litter or moss depth was multiplied by its coverage and bulk density to determine loading. Ten 1.0-square-foot samples were collected onsite from which to estimate western juniper litter bulk density ($17.11 \text{ tons} \cdot \text{ac}^{-1} \cdot \text{in}^{-1}$). Moss bulk density ($2.44 \text{ tons} \cdot \text{ac}^{-1} \cdot \text{in}^{-1}$) is from Ottmar et al. (2002).
7. Litter and woody material loading are reported in tons per acre; vegetation loading is reported in pounds per acre.
8. Trace coverage, constancy, loading, or biomass is indicated either as “trace” or “t.” The designation of “na” indicates cases where data are missing or “not available.”
9. A distinction is made between rotten and sound woody material for pieces larger than 3 inches in diameter.

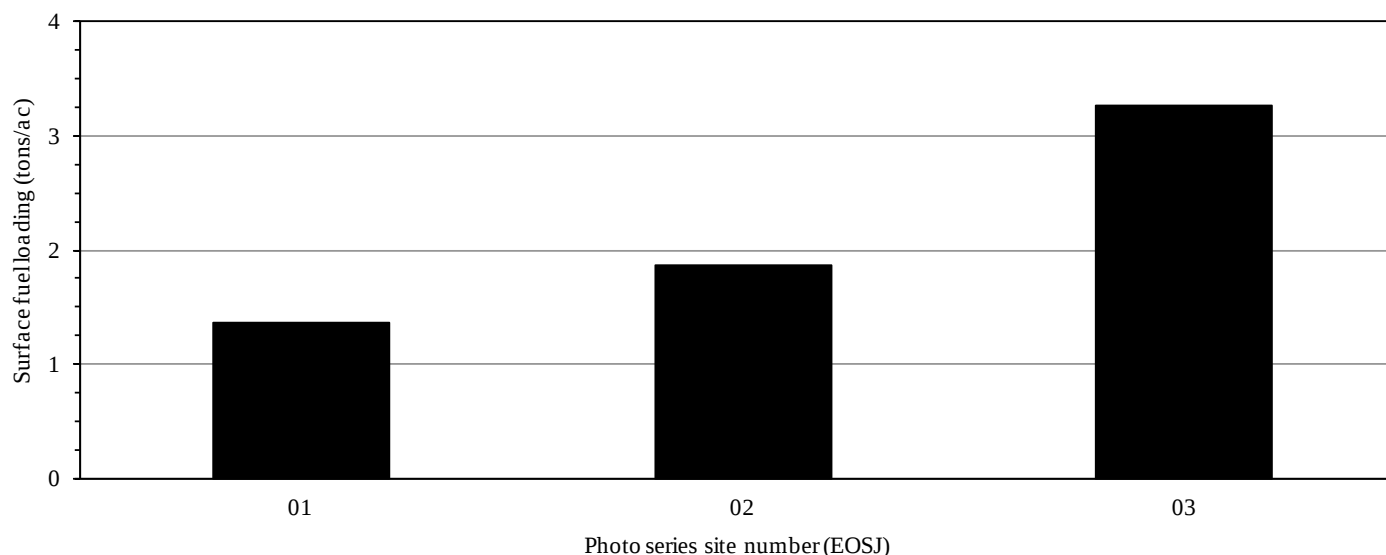


Figure 3—Eastern Oregon sagebrush with western juniper photo series (EOSJ) in order of increasing surface fuel loading.



SITE AND STAND INFORMATION

Site location: N 42° 54' 06.1" W 119° 55' 12.9"
 Elevation: 5,320 ft Aspect: 20° Slope: 6%

Plant association: *Juniperus occidentalis*/
Pseudoroegneria spicata wooded herbaceous
 vegetation

Cover type: Western juniper/big sagebrush/
 bluebunch wheatgrass (SRM 107)

Biophysical setting: Columbia Plateau Western
 Juniper Woodland and Savanna – A
 Juniper woodland successional stage: Phase I

Litter loading: trace

Litter coverage: trace

Mineral soil exposure: 35%

Understory (% cover): *Artemisia tridentata* ssp.
vaseyana (17), *Pseudoroegneria spicata* (2),
Achnatherum thurberianum (2), *Chrysothamnus*
viscidiflorus (t), *Elymus elymoides* (t), *Koeleria*
macrantha (t), *Bromus tectorum* (t)

Trees (% of stems): *Juniperus occidentalis* (100)
 Crown closure: 0%

Seedlings (% of stems): *Juniperus occidentalis* (100)
 Density: 74/ac

SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤4 in	4 - 9 in	9 - 16 in	16 - 25 in	>25 in	>4 in
Species	<i>Juniperus occidentalis</i>	<i>Juniperus occidentalis</i>	--	--	--	<i>Juniperus occidentalis</i>
Tree density (stems/ac)	30	5	0	0	0	5
Live	25	0	0	0	0	0
Dead	5	5	0	0	0	5
Avg d.b.h. (in)	0.9	6.3	--	--	--	6.3
Live	0.5	--	--	--	--	--
Dead	2.8	6.3	--	--	--	6.3
Avg height (ft)	5.6	12.9	--	--	--	12.9
Live	5.3	--	--	--	--	--
Dead	6.9	12.9	--	--	--	12.9
Avg height to crown base (ft)	0.0	0.0	--	--	--	0.0
Live	0.0	--	--	--	--	--
Dead	0.0	0.0	--	--	--	0.0
Avg height to live crown (ft)	0.0	--	--	--	--	--
Live crown mass (tons/ac)	0.11	0.00	0.00	0.00	0.00	0.00

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species	<i>Artemisia tridentata</i>	na	<i>Pseudoroegneria spicata</i>
Coverage (%)	17	trace	4
Avg height (ft)	1.2	0.2	0.9
Biomass (lbs/ac)	2,265	trace	125

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤0.25	0.02	--	0.02	--	--	--
0.26 - 1.0	0.10	--	0.10	--	--	--
1.1 - 3.0	0.04	--	0.04	--	--	--
3.1 - 9.0	0.00	0.00	0.00	0	0	0
>9.0	0.00	0.00	0.00	0	0	0
Total	0.16	0.00	0.16	0	0	0

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Artemisia tridentata</i>	4,436	2	1.3	1.7	1.1	2.1	2,207	0	0	0	2,207
<i>Chrysothamnus viscidiflorus</i>	156	100	1.9	3.0	1.6	1.7	0	0	58	0	58



SITE AND STAND INFORMATION

Site location: N 42° 54' 57.2" W 119° 57' 45.7"
 Elevation: 5,490 ft Aspect: 150° Slope: 2%

Plant association: *Juniperus occidentalis*/
Pseudoroegneria spicata wooded herbaceous
 vegetation

Cover type: Western juniper/big sagebrush/
 bluebunch wheatgrass (SRM 107)

Biophysical setting: Columbia Plateau Western
 Juniper Woodland and Savanna – C

Juniper woodland successional stage: Phase II

Litter loading: 0.28 tons/ac

Litter coverage: 13%

Mineral soil exposure: 46%

Understory (% cover): *Artemisia tridentata* (6),
Achnatherum thurberianum (2), *Leptodactylon*
pungens (1), *Hesperostipa comata* (t), *Koeleria*
macrantha (t), *Pseudoroegneria spicata* (t),
Chrysothamnus viscidiflorus (t)

Trees (% of stems): *Juniperus occidentalis* (100)

Crown closure: 15%

Seedlings (% of stems): *Juniperus occidentalis* (100)

Density: 15/ac

SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤4 in	4 - 9 in	9 - 16 in	16 - 25 in	>25 in	>4 in
Species	<i>Juniperus occidentalis</i>	--	<i>Juniperus occidentalis</i>	<i>Juniperus occidentalis</i>	--	<i>Juniperus occidentalis</i>
Tree density (stems/ac)	20	0	15	5	0	20
Live	20	0	15	5	0	20
Dead	0	0	0	0	0	0
Avg d.b.h. (in)	2.9	--	11.2	22.7	--	14.1
Live	2.9	--	11.2	22.7	--	14.1
Dead	--	--	--	--	--	--
Avg height (ft)	10.1	--	19.9	29.0	--	22.2
Live	10.1	--	19.9	29.0	--	22.2
Dead	--	--	--	--	--	--
Avg height to crown base (ft)	0.1	--	0.3	0.5	--	0.4
Live	0.1	--	0.3	0.5	--	0.4
Dead	--	--	--	--	--	--
Avg height to live crown (ft)	0.4	--	1.8	0.5	--	1.5
Live crown mass (tons/ac)	0.10	0.00	1.08	1.55	0.00	2.63

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species	<i>Artemisia tridentata</i>	na	<i>Achnatherum thurberianum</i>
Coverage (%)	8	trace	3
Avg height (ft)	0.8	0.5	1.1
Biomass (lbs/ac)	1,119	trace	50

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤0.25	trace	--	trace	--	--	--
0.26 - 1.0	0.10	--	0.10	--	--	--
1.1 - 3.0	0.00	--	0.00	--	--	--
3.1 - 9.0	0.00	0.00	0.00	0	0	0
>9.0	0.00	0.00	0.00	0	0	0
Total	0.10	0.00	0.10	0	0	0

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Artemisia tridentata</i>	4,125	15	0.8	0.6	0.6	1.8	955	0	86	0	1,041
<i>Leptodactylon pungens</i>	2,335	0	0.5	0.2	0.3	0.8	70	0	0	0	70
<i>Chrysothamnus viscidiflorus</i>	156	50	0.6	0.3	1.3	1.5	6	0	2	0	8



SITE AND STAND INFORMATION

Site location: N 42° 54' 47.4" W 119° 55' 42.3"
 Elevation: 5,545 ft Aspect: 150° Slope: 4%

Plant association: *Juniperus occidentalis*/*Artemisia tridentata* ssp. *vaseyana*/*Pseudoroegneria spicata* woodland

Cover type: Western juniper (SAF 238)

Biophysical setting: Columbia Plateau Western
 Juniper Woodland and Savanna – E

Juniper woodland successional stage: Phase III

Litter loading: 1.52 tons/ac (includes 0.31 tons/ac of moss)

Litter coverage: 17% (includes 8% moss coverage)

Mineral soil exposure: 13%

Understory (% cover): *Artemisia tridentata* ssp. *vaseyana* (3), *Achnatherum thurberianum* (2), *Purshia tridentata* (t), *Elymus elymoides* (t), *Bromus tectorum* (t), *Acnatherum hymenoides* (t), *Lupinus* spp. (t), *Pseudoroegneria spicata* (t), *Chrysothamnus viscidiflorus* (t)

Trees (% of stems): *Juniperus occidentalis* (100)

Crown closure: 44%

Seedlings (% of stems): *Juniperus occidentalis* (100)

Density: 15/ac

SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤4 in	4 - 9 in	9 - 16 in	16 - 25 in	>25 in	>4 in
Species	<i>Juniperus occidentalis</i>	<i>Juniperus occidentalis</i>	<i>Juniperus occidentalis</i>	<i>Juniperus occidentalis</i>	<i>Juniperus occidentalis</i>	<i>Juniperus occidentalis</i>
Tree density (stems/ac)	25	50	74	30	5	159
Live	25	50	59	30	5	144
Dead	0	0	15	0	0	15
Avg d.b.h. (in)	2.4	5.8	12.7	19.0	38.8	12.5
Live	2.4	5.8	13.2	19.0	38.8	12.7
Dead	--	--	10.9	--	--	10.9
Avg height (ft)	11.6	19.9	20.5	27.3	36.3	22.1
Live	11.6	19.9	21.4	27.3	36.3	22.6
Dead	--	--	16.9	--	--	16.9
Avg height to crown base (ft)	1.3	0.3	1.1	1.0	0.0	0.8
Live	1.3	0.3	0.6	1.0	0.0	0.6
Dead	--	--	2.8	--	--	2.8
Avg height to live crown (ft)	2.3	2.2	3.5	3.2	3.8	3.0
Live crown mass (tons/ac)	0.09	0.88	5.87	6.30	5.17	18.22

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species	<i>Artemisia tridentata</i>	<i>Lupinus</i> spp.	<i>Achnatherum thurberianum</i>
Coverage (%)	4	trace	3
Avg height (ft)	1.5	0.4	0.7
Biomass (lbs/ac)	598	10	45

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤0.25	0.07	--	0.07	--	--	--
0.26 - 1.0	0.44	--	0.44	--	--	--
1.1 - 3.0	0.39	--	0.39	--	--	--
3.1 - 9.0	0.30	0.22	0.52	19	19	38
>9.0	0.00	0.00	0.00	0	0	0
Total	1.20	0.22	1.42	19	19	38

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Artemisia tridentata</i>	1,096	19	1.2	1.4	1.2	2.7	525	0	73	0	598
<i>Purshia tridentata</i>	trace	0	na	na	na	na	trace	0	0	0	trace
<i>Chrysothamnus viscidiflorus</i>	trace	0	na	na	na	na	trace	0	0	0	trace

EASTERN OREGON
SAGEBRUSH WITH PONDEROSA PINE
PHOTO SERIES

A SERIES OF 5 SITES
EOSP 01 THROUGH EOSP 05

NOTES TO USERS:

1. Sites are grouped by biophysical setting and ordered by successional stage as defined by the LANDFIRE Biophysical Settings Model descriptions (Rollins and Frame 2006). Figure 4, however, shows how sites would be arranged in order of increasing surface fuel loading (i.e., standing live and dead vegetation except for trees, litter, and dead and down woody fuels).
2. A list of scientific and common species names can be found on pages 7-8.
3. Photographs were taken in July 2008. Sampling was performed in July and August 2008.
4. The year of sampling (2008) was considered an “above average” growing year for grasses and other herbaceous vegetation.
5. The marker in these photographs is a 1-ft square, and the pole is painted in contrasting colors at 1-ft intervals. The pole is 30 ft from the camera and is 6-ft tall. Note that no sampling occurs in the foreground between the camera and the sign.
6. Litter and woody material loading are reported in tons per acre; vegetation loading is reported in pounds per acre.
7. Trace coverage, constancy, loading, or biomass is indicated either as “trace” or “t.” The designation of “na” indicates cases where data are missing or “not available.”
8. A distinction is made between rotten and sound woody material for pieces larger than 3 inches in diameter.

