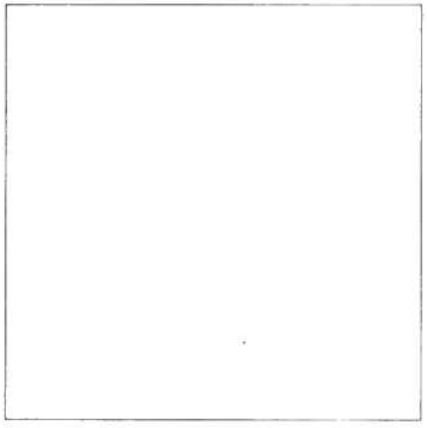
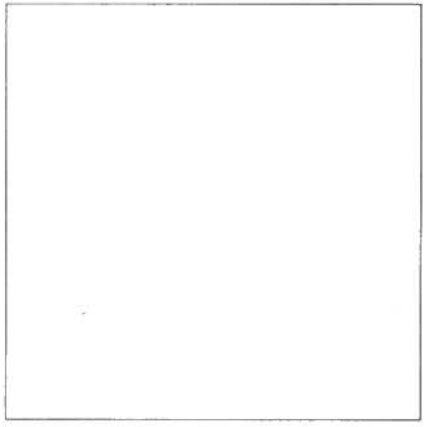
Stereo Photoseries for Quantifying Natural Fuels

Volume I: Mixed-Conifer With Mortality, Western Juniper, Sagebrush, and Grassland Types in the Interior Pacific Northwest

Roger D. Ottmar, Robert E. Vihnanek, and Clinton S. Wright





ABSTRACT

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Four series of single and stereo photographs display a range of natural conditions and fuel loadings in mixed-conifer, western juniper, sagebrush, and grassland ecosystem types in the interior Pacific Northwest. 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 photoseries is designed to help land managers appraise fuel and vegetation conditions in natural settings.

Keywords: Woody material, biomass, fuel loading, natural fuels, Douglas-fir, *Pseudotsuga menziesii*, grand fir, *Abies grandis*, ponderosa pine, *Pinus ponderosa*, western larch, *Larix occidentalis*, western juniper, *Juniperus occidentalis*, big sagebrush, *Artemisia tridentata*, mixed-conifer, grassland.

COOPERATORS

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WHAT IS THE NATURAL FUELS PHOTOSERIES?

The natural fuels photoseries is a collection of six volumes, each representing a region of the United States. Volume I (this volume) includes sites in mixed-conifer, western juniper, sagebrush, and grassland ecosystem types in the interior Pacific Northwest. Volume II includes sites in black spruce and white spruce ecosystem types in Alaska. Volume III includes sites in lodgepole pine, quaking aspen and gambel oak ecosystem types in the Rocky Mountains. Volume IV includes sites in pinyon-juniper, sagebrush, and chaparral ecosystem types in the Southwest. Volume V includes sites in red and white pine, northern tallgrass prairie, and hardwood ecosystem types in the Midwest. Volume VI includes sites in longleaf pine, pocosin, and marsh grass ecosystem types in the Southeast.

There are two to four series in each volume, each composed of between 4 and 17 sites. Generally, sites include standard, wide-angle and stereo-pair photographs 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 I) includes sites in mixed-conifer, western juniper, sagebrush, and grassland ecosystem types in the interior Pacific Northwest. The sites in this volume provide a basis for appraising and describing woody material, vegetation, and stand conditions in many areas across the interior Pacific Northwest.

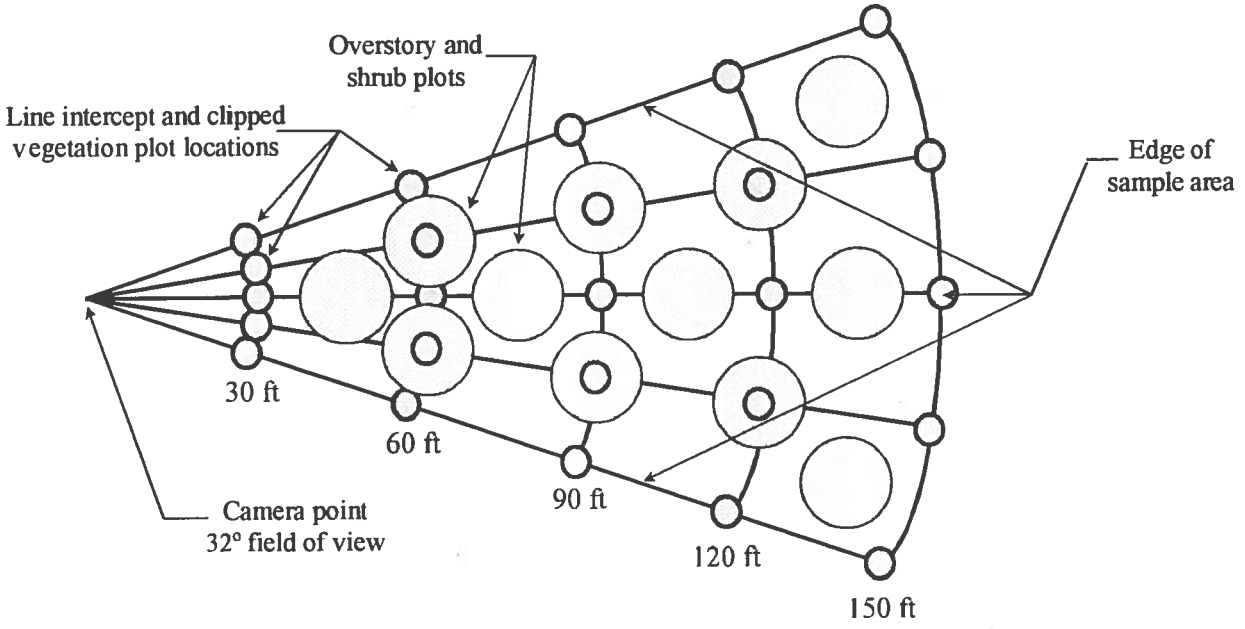

Figure 1--Photoseries sample area layout. Forty random azimuth line transects (one at each point on the 30 and 150 foot arcs, and two at each point on the 60, 90 and 120 foot arcs) and 10 to 15 clipped vegetation plots (two to three per arc) were located within the sample area. Trees and shrubs were inventoried on 12 systematically located sample plots. Seedlings were inventoried on smaller plots nested within the overstory and shrub plots.

WHY IS THE PHOTOSERIES NEEDED?

These photoseries are important land management tools that can be used to ecologically assess landscapes through appraisal of living and dead woody material and vegetation (i.e., fuels) and stand characteristics. Once an ecological 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 photoseries has application in several branches of natural resource science and management. Inventory data such as these can be used as inputs for evaluating animal and insect habitat, nutrient cycling, and microclimate, for example. Fire managers will find these data useful for predicting fuel consumption, smoke production, fire behavior, and fire effects during wildfires and prescribed fires. In addition, the photoseries 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. However, ground inventory is time consuming and expensive. Photoseries 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 PHOTOSERIES DEVELOPED?

Sites photographed for the series in this volume were selected to show a range of conditions of several site attributes depending on the ecosystem type. The mixed-conifer sites show ranges of down and dead woody material loading and insect-related tree mortality. The western juniper and sagebrush sites depict varying degrees of western juniper and sagebrush density, respectively. The grassland sites represent a range of total biomass. Photographs were taken and fuel loading, stand structure, and composition data were collected using the procedures of Maxwell and Ward (1980) as a guide.

PHOTOGRAPHS

Stereo-pair photographs are included in this guide. The three-dimensional image obtained by viewing the photographs with a stereoscope will improve the ability of the land manager to appraise natural fuel, vegetation, and stand structure conditions. Two larger photographs (wide-angle and standard views) have been included for additional comparisons. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals to provide scale. The pole is 30 feet from the camera. The summary data relate to the field of view of the stereo-pair photographs but are based on measurements taken in the sample area only (see fig. 1).

PHOTOGRAPH AND INFORMATION ARRANGEMENT

The photographs and accompanying data summaries are presented as single sites organized into four series. Each site is arranged to occupy two facing pages (with the exception of the grasslands series in which each site covers only a single page). The upper page contains the wide-angle (50 mm) and standard (80 mm) view photographs and general site information for all series. General stand information is located on the upper page for the mixed-conifer series as well. The lower page includes the stereo-pair photographs for all series and summaries of overstory structure and composition, understory composition and loading, shrub structure and composition, and dead and down woody material loading and density by size class, as appropriate for the ecosystem type. For the grassland sites, all available data are reported as site information.

SITE INFORMATION

The camera point of each site was located with a global positioning system (GPS) receiver. Elevations, where reported, were derived from U.S. Geological Survey topographic maps. Slope and aspect were measured at the mixed-confer sites only. Major species present at a site are listed in order of abundance.[1] Cover type, an indicator of current vegetation composition, was assigned for each site (Eyre 1980, Shiflet 1994). Note that in the mixed-conifer series, the species list (tree species only) and cover type appear with the stand information. Plant association was determined using locally-appropriate classifications for all sites, where available, and follows the potential vegetation concept (Hopkins and Kovalchik 1983, Johnson and Clausnitzer 1992). Classifications reported in Franklin and Dyrness (1988) were used as the phytosociological authorities where local classifications were unavailable. Soil type, where reported, was determined from county soil survey maps (Soil Conservation Service 1983, 1985).

For the mixed-conifer series, woody fuel depth was calculated as the average high particle height of 10-hour fuels measured at three locations on each of 40 random azimuth line transects used for determining dead and down woody material loading and density (fig. 1).[2] Similarly, litter and duff depth were calculated as the average of measurements taken along the line transects with loading calculated from bulk density values derived from field measurements.[3]

For the western juniper and sagebrush series, species cover values were based on canopy size data collected for all plants within the boundaries of twelve 0.005-acre shrub plots (fig. 1). For calculation purposes, we assumed that the canopies of individual plants did not overlap. Total aboveground biomass is the sum, on an area basis, of all living and dead biomass found in the sample area.

For the grassland series, grass, forb, shrub, litter, 1-hour, 10-hour, and 100-hour loadings were calculated as the average amount present in fifteen 2.69 square foot clipped vegetation plots located systematically throughout the sample area (fig. 1). Grass and forb heights are the averages from 25

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[1] A list of scientific and common species names used in this volume appears on page 8.

[2] 1-hour, 10-hour and 100-hour fuels are defined as woody material ≤0.25 inch, 0.26-1.0 inch and 1.1-3.0 inches, respectively.

[3] All biomass and loading values are reported on an oven-dry basis.

systematically located points within the sample area. Shrub height, where noted, is the average of all shrubs within the sample area. Also noted are the dates of the photography and the most recent fire, if available.

