

DOUGLAS-FIR SERIES

Pseudotsuga menziesii

PSME

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The latitudinal range of Douglas-fir is the greatest of any commercial conifer of western North America. Nearly pure stands of Douglas-fir continue south from their northern limit on Vancouver Island through western Washington, Oregon, and the Klamath and Coast Ranges of northern California as far south as the Santa Cruz Mountains.

Douglas-fir behaves as a drought tolerant pioneer, with moderate tolerance to shade. It is best described as a generalist. Douglas-fir occurs in all series and at elevations ranging from sea level to 5600 feet. Rather than any particular parent material, soil depth, or aspect, Douglas-fir regeneration is associated with recently disturbed ground. Overstory presence of Douglas-fir indicates disturbance, while presence and dominance in the understory can indicate hot, dry conditions characteristic of the Series. Ponderosa pine and incense-cedar are the only major conifers with greater tolerance to drought (Minore 1979). Douglas-fir reproduces well in temperatures near 80 degrees F (Cleary and Waring 1969) and survives in less than two percent of full sunlight for at least several decades (Atzet and Waring 1970). Douglas-fir is not known, however, for its frost tolerance. Except for the isolated occurrences of climax stands of Oregon white oak and ponderosa pine, the Series occurs in the hottest, driest forest environments in southwestern Oregon.

Douglas-fir grows under a wide variety of climatic conditions. Douglas-fir typically dominates the overstory in early, mid, and late seral successional stages in Temperate and Mediterranean ecosystems throughout the Pacific Northwest. The coastal region of the Pacific Northwest has a maritime climate characterized by mild, wet winters and cool, relatively dry summers, a long frost-free season, and narrow diurnal fluctuations of temperature. Precipitation, mostly in the form of rain, is concentrated in the winter months. Climate in the Cascade range tends to be more severe; colder, shorter frost-free period, and more snow (Hermann and Lavender 1990).

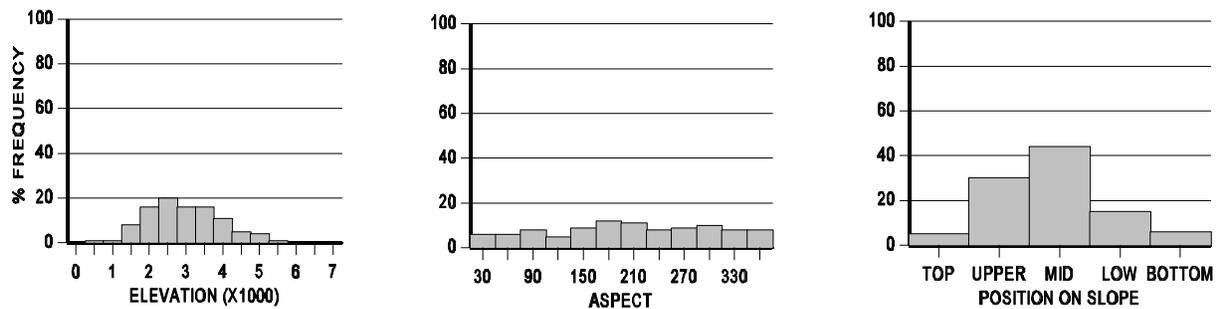
On most Temperate sites, Douglas-fir is succeeded by more shade tolerant species in the late stages of succession, and rarely attains climax status. In the southern extreme of the Temperate Zone, where it mixes with Mediterranean ecosystems, isolated stands, potentially climax to Douglas-fir, become increasingly common. These stands are usually associated with shallow, skeletal soils on south aspects. This localized hot, dry microclimate gives Douglas-fir a competitive advantage. This advantage is similar to the advantage it has immediately after disturbance, when sites are exposed to radiation, night-time re-radiation, extreme heat and cold, and desiccating winds.

Because Mediterranean ecosystems are hotter, drier, and have more clear days and nights (temperature extremes not dampened by cloud cover or high humidity) than

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Temperate systems, Douglas-fir has the potential to attain climax status (is the climax dominant) on a wide variety of soil conditions across the landscape. Yet, the Series distribution is not totally associated with a particular elevational band or continuum, like the White Fir Series. Instead, the Douglas-fir Series can be found on the hotter, drier sites at high elevations or on the coastal side of the Coastal Crest mixed with the Western Hemlock or Tanoak Series.