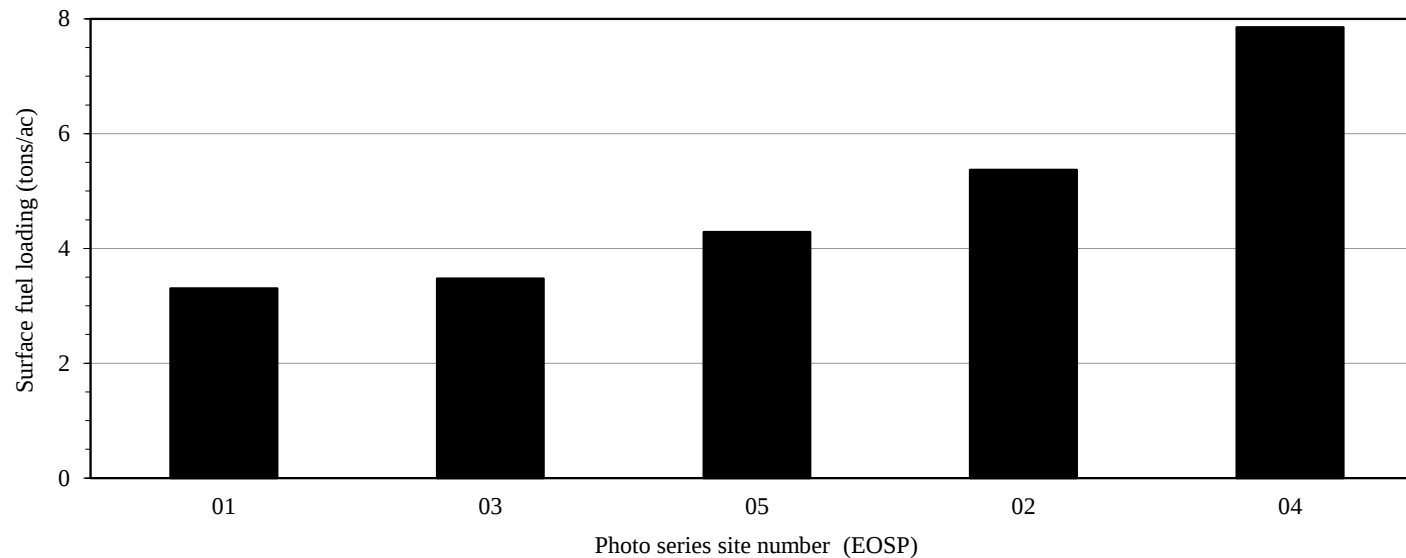


Figure 4—Eastern Oregon sagebrush with ponderosa pine photo series (EOSP) in order of increasing surface fuel loading.

**SITE AND STAND INFORMATION**

Site location: N 43° 56' 17.4" W 121° 11' 57.7"
Elevation: 4,315 ft Aspect: 319° Slope: 1%

Plant association: *Pinus ponderosa*/*Purshia tridentata* woodland

Cover type: Interior ponderosa pine (SAF 237)

Biophysical setting: Northern Rocky Mountain
Ponderosa Pine Woodland and Savanna - Xeric – A

Litter loading: 0.01 tons/ac

Litter coverage: trace

Mineral soil exposure: 28%

Understory (% cover): *Hesperostipa comata* (23),
Chrysothamnus viscidiflorus (15), *Koeleria macrantha* (3),
Elymus elymoides (2), *Purshia tridentata* (1), *Bromus tectorum* (1), *Achnatherum hymenoides* (1)

Trees (% of stems): *Pinus ponderosa* (100)

Crown closure: 0%

Seedlings (% of stems): none

Density: 0/ac

SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤4 in	4 - 9 in	9 - 16 in	16 - 25 in	>25 in	>4 in
Species	--	--	<i>Pinus ponderosa</i>	--	--	<i>Pinus ponderosa</i>
Tree density (stems/ac)	0	0	10	0	0	10
Live	0	0	0	0	0	0
Dead	0	0	10	0	0	10
Avg d.b.h. (in)	--	--	14.8	--	--	14.8
Live	--	--	--	--	--	--
Dead	--	--	14.8	--	--	14.8
Avg height (ft)	--	--	33.5	--	--	33.5
Live	--	--	--	--	--	--
Dead	--	--	33.5	--	--	33.5
Avg height to crown base (ft)	--	--	27.0	--	--	27.0
Live	--	--	--	--	--	--
Dead	--	--	27.0	--	--	27.0
Avg height to live crown (ft)	--	--	--	--	--	--
Live crown mass (tons/ac)	0.00	0.00	0.00	0.00	0.00	0.00

UNDERSTORY VEGETATION

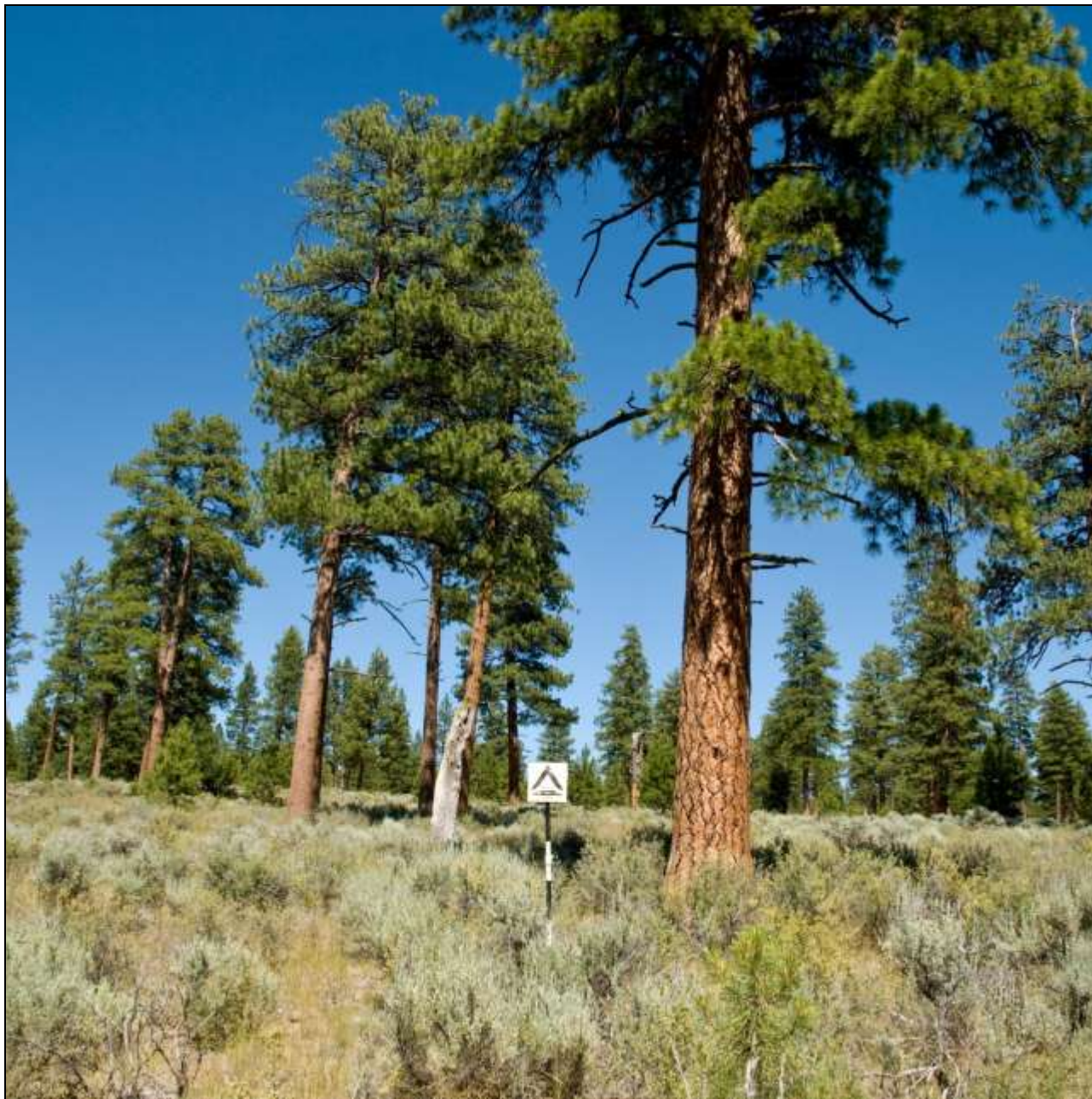
	Lifeform		
	Shrub	Forb	Graminoid
Most common species	<i>Chrysothamnus viscidiflorus</i>	na	<i>Hesperostipa comata</i>
Coverage (%)	17	trace	29
Avg height (ft)	1.9	0.8	1.4
Biomass (lbs/ac)	2,116	trace	591

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤0.25	0.02	--	0.02	--	--	--
0.26 - 1.0	0.06	--	0.06	--	--	--
1.1 - 3.0	1.05	--	1.05	--	--	--
3.1 - 9.0	0.50	0.31	0.81	19	15	34
>9.0	0.00	0.00	0.00	0	0	0
Total	1.63	0.31	1.94	19	15	34

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Chrysothamnus viscidiflorus</i>	5,370	3	1.3	1.8	1.7	4.2	1,946	0	170	0	2,116
<i>Purshia tridentata</i>	trace	0	na	na	na	na	trace	0	0	0	trace



SITE AND STAND INFORMATION

Site location: N 43° 34' 24.6" W 120° 55' 17.6"
 Elevation: 4,900 ft Aspect: 235° Slope: 9%

Plant association: *Pinus ponderosa*/*Purshia tridentata* woodland

Cover type: Interior ponderosa pine (SAF 237)

Biophysical setting: Columbia Plateau Western
 Juniper Woodland and Savanna - B

Litter loading: 1.45 tons/ac (includes 0.89 tons/ac of duff)

Litter coverage: 25%

Mineral soil exposure: 7%

Understory (% cover): *Purshia tridentata* (18),
Hesperostipa comata (15), *Artemisia tridentata* (13),
Chrysothamnus viscidiflorus (1), *Achnatherum*
thurberianum (1), *Elymus elymoides* (t), *Koeleria*
macrantha (t)

Trees (% of stems): *Pinus ponderosa* (100)

Crown closure: 21%

Seedlings (% of stems): *Pinus ponderosa* (81),
Juniperus occidentalis (19)

Density: 79/ac

SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤4 in	4 - 9 in	9 - 16 in	16 - 25 in	>25 in	>4 in
Species	<i>Pinus ponderosa</i>	<i>Pinus ponderosa</i>	--	<i>Pinus ponderosa</i>	<i>Pinus ponderosa</i>	<i>Pinus ponderosa</i>
Tree density (stems/ac)	5	5	0	10	20	35
Live	5	5	0	5	20	30
Dead	0	0	0	5	0	5
Avg d.b.h. (in)	3.5	4.7	--	19.5	30.9	23.9
Live	3.5	4.7	--	21.0	30.9	24.9
Dead	--	--	--	18.1	--	18.1
Avg height (ft)	10.6	12.8	--	42.9	94.4	68.1
Live	10.6	12.8	--	73.8	94.4	77.4
Dead	--	--	--	12.0	--	12.0
Avg height to crown base (ft)	1.0	1.0	--	32.7	27.8	24.1
Live	1.0	1.0	--	32.7	27.8	24.1
Dead	--	--	--	--	--	--
Avg height to live crown (ft)	1.8	1.8	--	32.7	27.8	24.3
Live crown mass (tons/ac)	0.04	0.08	0.00	1.79	16.13	18.00

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species	<i>Purshia tridentata</i>	na	<i>Hesperostipa comata</i>
Coverage (%)	32	trace	16
Avg height (ft)	2.4	1.1	2.0
Biomass (lbs/ac)	2,493	2	425

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤0.25	0.10	--	0.10	--	--	--
0.26 - 1.0	0.11	--	0.11	--	--	--
1.1 - 3.0	0.43	--	0.43	--	--	--
3.1 - 9.0	0.00	0.82	0.82	0	44	44
>9.0	0.00	1.00	1.00	0	15	15
Total	0.64	1.82	2.46	0	59	59

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Purshia tridentata</i>	1,245	0	2.1	4.1	2.5	3.7	1,301	176	103	0	1,580
<i>Artemisa tridentata</i>	1,245	50	1.5	2.2	1.6	2.7	341	0	383	29	753
<i>Chrysothamnus viscidiflorus</i>	1,245	6	1.0	0.9	1.1	1.8	158	0	2	0	160

**SITE AND STAND INFORMATION**

Site location: N 43° 30' 55.8" W 121° 01' 15.9"
Elevation: 4,600 ft Aspect: 232° Slope: 3%

Plant association: *Pinus ponderosa*/*Purshia tridentata* woodland

Cover type: Interior ponderosa pine (SAF 237)

Biophysical setting: Columbia Plateau Western
Juniper Woodland and Savanna - C

Litter loading: 0.92 tons/ac

Litter coverage: 38%

Mineral soil exposure: 5%

Understory (% cover): *Purshia tridentata* (17),
Hesperostipa comata (17), *Artemisia tridentata* (9),
Achnatherum thurberianum (1), *Chrysothamnus*
viscidiflorus (t), *Elymus elymoides* (t)

Trees (% of stems): *Pinus ponderosa* (100)

Crown closure: 34%

Seedlings (% of stems): *Pinus ponderosa* (100)

Density: 5/ac

SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤4 in	4 - 9 in	9 - 16 in	16 - 25 in	>25 in	>4 in
Species	--	--	<i>Pinus ponderosa</i>	<i>Pinus ponderosa</i>	--	<i>Pinus ponderosa</i>
Tree density (stems/ac)	0	0	10	35	0	45
Live	0	0	10	35	0	45
Dead	0	0	0	0	0	0
Avg d.b.h. (in)	--	--	12.7	19.4	--	17.9
Live	--	--	12.7	19.4	--	17.9
Dead	--	--	--	--	--	--
Avg height (ft)	--	--	44.5	68.8	--	63.4
Live	--	--	44.5	68.8	--	63.4
Dead	--	--	--	--	--	--
Avg height to crown base (ft)	--	--	4.9	7.8	--	8.1
Live	--	--	4.9	7.8	--	8.1
Dead	--	--	--	--	--	--
Avg height to live crown (ft)	--	--	9.3	7.8	--	7.1
Live crown mass (tons/ac)	0.00	0.00	1.28	10.77	0.00	12.05

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species	<i>Purshia tridentata</i>	na	<i>Hesperostipa comata</i>
Coverage (%)	26	trace	18
Avg height (ft)	1.7	0.2	1.0
Biomass (lbs/ac)	2,527	1	341

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤0.25	0.03	--	0.03	--	--	--
0.26 - 1.0	0.17	--	0.17	--	--	--
1.1 - 3.0	0.92	--	0.92	--	--	--
3.1 - 9.0	0.00	0.00	0.00	0	0	0
>9.0	0.00	0.00	0.00	0	0	0
Total	1.12	0.00	1.12	0	0	0

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Purshia tridentata</i>	1,479	0	1.6	3.2	1.7	4.2	987	54	102	0	1,143
<i>Artemisia tridentata</i>	1,089	21	1.7	3.6	1.6	3.4	730	262	367	22	1,381
<i>Chrysothamnus viscidiflorus</i>	156	0	1.2	1.1	1.2	1.2	3	0	0	0	3

**SITE AND STAND INFORMATION**

Site location: N 43° 35' 25.0" W 120° 48' 54.1"
Elevation: 5,840 ft Aspect: 165° Slope: 2%

Plant association: *Pinus ponderosa*/*Purshia tridentata* woodland

Cover type: Interior ponderosa pine (SAF 237)

Biophysical setting: Columbia Plateau Western
Juniper Woodland and Savanna - D

Litter loading: 3.21 tons/ac (includes 1.02 tons/ac of duff)

Litter coverage: 49%

Mineral soil exposure: 0%

Understory (% cover): *Hesperostipa comata* (21),
Purshia tridentata (16), *Artemisia tridentata* (1),
Elymus elymoides (t), *Acnatherum hymenoides* (t),
Koeleria macrantha (t)

Trees (% of stems): *Pinus ponderosa* (100)

Crown closure: 43%

Seedlings (% of stems): *Pinus ponderosa* (100)