STAND INFORMATION

Stand information is reported only for the mixed-conifer series. As noted above (see "Site Information"), a species list and cover type are reported as stand information. Overstory tree, seedling, and sapling species composition and the percentage of dead standing trees were determined by sampling within the site (fig. 1). Twelve systematically located 0.005-acre circular plots comprised the overstory and sapling sample and represented 43 percent of the total sample area. Seedling density was estimated using twelve 0.001-acre circular plots nested within the overstory plots. Crown closure was measured with a spherical densiometer at 10 systematically located points in the sample area.

OVERSTORY

Overstory trees were sampled in 12 circular plots (0.005 acre each) located systematically throughout the sample area (fig. 1), for both forested series (mixed-conifer and western juniper). Tree measurement data were summarized by size class (either diameter at breast height [d.b.h.] or height).[4]

For the mixed-conifer series, tree data were further summarized by tree status (all, live, or dead). Ladder fuel height was defined as the height of the lowest live or dead branch material that could carry fire into the crown of the tree, while height to live crown was the height of the lowest continuous live branches of the tree canopy. Live crown mass values (i.e., live branches and foliage) for the mixed-conifer series were calculated from allometric equations (that use tree d.b.h.) developed by Brown (1978) for conifer species in the interior Western United States.

For the western juniper series, crown breadth was defined as the average of the diameter of the crown at the maximum width and the widest point perpendicular to the maximum width. Crown mass (live branches, dead branches and foliage) and aboveground mass (crown mass and stem mass) were calculated from allometric equations (that use crown volume) developed by Gholz (1980) for western juniper in central Oregon.

SHRUB DATA

Shrubs were measured for the western juniper and sagebrush series only. The species, basal diameter, height, maximum crown width, and the widest point perpendicular to the maximum crown width of all sagebrush (*Artemisia tridentata*) and bitterbrush (*Purshia tridentata*) plants within twelve 0.005-acre shrub plots were noted (fig. 1). The crown area was calculated for each plant and averaged to determine the mean crown area.

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

Understory or Vegetation and Biomass Data

Depending on density, understory vegetation was sampled in 10 to 15 square, clipped vegetation plots (2.69 square feet each) located systematically throughout the sample area (fig. 1). All shrubs (except sagebrush and bitterbrush), grasses, and forbs growing within each square plot were clipped at ground level and returned to the laboratory for oven drying. For the western juniper, sagebrush, and grassland series, moss, litter, duff, 1-hour, 10-hour and 100-hour fuels, if present, also were collected in the square clipped vegetation plots. Note that woody material loading (i.e., 1-hour, 10-hour and 100-hour fuels) is reported in the woody material section for the western juniper and sagebrush series. Understory vegetation and other collected material were oven-dried at a minimum of 158 °F for at least 48 hours before weighing and determination of area loading.

For the western juniper and sagebrush series, sagebrush (*Artemisia tridentata*) and bitterbrush (*Purshia tridentata*) biomass values were calculated using allometric equations (Uresk et al. 1977, Vora 1988). All other shrub biomass values are based on clipped vegetation plots. Shrub height is the average rabbitbrush (*Chrysothamnus* spp.) height measured at up to 25 systematically located points within the sample area. Sagebrush (*Artemisia*) and bitterbrush (*Purshia*) heights, however, are averages of all sagebrush and bitterbrush heights, respectively, within the twelve 0.005-acre shrub plots.

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 in 1-hour, 10-hour, and 100-hour and larger size classes was tallied on transects that were 3.3 feet, 10 feet, and 30 feet long, respectively. The decay class (sound or rotten) and the actual diameter at the point of intersection was measured for all pieces >3 inches in diameter. All woody material <3 inches in diameter was considered sound. Woody material loading and woody material density were calculated from relationships that use number of pieces intersected and transect length (and wood specific gravity for loading) developed by Brown (1974) and Safranyik and Linton (1987), respectively. Woody material data are reported by size classes that correspond to timelag fuel classes (e.g., ≤0.25 inch diameter = 1-hour timelag class) used in fire behavior modeling (see, for example, Burgan and Rothermel 1984).

Using the Photoseries

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

- Observe each characteristic for a specific size class of woody material on the ground (e.g., 3.1-9.0 inch woody material loading).
- Select a photoseries 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 photoseries site, or interpolate a value between sites.
- Repeat these steps for each size class or stand characteristic of interest.

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

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

The 20 National Fire-Danger Rating System (Burgan 1988, Deeming et al. 1977) and the 13 fire behavior (Albini 1976) fuel models are very general in content and broadly applied, consequently, we chose not to assign one of these existing fuel models to individual sites in this photoseries. The photoseries 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 Hitchcock and Cronquist (1973), unless otherwise noted.

SCIENTIFIC NAME	COMMON NAME
TREES	
Abies grandis	Grand fir
Abies lasiocarpa	Subalpine fir
Juniperus occidentalis	Western juniper
Larix occidentalis	Western larch
Pinus contorta	Lodgepole pine
Pinus ponderosa	Ponderosa pine
Pseudotsuga menziesii	Douglas-fir
SHRUBS	
Artemisia tridentata	Big sagebrush
Chimaphila umbellata	Common pipsissewa
Chrysothamnus spp.	Rabbitbrush
Linnaea borealis var. *longiflora*	Twinflower
Lonicera involucrata	Bearberry honeysuckle
Mahonia repens (formerly *Berberis repens*)	Oregongrape
Purshia tridentata	Antelope bitterbrush
Spirea betulifolia	Shiny-leaf spirea
Vaccinium membranaceum	Big huckleberry
Vaccinium scoparium	Grouse huckleberry

SCIENTIFIC NAME	COMMON NAME
FORBS	
Balsamorhiza sagittata	Arrowleaf balsamroot
Centaurea diffusa	Bushy knapweed
Fragaria virginiana	Broadpetal strawberry
Hieracium albiflorum	White-flowered hawkweed
Viola orbiculata	Round-leaved violet
Pyrola secunda	Sidebells pyrola
Mitella stauropetala	Side-flowered mitrewort
Goodyera oblongifolia	Rattlesnake plantain
GRASSES	
Bromus tectorum	Cheatgrass
Bromus vulgaris	Columbia brome
Calamagrostis rubescens	Pinegrass
Carex geyeri	Elk sedge
Carex concinnoides	Northwestern sedge
Elytrigia pontica (formerly *Agropyron elongatum*)	Tall wheatgrass
Festuca idahoensis	Idaho fescue
Festuca ovina	Sheep fescue
Koelaria cristata	Prairie junegrass
Sitanion hystrix	Bottlebrush squirreltail
Phalaris arundinacea	Reed canarygrass
Pseudoroegnaria spicata (formerly *Agropyron spicatum*)	Bluebunch wheatgrass

METRIC CONVERSIONS

1 foot = 0.3048 meter	1 acre = 0.4047 hectare	1 square foot = 0.0929 square meter	1 ton = 0.9072 metric ton
1 inch = 2.54 centimeters	1 acre = 4046.9 square meters	1 pound = 0.4536 kilogram	1 ton = 907.2 kilograms

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INTERIOR PACIFIC NORTHWEST MIXED-CONIFER PHOTOSERIES

A SERIES OF 17 SITES
MC 01 THROUGH MC 17

INTERIOR PNW MIXED-CONIFER

NOTES TO USERS:

1. The sites in this series are ordered from lightest to heaviest woody material loading.
2. A list of scientific and common species names can be found on page 8.
3. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals. The pole is 30 feet from the camera.
4. A distinction is made between rotten and sound woody material for pieces larger than 3 inches in diameter.
5. Woody material depth is the average high particle height of 10-hour fuels (see Brown 1974).
6. Bulk density values used for calculating litter and duff loading from depth are 3.00 tons·acre^{-1}·inch^{-1} and 12.10 tons·acre^{-1}·inch^{-1}, respectively.
7. Woody material and forest floor loading and live crown mass are reported in tons per acre.
8. Understory loading is reported in pounds per acre.

MC 01 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 15' 01.31" W 118° 32' 12.63"
Slope: < 10% Aspect: North
Plant association: *Pseudotsuga menziesii/Calamagrostis rubescens*
Soil type: Loamy-skeletal, mixed, frigid Ultic Argixerolls

Woody material depth: 0.1 ft	Woody material loading: 9.7 tons/ac
Litter depth: 0.5 in	Litter loading: 1.5 tons/ac
Duff depth: 0.8 in	Duff loading: 9.7 tons/ac

STAND INFORMATION

SAF cover type: Interior Ponderosa Pine
Species: *Pinus ponderosa* 57%; *Pseudotsuga menziesii* 29%; *Abies grandis* 14%
Standing dead trees: 43% Crown closure: 50%
Seedling density: 1552/ac
Most common species: *Pinus ponderosa*
Sapling density: 0/ac
Most common species: no saplings

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Pinus ponderosa*	*Pinus ponderosa*	--	--	*Pinus ponderosa*
Second most common species	--	*Pseudotsuga menziesii*	--	--	*Pseudotsuga menziesii*
Tree density (stems/ac)	34	84	0	0	118
Live	34	34	0	0	68
Dead	0	50	0	0	50
Avg DBH (in)	6.2	12.0	--	--	10.3
Live	6.2	13.4	--	--	9.8
Dead	--	11.1	--	--	11.1
Avg height (ft)	29.0	52.0	--	--	45.4
Live	29.0	55.0	--	--	42.0
Dead	--	50.0	--	--	50.0
Avg ladder fuel height (ft)	4.0	6.6	--	--	5.9
Live	4.0	6.0	--	--	5.0
Dead	--	7.0	--	--	7.0
Avg height to live crown (ft)	13.5	14.5	--	--	14.0
Live crown mass (tons/ac)	1.05	3.82	--	--	4.88

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Lonicera involucrata*	*Fragaria virginiana*	*Carex geyeri*
Other common species	*Mahonia repens*	--	--
Loading (lbs/ac)	399	71	640

WOODY MATERIAL

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	0.0	0.3	--	--	--
0.26 - 1.0	0.6	0.0	0.6	--	--	--
1.1 - 3.0	1.5	0.0	1.5	--	--	--
3.1 - 9.0	2.6	1.6	4.2	97	97	195
9.1 - 20.0	1.7	1.5	3.1	15	24	39
> 20.0	0.0	0.0	0.0	0	0	0
Total	6.7	3.1	9.7	112	122	234

MC 02 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 05' 33.07" W 119° 23' 21.77"
Slope: < 10% Aspect: South
Plant association: *Abies grandis/Carex geyeri*
Soil type: Loamy-skeletal, mixed, frigid Ultic Argixerolls

