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Introduction to the Douglas-fir series

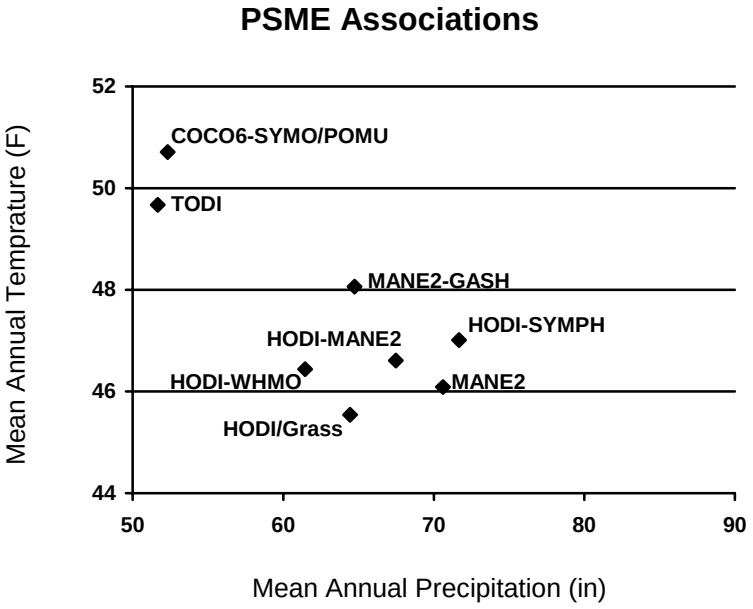
The Douglas-fir series is warm and dry. It occurs widely in low precipitation, low elevation sites, but also is common on dry microsites, shallow or skeletal soils, on warm aspects across a wide elevation range.

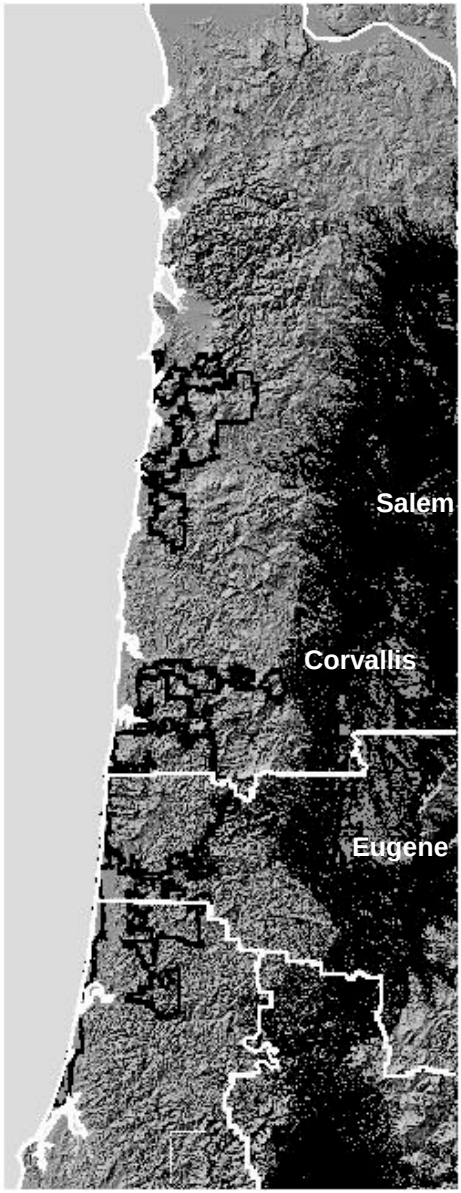
This series has the highest vascular plant diversity (species per plot) of all the forested series in NW Oregon. Both overstory and understory diversity is high. Most Douglas-fir series plots had at least two species of hardwood trees present. Oregon white oak appears to be an early seral member of several of the Douglas-fir associations, including Douglas-fir/poison oak, Douglas-fir/California hazel-snowberry, and the Douglas-fir/oceanspray group.

Douglas-fir series' plant association descriptions are duplicated in the Coast Range and Cascades guides, since most occur along both sides of the Willamette Valley. Plant associations in those series which occur **only** in the Cascades were excluded from this guide.

The discussions for this series encompass the Cascades plots. Be especially careful to account for this expanded database when reading the "Environment and Distribution" and "Vegetation Composition, Structure, and Diversity" sections. Maps display only the Coast Range plots; they omit plots in the eastern valley margins and the Cascades Range.

The graph below shows the relative distribution of the plant association plot averages for mean annual temperature versus total annual precipitation (data from Oregon Climate Service's statewide GIS layers).





Douglas-fir series distribution

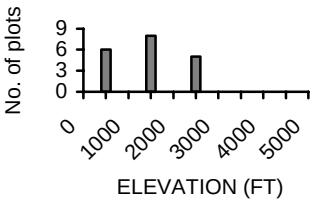
Series distribution (in black) from 2001 draft USFS R6 Potential Natural Vegetation model (Henderson, in prep).