Density: 30/ac

SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤4 in	4 - 9 in	9 - 16 in	16 - 25 in	>25 in	>4 in
Species	<i>Pinus ponderosa</i>	--	<i>Pinus ponderosa</i>	<i>Pinus ponderosa</i>	<i>Pinus ponderosa</i>	<i>Pinus ponderosa</i>
Tree density (stems/ac)	5	0	20	45	25	90
Live	5	0	20	40	20	80
Dead	0	0	0	5	5	10
Avg d.b.h. (in)	2.8	--	13.3	19.4	28.2	20.5
Live	2.8	--	13.3	19.8	27.4	20.1
Dead	--	--	--	16.2	31.3	23.8
Avg height (ft)	11.6	--	54.8	73.3	65.8	67.1
Live	11.6	--	54.8	74.6	77.5	70.4
Dead	--	--	--	63.0	19.0	41.0
Avg height to crown base (ft)	1.3	--	13.5	20.1	16.8	17.8
Live	1.3	--	13.5	19.5	16.8	17.3
Dead	--	--	--	25.0	--	25.0
Avg height to live crown (ft)	4.0	--	13.5	20.1	16.8	17.6
Live crown mass (tons/ac)	0.03	0.00	2.88	12.84	12.50	28.22

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species	<i>Purshia tridentata</i>	--	<i>Hesperostipa comata</i>
Coverage (%)	17	0	21
Avg height (ft)	2.0	--	1.8
Biomass (lbs/ac)	3,331	0	274

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤0.25	0.10	--	0.10	--	--	--
0.26 - 1.0	0.21	--	0.21	--	--	--
1.1 - 3.0	0.58	--	0.58	--	--	--
3.1 - 9.0	0.22	0.44	0.66	19	39	58
>9.0	0.00	1.29	1.29	0	15	15
Total	1.11	1.73	2.84	19	54	63

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Purshia tridentata</i>	1,790	4	2.0	3.9	2.1	3.0	1,368	143	94	0	1,605
<i>Artemisia tridentata</i>	1,090	57	2.0	4.2	1.9	3.2	237	191	1,157	141	1,726

**SITE AND STAND INFORMATION**

Site location: N 43° 31' 39.9" W 121° 01' 02.5"
Elevation: 4,650 ft Aspect: 39° Slope: 6%

Plant association: *Pinus ponderosa*/*Purshia tridentata* woodland

Cover type: Interior ponderosa pine (SAF 237)

Biophysical setting: Columbia Plateau Western
Juniper Woodland and Savanna - E

Litter loading: 2.19 tons/ac (includes 0.02 tons/ac of duff)

Litter coverage: 79%

Mineral soil exposure: 2%

Understory (% cover): *Hesperostipa comata* (14),
Purshia tridentata (10), *Artemisia tridentata* (4),
Achnatherum thurberianum (t), *Elymus elymoides* (t)

Trees (% of stems): *Pinus ponderosa* (100)

Crown closure: 28%

Seedlings (% of stems): *Pinus ponderosa* (100)

Density: 5/ac

SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤4 in	4 - 9 in	9 - 16 in	16 - 25 in	>25 in	>4 in
Species	<i>Pinus ponderosa</i>	<i>Pinus ponderosa</i>	<i>Pinus ponderosa</i>	<i>Pinus ponderosa</i>	--	<i>Pinus ponderosa</i>
Tree density (stems/ac)	15	55	74	35	0	164
Live	5	35	74	35	0	144
Dead	10	20	0	0	0	20
Avg d.b.h. (in)	3.4	6.1	12.3	18.0	--	11.4
Live	3.4	6.3	12.3	18.0	--	12.2
Dead	3.4	5.9	--	--	--	5.9
Avg height (ft)	12.0	24.1	53.8	66.6	--	46.6
Live	9.0	27.4	53.8	66.6	--	50.5
Dead	13.5	18.4	--	--	--	18.4
Avg height to crown base (ft)	4.0	9.3	13.7	18.4	--	13.3
Live	4.0	8.4	13.7	18.4	--	13.6
Dead	--	11.3	--	--	--	11.3
Avg height to live crown (ft)	4.0	8.4	13.7	18.4	--	13.6
Live crown mass (tons/ac)	0.04	1.07	9.16	9.08	0.00	19.31

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species	<i>Purshia tridentata</i>	na	<i>Hesperostipa comata</i>
Coverage (%)	14	trace	14
Avg height (ft)	1.7	--	0.8
Biomass (lbs/ac)	2,090	trace	302

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤0.25	0.03	--	0.03	--	--	--
0.26 - 1.0	0.09	--	0.09	--	--	--
1.1 - 3.0	0.39	--	0.39	--	--	--
3.1 - 9.0	0.06	0.33	0.39	5	24	29
>9.0	0.00	0.00	0.00	0	0	0
Total	0.57	0.33	0.90	5	24	29

SELECTED SHRUB SPECIES

	Density (plants/ac)	Dead (% of plants)	Avg crown breadth (ft)	Avg crown area (ft ²)	Avg height (ft)	Max height (ft)	Biomass (lbs/ac)				
							Foliage and live ≤1 in	Live >1 in	Dead ≤1 in	Dead >1 in	Total
<i>Purshia tridentata</i>	2,179	11	1.4	2.2	1.7	3.4	751	24	380	0	1,155
<i>Artemisia tridentata</i>	778	40	1.9	4.3	1.7	3.5	346	250	314	26	935

SPOTTED OWL
NESTING HABITAT
PHOTO SERIES
A SERIES OF 19 SITES
SONH 01 THROUGH SONH 19

NOTES TO USERS:

1. The sites in this series are ordered geographically by Northwest Forest Plan northern spotted owl province (generally from the wettest province to the driest province), and within province on a gradient from driest to wettest Landfire biophysical setting. Figure 5, however, shows how sites would be arranged in order of increasing surface fuel loading (i.e., standing live and dead vegetation except for trees, litter, and dead and down woody fuels).
2. A list of scientific and common species names can be found on pages 7-8.
3. Photographs were taken between June and August 2010. Sampling occurred from June to September 2010.
4. The marker in these photographs is a 1-foot square and the pole is painted in contrasting colors at 1-ft intervals. The pole is 30 ft from the camera. Note that no sampling occurs in the foreground between the camera and the sign.
5. Forest floor and woody material loading are reported in tons per acre; vegetation loading is reported in pounds per acre.
6. Trace coverage, constancy, loading, or biomass is indicated either as “trace” or “t.” The designation of “na” indicates cases where data are missing or “not available.”
7. A distinction is made between rotten and sound woody material for pieces larger than 3 inches in diameter.

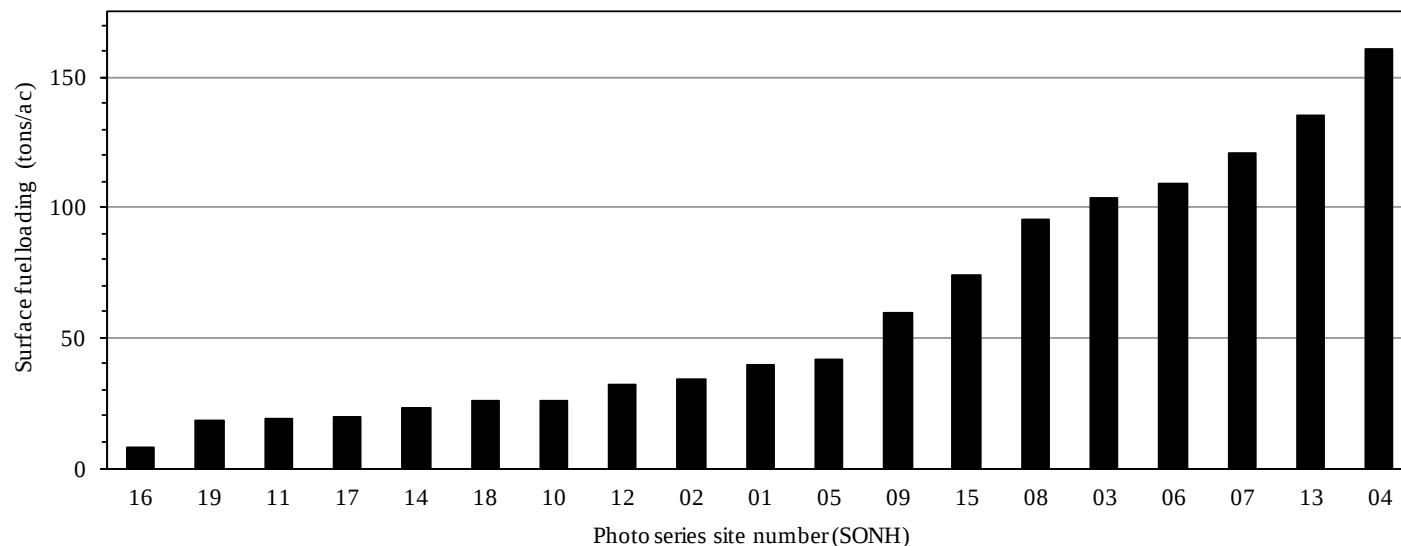


Figure 5—Spotted owl nesting habitat photo series (SONH) in order of increasing surface fuel loading.

**SITE INFORMATION**

Site location: N 47° 54' 20.2" W 124° 17' 35.1"

Elevation: 840 ft Aspect: 45° Slope: 70%

Cover type: Douglas-fir–Western hemlock (SAF 230)

Biophysical setting: North Pacific Maritime Dry-Mesic

Douglas-fir – Western Hemlock Forest

Spotted Owl Province: Olympic Peninsula

STAND INFORMATION

Understory: *Fragaria vesca*, *Galtheria shallon*, *Maianthemum stellatum*, *Opplopanax horridus*, *Polypodium glycyrrhiza*, *Polystichum munitum*, *Pteridium aquilinum*, *Rubus ursinus*, *Vaccinium alaskaense*, *Vaccinium membranaceum*, *Vaccinium parvifolium*, *Vicia* spp.

Trees (% of stems >4 in d.b.h.): *Tsuga heterophylla* (60), *Pseudotsuga menziesii* (40)

Standing dead trees: 49% of stems >20 in d.b.h.

Snags > 20 in d.b.h.: 29/ac

Crown closure: 79%

Seedlings (% of stems): Unknown conifer (72), *Tsuga heterophylla* (28)

Density: 68,281/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.3	1.0	100
Conifer litter	0.3	1.0	10
Other	--	0.0	0
Duff	2.7	32.7	100
Litter derived	2.7	32.7	100
Rotten wood	--	0.0	0
Total	3.0	33.7	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Tsuga heterophylla</i>
Second most common species	--	--	<i>Pseudotsuga menziesii</i>	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Pseudotsuga menziesii</i>
Tree density (stems/ac)	134	70	79	53	6	208
Live	117	67	76	26	4	173
Dead	17	3	3	27	2	35
Avg d.b.h. (in)	2.4	6.3	14.1	29.4	44.7	16.3
Live	2.3	6.2	14.0	28.9	47.1	13.9
Dead	3.5	7.2	17.1	29.9	41.2	27.4
Avg height (ft)	16.4	37.3	88.2	108.4	116.0	77.1
Live	16.8	38.5	91.5	136.3	163.4	79.4
Dead	14.0	15.3	11.7	80.9	48.3	66.1
Avg height to crown base (ft)	5.8	16.2	22.1	29.8	45.5	22.4
Live	5.2	16.2	22.2	24.2	54.2	20.8
Dead	9.5	--	15.0	38.2	26.6	36.3
Avg height to live crown (ft)	11.1	20.7	38.8	42.4	65.1	32.9
Basal area (ft ² /ac)	5.3	3.9	22.0	64.5	16.3	106.7
Live	4.2	3.7	20.7	30.9	10.6	65.9
Dead	1.1	0.2	1.3	33.6	5.7	44.8

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Vaccinium parvifolium</i>	--	<i>Polystichum munitum</i>	--
Second most common species	<i>Gaultheria shallon</i>	--	<i>Polypodium glycyrrhiza</i>	--
Coverage (%)	13	0	18	0
Avg height (ft)	2.2	--	1.8	--
Biomass (lbs/ac)	613	0	700	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	--	0.3	--	--	--
0.26 - 1.0	1.4	--	1.4	--	--	--
1.1 - 3.0	2.8	--	2.8	--	--	--
3.1 - 9.0	1.3	3.7	5.0	65	136	201
9.1 - 20.0	0.0	13.6	13.6	0	84	84
20.1 - 40.0	0.0	13.0	13.0	0	19	19
> 40.0	0.0	0.0	0.0	0	0	0
Total	5.8	30.3	36.1	65	239	304

**SITE INFORMATION**

Site location: N 47° 46' 56.2" W 123° 03' 21.1"
 Elevation: 2,690 ft Aspect: 180° Slope: 57%
 Cover type: Douglas-fir–Western hemlock (SAF 230)
 Biophysical setting: North Pacific Maritime Mesic-Wet
 Douglas-fir – Western Hemlock Forest
 Spotted Owl Province: Olympic Peninsula

STAND INFORMATION

Understory: *Achlys triphylla*, *Adenocaulon bicolor*,
Fragaria vesca, *Galium triflorum*, *Gaultheria ovatifolia*,
Gaultheria shallon, *Mahonia nervosa*, *Maianthemum*
stellatum, *Oplopanax horridus*, *Polystichum munitum*,
Pteridium aquilinum, *Rhododendron macrophyllum*,
Ribes spp., *Trientalis borealis*, *Trillium ovatum*,
Vaccinium alaskaense, *Vaccinium parvifolium*

Trees (% of stems >4 in d.b.h.): *Pseudotsuga menziesii* (52),
Tsuga heterophylla (40), *Thuja plicata* (5), *Abies*
amabilis (2), *Taxus brevifolia* (1)

Standing dead trees: 8% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 5/ac
 Crown closure: 95%

Seedlings (% of stems): Unknown conifer (49), *Tsuga*
heterophylla (46), *Taxus brevifolia* (3), *Thuja plicata* (1),
Abies amabilis (1)
 Density: 4,495/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.6	1.6	100
Conifer litter	0.5	1.1	76
Other	1.0	0.5	24
Duff	3.0	36.2	100
Litter derived	3.0	36.2	100
Rotten wood	--	0.0	0
Total	3.6	37.8	100



SAPPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>
Second most common species	<i>Thuja plicata</i>	<i>Abies amabilis</i>	<i>Pseudotsuga menziesii</i>	<i>Tsuga heterophylla</i>	--	<i>Tsuga heterophylla</i>
Tree density (stems/ac)	134	35	45	33	27	140
Live	134	26	32	31	24	113
Dead	0	9	13	2	3	27
Avg d.b.h. (in)	1.8	6.4	14.0	28.9	49.6	22.4
Live	1.8	6.4	14.0	29.0	48.3	23.7
Dead	--	6.2	14.0	27.8	59.3	17.3
Avg height (ft)	12.3	27.3	73.7	153.5	185.4	102.3
Live	12.3	34.2	87.1	160.2	195.2	118.1
Dead	--	8.4	42.0	58.7	108.0	39.0
Avg height to crown base (ft)	4.3	13.2	28.5	58.6	61.3	40.4
Live	4.3	13.2	27.2	61.3	58.9	40.2
Dead	--	--	34.6	12.2	80.0	42.6
Avg height to live crown (ft)	5.3	18.1	34.7	80.0	82.8	53.6
Basal area (ft ² /ac)	3.6	2.1	12.5	39.5	91.4	145.5
Live	3.6	1.6	8.8	37.2	77.1	124.7
Dead	0.0	0.5	3.7	2.3	14.3	20.8