Woody material depth: 0.1 ft Woody material loading: 17.1 tons/ac
Litter depth: 0.4 in Litter loading: 1.3 tons/ac
Duff depth: 1.2 in Duff loading: 14.3 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 76%; *Pseudotsuga menziesii* 15%; *Pinus ponderosa* 9%
Standing dead trees: 59% Crown closure: 85%
Seedling density: 0/ac
Most common species: no seedlings
Sapling density: 199/ac
Most common species: *Pseudotsuga menziesii*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Pseudotsuga menziesii*	*Pinus ponderosa*	*Pinus ponderosa*	*Abies grandis*
Second most common species	*Pinus ponderosa*	*Abies grandis*	--	--	*Pseudotsuga menziesii*
Tree density (stems/ac)	386	151	17	17	571
Live	134	67	17	17	235
Dead	252	84	0	0	336
Avg DBH (in)	6.1	10.7	21.9	29.0	8.4
Live	6.4	10.1	21.9	29.0	10.2
Dead	5.9	11.2	--	--	7.2
Avg height (ft)	52.7	66.1	110.0	107.0	59.6
Live	59.1	67.5	110.0	107.0	68.6
Dead	49.3	65.0	--	--	53.3
Avg ladder fuel height (ft)	8.0	4.6	40.0	45.0	9.1
Live	5.3	4.0	40.0	45.0	10.2
Dead	9.5	5.0	--	--	8.3
Avg height to live crown (ft)	41.9	43.8	60.0	51.0	44.4
Live crown mass (tons/ac)	4.99	4.62	6.61	11.83	28.05

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Mahonia repens*	*Hieracium albiflorum*	*Carex geyeri*
Other common species	--	--	--
Loading (lbs/ac)	0	2	35

WOODY MATERIAL

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	0.0	0.4	--	--	--
0.26 - 1.0	1.5	0.0	1.5	--	--	--
1.1 - 3.0	2.7	0.0	2.7	--	--	--
3.1 - 9.0	4.6	3.3	7.8	258	165	423
9.1 - 20.0	2.2	2.4	4.7	10	24	34
> 20.0	0.0	0.0	0.0	0	0	0
Total	11.4	5.7	17.1	268	190	457

MC 03 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 15' 07.09" W 118° 33' 34.08"
Slope: < 10% Aspect: North
Plant association: *Abies grandis/Linnaea borealis* var. *longiflora*
Soil type: Loamy-skeletal, mixed, frigid Ultic Argixerolls

Woody material depth: 0.1 ft Woody material loading: 18.6 tons/ac
Litter depth: 0.6 in Litter loading: 1.9 tons/ac
Duff depth: 1.3 in Duff loading: 16.3 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 36%; *Larix occidentalis* 28%; *Pseudotsuga menziesii* 28%; *Pinus contorta* 8%
Standing dead trees: 60% Crown closure: 60%
Seedling density: 915/ac
Most common species: *Larix occidentalis*
Sapling density: 875/ac
Most common species: *Abies grandis*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Pseudotsuga menziesii*	*Pseudotsuga menziesii*	--	*Abies grandis*
Second most common species	*Larix occidentalis*	*Larix occidentalis*	--	--	*Pseudotsuga menziesii*
Tree density (stems/ac)	319	84	17	0	419
Live	118	50	0	0	168
Dead	201	34	17	0	252
Avg DBH (in)	6.2	13.5	18.1	--	8.1
Live	6.8	12.1	--	--	8.4
Dead	5.9	15.6	18.1	--	8.0
Avg height (ft)	46.0	63.6	38.0	--	49.2
Live	61.4	63.7	--	--	62.1
Dead	37.0	63.5	38.0	--	40.6
Avg ladder fuel height (ft)	14.0	21.2	6.0	--	15.1
Live	26.7	31.0	--	--	28.0
Dead	6.6	6.5	6.0	--	6.5
Avg height to live crown (ft)	40.6	45.3	--	--	42.0
Live crown mass (tons/ac)	2.40	3.01	--	--	5.41

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Linnaea borealis*	*Fragaria virginiana*	*Carex geyeri*
Other common species	--	--	*Carex concinnoides*
Loading (lbs/ac)	266	59	118

WOODY MATERIAL

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.5	0.0	0.5	--	--	--
0.26 - 1.0	1.7	0.0	1.7	--	--	--
1.1 - 3.0	2.4	0.0	2.4	--	--	--
3.1 - 9.0	9.7	0.7	10.4	404	39	443
9.1 - 20.0	0.8	2.8	3.6	10	34	44
> 20.0	0.0	0.0	0.0	0	0	0
Total	15.1	3.5	18.6	414	73	487

MC 04 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 15' 20.09" W 118° 32' 07.93"
Slope: < 10% Aspect: North
Plant association: *Abies grandis/Spirea betulifolia*
Soil type: Loamy-skeletal, mixed, frigid, Ultic Argixerolls

Woody material depth: 0.1 ft	Woody material loading: 25.8 tons/ac
Litter depth: 0.5 in	Litter loading: 1.4 tons/ac
Duff depth: 1.3 in	Duff loading: 15.6 tons/ac

STAND INFORMATION

SAF cover type: Interior Douglas-fir
Species: *Pseudotsuga menziesii* 78%; *Pinus ponderosa* 22%

Standing dead trees: 67% Crown closure: 57%
Seedling density: 2109/ac
Most common species: *Abies grandis*
Sapling density: 40/ac
Most common species: *Abies grandis*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Pseudotsuga menziesii*	*Pseudotsuga menziesii*	*Pinus ponderosa*	--	*Pseudotsuga menziesii*
Second most common species	*Pinus ponderosa*	--	--	--	*Pinus ponderosa*
Tree density (stems/ac)	84	50	17	0	151
Live	17	17	17	0	51
Dead	67	33	0	0	100
Avg DBH (in)	7.1	11.3	20.1	--	9.9
Live	8.7	13.6	20.1	--	14.1
Dead	6.7	10.2	--	--	7.9
Avg height (ft)	36.2	47.3	85.0	--	45.3
Live	52.0	75.0	85.0	--	70.7
Dead	32.3	33.5	--	--	32.7
Avg ladder fuel height (ft)	3.4	4.7	10.0	--	4.6
Live	6.0	7.0	10.0	--	7.7
Dead	2.8	3.5	--	--	3.0
Avg height to live crown (ft)	12.0	30.0	35.0	--	25.7
Live crown mass (tons/ac)	0.97	1.62	5.53	--	8.13

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Spirea betulifolia*	*Fragaria virginiana*	*Carex geyeri*
Other common species	--	--	--
Loading (lbs/ac)	740	82	797

WOODY MATERIAL

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	0.0	0.3	--	--	--
0.26 - 1.0	1.0	0.0	1.0	--	--	--
1.1 - 3.0	1.4	0.0	1.4	--	--	--
3.1 - 9.0	3.3	3.2	6.5	146	170	316
9.1 - 20.0	5.9	5.5	11.5	54	39	93
> 20.0	0.0	5.1	5.1	0	15	15
Total	11.9	13.9	25.8	200	224	423

MC 05 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 15' 24.85" W 118° 33' 19.40"
Slope: ~ 20% Aspect: North
Plant association: *Abies grandis/Linnaea borealis* var. *longiflora*
Soil type: Loamy-skeletal, mixed, frigid Ultic Argixerolls

Woody material depth: 0.3 ft Woody material loading: 30.9 tons/ac
Litter depth: 0.8 in Litter loading: 2.3 tons/ac
Duff depth: 1.4 in Duff loading: 17.3 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 40%; *Pinus contorta* 27%; *Pseudotsuga menziesii* 20%; *Larix occidentalis* 13%
Standing dead trees: 60% Crown closure: 50%
Seedling density: 3462/ac
Most common species: *Abies grandis*
Sapling density: 676/ac
Most common species: *Abies grandis*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Abies grandis*	*Larix occidentalis*	--	*Abies grandis*
Second most common species	*Pinus contorta*	*Pseudotsuga menziesii*	--	--	*Pinus contorta*
Tree density (stems/ac)	184	34	34	0	252
Live	67	0	34	0	101
Dead	117	34	0	0	151
Avg DBH (in)	5.6	13.1	20.4	--	8.6
Live	6.9	--	20.4	--	11.4
Dead	4.8	13.1	--	--	6.7
Avg height (ft)	40.0	56.5	105.0	--	50.9
Live	59.5	--	105.0	--	74.7
Dead	28.9	56.5	--	--	35.0
Avg ladder fuel height (ft)	13.3	3.0	30.0	--	14.1
Live	29.3	--	30.0	--	29.5
Dead	4.1	3.0	--	--	3.9
Avg height to live crown (ft)	40.0	--	41.0	--	40.3
Live crown mass (tons/ac)	1.46	--	4.14	--	5.60

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Linnaea borealis*	*Fragaria virginiana*	*Calamagrostis rubescens*
Other common species	--	--	*Carex concinnoides*
Loading (lbs/ac)	840	35	285

WOODY MATERIAL

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	0.0	0.3	--	--	--
0.26 - 1.0	1.1	0.0	1.1	--	--	--
1.1 - 3.0	5.4	0.0	5.4	--	--	--
3.1 - 9.0	22.2	1.4	23.6	1,256	131	1,387
9.1 - 20.0	0.0	0.5	0.5	0	0	0
> 20.0	0.0	0.0	0.0	0	0	0
Total	29.0	1.8	30.9	1,256	131	1,387

MC 06 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 10' 46.14" W 119° 07' 20.59"
Slope: < 10% Aspect: Northeast
Plant association: *Abies grandis/Vaccinium scoparium - Linnaea borealis* var. *longiflora*
Soil type: Unknown
Woody material depth: 0.1 ft Woody material loading: 31.0 tons/ac
Litter depth: 0.4 in Litter loading: 1.2 tons/ac
Duff depth: 1.4 in Duff loading: 17.2 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 83%; *Pseudotsuga menziesii* 11%; *Pinus contorta* 6%
Standing dead trees: 11% Crown closure: 78%
Seedling density: 1194/ac
Most common species: *Abies grandis*
Sapling density: 1592/ac
Most common species: *Abies grandis*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Abies grandis*	*Abies grandis*	*Pseudotsuga menziesii*	*Abies grandis*
Second most common species	*Pinus contorta*	*Pseudotsuga menziesii*	--	--	*Pseudotsuga menziesii*
Tree density (stems/ac)	235	34	17	17	303
Live	218	17	17	17	269
Dead	17	17	0	0	34
Avg DBH (in)	5.6	10.5	18.0	38.0	8.7
Live	5.7	9.4	18.0	38.0	8.6
Dead	6.5	11.6	--	--	9.1
Avg height (ft)	40.7	57.5	95.0	140.0	51.1
Live	40.4	60.0	95.0	140.0	51.3
Dead	45.0	55.0	--	--	50.0
Avg ladder fuel height (ft)	4.8	14.5	5.0	5.0	5.9
Live	4.6	4.0	5.0	5.0	4.6
Dead	7.0	25.0	--	--	16.0
Avg height to live crown (ft)	24.0	18.0	45.0	20.0	24.7
Live crown mass (tons/ac)	6.29	1.14	3.24	8.25	18.92

