Upland Plant Associations of the Puget Trough Ecoregion, Washington

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Cover photo: Joe Rocchio.

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INTRODUCTION

The purpose of the this document is to inform the reader about the characteristics of native-dominated plant associations that occur on upland, as opposed to wetland or rip arian floodplain, sites in the Puget Trough ecoregion. Vegetation in the Puget Trough ecoregion has not been comprehensively described in the past, unlike adjacent ecoregions with large federal land holdings. The Washington Natural Heritage Program has been collecting and analyzing vegetation plot data from the ecoregion for the last 14 years. These data contribute to the development of an existing vegetation classification to fill this gap in our knowledge of biodiversity in the state. The fact sheets, key, and association tables are a means of communicating this information to a broader audience.

This classification of plant associations uses st andards of the International Classification of Ecological Communities and the National Vegetation Classification (Federal Geographic Dat a Committee 1997, Grossman et al. 1998, Jennings et al. 2003). These "plant associations" dif fer from "plant associations" as described on surrounding National Forest s in that they refer to existing vegetation rather than potential veget ation. As such, in the lexicon of Pacific Northwest potential natural veget ation literature (*e.g.,* Franklin and Dyrness 1973), many of them would be called "plant community types." The classification is based primarily on floristics and physiognomy , and secondarily on environmental factors (including natural disturbance regimes).

The fact sheets are intended for use only within or immediately adjacent to the Puget Trough ecoregion (Washington Department of Natural Resources 2003). The ecoregion is illustrated by shading on plot location map s within the individual fact sheets. The Puget Trough is generally characterized by a relatively dry, warm climate in comp arison to adjacent areas of

western Washington, and low elevations (mostly below 1000 feet, maximum 2400 feet). It includes the far northern end of what is sometimes considered a separate ecoregion located mostly in Oregon, the Willamette Valley. A distinctive climatic area, the Olympic Mountains rainshadow, is frequently referred to in the text. It includes San Juan County, far western Whatcom and Skagit counties (Lummi, Fidalgo, Cypress, and Guemes islands), central and northern Island County, far northeastern Jefferson County (Quimper and Miller peninsulas), and eastern Clallam County (Sequim to Port Angeles).

Associations in the text are named by dominant and diagnostic plant species. Dashes in the names separate species that are in the same physiognomic layer (trees, shrubs, herbs); slashes in the names separate species in different physiognomic layers; parentheses around a species name indicate that the taxon occurs with less than 60 to 80% constancy in the association. In the association names and in the vegetation composition tables, parentheses around 2 species but not the genus, e.g. *Symphoricarpos (albus, hesperius)*, implies that either one or both of the two species occur in any particular plot or occurrence. The order of species within a layer typically indicates decreasing levels of dominance. Species names used in the association names may be those of dominant species and/or diagnostic species; at least one dominant species appears in every association name. The presence of a species in the name of an association does not imply that the species is always found in every occurrence of that association, but rather that it does occur in most of them. Nomenclature follows Kartesz (2003). Synonyms, using Hitchcock and Cronquist (1973) nomenclature, are included where a Hitchcock and Cronquist name differs from that used by Kartesz (2003).

A key is included to assist the reader in identifying the plant association. The association tables (found on the web at http://www.dnr.wa.gov/nhp/refdesk/communities/html/assoc_tables.html) display nearly complete vegetation composition data summarized by plant association.

METHODS

Stands of relatively homogeneous vegetation were sampled during inventory efforts that focused on locating remnant

communities that had been little disturbed by p ast timber harvest and that were dominated in all physiognomic layers by native species. Thus the sampling was biased toward those environments that had been least disturbed by post-W estern settlement anthropogenic influences. Some dat a from natural-regeneration young forests more disturbed by timber harvest were collected in those geographic areas where little in the way of undisturbed forest stands remain, especially on Fort Lewis in Pierce and Thurston counties. A total of 945 plots were sampled, mostly during the period 1992-2004. W etlands and riparian floodplains were not targeted as part of this work. For freshwater wetland plant associations, see Kunze (1994).