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Mahonia nervosa</i>	<i>Gaultheria ovatifolia</i>	<i>Polystichum munitum</i>	--
Second most common species	<i>Gaultheria shallon</i>	--	<i>Fragaria vesca</i>	--
Coverage (%)	7	trace	8	0
Avg height (ft)	0.7	0.2	1.2	--
Biomass (lbs/ac)	59	1	155	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.9	--	0.9	--	--	--
0.26 - 1.0	2.4	--	2.4	--	--	--
1.1 - 3.0	3.3	--	3.3	--	--	--
3.1 - 9.0	0.9	4.5	5.4	58	130	188
9.1 - 20.0	4.6	6.9	11.5	26	32	58
20.1 - 40.0	0.0	8.7	8.7	0	19	19
> 40.0	0.0	0.0	0.0	0	0	0
Total	12.1	20.1	32.2	84	181	265

**SITE INFORMATION**

Site location: N 47° 49' 44.3" W 123° 03' 05.8"
 Elevation: 2,815 ft Aspect: 135° Slope: 40%
 Cover type: Douglas-fir–Western Hemlock (SAF 230)
 Biophysical setting: North Pacific Mesic Western
 Hemlock – Pacific Silver Fir Forest
 Spotted Owl Province: Olympic Peninsula

STAND INFORMATION

Understory: *Arnica latifolia*, *Clintonia uniflora*,
Fragaria vesca, *Gaultheria ovatifolia*, *Galtheria*
shallon, *Mahonia nervosa*, *Maianthemum stellatum*,
Rhododendron macrophyllum, *Symphoricarpos albus*,
Trientalis borealis, *Trillium ovatum*, *Vaccinium*
alaskaense, *Vaccinium parvifolium*

Trees (% of stems >4 in d.b.h.): *Pseudotsuga menziesii* (30),
Thuja plicata (30), *Tsuga heterophylla* (22), *Abies*
amabilis (15), Unknown spp. (2), *Taxus brevifolia* (1)

Standing dead trees: 25% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 24/ac
 Crown closure: 80%

Seedlings (% of stems): *Tsuga heterophylla* (36), *Abies*
amabilis (28), unknown conifer (23), *Thuja plicata* (13),
Taxus brevifolia (1)
 Density: 20,161/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	1.1	2.7	100
Conifer litter	0.6	1.1	60
Other	1.7	1.6	40
Duff	6.2	95.0	100
Litter derived	4.2	36.1	72
Rotten wood	11.3	58.9	28
Total	7.2	97.7	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Tsuga heterophylla</i>	<i>Thuja plicata</i>	<i>Tsuga heterophylla</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>
Second most common species	<i>Abies amabilis</i>	<i>Tsuga heterophylla</i>	<i>Abies amabilis</i>	<i>Thuja plicata</i>	<i>Thuja plicata</i>	<i>Thuja plicata</i>
Tree density (stems/ac)	788	136	156	81	14	387
Live	788	124	107	59	12	302
Dead	0	12	49	22	2	85
Avg d.b.h. (in)	0.7	7.3	14.0	30.0	55.8	16.6
Live	0.7	7.3	14.6	28.8	57.4	16.1
Dead	--	7.4	12.8	33.1	47.5	18.3
Avg height (ft)	7.0	45.8	86.2	105.3	162.4	78.9
Live	7.0	45.8	103.7	139.2	168.0	89.5
Dead	--	46.2	48.2	16.8	134.2	42.1
Avg height to crown base (ft)	1.8	10.1	28.4	44.8	73.0	25.9
Live	1.8	9.1	28.4	44.8	71.1	25.4
Dead	--	19.8	28.3	--	84.5	28.4
Avg height to live crown (ft)	2.8	24.2	48.3	69.1	81.6	43.8
Basal area (ft ² /ac)	2.9	10.3	43.5	102.8	65.1	221.7
Live	2.9	9.3	32.0	67.7	57.5	166.5
Dead	0.0	1.0	11.5	35.1	7.6	55.2

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Vaccinium alaskaense</i>	<i>Gaultheria ovatifolia</i>	<i>Fragaria vesca</i>	--
Second most common species	<i>Rhododendron macrophyllum</i>	<i>Mahonia nervosa</i>	<i>Clintonia uniflora</i>	--
Coverage (%)	8	10	4	0
Avg height (ft)	1.2	0.3	0.5	--
Biomass (lbs/ac)	302	30	14	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.6	--	0.6	--	--	--
0.26 - 1.0	1.5	--	1.5	--	--	--
1.1 - 3.0	0.9	--	0.9	--	--	--
3.1 - 9.0	1.4	2.1	3.5	32	110	142
9.1 - 20.0	5.0	25.6	30.6	26	123	149
20.1 - 40.0	4.4	42.4	46.8	6	52	58
> 40.0	0.0	16.6	16.6	0	6	6
Total	13.8	86.7	100.5	64	292	356

**SITE INFORMATION**

Site location: N 46° 05' 38.2" W 121° 54' 32.5"
 Elevation: 1,960 ft Aspect: 296° Slope: 5%
 Cover type: Douglas-fir–Western Hemlock (SAF 230)
 Biophysical setting: North Pacific Maritime Mesic-Wet
 Douglas-fir – Western Hemlock Forest
 Spotted Owl Province: Western Washington Cascades

STAND INFORMATION

Understory: *Achlys triphylla*, *Maianthemum stellatum*,
Polystichum munitum, *Pteridium aquilinum*, *Rosa*
gymnocarpa, *Symphoricarpos albus*, *Vaccinium* spp.
 Trees (% of stems >4 in d.b.h.): *Tsuga heterophylla* (65),
Pseudotsuga menziesii (24), *Taxus brevifolia* (6), *Thuja*
plicata (4)
 Standing dead trees: 20% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 13/ac
 Crown closure: 95%
 Seedlings (% of stems): *Tsuga heterophylla* (72), *Acer*
circinatum (22), unknown conifer (4), *Thuja plicata* (1),
Taxus brevifolia (1)
 Density: 2,767/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.6	1.7	100
Conifer litter	0.6	1.7	100
Other	--	0.0	0
Duff	1.9	23.9	100
Litter derived	1.7	19.8	96
Rotten wood	5.5	4.1	4
Total	2.4	25.6	100



SAPLINGS AND TREES

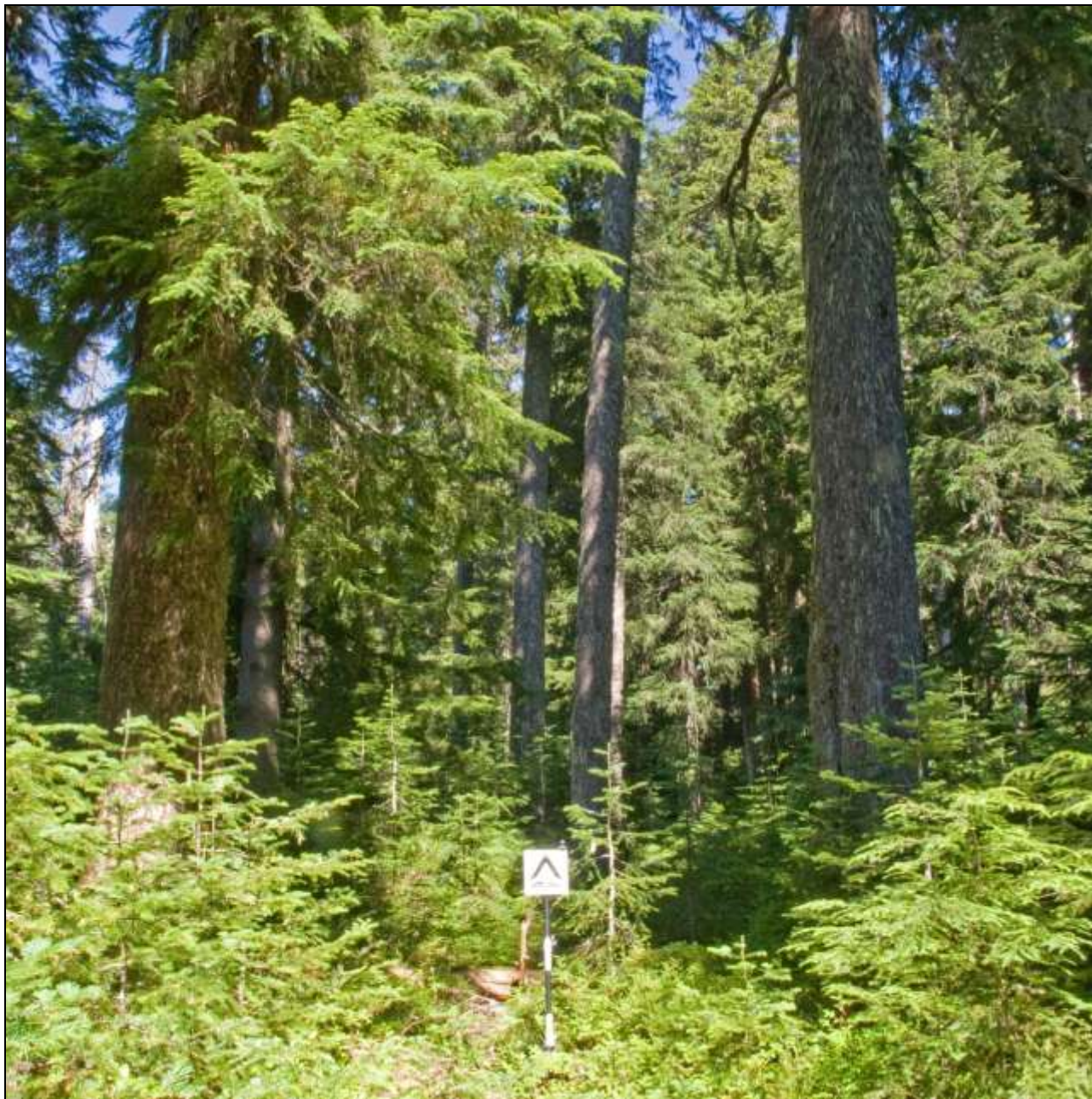
	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Pseudotsuga menziesii</i>	<i>Tsuga heterophylla</i>
Second most common species	<i>Acer circinatum</i>	<i>Taxus brevifolia</i>	<i>Thuja plicata</i>	<i>Thuja plicata</i>	<i>Tsuga heterophylla</i>	<i>Pseudotsuga menziesii</i>
Tree density (stems/ac)	185	29	50	32	33	144
Live	168	29	50	26	26	131
Dead	17	0	0	6	7	13
Avg d.b.h. (in)	1.3	5.7	12.7	27.1	72.4	28.3
Live	1.3	5.7	12.7	25.8	67.7	24.8
Dead	1.4	--	--	33.0	90.9	64.4
Avg height (ft)	11.6	30.7	75.5	111.9	178.2	98.3
Live	11.4	30.7	75.5	124.3	209.1	102.3
Dead	13.0	--	--	55.4	57.9	56.8
Avg height to crown base (ft)	2.9	6.9	23.6	40.8	107.8	40.3
Live	3.1	6.9	23.6	39.8	107.8	40.1
Dead	1.0	--	--	59.0	--	59.0
Avg height to live crown (ft)	3.5	13.1	27.3	47.2	107.8	44.4
Basal area (ft ² /ac)	2.1	1.3	11.2	33.7	245.0	291.2
Live	1.9	1.3	11.2	25.1	168.1	205.7
Dead	0.2	0.0	0.0	8.6	76.9	85.5

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Vaccinium</i> spp.	--	<i>Achlys triphylla</i>	--
Second most common species	<i>Rosa gymnocarpa</i>	--	<i>Polystichum munitum</i>	--
Coverage (%)	2	0	46	0
Avg height (ft)	1.4	--	1.2	--
Biomass (lbs/ac)	48	0	164	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.5	--	0.5	--	--	--
0.26 - 1.0	1.4	--	1.4	--	--	--
1.1 - 3.0	3.1	--	3.1	--	--	--
3.1 - 9.0	1.4	2.4	3.8	45	71	116
9.1 - 20.0	13.0	28.1	41.1	65	143	208
20.1 - 40.0	20.7	76.7	97.4	19	104	123
> 40.0	0.0	11.9	11.9	0	6	6
Total	40.1	119.1	159.2	129	324	453



SITE INFORMATION

Site location: N 46° 05' 44.8" W 121° 52' 01.5"
 Elevation: 3,390 ft Aspect: 204° Slope: 2%
 Cover type: Western Hemlock (SAF 224)
 Biophysical setting: North Pacific Maritime Dry-Mesic
 Pacific Silver Fir – Western Hemlock – Douglas-fir Forest
 Spotted Owl Province: Western Washington Cascades

STAND INFORMATION

Understory: *Chimaphila umbellata*, *Clintonia uniflora*,
Fragaria vesca, *Rosa gymnocarpa*, *Trientalis borealis*,
Vaccinium spp., *Xerophyllum tenax*
 Trees (% of stems >4 in d.b.h.): *Tsuga heterophylla* (52),
Abies amabilis (40), *Pseudotsuga menziesii* (8)
 Standing dead trees: 23% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 41/ac
 Crown closure: 51%
 Seedlings (% of stems): unknown conifer (46), *Abies*
amabilis (37), *Tsuga heterophylla* (16), *Acer circinatum* (1)
 Density: 14,760/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.3	0.8	100
Conifer litter	0.3	0.8	100
Other	--	0.0	0
Duff	1.6	19.1	100
Litter derived	1.6	19.1	100
Rotten wood	--	0.0	0
Total	1.9	19.9	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Abies amabilis</i>	<i>Abies amabilis</i>	<i>Abies amabilis</i>	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>
Second most common species	<i>Tsuga heterophylla</i>	--	<i>Tsuga heterophylla</i>	<i>Abies amabilis</i>	<i>Pseudotsuga menziesii</i>	<i>Abies amabilis</i>
Tree density (stems/ac)	1,342	199	45	91	86	421
Live	1,342	199	34	88	48	369
Dead	0	0	11	3	38	52
Avg d.b.h. (in)	1.4	4.9	15.1	32.0	45.6	20.2
Live	1.4	4.9	13.9	32.0	42.3	17.0
Dead	--	--	18.9	31.3	49.8	42.1
Avg height (ft)	10.4	21.6	55.8	137.0	133.0	73.0
Live	10.4	21.6	69.9	141.0	149.1	70.9
Dead	--	--	13.1	42.0	113.0	87.4
Avg height to crown base (ft)	2.3	7.2	27.6	54.4	59.8	30.3
Live	2.3	7.2	27.6	54.4	54.0	26.4
Dead	--	--	--	55.0	67.0	66.8
Avg height to live crown (ft)	4.2	8.3	29.3	55.0	54.0	27.3
Basal area (ft ² /ac)	21.7	6.7	15.1	128.7	246.5	397.0
Live	21.7	6.7	9.6	124.3	116.5	257.1
Dead	0.0	0.0	5.5	4.4	130.0	139.9

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Vaccinium</i> spp.	<i>Chimaphila umbellata</i>	<i>Fragaria vesca</i>	--
Second most common species	<i>Rosa gymnocarpa</i>	--	<i>Trientalis borealis</i>	--
Coverage (%)	21	trace	12	0
Avg height (ft)	2.7	0.3	0.6	--
Biomass (lbs/ac)	779	trace	32	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	--	0.3	--	--	--
0.26 - 1.0	0.7	--	0.7	--	--	--
1.1 - 3.0	1.4	--	1.4	--	--	--
3.1 - 9.0	0.9	3.3	4.2	39	117	156
9.1 - 20.0	2.3	23.6	25.9	13	149	162
20.1 - 40.0	0.0	8.2	8.2	0	26	26
> 40.0	0.0	0.0	0.0	0	0	0
Total	5.6	35.1	40.7	52	292	344

**SITE INFORMATION**

Site location: N 47° 53' 55.3" W 121° 24' 03.7"
 Elevation: 1,325 ft Aspect: -- Slope: 0%

Cover type: Douglas-fir–Western Hemlock (SAF 230)
 Biophysical setting: North Pacific Mesic Western
 Hemlock – Pacific Silver Fir Forest
 Spotted Owl Province: Western Washington Cascades

STAND INFORMATION

Understory: *Gaultheria ovatifolia*, *Gaultheria shallon*,
Polystichum munitum, *Trientalis borealis*, *Vaccinium*
ovatum

Trees (% of stems >4 in d.b.h.): *Pseudotsuga menziesii* (44),
Tsuga heterophylla (45), *Thuja plicata* (11)

Standing dead trees: 26% of stems >20 in d.b.h.