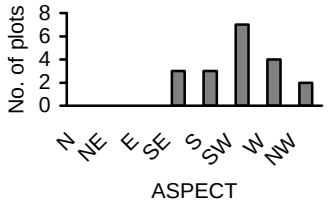
Douglas-fir/poison oak
Pseudotsuga menizesii/Rhus diversiloba
PSME/TODI
CDS124
N=25 (OSU=6; WIL=5; EBLM=10; SBLM=4)

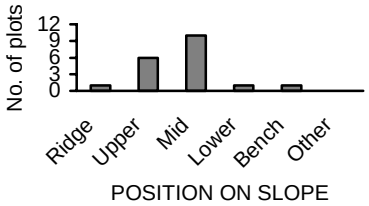
Environment and Distribution

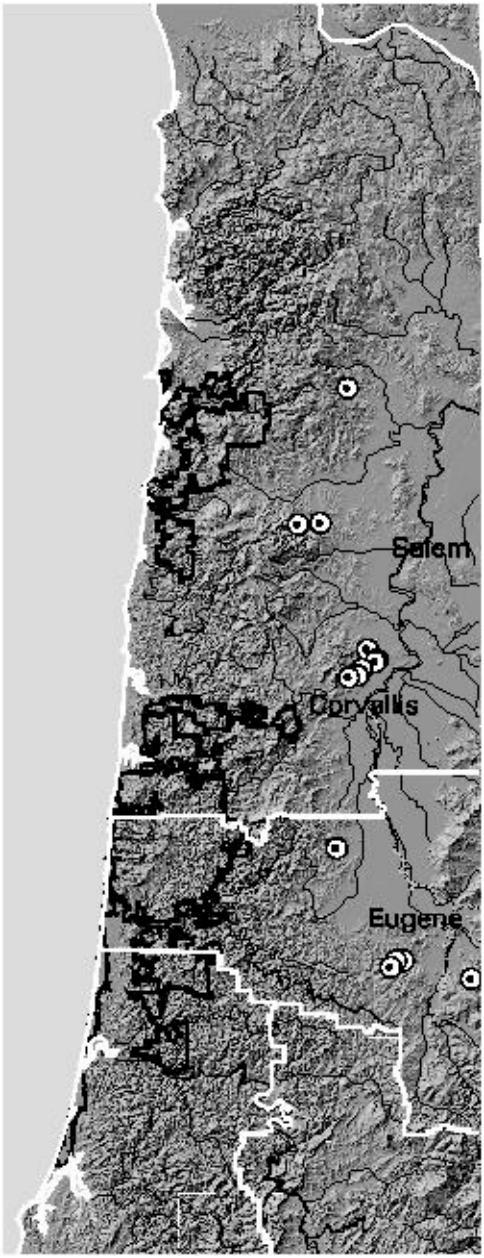
This plant association occurs primarily along the margins of the Willamette Valley on hot, relatively dry sites. Mean annual temperatures are very warm, and mean annual precipitation is very low. Plots in this sample are located on gentle to steep slopes averaging 36% (range 5-70%), primarily on middle and upper slope positions. Aspect is primarily southerly or westerly. This association occurs at relatively low elevations, with plots averaging 1,401 feet (range 730-2,465 ft.). Five of the 19 plots are on the coast and they fall within these averages.

Soils tend to be gravelly loam, skeletal, or deep clays, severely limiting soil moisture availability during the growing season.









PSME/TODI

Vegetation Composition, Structure, and Diversity

The overstory in the PSME/TODI association is dominated by Douglas-fir, often with a component of big-leaf maple, Pacific madrone, incense-cedar, ponderosa pine, Oregon white oak/and or grand fir. Sugar pine and black oak can also occur. Canopy closure of mature trees averages 70%. Cover of understory trees is low, averaging 3%. This association has a moderately developed shrub layer, with tall shrubs averaging 17% cover and low shrubs averaging 41% cover.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	59
Big-leaf maple	ACMA3	56	21
Pacific madrone	ARME	44	6
Incense-cedar	CADE27	32	6
Ponderosa pine	PIPO	32	11
Oregon white oak	QUGA4	32	8
Understory trees			
Douglas-fir	PSME	60	4
Big-leaf maple	ACMA3	48	1
Shrubs			
Poison oak	TODI	100	26
California hazel	COCO6	88	11
Trailing blackberry	RUUR	84	3
Baldhip rose	ROGY	72	2
Hairy honeysuckle	LOHI2	60	1
Trailing snowberry	SYMO	56	8
Oceanspray	HODI	48	5
Dwarf Oregon grape	MANE2	36	15
Tall Oregon grape	MAAQ2	36	1
Common snowberry	SYAL	36	5
Saskatoon serviceberry	AMAL	32	2
Whipple vine	WHMO	32	5
Herbaceous			
Sword fern	POMU	96	6
Pathfinder	ADBI	84	1
Wild strawberry	FRVE	80	1
Sweetscented bedstraw	GATR3	76	1
Yerba buena	SADO5	72	2
Star-flower	TRBO2	64	1
Rattlesnake plantain	GOOB2	64	Tr
Snow queen	SYRE	56	2
Sweet cicely	OSCH	52	1
Bluntleaf sandwort	MOMA3	52	1

The shrub layer is dominated by poison oak, and usually smaller amounts of baldhip rose, California hazel, and/or trailing blackberry. The composition of the shrub layer is typical of warm to hot, dry sites with well-drained soils. Herb cover is relatively low, averaging 16% cover. The composition of the herb layer indicates warm sites. Moss cover averages 47%.

PSME/TODI plots average 132 years. Stands are moderately stocked, with an average live basal area of 268 ft^2/acre. Plots average 34 vascular plant species, which is about average for the Douglas-fir series which tends to have higher values than do other forested series in western Oregon.

Stands in this type that were sampled in OSU's McDonald-Dunn Forest suggest a potential successional link to the ABGR/TODI association in some environments.

Management Implications

Site productivity is the lowest of all lower elevation forested plant associations sampled. Soils are either rocky and shallow or deep clay. Summer drought severely limits conifer growth and planted seedling should be shaded especially on southerly aspects. Ponderosa and sugar pine, as well as Oregon white oak and black oak, are of special interest to a variety of forest users.