Data were collected from circular plots located non-randomly to represent the stand, that is, a relatively homogeneous area of vegetation present on a topographically relatively homogeneous site. Most plots were approximately 400 m^2, though for some herbaceous vegetation, plots were as small as 42 m^2. On each plot, all vascular plant species were identified and placed in percent crown cover classes (<1%, 1-5%, 6-10%, 1 1-15%, 16-25%, 26-35%, 36-45%, 46-55%, 56-65%, 66-75%, 76-85%, 86-95%, 96-100%). Early on, some plot s were collected using 25% cover class intervals for those classes above 25% cover . Tree canopy layering was noted and one or more tree cores were collected to ascertain dominant stand age class(es). Evidence of disturbance was noted.

Aspect, slope, slope position, microtopography , and landform were recorded on each plot. Geographic location of each plot was recorded in a geographic information system. Shallow soil pits, usually 10-30 inches deep, were dug on each Fort Lewis plot (92 total), with the objective of verifying or refuting the soil map designation for the plot and recording obvious surficial texture and color characteristics.

Vegetation data was analyzed using TWINSPAN, a divisive hierarchical classification technique, and detrended correspondence analysis (DCA), an ordination method. The analysis process was iterative and adaptive, with the goal of underst anding relatively consistent p atterns in the data, and relating them where possible to environment al variables, disturbance regimes, or successional relationship s. Analyses were run with all species included and with native disturbance-associated increaser species and exotic species removed. Correlations

between environmental variables and DCA ordination axes were examined.

Conservation status of the plant associations referred to in the fact sheets as **global/state status** follows NatureServe terminology. The primary factors for assessing status are: total number of occurrences of the association and total acreage occupied by the association. Secondary factors include geographic range over which the community occurs, threats, long-term trends, degree of environmental specificity, and ecological integrity of the occurrences. The conservation status ranks are as follows (G ranks refer to global ranks, S ranks refer to state ranks):

G1 Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer occurrences), very steep declines, or other factors.

G2 Imperiled—At high risk of extinction due to very restricted range, very few occurrences (often 20 or fewer), steep declines, or other factors.

G3 Vulnerable—At moderate risk of extinction due to a restricted range, relatively few occurrences (often 80 or fewer), recent and widespread declines, or other factors.

G4 Apparently Secure—Some cause for long-term concern due to declines or other factors.

G5 Demostrably Secure—Common; widespread and abundant.

G#G# Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank.

GNR Unranked—Global rank not yet assessed.

GH Presumed Eliminated— Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration.

? Inexact Numeric Rank—e.g., G2?

Q Questionable taxonomy—Taxonomic distinctiveness of this entity at the current level is questionable.

The **distribution** section in the fact sheet describes the range of the type in Washington and globally. The maps that appear with each fact sheet illustrate only the locations of plots where data were collected for the plant association. They do not illustrate the entire range of the type in the Puget Trough.

The **environment** section of each fact sheet includes data collected on the plot itself and data from geographic information systems (GIS). Mean annual precipitation data referred to is modeled from the 1960 to 1990 period. Most of the soils information was not verified on plots in the field, but was pulled from the Department of Natural Resources GIS (which refers to county soil surveys) based on the plot location. Therefore, a degree of uncertainty exists with regard to soils descriptions. In some cases, these mapped soil series were not what would be ecologically expected based on the vegetation and such series were not used to describe the environment for the association. Apparent relative nutrient status of the soil was derived from an examination of vegetation indicators and their abundance in the association (Klinka et al. 1989, Green and Klinka 1994). The data reported in the environment summary tables at the end of the environment section refers primarily to the plots that were sampled. Slope positions are abbreviated in the table such that the word slope does not appear, e.g. mid = mid-slope. A short slope is less than 100 vertical feet. Slope positions or soil series underlined in the summary tables are those that are most frequent for the association.

The **ID tips** (identification tips) section gives a quick overview of distinguishing characteristics for the association. For the most common and widespread forest alliance, those forests that have abundant Douglas-fir and greater than 10% cover or dominant tree regeneration of western hemlock or western redcedar, the tree layer is not referred to in the ID tips section.