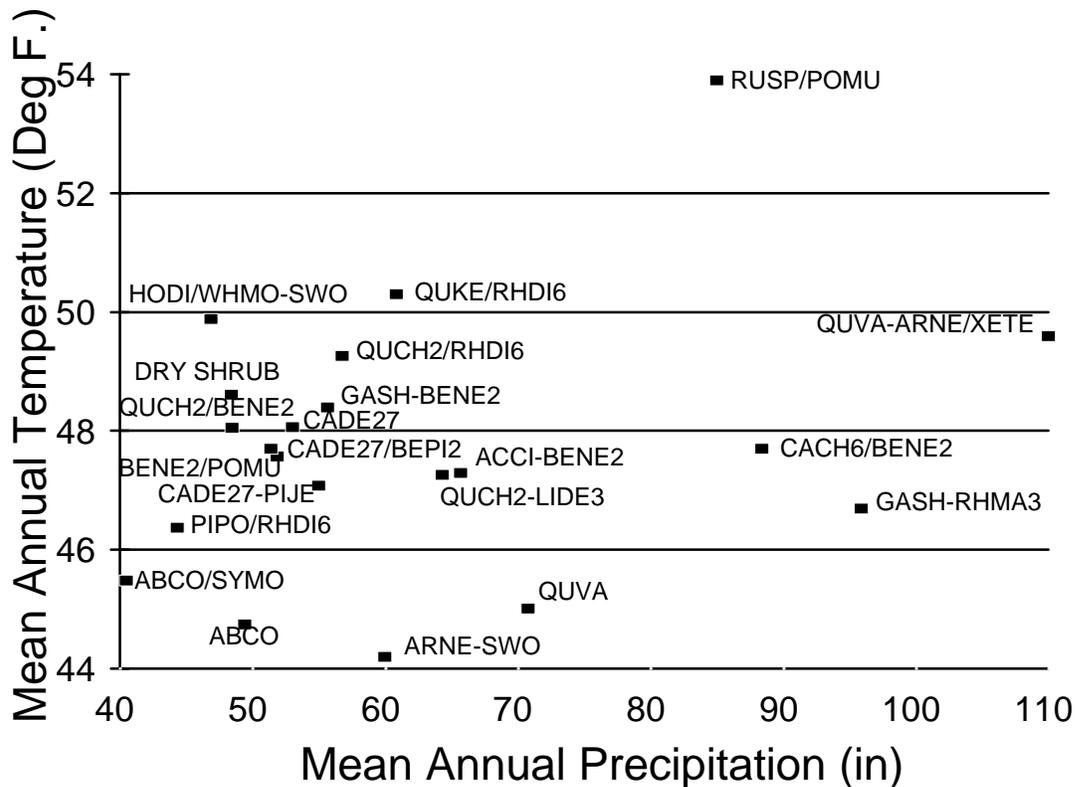
As shown in the graphs below, the Douglas-fir Series covers a wide elevational band, from 180 feet to 5620 feet with an average elevation of 2830 feet. It occurs on all aspects. Although this Series occurs on all slope positions, it is more commonly found on upper and middle-third slope positions.



Parent material is variable, consisting of basalt, andesite, sandstone, mudstone, siltstone, shale, serpentine, peridotite, or other ultramafic materials, metavolcanic materials, granodiorite, diorite, mixed metamorphic materials, sedimentary materials, schist, greywacke, welded tuff, amphibolite, granite, gabbro, pumice, rhyolite, tephra, ash, breccia, and chert. Gravel cover ranges from 4 to 29 percent, with an average of 14 percent. Rock cover ranges from 1 to 42 percent, with an average of 10 percent. Bedrock cover ranges from 0 to 10 percent, with an average of 2 percent. Litter ranges from 47 to 98 percent, with an average of 78 percent, while bare ground ranges from 0 to 12 percent, with an average of 3 percent. Moss cover ranges from 2 to 29 percent, with an average of 12 percent.

Based on 298 plots sampled, soils are shallow to deep. Surface texture is clay loam, loam, silty clay loam, sandy clay loam, silt loam, sandy loam, silty clay, loamy sand, and clay. Average rock fragment content is 44 percent, most of which is gravel (average of 34 percent).