	Site Index PIPO	Site Index PSME
Mean	112	115
SE	4	3
Range	80-130	68-172
Age	154	142
n	12	61

Post disturbance competition from big leaf maple, madrone, shrubs and grasses may cause seedling mortality. Fire, which consumes the duff layer, can degrade the site. Site disturbance can also stimulate establishment of Scotch broom.

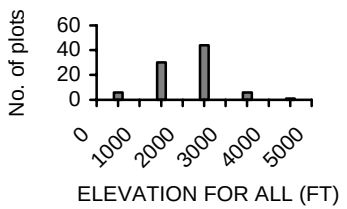
People sensitive to poison oak should take precautions when in this plant association.

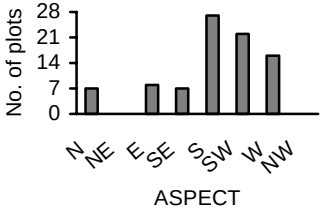
Douglas-fir/dwarf Oregon grape-salal
Pseudotsuga menizesii/Mahonia nervosa-Gaultheria shallon
PSME/MANE2-GASH
CDS512
N=87 (SIU=1; WIL=43; EBLM=37; SBLM=6)

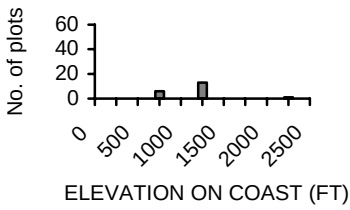
Environment and Distribution

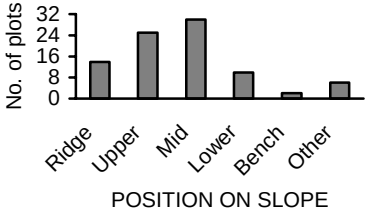
This is a common plant association in the Douglas-fir series in NW Oregon, but in the study area it occurs primarily along the margins of the Willamette Valley on hot, dry sites. Plots in this sample are located on gentle to steep slopes averaging 43% (range 7-90%), primarily on middle and upper slope and ridge positions. Aspect varies, but most plots are on south to west facing slopes. This association occurs over a range of elevations, but primarily below 3,000 feet. Elevations average 2,016 feet (range 590-4,080 ft.). Twenty of the 87 plots are on the coast, and the average elevation is 1101 ft. The other averages remain similar for these coastal plots.

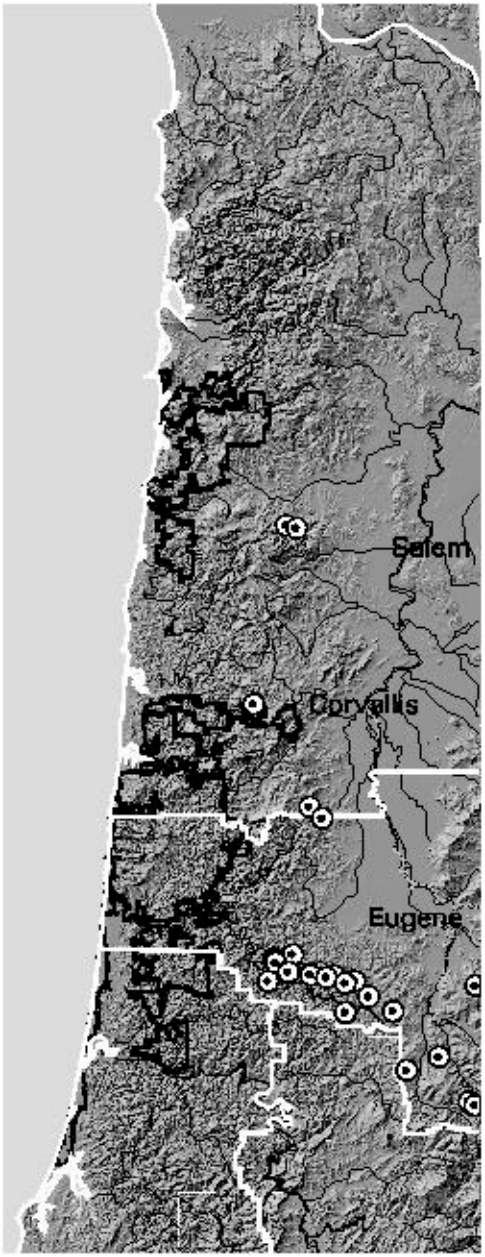
Soils tend to be gravelly or cobbley and well drained, with clay loam or silty clay loam. Some sites have shallow soils.











PSME/MANE2-GASH

Vegetation Composition, Structure, and Diversity

The overstory in the PSME/MANE2-GASH association is dominated by Douglas-fir, often with a component of incense-cedar, big-leaf maple, madrone, and western hemlock. Canopy closure of mature trees averages 71%. Cover of understory trees was low, averaging 4%. This association has a relatively well-developed shrub layer, with tall shrubs averaging 26% cover and low shrubs averaging 55% cover. The shrub layer includes salal, dwarf Oregon grape, and often vine maple and/or oceanspray as dominants. The composition of the shrub layer is typical of warm, dry sites with well-drained soils.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	61
Incense-cedar	CADE27	46	14
Big-leaf maple	ACMA3	43	8
Pacific madrone	ARME	30	4
Western hemlock	TSHE	29	4
Understory trees			
Douglas-fir	PSME	70	3
Golden chinquapin	CHCH7	41	2
Incense-cedar	CADE27	33	4
Western hemlock	TSHE	28	7
Shrubs			
Salal	GASH	100	41
Dwarf Oregon grape	MANE2	95	13
Baldhip rose	ROGY	87	2
Trailing blackberry	RUUR	83	1
California hazel	COCO6	74	6
Oceanspray	HODI	63	10
Whipple vine	WHMO	62	5
Vine maple	ACCI	59	17
Herbaceous			
Sword fern	POMU	94	7
Star-flower	TRBO2	71	1
Three-leaved anemone	ANDE3	70	1
Redwoods violet	VISE3	68	2
Sweetscented bedstraw	GATR3	67	1
Bracken fern	PTAQ	67	4
Twinflower	LIBO3	66	4