Snags > 20 in d.b.h.: 28/ac

Crown closure: 78%

Seedlings (% of stems): *Tsuga heterophylla* (100)
 Density: 889/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.3	1.0	100
Conifer litter	0.3	0.9	96
Other	0.4	0.1	4
Duff	7.3	96.8	96
Litter derived	6.8	62.2	76
Rotten wood	9.2	34.6	20
Total	7.4	97.8	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>
Second most common species	--	<i>Thuja plicata</i>	<i>Pseudotsuga menziesii</i>	<i>Thuja plicata</i>	--	<i>Tsuga heterophylla</i>
Tree density (stems/ac)	134	81	149	64	42	336
Live	134	73	123	36	42	274
Dead	0	8	26	28	0	62
Avg d.b.h. (in)	1.6	6.3	11.1	28.6	45.7	17.6
Live	1.6	6.2	10.8	28.9	45.7	17.3
Dead	--	7.5	12.5	28.3	--	19.0
Avg height (ft)	9.3	36.2	67.0	105.9	232.9	87.6
Live	9.3	35.3	77.4	147.5	232.9	99.2
Dead	--	43.5	17.8	53.0	--	37.1
Avg height to crown base (ft)	5.1	14.7	27.4	48.0	115.5	39.8
Live	5.1	14.3	27.4	46.0	115.5	39.8
Dead	--	20.0	--	62.5	--	40.3
Avg height to live crown (ft)	6.5	16.1	38.8	58.8	118.4	47.5
Basal area (ft ² /ac)	2.3	4.7	25.6	73.2	122.7	226.2
Live	2.3	4.0	20.0	41.4	122.7	188.1
Dead	0.0	0.7	5.6	31.8	0.0	38.1

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Vaccinium ovatum</i>	<i>Gaultheria ovatifolia</i>	<i>Polystichum munitum</i>	--
Second most common species	<i>Gaultheria shallon</i>	--	<i>Trientalis borealis</i>	--
Coverage (%)	13	2	14	0
Avg height (ft)	2.6	0.6	0.7	--
Biomass (lbs/ac)	913	7	40	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.6	--	0.6	--	--	--
0.26 - 1.0	1.9	--	1.9	--	--	--
1.1 - 3.0	3.3	--	3.3	--	--	--
3.1 - 9.0	1.3	8.4	9.7	26	201	227
9.1 - 20.0	5.6	29.8	35.4	19	182	201
20.1 - 40.0	4.1	17.8	21.9	6	39	45
> 40.0	0.0	35.0	35.0	0	19	19
Total	16.8	91.0	107.8	51	441	492

**SITE INFORMATION**

Site location: N 44° 14' 23.3" W 123° 28' 57.8"
 Elevation: 1,395 ft Aspect: 200° Slope: 15%
 Cover type: Douglas-fir-Western Hemlock (SAF 230)
 Biophysical setting: North Pacific Maritime Dry-Mesic
 Douglas-fir – Western Hemlock Forest
 Spotted Owl Province: Oregon Coast Range

STAND INFORMATION

Understory: *Polystichum munitum*, *Pteridium aquilinum*, *Vaccinium* spp.
 Trees (% of stems >4 in d.b.h.): *Tsuga heterophylla* (72),
Pseudotsuga menziesii (27), *Acer circinatum* (1)
 Standing dead trees: 0% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 0/ac
 Crown closure: 88%
 Seedlings (% of stems): *Tsuga heterophylla* (100), *Thuja plicata* (t)
 Density: 120,058/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.4	1.3	100
Conifer litter	0.4	1.3	100
Other	--	0.0	0
Duff	2.8	36.7	100
Litter derived	2.6	28.7	92
Rotten wood	5.3	8.0	8
Total	3.3	38.0	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	--	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Pseudotsuga menziesii</i>	<i>Tsuga heterophylla</i>
Second most common species	--	<i>Acer circinatum</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	--	<i>Pseudotsuga menziesii</i>
Tree density (stems/ac)	0	18	36	27	19	100
Live	0	16	33	27	19	95
Dead	0	2	3	0	0	5
Avg d.b.h. (in)	--	7.0	13.8	22.6	50.5	22.0
Live	--	7.1	13.5	22.6	50.5	22.5
Dead	--	6.1	17.5	--	--	12.4
Avg height (ft)	--	46.9	101.8	130.4	187.5	115.9
Live	--	51.4	106.9	130.4	187.5	120.5
Dead	--	13.7	39.8	--	--	28.0
Avg height to crown base (ft)	--	30.0	35.2	46.3	92.4	48.9
Live	--	30.0	34.6	46.3	92.4	48.9
Dead	--	--	60.0	--	--	60.0
Avg height to live crown (ft)	--	30.0	50.1	55.2	98.7	58.0
Basal area (ft ² /ac)	0.0	1.2	9.7	18.7	68.8	98.4
Live	0.0	1.1	8.5	18.7	68.8	97.1
Dead	0.0	0.1	1.2	0.0	0.0	1.3

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Vaccinium</i> spp.	--	<i>Polystichum munitum</i>	na
Second most common species	--	--	<i>Pteridium aquilinum</i>	--
Coverage (%)	2	0	14	1
Avg height (ft)	1.2	--	2.1	1.3
Biomass (lbs/ac)	72	0	335	trace

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.6	--	0.6	--	--	--
0.26 - 1.0	1.3	--	1.3	--	--	--
1.1 - 3.0	3.2	--	3.2	--	--	--
3.1 - 9.0	2.2	2.4	4.6	71	58	129
9.1 - 20.0	23.4	6.0	29.4	143	32	175
20.1 - 40.0	25.4	0.0	25.4	26	0	26
> 40.0	42.4	12.6	55.0	19	7	26
Total	98.5	21.0	119.5	259	97	356

**SITE INFORMATION**

Site location: N 44° 07' 58.6" W 123° 55' 20.7"
 Elevation: 590 ft Aspect: 45° Slope: 25%
 Cover type: Pacific Douglas-fir (SAF 229)
 Biophysical setting: North Pacific Maritime Mesic-Wet
 Douglas-fir – Western Hemlock Forest
 Spotted Owl Province: Oregon Coast Range

STAND INFORMATION

Understory: *Polystichum munitum*, *Pteridium aquilinum*, *Rhododendron macrophyllum*, *Rubus ursinus*, *Vaccinium* spp.
 Trees (% of stems >4 in d.b.h.): *Pseudotsuga menziesii* (61), *Tsuga heterophylla* (27), *Alnus rubra* (9), *Acer circinatum* (3)
 Standing dead trees: 22% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 14/ac
 Crown closure: 92%
 Seedlings (% of stems): *Acer circinatum* (100)
 Density: 352/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.7	1.9	92
Conifer litter	0.7	1.9	92
Other	--	0.0	0
Duff	4.5	56.8	92
Litter derived	3.8	38.0	84
Rotten wood	12.6	18.8	8
Total	5.2	58.7	92



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Acer circinatum</i>	<i>Alnus rubra</i>	<i>Tsuga heterophylla</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>
Second most common species	<i>Tsuga heterophylla</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Tsuga heterophylla</i>	--	<i>Tsuga heterophylla</i>
Tree density (stems/ac)	235	44	39	30	35	148
Live	235	24	31	30	21	106
Dead	0	20	8	<1	14	42
Avg d.b.h. (in)	1.8	5.3	15.6	27.6	54.7	24.4
Live	1.8	4.7	15.8	27.6	58.4	25.1
Dead	--	6.1	14.9	33.8	49.2	22.5
Avg height (ft)	16.4	33.6	104.1	144.3	129.6	97.6
Live	16.4	29.0	112.3	145.2	200.2	120.3
Dead	--	39.3	72.8	11.5	23.7	40.4
Avg height to crown base (ft)	8.7	14.3	30.8	53.6	83.6	40.9
Live	8.7	8.0	30.8	53.6	83.6	42.6
Dead	--	26.2	--	--	--	26.2
Avg height to live crown (ft)	9.9	8.8	48.3	77.2	89.5	55.7
Basal area (ft ² /ac)	5.5	1.8	13.6	32.2	153.7	201.3
Live	5.5	0.7	11.0	31.9	103.5	147.1
Dead	0.0	1.1	2.6	0.3	50.2	54.2

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Vaccinium</i> spp.	--	<i>Polystichum munitum</i>	na
Second most common species	<i>Rhododendron macrophyllum</i>	--	<i>Pteridium aquilinum</i>	--
Coverage (%)	31	0	9	trace
Avg height (ft)	2.9	--	1.8	na
Biomass (lbs/ac)	2,508	0	144	1

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.6	--	0.6	--	--	--
0.26 - 1.0	1.3	--	1.3	--	--	--
1.1 - 3.0	1.9	--	1.9	--	--	--
3.1 - 9.0	2.6	0.9	3.5	84	39	123
9.1 - 20.0	3.8	11.2	15.0	20	45	65
20.1 - 40.0	0.0	46.2	46.2	0	65	65
> 40.0	0.0	23.6	23.6	0	13	13
Total	10.2	81.9	92.1	104	162	266

**SITE INFORMATION**

Site location: N 43° 26' 29.6" W 122° 33' 23.9"
 Elevation: 2,830 ft Aspect: 60° Slope: 46%

Cover type: Douglas-fir–Western Hemlock (SAF 230)
 Biophysical setting: North Pacific Maritime Dry-Mesic
 Douglas-fir – Western Hemlock Forest
 Spotted Owl Province: Western Oregon Cascades

STAND INFORMATION

Understory: *Achlys triphylla*, *Gaultheria shallon*,
Goodyera oblongifolia, *Mahonia nervosa*,
Rhododendron macrophyllum, *Trientalis borealis*,
Trillium ovatum, *Vaccinium* spp.

Trees (% of stems >4 in d.b.h.): *Tsuga heterophylla* (42),
Pseudotsuga menziesii (29), *Thuja plicata* (22),
 Unknown conifer (4), *Calocedrus decurrens* (3),
Cornus nutallii (1), *Pinus lambertiana* (1), *Chrysolepis*
chrysophylla (1)

Standing dead trees: 13% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 16/ac
 Crown closure: 88%

Seedlings (% of stems): *Acer circinatum* (53), unknown
 conifer (24), *Tsuga heterophylla* (21), *Chrysolepis*
chrysophylla (1), *Thuja plicata* (1), *Taxus brevifolia* (1)
 Density: 5,904/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.7	1.7	92
Conifer litter	0.6	1.2	72
Other	1.1	0.5	20
Duff	5.5	84.1	100
Litter derived	4.8	34.2	60
Rotten wood	6.7	49.9	40
Total	6.2	85.8	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Acer circinatum</i>	<i>Tsuga heterophylla</i>	<i>Tsuga heterophylla</i>	<i>Thuja plicata</i>	<i>Pseudotsuga menziesii</i>	<i>Tsuga heterophylla</i>
Second most common species	<i>Tsuga heterophylla</i>	<i>Calocedrus decurrens</i>	<i>Thuja plicata</i>	<i>Tsuga heterophylla</i>	<i>Thuja plicata</i>	<i>Pseudotsuga menziesii</i>
Tree density (stems/ac)	503	55	47	112	16	230
Live	436	50	33	97	15	195
Dead	67	5	14	15	1	35
Avg d.b.h. (in)	1.3	6.1	16.4	27.5	46.6	21.5
Live	1.3	6.0	16.8	26.7	46.8	21.3
Dead	1.5	7.3	15.3	33.0	41.3	22.4
Avg height (ft)	10.5	34.5	70.6	129.4	187.7	98.8
Live	10.9	34.6	85.9	143.8	193.0	110.0
Dead	7.9	33.1	34.2	32.4	58.0	33.7
Avg height to crown base (ft)	5.3	13.1	17.3	14.2	67.3	18.3
Live	5.3	12.7	17.3	12.3	67.3	17.5
Dead	--	18.1	--	47.0	--	34.5
Avg height to live crown (ft)	5.9	18.2	43.2	51.9	83.0	44.2
Basal area (ft ² /ac)	7.5	2.8	17.5	117.4	47.2	184.9
Live	6.5	2.5	13.0	95.5	45.8	156.8
Dead	1.0	0.3	4.5	21.9	1.4	28.1

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Gaultheria shallon</i>	na	<i>Achlys triphylla</i>	--
Second most common species	<i>Mahonia nervosa</i>	--	<i>Trientalis borealis</i>	--
Coverage (%)	7	trace	1	0
Avg height (ft)	1.6	0.2	0.4	--
Biomass (lbs/ac)	256	8	3	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.6	--	0.6	--	--	--
0.26 - 1.0	1.3	--	1.3	--	--	--
1.1 - 3.0	2.2	--	2.2	--	--	--
3.1 - 9.0	0.0	1.0	1.0	0	45	45
9.1 - 20.0	1.6	12.9	14.5	13	65	78
20.1 - 40.0	0.0	37.9	37.9	0	52	52
> 40.0	0.0	0.0	0.0	0	0	0
Total	5.7	51.8	57.5	13	162	175



SITE INFORMATION

Site location: N 44° 17' 22.5" W 122° 10' 26.1"
 Elevation: 2,795 ft Aspect: 320° Slope: 15%
 Cover type: Douglas-fir–Western Hemlock (SAF 230)
 Biophysical setting: North Pacific Maritime Mesic-Wet
 Douglas-fir – Western Hemlock Forest
 Spotted Owl Province: Western Oregon Cascades