In the **vegetation** section, the range and characteristic expression of vegetation physiognomy (structure) is described using categories (mostly formations) defined by the International Classification of Ecological Communities (Grossman et al. 1998). These include forest (generally >60% crown cover of trees, tree crowns touching), woodland (generally 25-60% crown cover of trees, tree crowns not touching for the most part), herbaceous vegetation with a sparse tree layer (10-25%

crown cover of trees over a grass-forb-dominated vegetation, referred to in the text as savanna), and herbaceous vegetation (herbaceous vegetation dominates, tree crown cover typically <10%). The terms "present," "prominent," "co-dominant," and "dominant" are often used to describe the vegetation composition. "Present" means present on the sample plot but less than about 5% crown cover. "Prominent" means about 5% to 15% crown cover. "Co-dominant" means that species shares dominance in overstory or understory layer with other species and usually has about 10% to 50% crown cover. "Dominant" means that the species is the sole dominant in overstory or understory and usually has crown cover of greater than 25%. "Dominant tree regeneration" refers to the tree species that is most abundant in the <5 inch diameter size class (understory trees) and that has at least 25 individuals per acre of this size. "Crown cover" refers to the percent of the sample plot covered by the total vertical projection of the crown of all above-ground stems of a species or physiognomic layer. In other words, spaces between branches or leaves connected to the same individual stem of a plant are counted toward the cover for that species.

The **classification notes** section in each fact sheet is intended to clarify how the association as here defined relates to others that have been described in the past, especially in Washington state. In addition, if the name of the association as presented here differs from that used by NatureServe (www.natureserve.org/explorer), then the differences and relationships are described. If the NatureServe 2005 name is identical, then no mention is made of NatureServe as a reference. In classification notes, names for associations or plant community types are abbreviated using 4-letter codes for genus and species.

The **biodiversity notes** section is only included if there are rare or otherwise remarkable species that are known to use the association in the Puget Trough. The **vegetation composition table** includes partial listings of plant species that help to characterize the association or distinguish it from similar ones, and includes all abundant species.

Instructions for Using the Keys to Puget Trough Terrestrial Plant Associations

1. Select a relatively uniform area of vegetation and topography to key out. A representative 1/10 acre plot is a simple way to examine a stand, just be sure the plot does represent the stand of interest.

2. “Present” means the species is found on a representative 1/10 acre plot, i.e. it regularly occurs in the stand.

3. This is not a classic dichotomous key but an abbreviated form of a dichotomous key. Each line is mutually exclusive from the next line down in the key. If the stand or plot meets all the criteria in a line, then read to the right or (if blank) to the next indented line down. If the stand or plot does not meet the criteria in a line, then go to the next line down the page that is not indented from the current line.

4. A dominance type key precedes keys to the individual associations within the dominance types.

5. Percentage values in the key (e.g., 25%) refer to % crown cover, that is the vertical projection below the entire crown of the plant, do not subtract for spaces between leaves and branches.

6. Snowberry in the key refers to both species of snowberry, common and creeping, unless preceded by the species name.

7. “+” = add the crown cover of each of the species indicated, e.g. 7+22 = 29% cover, overlap between the species gets counted twice.

8. “Dominant successful regeneration” refers to the tree species that is most abundant in < 5 inch dbh size classes (understory trees) and that has at least 30 individuals per acre of this size (at least 3 on a representative 1/10 acre plot).

9. “Olympic Mountains rainshadow” refers to a geographic and climatic area encompassing San Juan County, far western Skagit and Whatcom counties (Cypress, Guemes, Lummi, Fidalgo islands), northern and central Island County, northeastern Jefferson County (Miller and Quimper Peninsulas), and part of eastern Clallam County (Sequim Bay to Port Angeles).

10. **The key is not the classification.** After you have keyed out a stand, always read the association description of vegetation composition, geographic distribution, and physical environment. If it sounds like it fits in most regards, you have made a correct identification. If there are multiple inconsistencies between the stand and the description, the key probably was incorrect. In this case, you probably need to try the key again and follow slightly different leads or identify the stand by reading the descriptions.

11. In the interactive version of the key, clicking on an underlined item will take you to the appropriate key or description of the association.