Herb cover is relatively low, averaging 18% cover. Sword fern, bracken fern, and/or twinflower are the most abundant herbs. Moss cover averages 24%.

This plant association is often transitional to warm, dry western hemlock associations; some stands may key to this association because of local lack of western hemlock seed sources.

Some of the stands in the PSME/MANE2-GASH sample are the oldest in the series, with a mean of 149 years (range 52-350 years). Stands are moderately stocked; live basal area averages 279 ft^2/acre, which is a moderate value for the Douglas-fir series.

Plots average 33 vascular plant species, which is about average for the Douglas-fir series which tends to have higher values than other forested series in western Oregon.

Management Implications

Summer drought inhibits conifer growth and seedling survival. Conifer seedlings should be shaded on south slopes. Once established, Douglas-fir grows moderately well.

	Site Index PSME
Mean	131
SE	2
Range	43-207
Age	157
n	214

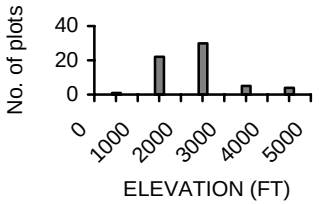
Competition from associated hardwood and shrub species can affect conifer growth and survival. Fire may lower site productivity when duff layers are consumed and when soils are shallow.

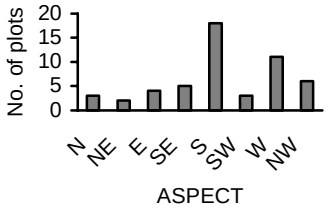
Douglas-fir/oceanspray-dwarf Oregon grape
Pseudotsuga menizesii/Holodiscus discolor-Mahonia nervosa
PSME/HODI-MANE2
(Old code: PSME/HODI-BENE)
CDS216
N=62 (MTH=8; WIL=42; EBLM=11; SBLM=1)

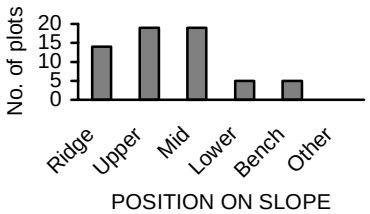
Environment and Distribution

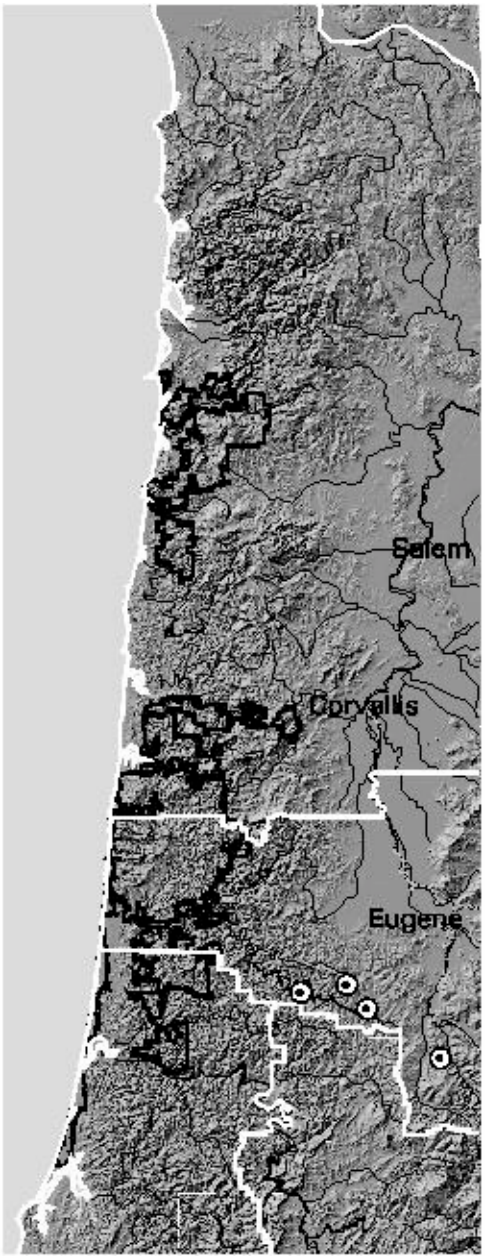
This is a common plant association in the Douglas-fir series in NW Oregon, but in the study area it occurs primarily in the southern margin of the Willamette Valley on hot, dry sites. Plots in this sample are located on gentle to steep slopes averaging 47% (range 2-88%), primarily on middle and upper slope and ridge positions. Aspect varies, but most plots are on southerly or westerly slopes. This association occurs at a range of elevations, but primarily below 3,000 feet. Elevation of sample plots averages 2,326 feet (range 650-4,300 ft.). Only 2 of the 62 plots are on the coast.

Soils tend to be either shallow and gravelly or heavy clay. Soils are well drained.