STAND INFORMATION

Understory: *Gaultheria shallon*, *Goodyera oblongifolia*,
Mahonia nervosa, *Pyrola picta*, *Vaccinium* spp.
 Trees (% of stems >4 in d.b.h.): *Pseudotsuga menziesii* (77),
Thuja plicata (19), *Tsuga heterophylla* (4)
 Standing dead trees: 40% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 8/ac
 Crown closure: 91%
 Seedlings (% of stems): *Thuja plicata* (92), *Tsuga*
heterophylla (8)
 Density: 218/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.5	1.4	100
Conifer litter	0.4	1.0	80
Other	0.9	0.4	20
Duff	2.8	41.5	100
Litter derived	2.0	19.3	80
Rotten wood	5.9	22.2	20
Total	3.3	42.9	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Tsuga heterophylla</i>	<i>Thuja plicata</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>
Second most common species	<i>Thuja plicata</i>	<i>Pseudotsuga menziesii</i>	<i>Thuja plicata</i>	<i>Tsuga heterophylla</i>	--	<i>Thuja plicata</i>
Tree density (stems/ac)	117	264	309	16	4	593
Live	67	209	253	9	3	474
Dead	50	55	56	7	1	119
Avg d.b.h. (in)	2.2	6.2	12.5	25.8	50.8	10.3
Live	2.0	6.2	13.0	21.5	53.1	10.4
Dead	2.4	6.0	10.6	31.7	41.5	9.8
Avg height (ft)	13.3	37.4	89.5	76.0	120.6	66.1
Live	14.9	40.7	102.0	123.0	144.9	75.6
Dead	11.2	24.6	32.7	11.6	20.0	27.7
Avg height to crown base (ft)	7.9	14.3	45.5	52.4	66.7	32.8
Live	8.1	12.7	50.7	52.4	66.7	34.1
Dead	7.7	36.0	20.0	--	--	23.6
Avg height to live crown (ft)	10.8	19.0	65.7	69.7	73.0	45.3
Basal area (ft ² /ac)	3.8	14.5	68.1	14.8	12.9	110.3
Live	2.1	11.7	59.5	5.6	11.3	88.1
Dead	1.7	2.8	8.6	9.2	1.6	22.2

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Gaultheria shallon</i>	na	<i>Pyrola picta</i>	na
Second most common species	<i>Mahonia nervosa</i>	--	<i>Goodyera oblongifolia</i>	--
Coverage (%)	7	1	2	trace
Avg height (ft)	0.8	0.2	0.3	0.7
Biomass (lbs/ac)	43	4	6	6

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.8	--	0.8	--	--	--
0.26 - 1.0	2.3	--	2.3	--	--	--
1.1 - 3.0	2.5	--	2.5	--	--	--
3.1 - 9.0	7.6	2.8	10.4	227	130	357
9.1 - 20.0	0.7	2.7	3.4	7	19	26
20.1 - 40.0	0.0	5.3	5.3	0	7	7
> 40.0	0.0	0.0	0.0	0	0	0
Total	13.9	10.8	24.7	234	156	390

**SITE INFORMATION**

Site location: N 44° 12' 03.3" W 121° 55' 11.8"
 Elevation: 4,800 ft Aspect: -- Slope: 0%

Cover type: Douglas-fir–Western Hemlock (SAF 230)
 Biophysical setting: North Pacific Maritime Dry-Mesic
 Pacific Silver Fir – Western Hemlock – Douglas-fir Forest
 Spotted Owl Province: Western Oregon Cascades

STAND INFORMATION

Understory: *Fragaria vesca*, *Vaccinium* spp.,
Xerophyllum tenax

Trees (% of stems >4 in d.b.h.): *Abies amabilis* (51), *Tsuga mertensiana* (23), *Pseudotsuga menziesii* (19), *Pinus monticola* (7)

Standing dead trees: 15% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 5/ac
 Crown closure: 52%

Seedlings (% of stems): *Abies amabilis* (74), unknown
 conifer (24), *Tsuga mertensiana* (2), *Pinus monticola* (1)
 Density: 8,503/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.4	1.0	100
Conifer litter	0.4	1.0	100
Other	--	0.0	0
Duff	2.5	30.9	100
Litter derived	2.3	26.6	96
Rotten wood	5.7	4.3	4
Total	2.8	31.9	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Abies amabilis</i>	<i>Abies amabilis</i>	<i>Abies amabilis</i>	<i>Pseudotsuga menziesii</i>	--	<i>Abies amabilis</i>
Second most common species	<i>Tsuga mertensiana</i>	<i>Tsuga mertensiana</i>	<i>Pinus monticola</i>	<i>Tsuga mertensiana</i>	--	<i>Tsuga mertensiana</i>
Tree density (stems/ac)	621	155	177	33	0	365
Live	537	155	58	28	0	241
Dead	84	0	119	5	0	124
Avg d.b.h. (in)	1.9	5.7	11.7	25.8	--	10.4
Live	1.7	5.7	11.7	26.3	--	9.5
Dead	3.0	--	11.7	23.6	--	12.2
Avg height (ft)	9.3	28.1	39.0	98.5	--	39.8
Live	8.6	28.1	62.8	100.3	--	44.8
Dead	13.6	--	27.3	89.0	--	30.0
Avg height to crown base (ft)	3.8	8.0	10.3	17.4	--	9.8
Live	3.7	8.0	11.6	18.4	--	10.0
Dead	5.5	--	7.7	12.0	--	8.4
Avg height to live crown (ft)	4.5	10.5	21.5	34.6	--	15.9
Basal area (ft ² /ac)	14.9	7.3	33.4	30.9	0.0	71.6
Live	10.6	7.3	11.1	26.9	0.0	45.3
Dead	4.3	0.0	22.3	4.0	0.0	26.3

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Vaccinium</i> spp.	--	<i>Xerophyllum tenax</i>	--
Second most common species		--	<i>Fragaria vesca</i>	--
Coverage (%)	21	0	31	0
Avg height (ft)	1.4	--	1.1	--
Biomass (lbs/ac)	171	0	1,699	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	--	0.3	--	--	--
0.26 - 1.0	0.6	--	0.6	--	--	--
1.1 - 3.0	0.8	--	0.8	--	--	--
3.1 - 9.0	2.2	4.5	6.7	65	117	182
9.1 - 20.0	1.5	7.4	8.9	13	58	71
20.1 - 40.0	0.0	0.0	0.0	0	0	0
> 40.0	0.0	0.0	0.0	0	0	0
Total	5.4	11.9	17.3	78	175	253

**SITE INFORMATION**

Site location: N 42° 48' 13.5" W 122° 25' 08.8"
 Elevation: 3,810 ft Aspect: 180° Slope: 2%

Cover type: White fir (SAF 211)
 Biophysical setting: Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland
 Spotted Owl Province: Western Oregon Cascades

STAND INFORMATION

Understory: *Adenocaulon bicolor*, *Chimaphila umbellata*, *Fragaria vesca*, *Gaultheria ovatifolia*, *Mahonia repens*, *Pyrola* spp., *Ribes sanguineum*, *Rosa gymnocarpa*, *Rubus nivalis*, *Rubus ursinus*, *Maianthemum stellatum*, *Symphoricarpos mollis*, *Trientalis borealis*, *Vaccinium membranaceum*

Trees (% of stems >4 in d.b.h.): *Abies concolor* (37), *Pseudotsuga menziesii* (24), *Calocedrus decurrens* (20), *Chrysolepis chrysophylla* (14), *Pinus lambertiana* (4), *Cornus nuttallii* (1)

Standing dead trees: 17% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 8/ac
 Crown closure: 80%

Seedlings (% of stems): *Acer circinatum* (40), *Alnus rubra* (31), unknown conifer (26), *Cornus nuttallii* (1), *Pinus lambertiana* (1), *Lithocarpus densiflorus* (1), *Calocedrus decurrens* (1), *Abies concolor* (1)
 Density: 6,323/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.8	2.3	100
Conifer litter	0.8	2.3	100
Other	--	0.0	0
Duff	3.1	42.2	96
Litter derived	2.3	24.5	88
Rotten wood	11.8	17.7	8
Total	3.8	44.5	100



SAPLINGS AND TREES

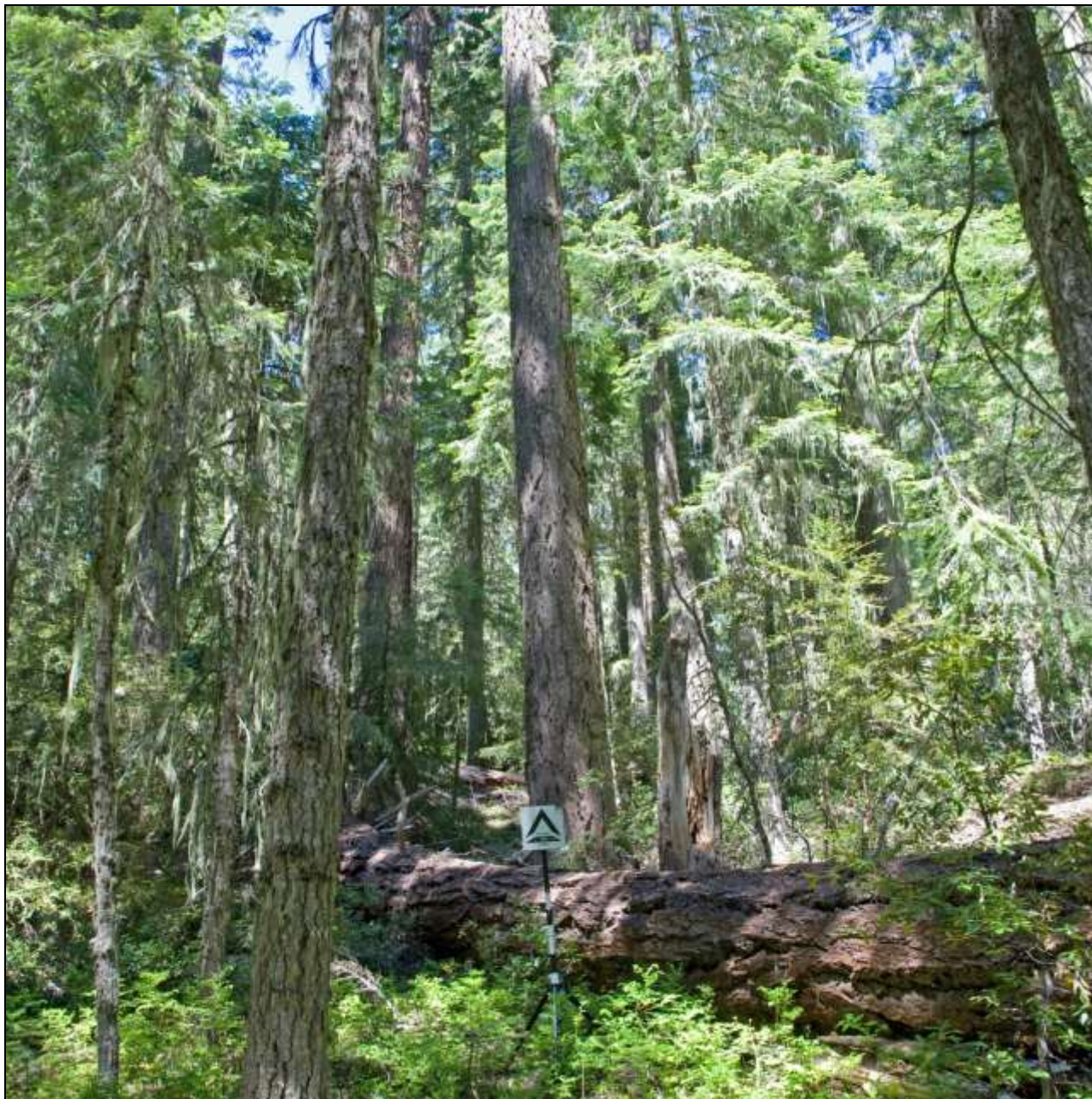
	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Alnus rubra</i>	<i>Calocedrus decurrens</i>	<i>Abies concolor</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Abies concolor</i>
Second most common species	<i>Acer circinatum</i>	<i>Abies concolor</i>	<i>Chrysopsis chrysophylla</i>	<i>Abies concolor</i>	<i>Calocedrus decurrens</i>	<i>Pseudotsuga menziesii</i>
Tree density (stems/ac)	772	243	73	36	10	362
Live	688	222	35	29	9	295
Dead	84	21	38	7	1	67
Avg d.b.h. (in)	0.7	6.7	14.1	26.3	52.6	11.4
Live	0.6	6.9	14.9	25.6	53.3	11.1
Dead	1.2	5.2	13.4	29.4	44.4	12.7
Avg height (ft)	8.9	41.2	83.7	118.6	168.0	60.9
Live	8.9	43.5	97.0	131.7	174.5	62.6
Dead	9.1	17.0	71.4	61.0	87.1	53.6
Avg height to crown base (ft)	3.0	5.7	4.2	6.5	37.8	6.4
Live	3.0	5.6	4.8	6.3	39.9	6.7
Dead	3.5	7.2	3.7	8.1	5.3	4.8
Avg height to live crown (ft)	3.7	22.4	29.8	44.8	64.2	26.8
Basal area (ft ² /ac)	4.0	15.2	21.0	34.6	38.3	109.1
Live	3.3	14.4	11.1	26.6	36.3	88.4
Dead	0.7	0.8	9.9	8.0	2.0	20.7

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Vaccinium membranaceum</i>	<i>Gaultheria ovatifolia</i>	<i>Trientalis borealis</i>	--
Second most common species	<i>Symphoricarpos mollis</i>	<i>Chimaphila umbellata</i>	<i>Maianthemum stellatum</i>	--
Coverage (%)	17	4	8	0
Avg height (ft)	0.9	0.2	0.4	--
Biomass (lbs/ac)	303	40	10	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	--	0.4	--	--	--
0.26 - 1.0	1.7	--	1.7	--	--	--
1.1 - 3.0	2.3	--	2.3	--	--	--
3.1 - 9.0	3.1	1.9	5.0	156	71	227
9.1 - 20.0	0.0	1.2	1.2	0	6	6
20.1 - 40.0	0.0	18.7	18.7	0	26	26
> 40.0	0.0	0.0	0.0	0	0	0
Total	7.5	21.8	29.3	156	103	259

**SITE INFORMATION**

Site location: N 42° 20' 49.1" W 122° 21' 37.3"
 Elevation: 4,750 ft Aspect: 225° Slope: 28%

Cover type: Pacific Douglas-fir (SAF 229)
 Biophysical setting: Mediterranean California Mesic
 Mixed Conifer Forest and Woodland
 Spotted Owl Province: Western Oregon Cascades

STAND INFORMATION

Understory: *Chimaphila menziesii*, *Clintonia uniflora*,
Gaultheria ovatifolia, *Goodyera oblongifolia*, *Mahonia*
nervosa, *Pyrola* spp., *Ribes* spp., *Rosa gymnocarpa*,
Vaccinium membranaceum, *Vancouveria hexandra*

Trees (% of stems >4 in d.b.h.): *Pseudotsuga menziesii* (48),
Abies concolor (46), *Taxus brevifolia* (3), *Pinus*
lambertiana (3)

Standing dead trees: 17% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 8/ac
 Crown closure: 48%