UNDERSTORY

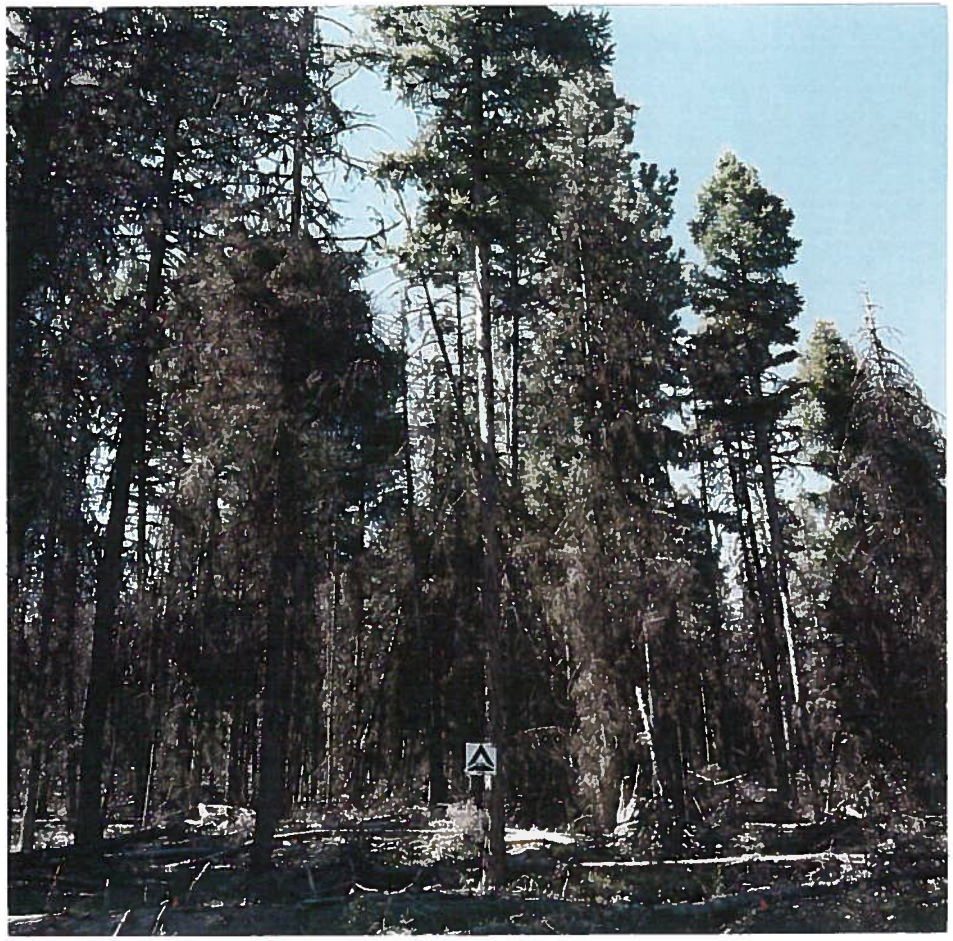
	Lifeform		
	Shrub	Forb	Grass
Most common species	*Vaccinium scoparium*	*Hieracium albiflorum*	*Calamagrostis rubescens*
Other common species	--	--	*Carex concinnoides*
Loading (lbs/ac)	322	0	27

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.7	0.0	0.7	--	--	--
0.26 - 1.0	1.6	0.0	1.6	--	--	--
1.1 - 3.0	3.8	0.0	3.8	--	--	--
3.1 - 9.0	8.7	4.0	12.7	389	243	633
9.1 - 20.0	1.9	7.2	9.1	20	68	88
> 20.0	0.0	3.1	3.1	0	10	10
Total	16.6	14.3	31.0	409	321	730

MC 07 INTERIOR PNW MIXED-CONIFER

Wide view



Standard view

SITE INFORMATION

Site location: N 45° 15' 15.42" W 118° 33' 35.52"
Slope: < 10% Aspect: East
Plant association: *Abies grandis/Calamagrostis rubescens*
Soil type: Loamy-skeletal, mixed, frigid Ultic Argixerolls

Woody material depth: 0.3 ft Woody material loading: 36.9 tons/ac
Litter depth: 0.7 in Litter loading: 2.0 tons/ac
Duff depth: 2.5 in Duff loading: 30.2 tons/ac

STAND INFORMATION

SAF cover type: Interior Douglas-fir
Species: *Pseudotsuga menziesii* 56%; *Abies grandis* 24%; *Larix occidentalis* 10%; *Pinus ponderosa* 10%
Standing dead trees: 59% Crown closure: 57%
Seedling density: 2069/ac
Most common species: *Abies grandis*
Sapling density: 279/ac
Most common species: *Pseudotsuga menziesii*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Pseudotsuga menziesii*	*Pseudotsuga menziesii*	--	--	*Pseudotsuga menziesii*
Second most common species	*Abies grandis*	*Abies grandis*	--	--	*Abies grandis*
Tree density (stems/ac)	353	135	0	0	488
Live	101	101	0	0	202
Dead	252	34	0	0	286
Avg DBH (in)	6.4	10.8	--	--	7.6
Live	6.6	11.2	--	--	8.9
Dead	6.3	9.7	--	--	6.7
Avg height (ft)	40.0	56.9	--	--	44.6
Live	46.7	58.0	--	--	52.3
Dead	37.3	53.5	--	--	39.2
Avg ladder fuel height (ft)	7.1	10.3	--	--	8.0
Live	10.2	12.5	--	--	11.3
Dead	5.9	3.5	--	--	5.6
Avg height to live crown (ft)	28.5	31.2	--	--	29.8
Live crown mass (tons/ac)	3.40	7.30	--	--	10.70

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Mahonia repens*	*Fragaria virginiana*	*Carex geyeri*
Other common species	*Chimaphila umbellata*	--	--
Loading (lbs/ac)	490	14	463

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	0.0	0.4	--	--	--
0.26 - 1.0	3.1	0.0	3.1	--	--	--
1.1 - 3.0	5.1	0.0	5.1	--	--	--
3.1 - 9.0	14.2	3.7	17.9	706	229	934
9.1 - 20.0	2.1	5.3	7.4	10	54	63
> 20.0	3.0	0.0	3.0	5	0	5
Total	27.9	8.9	36.9	720	282	1,002

MC 08 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 15' 05.72" W 118° 33' 27.12"
Slope: < 10% Aspect: East
Plant association: *Abies grandis/Carex geyeri*
Soil type: Loamy-skeletal, mixed, frigid Ultic Argixerolls

Woody material depth: 0.1 ft	Woody material loading: 39.9 tons/ac
Litter depth: 0.6 in	Litter loading: 1.7 tons/ac
Duff depth: 1.3 in	Duff loading: 15.7 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 42%; *Larix occidentalis* 26%; *Pseudotsuga menziesii* 26%; *Pinus contorta* 6%
Standing dead trees: 68% Crown closure: 42%
Seedling density: 358/ac
Most common species: *Pinus ponderosa*
Sapling density: 119/ac
Most common species: *Abies grandis*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Larix occidentalis*	*Larix occidentalis*	--	*Abies grandis*
Second most common species	*Pseudotsuga menziesii*	*Abies grandis*	--	--	*Larix occidentalis*
Tree density (stems/ac)	251	51	17	0	319
Live	50	34	17	0	101
Dead	201	17	0	0	218
Avg DBH (in)	5.6	9.8	22.9	--	7.2
Live	7.2	10.1	22.9	--	10.8
Dead	5.2	9.3	--	--	5.5
Avg height (ft)	38.9	69.0	95.0	--	46.6
Live	66.0	71.0	95.0	--	72.5
Dead	32.2	65.0	--	--	34.7
Avg ladder fuel height (ft)	15.9	23.7	50.0	--	19.1
Live	47.7	32.5	50.0	--	43.0
Dead	7.3	6.0	--	--	7.2
Avg height to live crown (ft)	47.7	32.5	50.0	--	43.0
Live crown mass (tons/ac)	1.10	1.25	2.49	--	4.84

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Lonicera involucrata*	*Fragaria virginiana*	*Carex geyeri*
Other common species	--	*Hieracium albiflorum*	*Bromus vulgaris*
Loading (lbs/ac)	42	246	423

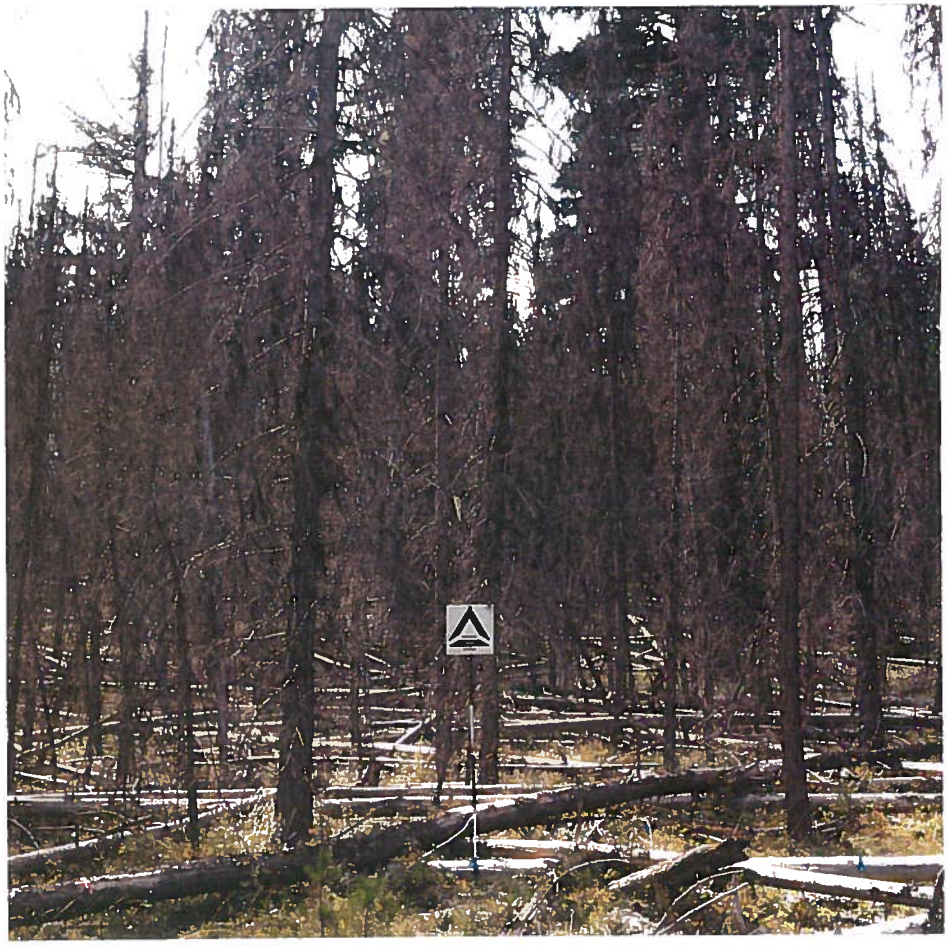
WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.8	0.0	0.8	--	--	--
0.26 - 1.0	2.5	0.0	2.5	--	--	--
1.1 - 3.0	4.4	0.0	4.4	--	--	--
3.1 - 9.0	22.6	3.1	25.7	1,100	131	1,231
9.1 - 20.0	1.5	3.5	5.1	15	44	58
> 20.0	0.0	1.4	1.4	0	5	5
Total	31.9	8.0	39.9	1,114	180	1,294