PSME/HODI-MANE2

Vegetation Composition, Structure, and Diversity

The overstory in the PSME/HODI-MANE2 association is dominated by Douglas-fir, often with incense-cedar, big-leaf maple, and/or Pacific madrone. Sugar pine and golden chinquapin are also common. Mature trees average 74% cover, and understory tree cover is low, averaging 5%.

This association has a moderately well developed shrub layer. Tall shrubs average 30% cover and low shrubs 36% cover. The shrub layer has abundant dwarf Oregon grape, usually with oceanspray and vine maple as dominants. Shrub composition is typical of warm, dry site with well-drained soils.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	65
Incense-cedar	CADE27	42	14
Big-leaf maple	ACMA3	40	11
Pacific madrone	ARME	31	5
Understory trees			
Douglas-fir	PSME	69	4
Incense-cedar	CADE27	37	3
Big-leaf maple	ACMA3	33	1
Pacific dogwood	CONU4	31	5
Shrubs			
Dwarf Oregon grape	MANE2	98	24
Baldhip rose	ROGY	92	4
Oceanspray	HODI	90	11
Trailing snowberry	SYMO	85	7
Trailing blackberry	RUUR	73	2
California hazel	COCO6	71	7
Vine maple	ACCI	58	17
Whipple vine	WHMO	58	6
Herbaceous			
Sword fern	POMU	84	8
Star-flower	TRBO2	77	1
Pathfinder	ADBI	68	2
White hawkweed	HIAL2	63	1
Three-leaved anemone	ANDE3	60	1
Rattlesnake plantain	GOOB2	60	1
Twinflower	LIBO3	53	7

Herb cover is moderate, averaging 25% cover. Sword fern, pathfinder, and/or twinflower tend to be the most abundant herbs. Moss cover averages 33%.

Stands in the PSME/HODI-MANE2 sample are of average age for the series, with a mean of 153 years and a range of 42 to 251 years. Stands are relatively densely stocked, with an average live basal area of 314 ft^2/acre.

Plots average 34 vascular plant species, which is near the average for the Douglas-fir series, which tends to have higher values than other forested series in western Oregon.

Management Implications

These are warm, dry sites, typically with shallow soils. Summer drought limits conifer growth and seedling survival. Douglas-fir seedlings should be shaded on south slopes. Ponderosa pine and sugar pine may grow better than Douglas-fir.

	Site Index PIPO	Site Index PSME
Mean	126	127
SE	9	2
Range	105-156	68-201
Age	167	148
n	5	121

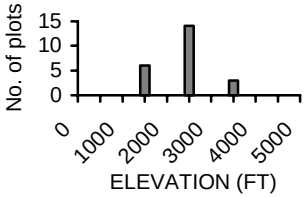
Competition from shrubs and grasses can cause conifer mortality. Fires that consume the duff layer may accelerate dry ravel of skeletal soils common to this type and reduce already low levels of soil nitrogen.

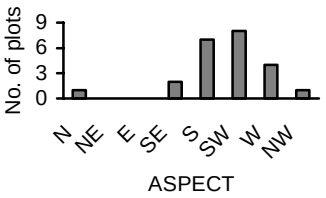
Douglas-fir/dwarf Oregon grape
Pseudotsuga menizesii/Mahonia nervosa
PSME/MANE2
(old code: PSME-TSHE/BENE)
CDC710
N=23 (MTH=3; WIL=17; EBLM=2; SBLM=1)

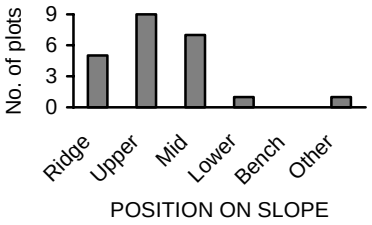
Environment and Distribution

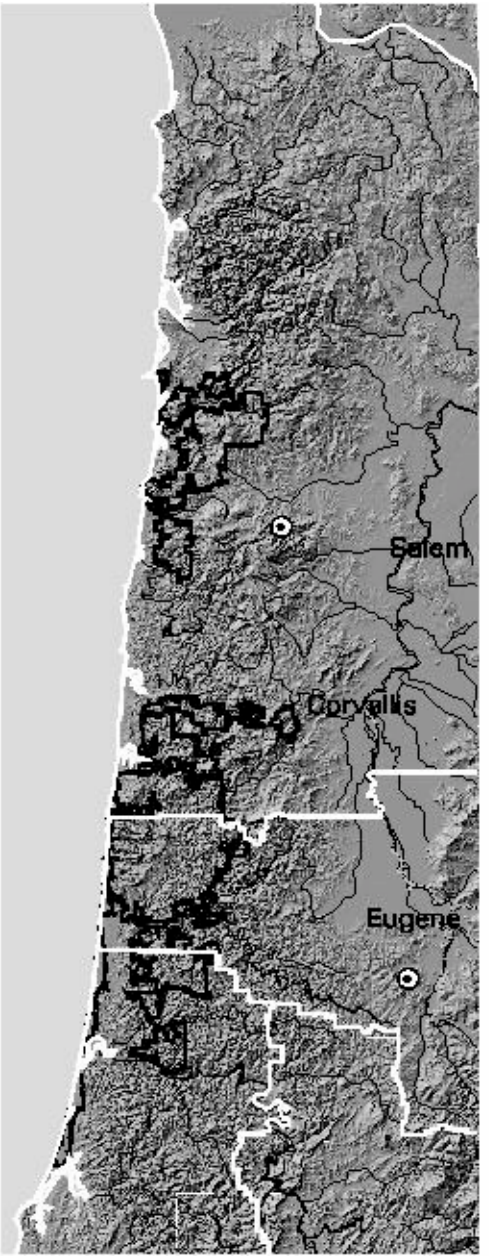
This is a common plant association in the Douglas-fir series in NW Oregon, but in the study area it occurs primarily in the margins of the Willamette Valley on warm, dry sites. Plots in this sample are located on gentle to steep slopes averaging 45% (range 6-85%), primarily on middle and upper slope and ridge positions. Most plots occur on south to west facing slopes. This association occurs mostly below 3,000 feet. Elevations average 2,334 feet (range 1,060-3,590 ft.). Only one of the 23 plots is in the Coast Range.