Seedlings (% of stems): *Chrysolepis chrysophylla* (91),
Taxus brevifolia (8), *Abies concolor* (1)
 Density: 4,109/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.4	0.9	84
Conifer litter	0.4	0.7	72
Other	0.5	0.2	12
Duff	2.5	30.6	88
Litter derived	2.0	18.2	76
Rotten wood	5.5	12.4	12
Total	2.6	31.5	96



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Chrysopsis chrysophylla</i>	<i>Abies concolor</i>	<i>Abies concolor</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>
Second most common species	<i>Taxus brevifolia</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Abies concolor</i>	--	<i>Abies concolor</i>
Tree density (stems/ac)	235	79	88	36	11	214
Live	235	71	81	28	11	191
Dead	0	8	7	8	<1	23
Avg d.b.h. (in)	1.2	6.0	14.5	24.7	46.8	14.8
Live	1.2	6.2	14.9	23.9	46.6	14.8
Dead	--	4.6	9.5	27.7	52.9	14.5
Avg height (ft)	8.8	29.6	70.6	103.4	149.8	65.2
Live	8.8	30.0	73.6	110.8	151.5	67.3
Dead	--	26.0	37.0	76.6	53.0	47.1
Avg height to crown base (ft)	1.7	9.7	17.9	33.8	50.6	19.1
Live	1.7	9.6	28.18.7	35.8	50.6	19.7
Dead	--	11.0	8.0	22.2	46.0	13.1
Avg height to live crown (ft)	2.8	15.0	28.0	45.7	68.1	28.0
Basal area (ft ² /ac)	3.1	4.1	26.3	30.8	33.5	94.7
Live	3.1	3.9	25.4	22.6	32.8	84.7
Dead	0.0	0.2	0.9	8.2	0.7	10.0

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Rosa gymnocarpa</i>	<i>Chimaphila umbellata</i>	<i>Vancouveria hexandra</i>	na
Second most common species	<i>Mahonia nervosa</i>	<i>Gaultheria ovatifolia</i>	<i>Goodyera oblongifolia</i>	--
Coverage (%)	7	1	3	trace
Avg height (ft)	1.3	0.1	0.4	1.2
Biomass (lbs/ac)	131	16	12	trace

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.5	--	0.5	--	--	--
0.26 - 1.0	1.4	--	1.4	--	--	--
1.1 - 3.0	2.4	--	2.4	--	--	--
3.1 - 9.0	4.3	2.2	6.5	169	97	266
9.1 - 20.0	5.9	2.9	8.8	45	20	65
20.1 - 40.0	14.6	8.1	22.7	26	13	39
> 40.0	92.4	0.0	92.4	45	0	45
Total	121.5	13.2	134.7	285	130	415

**SITE INFORMATION**

Site location: N 42° 05' 09.7" W 123° 01' 51.5"
 Elevation: 3,070 ft Aspect: 23° Slope: 48%

Cover type: Pacific Douglas-fir (SAF 229)
 Biophysical setting: Mediterranean California Dry-
 Mesic Mixed Conifer Forest and Woodland
 Spotted Owl Province: Oregon Klamath

STAND INFORMATION

Understory: *Adenocaulon bicolor*, *Apocynum androsaemifolium*, *Carex* spp., *Festuca* spp., *Goodyera oblongifolia*, *Lupinus* spp., *Mahonia aquifolium*, *Mahonia nervosa*, *Polystichum munitum*, *Prosartes hookeri*, *Pteridium aquilinum*, *Ribes sanguineum*, *Rubus ursinus*, *Maianthemum stellatum*, *Symphoricarpos mollis*, *Toxicodendron diversilobum*, *Trientalis borealis*

Trees (% of stems >4 in d.b.h.): *Pseudotsuga menziesii* (69), *Acer macrophyllum* (14), *Cornus nuttallii* (7), *Quercus* spp. (6), *Arbutus menziesii* (4)

Standing dead trees: 1% of stems >20 in d.b.h.

Snags > 20 in d.b.h.: 1/ac

Crown closure: 81%

Seedlings (% of stems): *Acer macrophyllum* (74), *Cornus nuttallii* (10), *Alnus rubra* (9), *Quercus* spp. (7)

Density: 1,157/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.7	2.2	100
Conifer litter	0.7	2.2	100
Other	--	0.0	0
Duff	2.3	29.3	100
Litter derived	2.2	24.9	96
Rotten wood	5.9	4.4	4
Total	3.0	31.5	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Alnus rubra</i>	<i>Pseudotsuga menziesii</i>	<i>Acer macrophyllum</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>
Second most common species	<i>Cornus nuttallii</i>	<i>Cornus nuttallii</i>	<i>Pseudotsuga menziesii</i>	--	--	<i>Acer macrophyllum</i>
Tree density (stems/ac)	101	30	49	124	6	209
Live	67	25	45	124	5	199
Dead	34	5	4	0	1	10
Avg d.b.h. (in)	0.3	5.8	11.5	30.3	52.3	23.0
Live	0.3	5.6	11.6	30.3	54.2	23.5
Dead	0.3	6.7	11.1	--	43.4	12.1
Avg height (ft)	7.8	35.4	78.3	166.3	165.9	126.6
Live	7.4	38.2	77.3	166.3	178.9	130.3
Dead	8.5	22.1	89.2	--	103.3	57.7
Avg height to crown base (ft)	2.3	13.2	20.2	32.2	53.5	27.5
Live	2.1	12.8	17.8	32.2	60.1	27.2
Dead	2.8	20.6	45.2	--	21.6	37.1
Avg height to live crown (ft)	2.6	20.9	38.4	102.4	95.2	77.4
Basal area (ft ² /ac)	<0.1	1.5	9.3	157.2	22.0	190.0
Live	<0.1	1.2	8.5	157.2	19.4	186.3
Dead	<0.1	0.3	0.8	0.0	2.6	3.7

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Mahonia nervosa</i>	--	<i>Adenocaulon bicolor</i>	<i>Carex</i> spp.
Second most common species	<i>Symphoricarpos mollis</i>	--	<i>Trientalis borealis</i>	<i>Festuca</i> spp.
Coverage (%)	16	0	9	3
Avg height (ft)	1.3	--	0.7	1.3
Biomass (lbs/ac)	271	0	23	7

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.5	--	0.5	--	--	--
0.26 - 1.0	1.7	--	1.7	--	--	--
1.1 - 3.0	3.6	--	3.6	--	--	--
3.1 - 9.0	2.1	2.7	4.8	78	110	188
9.1 - 20.0	4.7	5.2	9.9	26	39	65
20.1 - 40.0	0.0	0.0	0.0	0	0	0
> 40.0	0.0	0.0	0.0	0	0	0
Total	12.6	7.9	20.5	104	149	253

**SITE INFORMATION**

Site location: N 42° 29' 21.8" W 124° 17' 05.0"
 Elevation: 1,055 ft Aspect: 236° Slope: 23%
 Cover type: Douglas-fir-Tanoak-Pacific Madrone (SAF 234)
 Biophysical setting: Mediterranean California Mesic
 Mixed Conifer Forest and Woodland
 Spotted Owl Province: Oregon Klamath

STAND INFORMATION

Understory: *Polystichum munitum*, *Rhododendron macrophyllum*, *Vaccinium ovatum*, *Xerophyllum tenax*
 Trees (% of stems >4 in d.b.h.): *Calocedrus decurrens* (40),
Chamaecyparis lawsoniana (31), *Pseudotsuga menziesii* (26), *Acer macrophyllum* (2), *Alnus rubra* (1)
 Standing dead trees: 35% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 25/ac
 Crown closure: 90%
 Seedlings (% of stems): *Lithocarpus densiflorus* (99),
Chamaecyparis lawsoniana (1), *Umbellularia californica* (t), unknown conifer (t)
 Density: 9,778/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.7	1.9	100
Conifer litter	0.6	1.7	88
Other	0.8	0.2	12
Duff	2.7	32.9	100
Litter derived	2.7	32.9	100
Rotten wood	--	0.0	0
Total	3.4	34.8	100



SAPLINGS AND TREES

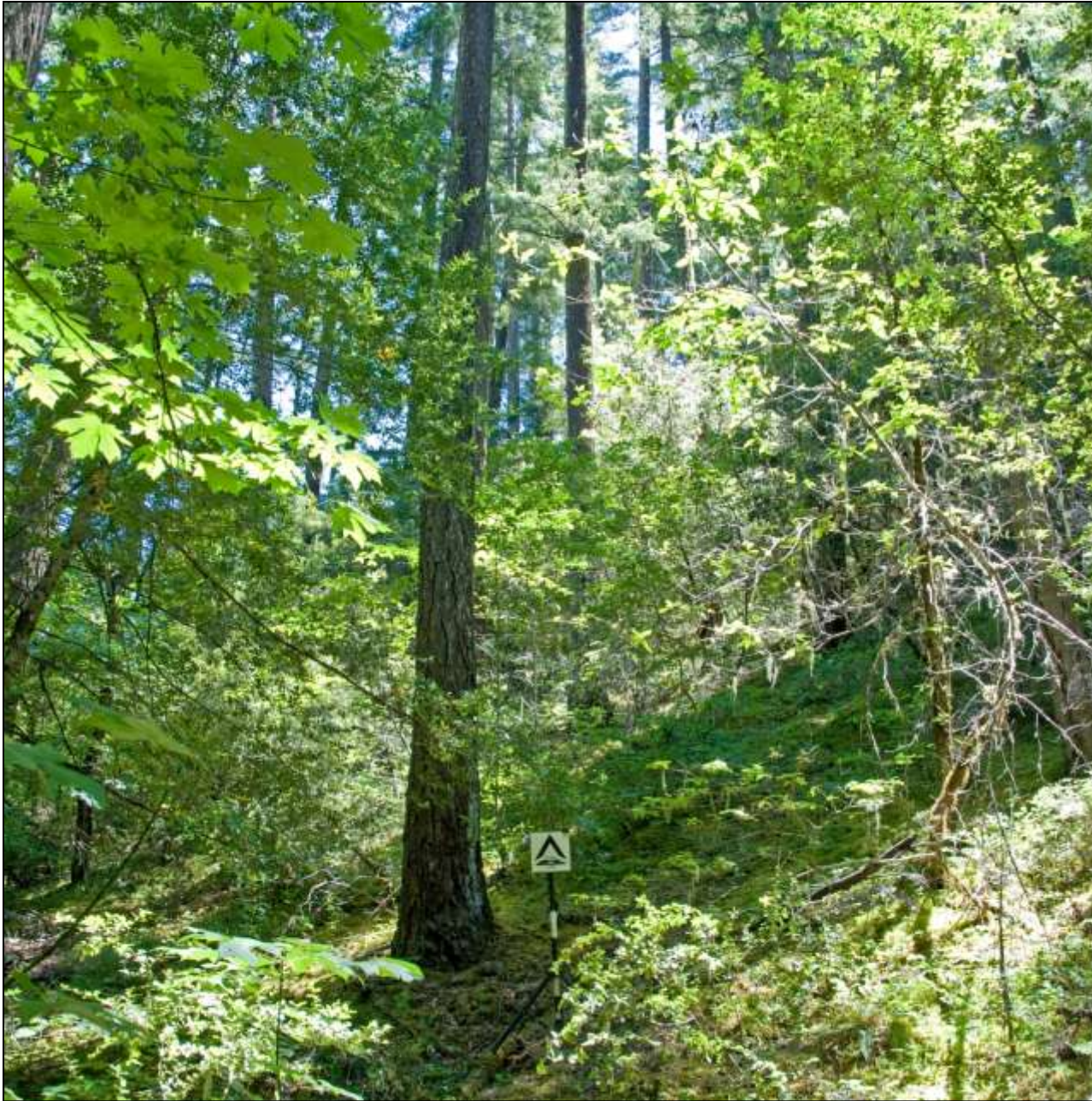
	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Lithocarpus densiflorus</i>	<i>Calocedrus decurrens</i>	<i>Calocedrus decurrens</i>	<i>Chamaecyparis lawsoniana</i>	<i>Pseudotsuga menziesii</i>	<i>Calocedrus decurrens</i>
Second most common species	<i>Chamaecyparis lawsoniana</i>	<i>Chamaecyparis lawsoniana</i>	<i>Chamaecyparis lawsoniana</i>	<i>Calocedrus decurrens</i>	<i>Chamaecyparis lawsoniana</i>	<i>Chamaecyparis lawsoniana</i>
Tree density (stems/ac)	218	38	75	33	39	185
Live	201	29	67	18	29	143
Dead	17	9	8	15	10	42
Avg d.b.h. (in)	1.7	6.7	9.3	22.7	70.0	23.9
Live	1.7	6.2	9.7	23.2	72.9	23.4
Dead	1.7	8.5	6.6	22.2	61.8	25.7
Avg height (ft)	13.1	32.5	67.4	104.1	156.6	85.5
Live	12.5	35.3	67.2	123.5	198.5	94.1
Dead	20.0	22.9	68.9	81.0	38.2	56.5
Avg height to crown base (ft)	3.4	12.3	21.0	27.4	81.6	30.7
Live	4.4	11.5	22.1	36.8	82.5	33.9
Dead	17.0	15.3	12.5	14.0	59.0	15.7
Avg height to live crown (ft)	5.7	16.8	34.5	53.8	90.5	44.6
Basal area (ft ² /ac)	5.0	2.5	11.2	24.1	277.9	315.7
Live	4.7	1.6	10.5	13.5	224.3	249.9
Dead	0.3	0.9	0.7	10.6	53.6	65.8

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Vaccinium ovatum</i>	--	<i>Polystichum munitum</i>	--
Second most common species	<i>Rhododendron macrophyllum</i>	--	<i>Xerophyllum tenax</i>	--
Coverage (%)	34	0	18	0
Avg height (ft)	4.7	--	2.3	--
Biomass (lbs/ac)	1,413	0	506	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.6	--	0.6	--	--	--
0.26 - 1.0	1.7	--	1.7	--	--	--
1.1 - 3.0	1.7	--	1.7	--	--	--
3.1 - 9.0	0.4	1.4	1.8	20	58	78
9.1 - 20.0	0.0	6.2	6.2	0	39	39
20.1 - 40.0	2.8	56.7	59.5	6	65	71
> 40.0	0.0	0.0	0.0	0	0	0
Total	7.2	64.3	71.5	26	162	188

**SITE INFORMATION**

Site location: N 42° 16' 49.9" W 123° 29' 50.5"
 Elevation: 1,720 ft Aspect: 350° Slope: 50%
 Cover type: Douglas-fir-Tanoak-Pacific Madrone (SAF 234)
 Biophysical setting: Mediterranean California Mixed
 Evergreen Forest
 Spotted Owl Province: Oregon Klamath

STAND INFORMATION

Understory: *Achlys triphylla*, *Adenocaulon bicolor*,
Apocynum androsaemifolium, *Goodyera oblongifolia*,
Polystichum munitum, *Pteridium aquilinum*, *Ribes* spp.,
Symphoricarpos mollis, *Toxicodendron diversilobum*,
Trientalis borealis, *Vancouveria hexandra*

Trees (% of stems >4 in d.b.h.): *Pseudotsuga menziesii* (52),
Quercus chrysolepis (26), *Pinus lambertiana* (9),
Quercus kelloggii (6), *Arbutus menziesii* (4),
Lithocarpus densiflorus (3), *Cornus nuttallii* (1)