The mean annual temperature for the Douglas-fir Series ranges from 44 degrees F to 54 degrees F and the mean annual precipitation ranges from 40 inches to 121 inches. The relative positions of the plant associations in the environment are shown on page PSME 3. Each association is plotted by mean annual temperature and mean annual precipitation.



Average species richness, based on vascular plants only, is calculated for each association. The average richness for the Douglas-fir Series ranges between 19 and 58 species per association. Richness is rated as very low, 19 to 26 species; low, 27 to 34 species; intermediate, 35 to 42 species; high, 43 to 50 species; and very high, anything greater than 51 species.

The overstory is dominated by Douglas-fir. Many other species, conifer and hardwoods alike, will be found in the overstory. The understory is dominated by Douglas-fir, with common occurrences of Pacific madrone. Canyon live oak, incense-cedar, and sugar pine occur occasionally. As in the overstory, many other species, conifers and hardwoods alike, may be present. Common shrubs include baldhip rose, dwarf Oregongrape, poison oak, creambush ocean-spray, California hazel, hairy honeysuckle, Pacific blackberry, salal, and creeping snowberry. Common herbs include white-flowered hawkweed, western starflower, rattlesnake-plantain, whipplevine, western sword-fern, pathfinder, snow-queen, braken, mountain sweet-root, vanillaleaf, slender-tubed iris, Scouler's harebell, common beargrass, and western twinflower.

For Forest Service sites, upper layer tree cover ranges from 48 to 75 percent, with an average of 62 percent. Mid-layer tree cover ranges from 27 to 52 percent, with an average of 41 percent while lower layer tree cover ranges from 16 to 56 percent, with an average of 29 percent. High shrub cover ranges from 2 to 58 percent, with an average of 18 percent, while low shrub cover ranges from 8 to 71 percent, and averages 30 percent. Herb cover ranges between 7 and 66 percent, and averages 27 percent. Low, intermediate, and high canopy covers are defined as the lower, middle, and upper thirds of the total range of average covers for each layer.

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For Bureau of Land Management sites, cover for trees greater than 10 feet tall (3 meters) ranges from 54 to 78 percent, and averages 71 percent, while cover for trees less than 10 feet tall ranges from 5 to 26 percent, and averages 11 percent. Cover for shrubs greater than 20 inches tall (50 centimeters) ranges from 3 to 44 percent, and averages 20 percent, and cover for shrubs less than 20 inches tall ranges from 7 to 58 percent, and averages 29 percent. Herb cover ranges from 6 to 44 percent, and averages 18 percent.

Twenty-one plant associations have been classified for the Douglas-fir Series in southwestern Oregon. They were described from 601 plots; 245 from Forest Service data, 337 from Bureau of Land Management data, and 19 from Natural Resources Conservation Service data. There may be some additional types on the Illinois Valley, Galice, and Chetco Ranger Districts of the Siskiyou National Forest not covered in this guide. If the southwestern Oregon key fails to work in these areas, try the Douglas-fir key in the guide "A Field Guide to the Tanoak and Douglas-fir Plant Associations in Northwestern California" (R5-ECOL-TP-009) by Thomas M. Jimerson, et. al. 1996.

The relationship of draft and final plant associations in the Douglas-fir Series is shown below. The draft associations are listed, with the final associations below, each in order of most to least common, with the percentage of plots that make up each association (refer to Methods section).

PSME-PIJE (N=7)

PSME-CADE27-PIJE (71%)
LIDE3-PIMO3/QUVA/XETE (14%)
PIMO3-LIDE3/QUVA/XETE (14%)

PSME-PIPO (N=1)

ABCO-PSME/ROGY (100%)

PSME-QUSA (N=2)

PSME-ABCO (100%)

PSME-BENE (N=11)

PSME-QUCH2/BENE2 (55%)
PSME-QUCH2/RHDI6 (27%)
PSME-ABCO/SYMO (9%)
PSME-CACH6/BENE2 (9%)

PSME/DEPAUPERATE (N=2)

PSME-PIPO/RHDI6 (50%)
PSME/ARNE-SWO (50%)

PSME/BENE/POMU (N=8)

PSME-ABCO (50%)
PSME/ARNE-SWO (25%)
PSME/ACCI-BENE2 (13%)
PSME/GASH-BENE2 (13%)

PSME/GASH/POMU (N=19)