Soils tend to be a shallow gravelly loam.









PSME/MANE2

Vegetation Composition, Structure, and Diversity

The overstory in the PSME/MANE2 association is dominated by Douglas-fir, often with incense-cedar, big-leaf maple, and Pacific madrone. Canopy closure of mature trees on sample plots averages 79%. Cover of understory trees is very low, averaging 2%.

This association has a moderately developed shrub layer, with tall shrubs averaging 13% cover and low shrubs averaging 32% cover. The shrub layer is dominated by dwarf Oregon grape, usually with small amounts of other dry site shrubs. The composition of the shrub layer is typical of warm, dry, and well-drained sites.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	68
Big-leaf maple	ACMA3	61	11
Incense-cedar	CADE27	48	15
Pacific madrone	ARME	39	4
Understory trees			
Douglas-fir	PSME	70	2
Big-leaf maple	ACMA3	52	1
Pacific dogwood	CONU4	52	1
Incense-cedar	CADE27	30	5
Shrubs			
Dwarf Oregon grape	MANE2	100	26
Baldhip rose	ROGY	87	2
Trailing snowberry	SYMO	74	2
California hazel	COCO6	70	2
Trailing blackberry	RUUR	70	1
Oceanspray	HODI	52	2
Whipple vine	WHMO	52	2
Herbaceous			
White hawkweed	HIAL2	91	1
Vanilla leaf	ACTR	78	2
Pathfinder	ADBI	78	2
Sword fern	POMU	78	4
Star-flower	TRLA3	78	2
Three-leaved anemone	ANDE3	70	1
Rattlesnake plantain	GOOB2	70	1
Sweetscented bedstraw	GATR3	65	1

Herb cover averages 21% cover. Sword fern, star-flower, vanilla leaf, and pathfinder tend to be the most abundant herbs. Moss cover averages 32%.

PSME/MANE2 plots average 131 years (range 53-250 years). Stands are densely stocked, with an average live basal area of 324 ft^2/acre, which is the highest value for the Douglas-fir series.

This plant association and PSME/MANE2-GASH, are transitional to the warm, dry western hemlock associations such as TSHE/MANE2-DRY-NWO Coast and TSHE/MANE2-DRY-NWO Coast.

Plots average 32 vascular plant species, about average for the Douglas-fir series which tends to have higher values than other forested series in western Oregon.

Management Implications

Summer drought can slow conifer establishment and cause seedling mortality in combination with competition from associated hardwoods and shrubs. Conifer seedlings should be shaded on southerly aspects.

When present, sugar pine may grow better than Douglas-fir. Fire may damage shallow soils and remove the duff layer leading to dry ravel and reduced soil nitrogen levels in already deficient soils.

	Site Index PSME
Mean	126
SE	5
Range	62-184
Age	148
n	39

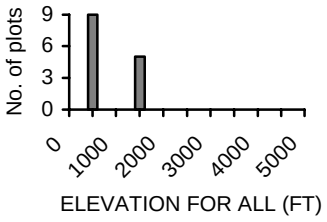
When present sugar pine may grow better than Douglas-fir. Fire may damage shallow soils and remove the duff layer leading to dry ravel and reduced soil nitrogen levels in already deficient soils.

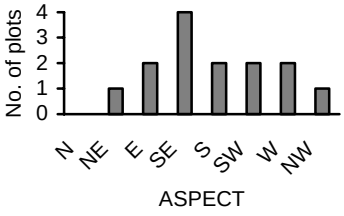
Douglas-fir/California hazel-snowberry/sword fern
Pseudotsuga menizesii/Corylus cornuta-Symphoricarpos mollis/Polystichum munitum
PSME/COCO6-SYMO/POMU
CDS312
N=18 (OSU=4; WIL=1; EBLM=10; SBLM=3)

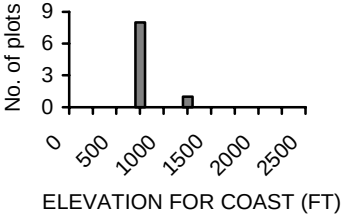
Environment and Distribution

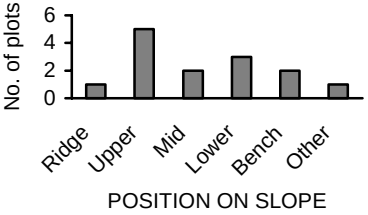
This plant association occurs primarily along Willamette Valley margins on relatively hot, dry sites. Mean annual temperatures are very warm, and mean annual precipitation is very low. Plots in this sample are located on gentle to steep slopes averaging 32% (range 3-92%) on a variety of slope positions. Aspect varies, but half the plots are on southeast or southwest facing slopes. This association occurs at the lowest elevations in the Douglas-fir series, with elevation of sample plots averaging 1,028 feet (range 640-1,710 ft.). Nine of the 14 plots are on the coast and they fell within these ranges.