MC 09 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view



SITE INFORMATION

Site location: N 45° 08' 24.15" W 118° 28' 43.85"
Slope: < 10% Aspect: East
Plant association: *Abies grandis/Vaccinium scoparium - Linnaea borealis* var. *longiflora*
Soil type: Unknown
Woody material depth: 0.1 ft Woody material loading: 45.2 tons/ac
Litter depth: 0.4 in Litter loading: 1.2 tons/ac
Duff depth: 1.2 in Duff loading: 14.6 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 85%; *Pinus contorta* 10%; *Pseudotsuga menziesii* 5%
Standing dead trees: 95% Crown closure: 56%
Seedling density: 1552/ac
Most common species: *Larix occidentalis*
Sapling density: 875/ac
Most common species: *Abies grandis*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Abies grandis*	--	--	*Abies grandis*
Second most common species	*Pinus contorta*	--	--	--	*Pinus contorta*
Tree density (stems/ac)	302	34	0	0	336
Live	17	0	0	0	17
Dead	285	34	0	0	319
Avg DBH (in)	5.5	9.4	--	--	5.8
Live	6.4	--	--	--	6.4
Dead	5.4	9.4	--	--	5.8
Avg height (ft)	35.4	45.0	--	--	36.4
Live	55.0	--	--	--	55.0
Dead	34.3	45.0	--	--	35.4
Avg ladder fuel height (ft)	2.6	1.5	--	--	2.5
Live	6.0	--	--	--	6.0
Dead	2.4	1.5	--	--	2.3
Avg height to live crown (ft)	40.0	--	--	--	40.0
Live crown mass (tons/ac)	0.31	--	--	--	0.31

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Linnaea borealis*	*Fragaria virginiana*	*Carex geyeri*
Other common species	*Vaccinium scoparium*	*Mitella stauropetala*	*Calamagrostis rubescens*
Loading (lbs/ac)	1,318	145	211

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	0.0	0.3	--	--	--
0.26 - 1.0	0.8	0.0	0.8	--	--	--
1.1 - 3.0	3.6	0.0	3.6	--	--	--
3.1 - 9.0	24.6	3.0	27.6	1,105	136	1,241
9.1 - 20.0	0.0	12.8	12.8	0	136	136
> 20.0	0.0	0.0	0.0	0	0	0
Total	29.3	15.8	45.2	1,105	273	1,377

MC 10 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 08' 06.72" W 118° 15' 38.57"
Slope: < 10% Aspect: Northwest
Plant association: *Pinus contorta (Abies lasiocarpa)/Vaccinium scoparium*
Soil type: Unknown
Woody material depth: 0.1 ft Woody material loading: 46.7 tons/ac
Litter depth: 0.3 in Litter loading: 1.0 tons/ac
Duff depth: 1.9 in Duff loading: 23.2 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 94%; *Pseudotsuga menziesii* 6%

Standing dead trees: 82% Crown closure: 62%
Seedling density: 2387/ac
Most common species: *Abies grandis*
Sapling density: 199/ac
Most common species: *Abies grandis*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Abies grandis*	*Pseudotsuga menziesii*	--	*Abies grandis*
Second most common species	--	--	*Abies grandis*	--	*Pseudotsuga menziesii*
Tree density (stems/ac)	117	135	34	0	286
Live	0	34	17	0	51
Dead	117	101	17	0	235
Avg DBH (in)	6.8	11.8	18.0	--	10.4
Live	--	12.6	19.0	--	14.7
Dead	6.8	11.5	16.9	--	9.5
Avg height (ft)	51.4	60.6	87.5	--	60.0
Live	--	82.5	95.0	--	86.7
Dead	51.4	53.0	80.0	--	54.3
Avg ladder fuel height (ft)	6.8	5.0	3.0	--	5.4
Live	--	3.5	6.0	--	4.3
Dead	6.8	5.5	0.0	--	5.7
Avg height to live crown (ft)	--	41.5	50.0	--	44.3
Live crown mass (tons/ac)	--	3.76	2.93	--	6.68

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Vaccinium scoparium*	*Pyrola secunda*	*Carex concinnoides*
Other common species	--	--	--
Loading (lbs/ac)	178	5	7

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.5	0.0	0.5	--	--	--
0.26 - 1.0	1.3	0.0	1.3	--	--	--
1.1 - 3.0	3.5	0.0	3.5	--	--	--
3.1 - 9.0	12.5	6.9	19.4	564	321	886
9.1 - 20.0	15.6	6.4	22.1	122	88	209
> 20.0	0.0	0.0	0.0	0	0	0
Total	33.3	13.3	46.7	686	409	1,095

MC 11 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 05' 37.61" W 119° 23' 07.18"
Slope: < 10% Aspect: South
Plant association: *Abies grandis/Vaccinium scoparium - Linnaea borealis* var. *longiflora*
Soil type: Loamy-skeletal, mixed, frigid Ultic Argixerolls
Woody material depth: 0.1 ft Woody material loading: 52.6 tons/ac
Litter depth: 0.3 in Litter loading: 0.9 tons/ac
Duff depth: 0.6 in Duff loading: 6.7 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 70%; *Pseudotsuga menziesii* 25%; *Pinus contorta* 5%
Standing dead trees: 95% Crown closure: 46%
Seedling density: 119/ac
Most common species: *Pseudotsuga menziesii*
Sapling density: 517/ac
Most common species: *Abies grandis*

Overstory

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Abies grandis*	*Pseudotsuga menziesii*	--	*Abies grandis*
Second most common species	*Pseudotsuga menziesii*	*Pseudotsuga menziesii*	--	--	*Pseudotsuga menziesii*
Tree density (stems/ac)	235	84	17	0	336
Live	0	0	17	0	17
Dead	235	84	0	0	319
Avg DBH (in)	6.3	11.8	22.0	--	8.5
Live	--	--	22.0	--	22.0
Dead	6.3	11.8	--	--	7.7
Avg height (ft)	31.9	58.6	90.0	--	41.5
Live	--	--	90.0	--	90.0
Dead	31.9	58.6	--	--	39.0
Avg ladder fuel height (ft)	3.5	3.0	40.0	--	5.3
Live	--	--	40.0	--	40.0
Dead	3.5	3.0	--	--	3.4
Avg height to live crown (ft)	--	--	43.0	--	43.0
Live crown mass (tons/ac)	--	--	3.98	--	3.98

Understory

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Vaccinium scoparium*	*Fragaria virginiana*	*Carex geyeri*
Other common species	--	--	--
Loading (lbs/ac)	0	334	692

Woody Material

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.5	0.0	0.5	--	--	--
0.26 - 1.0	1.1	0.0	1.1	--	--	--
1.1 - 3.0	2.1	0.0	2.1	--	--	--
3.1 - 9.0	15.1	2.2	17.3	657	136	793
9.1 - 20.0	11.6	4.6	16.2	88	73	161
> 20.0	15.4	0.0	15.4	20	0	20
Total	45.8	6.8	52.6	764	209	973

MC 12 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 12' 52.75" W 118° 46' 30.09"
Slope: ~ 15% Aspect: Southwest
Plant association: *Abies grandis/Linnaea borealis* var. *longiflora*
Soil type: Unknown

Woody material depth: 0.1 ft Woody material loading: 54.2 tons/ac
Litter depth: 0.5 in Litter loading: 1.4 tons/ac
Duff depth: 1.7 in Duff loading: 20.4 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 64%; *Pseudotsuga menziesii* 23%; *Pinus ponderosa* 10%; *Larix occidentalis* 5%
Standing dead trees: 64% Crown closure: 87%
Seedling density: 2348/ac
Most common species: *Pseudotsuga menziesii*
Sapling density: 676/ac
Most common species: *Abies grandis*

Overstory

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Abies grandis*	*Pseudotsuga menziesii*	*Pinus ponderosa*	*Abies grandis*
Second most common species	*Pseudotsuga menziesii*	--	*Abies grandis*	--	*Pseudotsuga menziesii*
Tree density (stems/ac)	235	34	68	34	371
Live	50	17	34	34	135
Dead	185	17	34	0	236
Avg DBH (in)	5.8	10.3	19.1	31.2	11.0
Live	6.5	11.0	18.3	31.2	16.2
Dead	5.7	9.6	19.9	--	8.0
Avg height (ft)	36.9	57.5	78.3	125.0	54.3
Live	45.0	58.0	79.0	125.0	75.1
Dead	34.6	57.0	77.5	--	42.4
Avg ladder fuel height (ft)	7.6	4.5	12.5	52.5	12.3
Live	6.0	5.0	9.5	52.5	18.4
Dead	8.1	4.0	15.5	--	8.9
Avg height to live crown (ft)	31.7	40.0	17.5	55.0	35.0
Live crown mass (tons/ac)	1.69	1.47	6.02	27.55	36.73

Understory

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Linnaea borealis*	*Fragaria virginiana*	*Carex concinnoides*
Other common species	--	*Hieracium albiflorum*	--
Loading (lbs/ac)	480	50	32

Woody Material

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	0.0	0.4	--	--	--
0.26 - 1.0	1.3	0.0	1.3	--	--	--
1.1 - 3.0	1.5	0.0	1.5	--	--	--
3.1 - 9.0	2.9	1.2	4.1	102	93	195
9.1 - 20.0	0.5	16.5	17.0	5	117	122
> 20.0	0.0	29.8	29.8	0	63	63
Total	6.7	47.5	54.2	107	273	380

MC 13 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

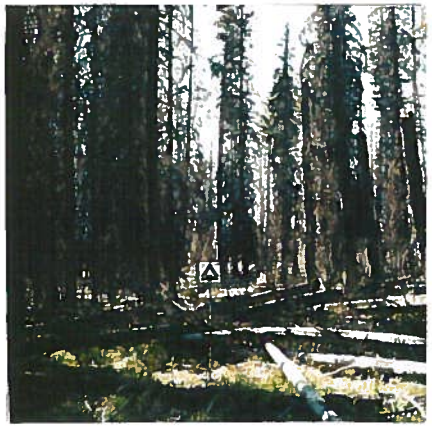
SITE INFORMATION

Site location: N 45° 13' 11.42" W 118° 35' 01.88"
Slope: < 10% Aspect: Northeast
Plant association: *Abies grandis/Vaccinium scoparium - Linnaea borealis* var. *longiflora*
Soil type: Loamy-skeletal, mixed, frigid Ultic Argixerolls
Woody material depth: 0.2 ft Woody material loading: 60.6 tons/ac
Litter depth: 0.4 in Litter loading: 1.3 tons/ac
Duff depth: 1.8 in Duff loading: 21.3 tons/ac