PSME/GASH-BENE2 (42%)
ABCO/RHMA3-BENE2/LIBOL (11%)
ABCO/GASH-BENE2 (11%)
PSME-CACH6/BENE2 (11%)
PSME/ACCI-BENE2 (11%)
PSME/GASH-RHMA3 (11%)
ABCO/BENE2 (5%)

PSME/RHDI (N=8)

PSME-QUCH2/RHDI6 (38%)
PSME-QUKE/RHDI6 (38%)
PSME-PIPO/RHDI6 (13%)
PSME-QUCH2-LIDE3 (13%)

PSME/RHDI-BEPI (N=16)

PSME-PIPO/RHDI6 (44%)
PSME-QUCH2/RHDI6 (31%)
PSME-ABCO/SYMO (13%)
PSME-CADE27/BEPI2 (6%)
PSME-PIPO/RHDI6 (6%)

PSME/RHMA (N=18)

PSME/GASH-RHMA3 (67%)
PSME-CACH6/BENE2 (11%)
CHLA/RHMA3-GASH (11%)
LIDE3/VAOV2-RHMA3-GASH (6%)
PSME-ABCO (6%)

PSME-ABCO-PIPO (N=13)
 ABCO-PSME/ROGY (23%)
 PSME-CADE27/BEPI2 (23%)
 ABCO-CADE27/TRLA2 (15%)
 PSME-ABCO/SYMO (15%)
 PSME-PIPO/RHDI6 (15%)
 PSME-QUCH2-LIDE3 (8%)

PSME-ABCO (N=4)
 PSME-ABCO/SYMO (100%)

PSME-ABCO/BENE (N=6)
 PSME-CACH6/BENE2 (50%)
 PSME-ABCO (33%)
 PSME-QUCH2-LIDE3 (17%)

PSME-ABCO/HODI (N=18)
 PSME-ABCO/SYMO (28%)
 PSME-CADE27/BEPI2 (17%)
 PSME-ABCO (17%)
 ABCO-PSME/ROGY (11%)
 PSME-QUCH2/BENE2 (11%)
 ABCO/BENE2/LIBOL (6%)
 PSME-QUCH2/RHDI6 (6%)
 PSME/ARNE-SWO (6%)

PSME-LIDE3 (N=4)
 LIDE3-PSME-QUCH2/RHDI6 (25%)
 PSME-PIPO/RHDI6 (25%)
 PSME-QUCH2-LIDE3 (25%)
 PSME/ACCI-BENE2 (25%)

PSME-LIDE3/RHDI6 (N=17)
 PSME-QUCH2/RHDI6 (35%)
 PSME-QUKE/RHDI6 (29%)
 LIDE3-PSME-QUCH2/RHDI6 (18%)
 PSME-QUCH2-LIDE3 (18%)

PSME-LIDE3-PILA (N=9)
 PSME-QUCH2-LIDE3 (56%)
 PSME-QUKE/RHDI6 (22%)
 PSME-ABCO/SYMO (11%)
 PSME-CACH6/BENE2 (11%)

PSME-LIDE3-QUCH (N=8)
 PSME-QUCH2/RHDI6 (50%)
 LIDE3-PSME-QUCH2/RHDI6 (13%)
 PSME-ABCO (13%)
 PSME-CADE27-PIJE (13%)
 PSME-QUCH2/BENE2 (13%)

PSME-LIDE3/GASH (N=6)
 PSME-QUCH2-LIDE3 (33%)
 LIDE3-TSHE/VAOV2/POMU-RIP
 (17%)
 PSME-ABCO (17%)
 PSME-CACH6/BENE2 (17%)
 PSME/ACCI-BENE2 (17%)

PSME/RHDI/CYGR (N=4)
 PSME-CADE27/BEPI2 (50%)
 PSME-ABCO/SYMO (25%)
 PSME-PIPO/RHDI6 (25%)

PSME/RHDI/PTAQ (N=15)
 PSME/GASH-BENE2 (47%)
 PSME-CADE27/BEPI2 (40%)
 PSME-PIPO/RHDI6 (7%)
 PSME-QUCH2/BENE2 (7%)

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The flowchart below and on the following pages shows a graphical presentation of the classification and the relationship between associations. It is not intended to be used as the plant association key.

LITERATURE CITED

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