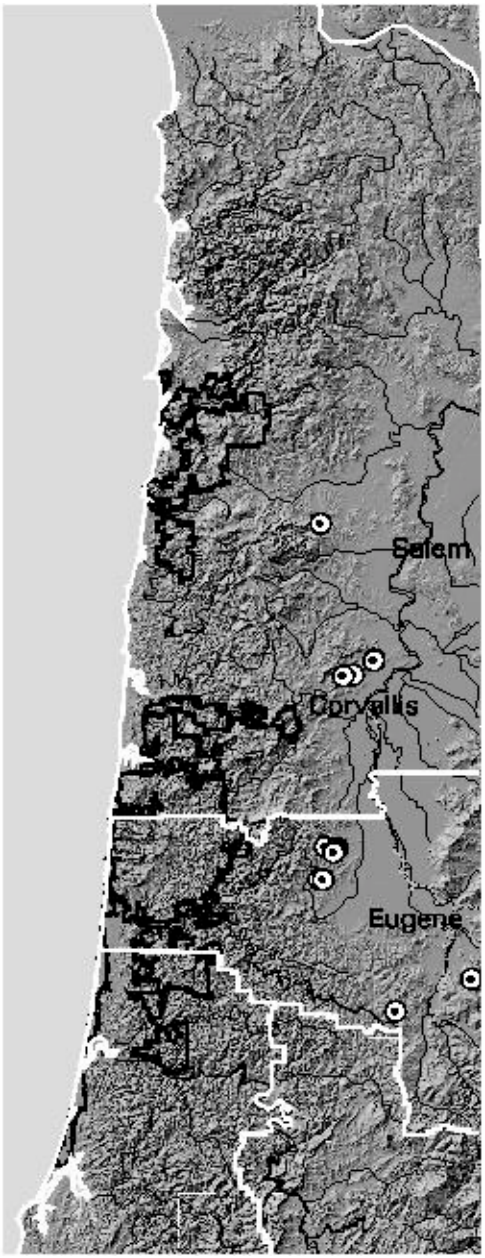
Soils are well drained and composed of silt loam, silty clay, or clay.











PSME/COCO6-SYMO/POMU

Vegetation Composition, Structure, and Diversity

The overstory in the PSME/COCO6-SYMO/POMU association is dominated by Douglas-fir, often with big-leaf maple and/or Oregon white oak. Canopy closure of mature trees on sample plots averages 76%. Cover of understory trees is very low, averaging 1%.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	64
Big-leaf maple	ACMA3	61	29
Understory trees			
Douglas-fir	PSME	67	1
Big-leaf maple	ACMA3	72	1
Golden chinquapin	CHCH7	33	Tr
Shrubs			
California hazel	COCO6	100	14
Trailing blackberry	RUUR	100	6
Poison oak	TODI	83	4
Oceanspray	HODI	78	9
Baldhip rose	ROGY	72	2
Trailing snowberry	SYMO	67	16
Common snowberry	SYAL	50	3
Herbaceous			
Pathfinder	ADBI	100	1
Sword fern	POMU	100	35
Sweet cicely	OSCH	83	1
Inside-out flower	VAHE	78	6
Wild strawberry	FRVE	72	1
Starflower	TRBO2	72	1
Big leaf sandwort	MOMA3	67	1
Fairy-bells	DISPO	61	2
Scouler's bluebell	CASC7	61	1
Yerba Buena	SADO5	61	1
Bracken fern	PTAQ	61	4
Stream violet	VIGL	56	3
Sweetscented bedstraw	GATR3	56	1
Snowqueen	SYRE	50	2

This association has a moderately developed shrub layer, with tall shrubs averaging 31% cover and low shrubs averaging 29% cover. The shrub layer includes California hazel and trailing snowberry

as dominants, and usually significant amounts of oceanspray, trailing blackberry and/or poison oak. The composition of the shrub layer is typical of warm to hot and dry sites with well-drained soils.
Herb cover is relatively high, averaging 51% cover. Sword fern dominates the herb layer, usually with significant amounts of inside-out flower and bracken fern. Moss cover averages 27%.

On average, sampled PSME/COCO6-SYMO/POMU stands were the youngest in the series, with a mean of 113 years and a range of 86 to 246 years. Stands have low stocking density; live basal area averages 217 ft^2/acre, the lowest value for the Douglas-fir series.

There is an average of 34 vascular plant species per plot, near average for the Douglas-fir series. PSME/COCO6-SYMO/POMU averaged three hardwood species per plot, highest in the series, which may be related to the age of the sampled stands.

Stands in this type that were sampled in OSU's McDonald-Dunn Forest suggest a potential successional link to the ABGR/COCO6/VAHE association in some environments.

Management Implications

	Site Index PSME
Mean	146
SE	4
Range	68-226
Age	113
n	56

Douglas-fir growth in this association is on average the best of all the Douglas-fir types. Summer drought limits conifer growth, but not as severely due to better soils and increased available water. Soil conditions do not appear to be as limiting as those associated with PSME/TODI.

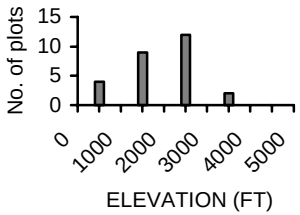
Moderate intensity fire may damage thin soils. Disturbed sites may be invaded by Scotch broom (*Cytisus scoparius*) or other non-native invasive species.