STAND INFORMATION

SAF cover type: Interior Douglas-fir
Species: *Pseudotsuga menziesii* 100%

Standing dead trees: 91% Crown closure: 67%
Seedling density: 159/ac
Most common species: *Pseudotsuga menziesii*
Sapling density: 0/ac
Most common species: no saplings



OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Pseudotsuga menziesii*	*Pseudotsuga menziesii*	*Pseudotsuga menziesii*	--	*Pseudotsuga menziesii*
Second most common species	--	--	--	--	--
Tree density (stems/ac)	50	101	34	0	185
Live	0	17	0	0	17
Dead	50	84	34	0	168
Avg DBH (in)	6.9	12.6	17.4	--	11.9
Live	--	15.1	--	--	15.1
Dead	6.9	12.1	17.4	--	11.6
Avg height (ft)	51.7	61.8	65.0	--	59.6
Live	--	85.0	--	--	85.0
Dead	51.7	57.2	65.0	--	57.1
Avg ladder fuel height (ft)	6.0	10.0	7.5	--	8.5
Live	--	5.0	--	--	5.0
Dead	6.0	11.0	7.5	--	8.8
Avg height to live crown (ft)	--	50.0	--	--	50.0
Live crown mass (tons/ac)	--	1.92	--	--	1.92

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Vaccinium scoparium*	*Pyrola secunda*	*Carex geyeri*
Other common species	*Vaccinium membranaceum*	*Fragaria virginiana*	--
Loading (lbs/ac)	896	95	519

WOODY MATERIAL

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	0.0	0.4	--	--	--
0.26 - 1.0	1.9	0.0	1.9	--	--	--
1.1 - 3.0	3.2	0.0	3.2	--	--	--
3.1 - 9.0	23.0	5.7	28.7	681	321	1,002
9.1 - 20.0	21.3	3.2	24.6	190	20	209
> 20.0	0.0	1.8	1.8	0	5	5
Total	49.8	10.8	60.6	871	346	1,217

MC 14 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 10' 44.25" W 119° 07' 15.99"
Slope: < 10% Aspect: West
Plant association: *Abies grandis/Vaccinium scoparium - Linnaea borealis* var. *longiflora*
Soil type: Unknown
Woody material depth: 0.3 ft Woody material loading: 63.6 tons/ac
Litter depth: 0.7 in Litter loading: 2.2 tons/ac
Duff depth: 1.4 in Duff loading: 16.5 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 67%; *Pinus contorta* 29%; *Pseudotsuga menziesii* 4%
Standing dead trees: 21% Crown closure: 78%
Seedling density: 1313/ac
Most common species: *Abies grandis*
Sapling density: 875/ac
Most common species: *Abies grandis*

Overstory

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Abies grandis*	*Abies grandis*	--	*Abies grandis*
Second most common species	*Pinus contorta*	*Pinus contorta*	--	--	*Pinus contorta*
Tree density (stems/ac)	285	101	17	0	403
Live	218	84	17	0	319
Dead	67	17	0	0	84
Avg DBH (in)	6.8	10.5	16.1	--	8.1
Live	7.1	10.8	16.1	--	8.5
Dead	5.8	9.4	--	--	6.5
Avg height (ft)	49.8	62.0	75.0	--	54.0
Live	50.2	61.4	75.0	--	54.4
Dead	48.8	65.0	--	--	52.0
Avg ladder fuel height (ft)	10.0	4.3	7.0	--	8.3
Live	10.7	3.8	7.0	--	8.7
Dead	5.5	7.0	--	--	6.0
Avg height to live crown (ft)	25.2	20.4	45.0	--	25.0
Live crown mass (tons/ac)	8.58	7.15	2.71	--	18.44

Understory

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Linnaea borealis*	*Hieracium albiflorum*	*Carex concinnoides*
Other common species	*Chimaphila umbellata*	*Goodyera oblongifolia*	--
Loading (lbs/ac)	554	82	10

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.7	0.0	0.7	--	--	--
0.26 - 1.0	1.9	0.0	1.9	--	--	--
1.1 - 3.0	3.0	0.0	3.0	--	--	--
3.1 - 9.0	33.7	3.0	36.7	1,596	185	1,781
9.1 - 20.0	19.1	2.2	21.2	131	34	165
> 20.0	0.0	0.0	0.0	0	0	0
Total	58.4	5.2	63.6	1,728	219	1,947

MC 15 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 14' 59.37" W 118° 33' 32.33"
Slope: < 10% Aspect: East
Plant association: *Abies grandis/Spirea betulifolia*
Soil type: Loamy-skeletal, mixed, frigid Ultic Argixerolls

Woody material depth: 0.1 ft Woody material loading: 72.4 tons/ac
Litter depth: 0.4 in Litter loading: 1.2 tons/ac
Duff depth: 1.1 in Duff loading: 13.9 tons/ac

STAND INFORMATION

SAF cover type: Interior Douglas-fir
Species: *Pseudotsuga menziesii* 56%; *Larix occidentalis* 31%; *Abies grandis* 13%
Standing dead trees: 75% Crown closure: 42%
Seedling density: 239/ac
Most common species: *Pinus ponderosa*
Sapling density: 796/ac
Most common species: *Abies grandis*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Pseudotsuga menziesii*	*Larix occidentalis*	*Pseudotsuga menziesii*	*Pseudotsuga menziesii*	*Pseudotsuga menziesii*
Second most common species	*Larix occidentalis*	--	--	--	*Larix occidentalis*
Tree density (stems/ac)	201	17	17	34	269
Live	50	17	0	0	67
Dead	151	0	17	34	202
Avg DBH (in)	5.8	10.5	23.9	29.3	10.2
Live	6.6	10.5	--	--	7.6
Dead	5.6	--	23.9	29.3	11.0
Avg height (ft)	33.4	70.0	6.0	60.5	37.4
Live	56.3	70.0	--	--	59.8
Dead	25.8	--	6.0	60.5	29.9
Avg ladder fuel height (ft)	10.5	20.0	na	9.0	10.9
Live	26.0	20.0	--	--	24.5
Dead	5.3	--	na	9.0	6.0
Avg height to live crown (ft)	36.7	20.0	--	--	32.5
Live crown mass (tons/ac)	0.95	0.67	--	--	1.62

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Mahonia repens*	*Fragaria virginiana*	*Carex geyeri*
Other common species	--	--	--
Loading (lbs/ac)	127	102	227

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.2	0.0	0.2	--	--	--
0.26 - 1.0	1.3	0.0	1.3	--	--	--
1.1 - 3.0	4.3	0.0	4.3	--	--	--
3.1 - 9.0	4.0	1.7	5.6	229	117	346
9.1 - 20.0	4.0	5.7	9.7	19	39	58
> 20.0	16.2	35.1	51.3	15	97	112
Total	29.9	42.5	72.4	263	253	516

MC 16 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 08' 01.31" W 118° 15' 32.86"
Slope: < 10% Aspect: Northwest
Plant association: *Abies lasiocarpa/Linnaea borealis* var. *longiflora*
Soil type: Unknown

Woody material depth: 0.3 ft Woody material loading: 76.4 tons/ac
Litter depth: 0.4 in Litter loading: 1.2 tons/ac
Duff depth: 1.6 in Duff loading: 18.9 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 75%; *Larix occidentalis* 25%

Standing dead trees: 75% Crown closure: 16%
Seedling density: 8037/ac
Most common species: *Abies grandis*
Sapling density: 80/ac
Most common species: *Abies grandis*

Overstory

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Abies grandis*	*Larix occidentalis*	--	*Abies grandis*
Second most common species	--	--	--	--	*Larix occidentalis*
Tree density (stems/ac)	34	17	17	0	68
Live	0	0	17	0	17
Dead	34	17	0	0	51
Avg DBH (in)	5.7	9.8	17.5	--	9.7
Live	--	--	17.5	--	17.5
Dead	5.7	9.8	--	--	7.0
Avg height (ft)	30.5	5.0	90.0	--	39.0
Live	--	--	90.0	--	90.0
Dead	30.5	5.0	--	--	22.0
Avg ladder fuel height (ft)	2.5	na	48.0	--	17.7
Live	--	--	48.0	--	48.0
Dead	2.5	na	--	--	2.5
Avg height to live crown (ft)	--	--	48.0	--	48.0
Live crown mass (tons/ac)	--	--	1.59	--	1.59

Understory

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Chimaphila umbellata*	*Viola orbiculata*	*Carex concinnoides*
Other common species	--	*Fragaria virginiana*	*Carex geyeri*
Loading (lbs/ac)	236	30	147

Woody Material

	Loading (tons/ac)			Density (pieces/ac)		
Diameter (in)	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.6	0.0	0.6	--	--	--
0.26 - 1.0	2.4	0.0	2.4	--	--	--
1.1 - 3.0	4.1	0.0	4.1	--	--	--
3.1 - 9.0	29.6	3.0	32.7	1,095	165	1,260
9.1 - 20.0	34.2	2.4	36.6	292	29	321
> 20.0	0.0	0.0	0.0	0	0	0
Total	70.9	5.4	76.4	1,387	195	1,582

MC 17 INTERIOR PNW MIXED-CONIFER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 05' 45.27" W 119° 23' 02.81"
Slope: ~ 15% Aspect: North
Plant association: *Abies grandis/Vaccinium scoparium - Linnaea borealis* var. *longiflora*
Soil type: Medial over loamy, mixed Entic Cryandepts
Woody material depth: 0.1 ft Woody material loading: 86.1 tons/ac
Litter depth: 0.4 in Litter loading: 1.1 tons/ac
Duff depth: 1.2 in Duff loading: 14.7 tons/ac

STAND INFORMATION

SAF cover type: Grand Fir
Species: *Abies grandis* 50%; *Pseudotsuga menziesii* 50%

Standing dead trees: 100% Crown closure: 19%
Seedling density: 2387/ac
Most common species: *Pseudotsuga menziesii*
Sapling density: 199/ac
Most common species: *Abies grandis*

OVERSTORY

	Size Class (Diameter at Breast Height)				
	4 - 9"	9 - 16"	16 - 25"	> 25"	≥ 4"
Most common species	*Abies grandis*	*Abies grandis*	*Pseudotsuga menziesii*	*Pseudotsuga menziesii*	*Pseudotsuga menziesii*
Second most common species	--	*Pseudotsuga menziesii*	--	--	*Abies grandis*
Tree density (stems/ac)	50	84	50	17	201
Live	0	0	0	0	0
Dead	50	84	50	17	201
Avg DBH (in)	6.3	11.8	18.0	32.5	13.7
Live	--	--	--	--	--
Dead	6.3	11.8	18.0	32.5	13.7
Avg height (ft)	43.3	54.0	48.3	118.0	55.3
Live	--	--	--	--	--
Dead	43.3	54.0	48.3	118.0	55.3
Avg ladder fuel height (ft)	4.7	4.8	7.0	10.0	5.8
Live	--	--	--	--	--
Dead	4.7	4.8	7.0	10.0	5.8
Avg height to live crown (ft)	--	--	--	--	--
Live crown mass (tons/ac)	--	--	--	--	0.00