Standing dead trees: 1% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: <1/ac
 Crown closure: 62%

Seedlings (% of stems): *Alnus rubra* (44), *Quercus chrysolepis* (38),
Cornus nuttallii (5), *Pseudotsuga menziesii* (5),
Lithocarpus densiflorus (4), *Pinus lambertiana* (2),
Acer macrophyllum (2)
 Density: 2,734/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	1.0	2.8	100
Conifer litter	0.6	0.3	16
Other	1.0	2.5	84
Duff	1.0	11.5	100
Litter derived	1.0	11.5	100
Rotten wood	--	0.0	0
Total	1.9	14.3	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Alnus rubra</i>	<i>Quercus chrysolepis</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>
Second most common species	<i>Quercus chrysolepis</i>	<i>Lithocarpus densiflorus</i>	<i>Quercus kelloggii</i>	<i>Pinus lambertiana</i>	<i>Pinus lambertiana</i>	<i>Quercus chrysolepis</i>
Tree density (stems/ac)	520	136	49	31	19	235
Live	520	136	49	26	19	230
Dead	0	0	1	<1	0	5
Avg d.b.h. (in)	1.2	5.3	14.6	29.0	44.3	13.1
Live	1.2	5.3	14.6	29.0	44.3	13.1
Dead	--	--	14.8	228.7	--	--
Avg height (ft)	11.1	26.4	70.4	144.8	164.9	60.3
Live	11.1	26.4	70.4	144.5	164.9	60.3
Dead	--	--	62.0	162.0	--	--
Avg height to crown base (ft)	2.7	6.6	24.0	63.5	40.0	19.3
Live	2.7	6.6	23.8	63.1	40.0	19.3
Dead	--	--	42.0	98.0	--	--
Avg height to live crown (ft)	4.4	9.8	31.2	76.8	51.0	25.2
Basal area (ft ² /ac)	6.8	5.4	14.9	31.1	49.9	101.3
Live	6.8	5.4	14.8	30.7	49.9	100.8
Dead	0.0	0.0	0.1	0.4	0.0	0.5

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Toxicodendron diversilobum</i>	--	<i>Apocynum androsaemifolium</i>	na
Second most common species	<i>Symphoricarpos mollis</i>	--	<i>Polystichum munitum</i>	--
Coverage (%)	9	0	12	1
Avg height (ft)	1.2	--	0.6	0.7
Biomass (lbs/ac)	112	0	119	1

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	--	0.3	--	--	--
0.26 - 1.0	1.0	--	1.0	--	--	--
1.1 - 3.0	1.4	--	1.4	--	--	--
3.1 - 9.0	0.1	1.0	1.1	6	26	32
9.1 - 20.0	1.1	0.0	1.1	6	0	6
20.1 - 40.0	0.0	0.0	0.0	0	0	0
> 40.0	0.0	0.0	0.0	0	0	0
Total	3.9	1.0	4.9	12	26	38

**SITE INFORMATION**

Site location: N 47° 15' 57.8" W 120° 42' 03.4"
 Elevation: 2,860 ft Aspect: 124° Slope: 12%

Cover type: Pacific Douglas-fir (SAF 229)
 Biophysical setting: East Cascades Mesic Montane
 Mixed Conifer Forest and Woodland
 Spotted Owl Province: Eastern Washington Cascades

STAND INFORMATION

Understory: *Calamagrostis rubescens*, *Galium triflorum*, *Holodiscus discolor*, *Mahonia nervosa*, *Rosa gymnocarpa*, *Symphoricarpos albus*, *Trillium ovatum*

Trees (% of stems >4 in d.b.h.): *Abies grandis* (48),
Pseudotsuga menziesii (27), *Pinus ponderosa* (25)

Standing dead trees: 10% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 5/ac
 Crown closure: 86%

Seedlings (% of stems): *Abies grandis* (87), *Pseudotsuga menziesii* (13)
 Density: 268/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.6	1.7	100
Conifer litter	0.6	1.7	100
Other	--	0.0	0
Duff	1.6	21.5	100
Litter derived	1.5	16.6	92
Rotten wood	3.3	4.9	8
Total	2.2	23.2	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Abies grandis</i>	<i>Abies grandis</i>	<i>Abies grandis</i>	<i>Pseudotsuga menziesii</i>	<i>Pinus ponderosa</i>	<i>Abies grandis</i>
Second most common species	--	--	<i>Pseudotsuga menziesii</i>	<i>Abies grandis</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>
Tree density (stems/ac)	34	72	72	45	3	196
Live	34	66	57	40	3	170
Dead	0	6	15	5	0	26
Avg d.b.h. (in)	1.3	6.8	13.4	22.0	48.0	14.1
Live	1.3	6.9	13.5	21.9	48.0	14.3
Dead	--	5.4	12.8	23.3	--	13.0
Avg height (ft)	8.0	43.9	62.8	110.2	153.3	70.1
Live	8.0	45.0	76.1	117.5	153.3	77.1
Dead	--	32.0	10.0	48.3	--	22.3
Avg height to crown base (ft)	1.5	3.3	6.2	22.5	67.2	11.1
Live	1.5	3.2	6.2	20.1	67.2	10.6
Dead	--	5.0	--	61.0	--	21.5
Avg height to live crown (ft)	5.0	16.2	27.4	43.2	72.6	28.4
Basal area (ft ² /ac)	0.3	4.8	18.3	31.5	9.5	64.1
Live	0.3	4.6	15.0	28.0	9.5	57.1
Dead	0.0	0.2	3.3	3.5	0.0	7.0

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Symphoricarpos albus</i>	--	<i>Galium triflorum</i>	<i>Calamagrostis rubescens</i>
Second most common species	<i>Rosa gymnocarpa</i>	--	<i>Trillium ovatum</i>	--
Coverage (%)	1	0	1	1
Avg height (ft)	1.7	--	0.4	0.8
Biomass (lbs/ac)	22	0	4	19

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.5	--	0.5	--	--	--
0.26 - 1.0	2.0	--	2.0	--	--	--
1.1 - 3.0	2.3	--	2.3	--	--	--
3.1 - 9.0	1.4	4.4	5.8	45	143	188
9.1 - 20.0	1.1	6.3	7.4	13	45	58
20.1 - 40.0	0.0	0.0	0.0	0	0	0
> 40.0	0.0	0.0	0.0	0	0	0
Total	7.3	10.7	18.0	58	188	246



SITE INFORMATION

Site location: N 42° 25' 04.0" W 122° 11' 27.2"
 Elevation: 4,755 ft Aspect: 40° Slope: 8%

Cover type: White fir (SAF 211)
 Biophysical setting: Mediterranean California Mesic
 Mixed Conifer Forest and Woodland
 Spotted Owl Province: Eastern Oregon Cascades

STAND INFORMATION

Understory: *Calamagrostis rubescens*, *Chimaphila umbellata*, *Chrysopsis chrysophylla*, *Galium triflorum*, *Gaultheria shallon*, *Mahonia nervosa*, *Maianthemum racemosum*, *Rosa gymnocarpa*, *Trientalis borealis*, *Trillium ovatum*

Trees (% of stems >4 in d.b.h.): *Abies concolor* (58), *Pseudotsuga menziesii* (27), *Abies magnifica* (10), *Pinus monticola* (5)

Standing dead trees: 29% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 24/ac
 Crown closure: 64%

Seedlings (% of stems): Unknown conifer (47), *Abies concolor* (38), *Pseudotsuga menziesii* (6), *Pinus monticola* (5), *Abies magnifica* (4)
 Density: 2,935/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.3	0.9	92
Conifer litter	0.3	0.9	92
Other	--	0.0	0
Duff	1.7	18.6	75
Litter derived	1.4	10.6	63
Rotten wood	3.4	8.0	12
Total	1.8	19.5	92



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Abies concolor</i>	<i>Abies concolor</i>	<i>Abies concolor</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Abies concolor</i>
Second most common species	<i>Pinus monticola</i>	<i>Abies magnifica</i>	--	<i>Abies concolor</i>	<i>Abies concolor</i>	<i>Pseudotsuga menziesii</i>
Tree density (stems/ac)	386	25	37	70	14	146
Live	386	25	37	49	11	122
Dead	0	0	0	21	3	24
Avg d.b.h. (in)	1.2	6.4	12.8	30.0	44.2	22.9
Live	1.2	6.4	12.8	31.5	44.3	21.9
Dead	--	--	--	26.5	43.8	28.4
Avg height (ft)	8.5	29.0	52.4	129.7	138.4	93.7
Live	8.5	29.0	52.4	137.0	162.5	91.7
Dead	--	--	--	112.5	32.6	103.8
Avg height to crown base (ft)	1.7	10.6	16.1	52.6	50.9	32.9
Live	1.7	10.6	16.1	52.7	50.3	32.9
Dead	--	--	--	23.0	73.0	54.8
Avg height to live crown (ft)	3.7	13.5	19.6	53.6	54.6	35.2
Basal area (ft ² /ac)	4.2	1.5	8.5	87.6	37.4	135.0
Live	4.2	1.5	8.5	67.7	30.7	108.4
Dead	0.0	0.0	0.0	19.9	6.7	26.6

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Chrysolepis chrysophylla</i>	<i>Chimaphila umbellata</i>	<i>Maianthemum racemosum</i>	<i>Calamagrostis rubescens</i>
Second most common species	<i>Mahonia nervosa</i>	<i>Gaultheria shallon</i>	<i>Galium triflorum</i>	--
Coverage (%)	18	12	3	3
Avg height (ft)	1.1	0.2	0.5	0.7
Biomass (lbs/ac)	567	52	18	4

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	--	0.4	--	--	--
0.26 - 1.0	1.0	--	1.0	--	--	--
1.1 - 3.0	1.3	--	1.3	--	--	--
3.1 - 9.0	0.0	2.7	2.7	0	84	84
9.1 - 20.0	0.0	3.2	3.2	0	19	19
20.1 - 40.0	0.0	16.2	16.2	0	19	19
> 40.0	0.0	0.0	0.0	0	0	0
Total	2.7	22.1	24.8	0	122	122

**SITE INFORMATION**

Site location: N 43° 33' 01.9" W 121° 50' 30.4"
 Elevation: 5,245 ft Aspect: 210° Slope: 15%

Cover type: White fir (SAF 211)
 Biophysical setting: Mediterranean California Mesic
 Mixed Conifer Forest and Woodland
 Spotted Owl Province: Eastern Oregon Cascades

STAND INFORMATION

Understory: *Arctostaphylos nevadensis*, *Chimaphila umbellata*, *Chrysolepis chrysophylla*, *Fragaria vesca*, *Goodyera oblongifolia*

Trees (% of stems >4 in d.b.h.): *Abies concolor* (43), *Pseudotsuga menziesii* (41), *Pinus contorta* (8), *Pinus ponderosa* (8)

Standing dead trees: 4% of stems >20 in d.b.h.
 Snags > 20 in d.b.h.: 2/ac
 Crown closure: 72%

Seedlings (% of stems): *Abies concolor* (68), unknown conifer (23), *Pseudotsuga menziesii* (9)
 Density: 369/ac

FOREST FLOOR INFORMATION

	Depth (in)	Loading (tons/ac)	Constancy (%)
Surface material	0.5	1.5	100
Conifer litter	0.5	1.5	100
Other	--	0.0	0
Duff	1.6	15.9	80
Litter derived	1.6	15.9	80
Rotten wood	--	0.0	0
Total	1.8	17.4	100



SAPLINGS AND TREES

	Size class (diameter at breast height)					
	≤ 4 in	4 - 9 in	9 - 20 in	20 - 40 in	> 40 in	> 4 in
Most common species	<i>Abies concolor</i>	<i>Abies concolor</i>	<i>Abies concolor</i>	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Abies concolor</i>
Second most common species	<i>Pseudotsuga menziesii</i>	<i>Pseudotsuga menziesii</i>	<i>Pinus contorta</i>	<i>Pinus ponderosa</i>	--	<i>Pseudotsuga menziesii</i>
Tree density (stems/ac)	336	232	84	54	1	371
Live	302	232	43	52	1	328
Dead	34	0	41	2	0	43
Avg d.b.h. (in)	2.0	6.5	13.4	30.8	51.0	11.7
Live	1.9	6.5	13.1	30.9	51.0	11.3
Dead	2.4	--	13.7	29.3	--	14.2
Avg height (ft)	10.8	42.1	83.5	119.4	129.0	62.9
Live	11.0	42.1	84.4	119.8	129.0	60.2
Dead	9.0	--	82.5	107.4	--	83.4
Avg height to crown base (ft)	4.0	7.6	12.7	35.2	89.0	12.9
Live	3.8	7.6	8.4	35.6	89.0	12.3
Dead	6.0	--	17.3	22.5	--	17.5
Avg height to live crown (ft)	8.1	17.7	19.7	54.4	89.0	24.0
Basal area (ft ² /ac)	9.6	14.1	21.4	72.3	1.9	109.7
Live	8.4	14.1	10.6	70.5	1.9	97.1
Dead	1.2	0.0	10.8	1.8	0.0	12.6

UNDERSTORY VEGETATION

	Lifeform			
	Tall shrub	Low shrub	Forb	Graminoid
Most common species	<i>Chrysolepis chrysophylla</i>	--	<i>Fragaria vesca</i>	--
Second most common species	<i>Chimaphila umbellata</i>	--	<i>Goodyera oblongifolia</i>	--
Coverage (%)	12	0	trace	0
Avg height (ft)	1.1	--	0.8	--
Biomass (lbs/ac)	901	0	trace	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.9	--	0.9	--	--	--
0.26 - 1.0	1.1	--	1.1	--	--	--
1.1 - 3.0	2.6	--	2.6	--	--	--
3.1 - 9.0	1.1	5.6	6.7	65	292	357
9.1 - 20.0	1.1	4.2	5.3	7	19	26
20.1 - 40.0	0.0	0.0	0.0	0	0	0
> 40.0	0.0	0.0	0.0	0	0	0
Total	6.8	9.8	16.6	72	311	383

Wright, Clinton S.; Vihnanek, Robert E.; Restaino, Joseph C.; Dvorak, Jon E. 2012. Photo series for quantifying natural fuels. Volume XI: eastern Oregon sagebrush-steppe and northern spotted owl nesting habitat in the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-878. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 85 p.

Three series of photographs display a range of natural conditions and fuel loadings for sagebrush-steppe types that are ecotonal with grasses, western juniper, and ponderosa pine in eastern Oregon, and one series of photographs displays a range of natural conditions and fuel loadings for northern spotted owl nesting habitat in forest types in Washington and 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, sagebrush-steppe, old-growth forest, greater sage-grouse, *Centrocercus urophasianus*, northern spotted owl, *Strix occidentalis caurina*, antelope bitterbrush, *Purshia tridentata*, big sagebrush, *Artemisia tridentata*, Douglas-fir, *Pseudotsuga menziesii*, grand fir, *Abies grandis*, Pacific silver fir, *Abies amabilis*, ponderosa pine, *Pinus ponderosa*, western hemlock, *Tsuga heterophylla*, western juniper, *Juniperus occidentalis*, western redcedar, *Thuja plicata*, white fir, *Abies concolor*.