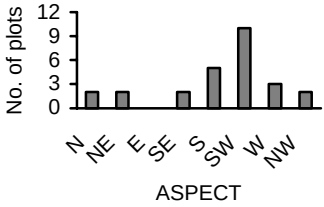
Douglas-fir/oceanspray-snowberry
Pseudotsuga menizesii/Holodiscus discolor-Symphoricarpus sp.
PSME/HODI-SYMPH
CDS217
N=27 (MTH=10; WIL=10; EBLM=4; SBLM=3)

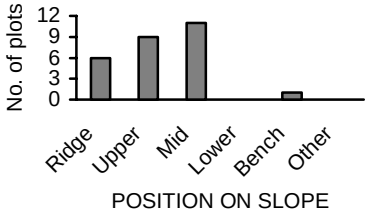
Environment and Distribution

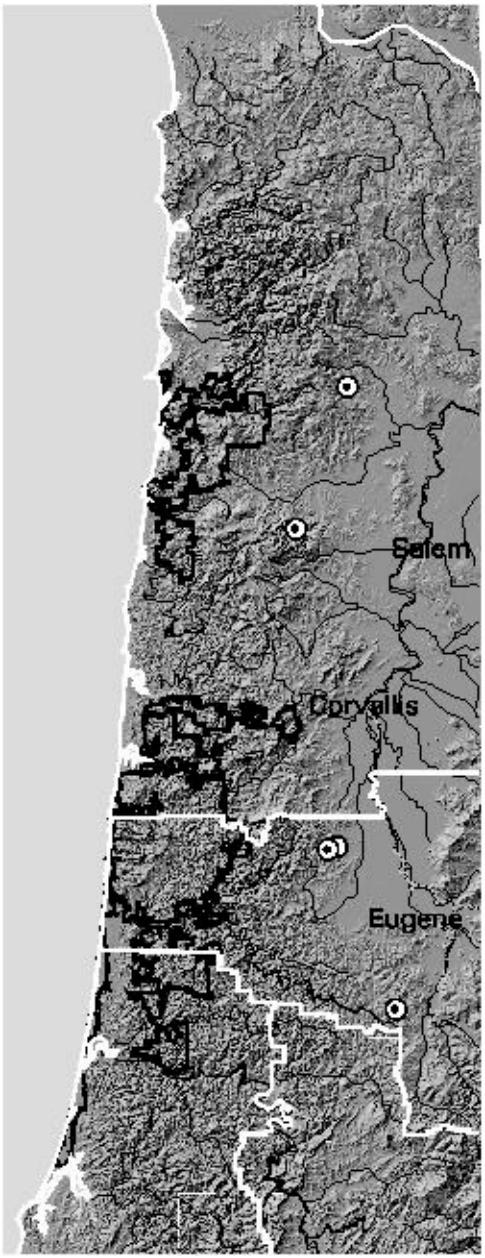
This plant association occurs on margins of the Willamette Valley and throughout the Willamette basin on relatively dry sites. Plots in this sample are located on flat to steep slopes averaging 41% (range 0-80%), primarily from mid-slope to the ridge. Aspect varies, but most are on southerly facing slopes. This association occurs primarily below 3,000 feet, with elevation of sample plots averaging 1,941 feet (range 630-3,625 ft.). Four of the 27 plots are on the coast. The average elevation is 925 ft and the average slope is 29% in these coastal plots; other averages remain similar.

Soils are well drained and composed of silty clay loam or clay.









PSME/HODI-SYMPH

Vegetation Composition, Structure, and Diversity

The overstory in the PSME/HODI-SYMPH association is dominated by Douglas-fir, sometimes with big-leaf maple. Pacific madrone, incense-cedar, Pacific dogwood, and Oregon white oak are often present. Canopy closure of mature trees average 73%. Cover of understory trees is low, averaging 2%.

This association has a relatively sparse shrub layer, with tall shrubs averaging 18% cover and low shrubs averaging 23% cover. The shrub layer includes snowberry and/or trailing snowberry as dominants, and usually significant amounts of vine maple and/or oceanspray. The composition of the shrub layer is typical of warm, dry sites with well-drained soils. Herb cover is relatively low, averaging 18% cover. Moss cover averages 33%.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	67
Big-leaf maple	ACMA3	37	11
Understory trees			
Douglas-fir	PSME	56	3
Cascara buckthorn	FRPU7	41	2
Pacific dogwood	CONU4	37	2
Shrubs			
Baldhip rose	ROGY	89	2
Oceanspray	HODI	81	10
California hazel	COCO6	78	5
Trailing blackberry	RUUR	70	2
Trailing snowberry	SYMO	67	21
Dwarf Oregon grape	MANE2	63	3
Vine maple	ACCI	52	9
Snowberry	SYAL	30	7
Herbaceous			
Sword fern	POMU	81	3
Star-flower	TRLA6	81	2
Wild strawberry	FRVE	80	3
Big leaf sandwort	MOMA3	74	1
Sweetscented bedstraw	GATR3	67	1
Bracken fern	PTAQ	63	7
Pathfinder	ADBI	63	2
White hawkweed	HIAL2	63	1

Stands average 116 years old (range 53-240 years). Stands are moderately stocked; live basal area averages 264 ft^2/acre, which is a moderate value for the Douglas-fir series.

Plots average 30 vascular plant species, relatively low for the Douglas-fir series which tends to have higher values than other forested series in western Oregon.

Management Implications

More mesic and generally better soil conditions provide for better productivity of these sites. Douglas-fir grows well although summer drought limits conifer growth. Conifer seedlings should be shaded on south aspects. Shrub competition should be minor on most sites. Fire that consumes the duff layer will reduce site productivity.

	Site Index PSME
Mean	145
SE	4
Range	75-221
Age	114
n	64

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