UNDERSTORY

	Lifeform		
	Shrub	Forb	Grass
Most common species	*Linnaea borealis*	*Fragaria virginiana*	*Carex geyeri*
Other common species	*Vaccinium scoparium*	--	--
Loading (lbs/ac)	898	263	276

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	0.0	0.4	--	--	--
0.26 - 1.0	2.0	0.0	2.0	--	--	--
1.1 - 3.0	2.6	0.0	2.6	--	--	--
3.1 - 9.0	19.9	1.8	21.7	633	107	740
9.1 - 20.0	49.6	5.1	54.7	409	49	458
> 20.0	4.7	0.0	4.7	10	0	10
Total	79.1	7.0	86.1	1,051	156	1,207

INTERIOR PACIFIC NORTHWEST WESTERN JUNIPER PHOTOSERIES

A SERIES OF 4 SITES
WJ 01 THROUGH WJ 04

INTERIOR PNW WESTERN JUNIPER

NOTES TO USERS:

1. The sites in this series are ordered from lowest to highest density of western juniper (*Juniperus occidentalis*).
2. A list of scientific and common species names can be found on page 8.
3. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals. The pole is 30 feet from the camera.
4. A distinction is made between rotten and sound woody material for pieces larger than 3 inches in diameter.
5. Woody material loading is reported in tons per acre.
6. All other biomass loading is reported in pounds per acre.
7. Live shrub loading includes live sagebrush (*Artemisia*) loading; dead shrub loading includes dead sagebrush loading.

WJ 01 INTERIOR PNW WESTERN JUNIPER

Wide view

Standard view

SITE INFORMATION

Site location: N 45° 15' 01.31" W 118° 32' 12.63" 3,040 ft elevation
Species: *Juniperus occidentalis, Artemisia tridentata, Festuca idahoensis, Chrysothamnus* spp.
SAF cover type: Western Juniper
Plant association: *Juniperus occidentalis/Artemisia tridentata/Agropyron spicatum*
Juniperus cover: 11.2% *Artemisia* cover: 4.4%
Total aboveground biomass: 21,187 lbs/ac

Juniperus Data

	Size Class (Height)			
	< 4.5 ft	4.5 - 10 ft	>10 ft	> 0 ft
Density (stems/ac)	94	14	22	130
Basal diameter (in)	0.7	1.7	18.7	3.8
Height (ft)	1.5	6.2	23.5	6.0
Crown breadth (ft)	1.35	3.38	15.68	3.96
Crown area (ft^2)	1.60	9.21	211.91	37.49
Crown mass (lbs/ac)	57	37	6,827	6,921
Aboveground mass (lbs/ac)	63	44	13,926	14,032

Vegetation and Biomass Data

Loading (lbs/ac)		Height (ft)	
Live shrub:	695	Shrubs:	1.0*
Artemisia:	362	*Artemisia*:	1.3
Dead shrub:	86		
Forb:	14		
Grass:	269	Grass:	0.8
Moss:	9		
Litter:	261		
Duff:	22		
TOTAL:	1,356		

**Chrysothamnus* spp. height only

Shrub Data

	Percent Dead	Density (plants/ac)	Mean crown area (ft^2)	Mean basal diameter (in)
Artemisia tridentata	54	621	3.09	1.22

Woody Material

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.05	0	0.05	--	--	--
0.26 - 1.0	0.16	0	0.16	--	--	--
1.1 - 3.0	0.40	0	0.40	--	--	--
3.1 - 9.0	0.30	0.60	0.90	20	24	44
9.1 - 20.0	0	1.40	1.40	0	15	15
Total	0.90	2.00	2.90	20	39	59

WJ 02 INTERIOR PNW WESTERN JUNIPER

Wide view

Standard view

SITE INFORMATION

Site location: N 44° 04' 00.19" W 120° 46' 54.05" 3,995 ft elevation
Species: *Artemisia tridentata, Chrysothamnus* spp., *Juniperus occidentalis, Bromus tectorum, Koelaria cristata, Sitanion hystrix*
SAF cover type: Western Juniper
Plant association: *Juniperus occidentalis/Artemisia tridentata - Purshia tridentata*
Juniperus cover: 1.2% *Artemisia* cover: 30.9%
Total aboveground biomass: 7,149 lbs/ac

JUNIPERUS DATA

	Size Class (Height)			
	< 4.5 ft	4.5 - 10 ft	>10 ft	> 0 ft
Density (stems/ac)	108	22	14	144
Basal diameter (in)	0.4	2.2	3.8	1.0
Height (ft)	0.9	5.2	10.3	2.5
Crown breadth (ft)	0.79	3.07	4.73	1.52
Crown area (ft^2)	0.79	7.40	17.56	3.46
Crown mass (lbs/ac)	22	87	159	268
Aboveground mass (lbs/ac)	24	108	216	348

VEGETATION AND BIOMASS DATA

Loading (lbs/ac)		Height (ft)	
Live shrub:	4,128	Shrubs:	1.7*
Artemisia:	3,559	*Artemisia*:	1.3
Dead shrub:	276		
Forb:	42		
Grass:	161	Grass:	1.0
Moss:	110		
Litter:	416		
Duff:	63		
TOTAL:	5,196		

**Chrysothamnus* spp. height only

SHRUB DATA

	Percent dead	Density (plants/ac)	Mean crown area (ft^2)	Mean basal diameter (in)
Artemisia tridentata	23	5,787	2.32	1.30

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.19	0	0.19	--	--	--
0.26 - 1.0	0.38	0	0.38	--	--	--
1.1 - 3.0	0.23	0	0.23	--	--	--
3.1 - 9.0	0	0	0	--	--	--
9.1 - 20.0	0	0	0	--	--	--
Total	0.80	0	0.80	--	--	--

WJ 03 INTERIOR PNW WESTERN JUNIPER

Wide view

Standard view

SITE INFORMATION

Site location: N 44° 07' 43.27" W 120° 48' 29.89" 3,200 ft elevation
Species: *Juniperus occidentalis, Artemisia tridentata, Bromus tectorum*

SAF cover type: Western Juniper
Plant association: *Juniperus occidentalis/Agropyron spicatum*
Juniperus cover: 34.4% *Artemisia* cover: 3.4%
Total aboveground biomass: 14,324 lbs/ac

Juniperus Data

	Size Class (Height)			
	< 4.5 ft	4.5 - 10 ft	>10 ft	> 0 ft
Density (stems/ac)	58	29	108	195
Basal diameter (in)	0.9	2.4	8.4	5.3
Height (ft)	1.4	6.3	15.1	9.9
Crown breadth (ft)	1.49	4.28	11.98	7.80
Crown area (ft^2)	2.08	17.67	131.89	76.93
Crown mass (lbs/ac)	55	163	7,323	7,541
Aboveground mass (lbs/ac)	64	212	12,984	13,260

Vegetation and Biomass Data

Loading (lbs/ac)		Height (ft)	
Live shrub:	438	Shrubs:	1.0*
Artemisia:	356	*Artemisia*:	1.4
Dead shrub:	19		
Forb:	0		
Grass:	163	Grass:	1.0
Moss:	0		
Litter:	265		
Duff:	0		
TOTAL:	885		

**Chrysothamnus* spp. height only

Shrub Data

	Percent dead	Density (plants/ac)	Mean crown area (ft^2)	Mean basal diameter (in)
Artemisia tridentata	38	352	4.16	1.61

Woody Material

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.04	0	0.04	--	--	--
0.26 - 1.0	0.05	0	0.05	--	--	--
1.1 - 3.0	0	0	0	--	--	--
3.1 - 9.0	0	0	0	--	--	--
9.1 - 20.0	0	0	0	--	--	--
Total	0.09	0	0.09	--	--	--

WJ 04 INTERIOR PNW WESTERN JUNIPER

Wide view

Standard view

SITE INFORMATION

Site location: N 44° 04' 00.21" W 120° 46' 49.57" 4,020 ft elevation
Species: *Juniperus occidentalis, Artemisia tridentata, Chrysothamnus* spp., *Koelaria cristata, Festuca idahoensis*
SAF cover type: Western Juniper
Plant association: *Juniperus occidentalis/Artemisia tridentata/Agropyron spicatum*
Juniperus cover: 8.6% *Artemisia* cover: 15.3%
Total aboveground biomass: 5,335 lbs/ac

JUNIPERUS DATA

	Size Class (Height)			
	< 4.5 ft	4.5 - 10 ft	>10 ft	> 0 ft
Density (stems/ac)	332	65	43	441
Basal diameter (in)	0.7	2.6	5.4	1.4
Height (ft)	1.7	6.9	14.7	3.7
Crown breadth (ft)	1.47	4.31	7.37	2.47
Crown area (ft^2)	2.26	14.98	46.52	8.49
Crown mass (lbs/ac)	203	370	573	1,592
Aboveground mass (lbs/ac)	228	476	1,541	2,243

VEGETATION AND BIOMASS DATA

Loading (lbs/ac)		Height (ft)	
Live shrub:	1,110	Shrubs:	1.1*
Artemisia:	871	*Artemisia*:	1.3
Dead shrub:	427		
Forb:	15		
Grass:	221	Grass:	1.1
Moss:	0		
Litter:	238		
Duff:	80		
TOTAL:	2,091		

**Chrysothamnus* spp. height only

SHRUB DATA

	Percent dead	Density (plants/ac)	Mean crown area (ft^2)	Mean basal diameter (in)
Artemisia tridentata	51	2,516	2.65	1.38

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.11	0	0.11	--	--	--
0.26 - 1.0	0.24	0	0.24	--	--	--
1.1 - 3.0	0.15	0	0.15	--	--	--
3.1 - 9.0	0	0	0	--	--	--
9.1 - 20.0	0	0	0	--	--	--
Total	0.50	0	0.50	--	--	--

INTERIOR PACIFIC NORTHWEST SAGEBRUSH PHOTOSERIES

A SERIES OF 4 SITES
SB 01 THROUGH SB 04

INTERIOR PNW SAGEBRUSH

NOTES TO USERS:

1. The sites in this series are ordered from lowest to highest density of sagebrush (*Artemisia tridentata*).
2. A list of scientific and common species names can be found on page 8.
3. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals. The pole is 30 feet from the camera.
4. Woody material loading is reported in tons per acre.
5. All other biomass loading is reported in pounds per acre.
6. Live shrub loading includes live sagebrush (*Artemisia*) and bitterbrush (*Purshia*) loading; dead shrub loading includes dead sagebrush and bitterbrush loading.

SB 01 INTERIOR PNW SAGEBRUSH

Wide view

Standard view

SITE INFORMATION

Site location: N 43° 46' 36.47" W 120° 49' 12.74" 4,850 ft elevation

Species: *Purshia tridentata, Chrysothamnus* spp., *Artemisia tridentata, Pseudoroegnaria spicata* (formerly *Agropyron spicatum*), *Festuca idahoensis, Bromus tectorum*

SRM cover type: Antelope Bitterbrush - Idaho Fescue

Plant association: *Purshia tridentata/Festuca idahoensis*

Artemisia cover: 3.1% *Purshia* cover: 4.1%

Total aboveground biomass: 2,797 lbs/ac

SHRUB DATA

	Percent dead	Density (plants/ac)	Mean crown area (ft^2)	Mean basal diameter (in)
Artemisia tridentata	63	403	3.39	1.77
Purshia tridentata	2	822	2.15	0.79

VEGETATION AND BIOMASS DATA

Loading (lbs/ac)		Height (ft)	
Live shrub:	1296	Shrubs:	1.4*
Artemisia:	171	*Artemisia*:	1.9
Purshia:	455	*Purshia*:	1.6
Dead shrub:	335		
Forb:	14		
Grass:	957	Grass:	2.7
Litter:	95		
TOTAL:	2,697		

Chrysothamnus spp. height only

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)		
	Sound	Rotten	Total
≤ 0.25	0.04	0	0.04
0.26 - 1.0	0.01	0	0.01
1.1 - 3.0	0	0	0
3.1 - 9.0	0	0	0
9.1 - 20.0	0	0	0
Total	0.05	0	0.05

SB 02 INTERIOR PNW SAGEBRUSH

Wide view

Standard view

SITE INFORMATION

Site location: N 43° 46' 36.91" W 120° 49' 08.16" 4,840 ft elevation

Species: *Purshia tridentata, Chrysothamnus* spp., *Artemisia tridentata, Festuca idahoensis, Bromus tectorum*

SRM cover type: Antelope Bitterbrush - Idaho Fescue

Plant association: *Purshia tridentata/Festuca idahoensis*

Artemisia cover: 18.6% *Purshia* cover: 17.4%

Total aboveground biomass: 6,480 lbs/ac

SHRUB DATA

	Percent dead	Density (plants/ac)	Mean crown area (ft^2)	Mean basal diameter (in)
Artemisia tridentata	3	1,845	4.39	1.06
Purshia tridentata	7	688	11.00	1.97

VEGETATION AND BIOMASS DATA

Loading (lbs/ac)		Height (ft)	
Live shrub:	4.905	Shrubs:	0.9*
Artemisia:	2.574	*Artemisia*:	1.3
Purshia:	1.921	*Purshia*:	3.0
Dead shrub:	86		
Grass:	885	Grass:	0.9
Litter:	227		
Duff:	52		
TOTAL:	6.155		

Chrysothamnus spp. height only

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)		
	Sound	Rotten	Total
≤ 0.25	0.10	0	0.10
0.26 - 1.0	0.06	0	0.06
1.1 - 3.0	0	0	0
3.1 - 9.0	0	0	0
9.1 - 20.0	0	0	0
Total	0.16	0	0.16

SB 03 INTERIOR PNW SAGEBRUSH

Wide view

Standard view

SITE INFORMATION

Site location:	N 43° 52` 03.44" W 120° 44` 00.93" 4,405 ft elevation
Species:	*Artemisia tridentata, Chrysothamnus* spp., *Festuca idahoensis*
SRM cover type:	Sagebrush - Grass
Plant association:	*Artemisia tridentata/Festuca idahoensis*
Artemisia cover:	17.5%
Total aboveground biomass:	5,027 lbs/ac

SHRUB DATA

	Percent dead	Density (plants/ac)	Mean crown area (ft^2)	Mean basal diameter (in)
Artemisia tridentata	13	2,248	3.40	1.30

VEGETATION AND BIOMASS DATA

Loading (lbs/ac)		Height (ft)	
Live shrub:	3,059	Shrubs:	1.1*
Artemisia:	2,018	*Artemisia*:	1.5
Dead shrub:	651		
Forb:	3		
Grass:	375	Grass:	0.8
Litter:	314		
Duff:	161		
TOTAL:	4,563		

Chrysothamnus spp. height only

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)		
	Sound	Rotten	Total
≤ 0.25	0.10	0	0.10
0.26 - 1.0	0.12	0	0.12
1.1 - 3.0	0.01	0	0.01
3.1 - 9.0	0	0	0
9.1 - 20.0	0	0	0
Total	0.23	0	0.23

SB 04 INTERIOR PNW SAGEBRUSH

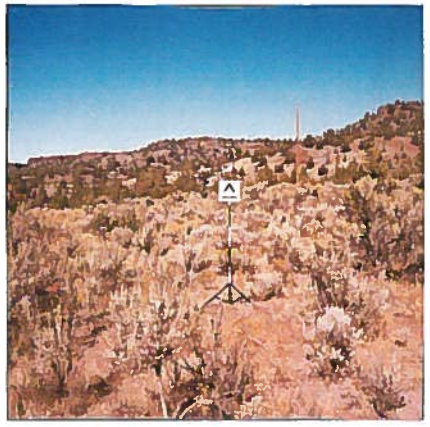
Wide view

Standard view

SITE INFORMATION

Site location: N 44° 01' 51.40" W 120° 42' 12.94" 3,440 ft elevation

Species: *Artemisia tridentata, Chrysothamnus* spp., *Juniperus occidentalis, Bromus tectorum*
SRM cover type: Western Juniper/Big Sagebrush/Bluebunch Wheatgrass
Plant association: *Juniperus occidentalis/Artemisia tridentata-Chrysothamnus viscidiflorus/ Festuca idahoensis-Balsamorhiza sagittata* (Hopkins and Kovalchick 1983)
Artemisia cover: 27.4% *Juniperus* cover: 5.3%
Total aboveground biomass: 7,206 lbs/ac



SHRUB DATA

	Percent dead	Density (plants/ac)	Mean crown area (ft^2)	Mean basal diameter (in)
Artemisia tridentata	20	3,456	3.45	1.42
Juniperus occidentalis	0	235	9.86	2.30

VEGETATION AND BIOMASS DATA

Loading (lbs/ac)		Height (ft)	
Live shrub:	4,777	Shrubs:	1.9*
Artemisia:	4,398	*Artemisia*:	2.7
Juniperus:	828	*Juniperus*:	4.1
Dead shrub:	252		
Grass:	210	Grass:	0.7
Litter:	236		
Moss:	39		
TOTAL:	6,342		

Chrysothamnus spp. height only

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)		
	Sound	Rotten	Total
≤ 0.25	0.17	0	0.17
0.26 - 1.0	0.26	0	0.26
1.1 - 3.0	0.01	0	0.01
3.1 - 9.0	0	0	0
9.1 - 20.0	0	0	0
Total	0.43	0	0.43

INTERIOR PACIFIC NORTHWEST GRASSLAND PHOTOSERIES

A SERIES OF 4 SITES
BG 01 THROUGH BG 04

INTERIOR PNW GRASSLAND

NOTES TO USERS:

1. The sites in this series are ordered from lowest to highest total biomass loading.

2. A list of scientific and common species names can be found on page 8.

3. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals. The pole is 30 feet from the camera.

4. All loadings are reported in pounds per acre.

BG 01 INTERIOR PNW GRASSLAND

Wide view

SITE INFORMATION

Site location: N 45° 11' 37.02" W 121° 04' 54.58" 950 ft elevation

Species: *Bromus tectorum, Centaurea diffusa, Artemisia tridentata*
SRM cover type: Bluebunch Wheatgrass
Plant association: *Artemisia tridentata/Bromus tectorum*

Loading (lbs/ac)	
Grass:	168
Forb:	1,262
Shrub:	199
Litter:	190
1-hr:	98
10-hr:	418
100-hr:	231
TOTAL:	2,512

Height (ft)	
Grass:	0.5
Forb:	1.5
Shrub:	2.4

Photographed in October 1996.

BG 02 INTERIOR PNW GRASSLAND

Wide view

SITE INFORMATION

Site location: N 46° 02' 30.16" W 118° 27' 38.02" 650 ft elevation

Species: *Festuca ovina*
SRM cover type: Bluebunch Wheatgrass
Plant association: *Agropyron-Festuca*

Loading (lbs/ac)	
Grass:	2,657
Forb:	242
Shrub:	0
Litter:	1,108
1-hr:	0
10-hr:	0
100-hr:	0
TOTAL:	4,007

Height (ft)	
Grass:	2.7

Site planted in 1993 or 1994.
Photographed in October 1996.

BG 03 INTERIOR PNW GRASSLAND

Wide view

SITE INFORMATION

Site location: N 46° 02' 27.71" W 118° 27' 54.95" 625 ft elevation

Species: *Elytrigia pontica* (formerly *Agropyron elongatum*)
SRM cover type: Bluebunch Wheatgrass
Plant association: *Agropyron-Festuca*

Loading (lbs/ac)	
Grass:	8,126
Forb:	0
Shrub:	0
Litter:	3,560
1-hr:	0
10-hr:	0
100-hr:	0
TOTAL:	11,685

Height (ft)	
Grass:	3.8

Site burned every three years (last burned in Spring 1993).
Photographed in October 1996.

BG 04 INTERIOR PNW GRASSLAND

Wide view

SITE INFORMATION

Site location: N 46° 02' 21.31" W 118° 27' 55.43" 625 ft elevation

Species: *Phalaris arundinacea, Elytrigia pontica* (formerly *Agropyron elongatum*)
SRM cover type: Bluebunch Wheatgrass
Plant association: *Agropyron-Festuca*

Loading (lbs/ac)	
Grass:	10,751
Forb:	119
Shrub:	0
Litter:	1,914
1-hr:	0
10-hr:	0
100-hr:	0
TOTAL:	12,785

Height (ft)	
Grass:	6.3

Site burned every three years (last burned in March 1996).
Photographed in October 1996.

Ottmar, Roger D.; Vihnanek, Robert E.; Wright, Clinton S. 1998. Stereo photoseries for quantifying natural fuels. Volume I: mixed-conifer with mortality, western juniper, sagebrush, and grassland types in the interior Pacific Northwest. 73 p.

Four series of single and stereo photographs display a range of natural conditions and fuel loadings in mixed-conifer, western juniper, sagebrush, and grassland ecosystem types in the interior Pacific Northwest. 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 photoseries is designed to help land managers appraise fuel and vegetation conditions in natural settings.

Keywords: Woody material, biomass, fuel loading, natural fuels, Douglas-fir, *Pseudotsuga menziesii*, grand fir, *Abies grandis*, ponderosa pine, *Pinus ponderosa*, western larch, *Larix occidentalis*, western juniper, *Juniperus occidentalis*, big sagebrush, *Artemisia tridentata*, mixed-conifer, grassland.