Complete Species List for Puget Trough Plant Associations

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Abies grandis	Abies grandis	grand fir	N
Acer circinatum	Acer circinatum vine	maple	N
Acer glabrum var. douglasii	Acer glabrum	Rocky Mountain maple	N
Acer macrophyllum	Acer macrophyllum	bigleaf maple	N
Achillea millefolium var. occidentalis	Achillea millefolium	yarrow	N
Achlys triphylla	Achlys triphylla	vanillaleaf	N
Achnatherum lemmonii var. lemmonii	Stipa lemmonii	Lemmon's needlegrass	N
Actaea rubra ssp. arguta	Actea rubra	baneberry	N
Adenocaulon bicolor	Adenocaulon bicolor	pathfinder	N
Adiantum aleuticum	Adiantum pedatum	western maidenhair fern	N
Agoseris grandiflora	Agoseris grandiflora large-flo	wered agoseris	N
Agrostis capillaris	Agrostis tenuis	colonial bentgrass	E
Agrostis pallens	Agrostis diegoensis	thin bentgrass	N
Agrostis spp.	Agrostis spp.	bentgrass	N
Aira caryophyllea	Aira caryophyllea silver	hairgrass	E
Aira praecox	Aira praecox	early hairgrass	E
Allium acuminatum	Allium acuminatum	Hooker's onion	N
Allium cernuum var. obtusum	Allium cernuum	nodding onion	N
Allium crenulatum	Allium crenulatum	Olympic onion	N
Allotropa virgata	Allotropa virgata	candystick	N
Alnus rubra	Alnus rubra	red alder	N
Alnus viridis ssp. sinuata	Alnus sinuata	Sitka alder	N
Amelanchier alnifolia	Amelanchier alnifolia	serviceberry	N
Amsinckia menziesii	Amsinckia menziesii Menzies'	fiddleneck	N
Anaphalis margaritacea	Anaphalis margaritacea pearl	y-everlasting	N
Anemone deltoidea	Anemone deltoidea	Columbia windflower	N
Anemone lyallii	Anemone lyallii	Lyall's anemone	N
Antennaria rosea	Antennaria microphylla	rosy pussytoes	N
Anthoxanthum odoratum	Anthoxanthum odoratum	sweet vernalgrass	E
Aphanes arvensis	Alchemilla occidentalis w	estern lady's-mantle	N
Apocynum androsaemifolium	Apocynum androsaemifolium	spreading dogbane	N
Aquilegia formosa	Aquilegia formosa	red columbine	N
Arabis hirsuta	Arabis hirsuta	hairy rockcress	N
Arbutus menziesii	Arbutus menziesii	Pacific madrone	N
Arctostaphylos columbiana	Arctostaphylos columbiana	hairy manzanita	N
Arctostaphylos uva-ursi	Arctostaphylos uva-ursi	kinnikinnick	N
Arctostaphylos x media	Arctostaphylos x media	media manzanita	N
Armeria maritima vars. (californica, purpurea)	Armeria maritima	thrift	N
Arrhenatherum elatius	Arrhenatherum elatius	tall oatgrass	E
Artemisia campestris ssp. borealis var. scouleriana	Artemisia campestris	northern wormwood	N
Aruncus dioicus var. acuminatus	Aruncus sylvester	goatsbeard	N

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Asarum caudatum	Asarum caudatum	wild ginger	N
Aspidotis densa	Aspidotis densa	Indian's dream	N
Asplenium trichomanes	Asplenium trichomanes ma	indenhair spleenwort	N
Athyrium filix-femina ssp. cyclosorum	Athyrium filix-femina	lady-fern	N
Atriplex subspicata	Atriplex patula	triangle orache	N
Balsamorhiza deltoidea	Balsamorhiza deltoidea	Puget balsamroot	N
Betula papyrifera var. papyrifera	Betula papyrifera	paper birch	N
Blechnum spicant	Blechnum spicant	deerfern	N
Botrychium multifidum	Botrychium multifidum	leathery grapefern	N
Brodiaea coronaria ssp. coronaria	Brodiaea coronaria	harvest brodiaea	N
Bromus carinatus	Bromus carinatus	California brome	N
Bromus commutatus	Bromus commutatus	meadow brome	N
Bromus hordeaceus	Bromus mollis	soft brome	E
Bromus inermis	Bromus inermis	smooth brome	E
Bromus pacificus	Bromus pacificus Pacific	brome	N
Bromus rigidus	Bromus rigidus rip-gut	brome	E
Bromus sitchensis	Bromus sitchensis Sitka	brome	N
Bromus spp.	Bromus spp.	brome	
Bromus sterilis	Bromus sterilis	poverty brome	E
Bromus tectorum	Bromus tectorum	cheatgrass	E
Bromus vulgaris	Bromus vulgaris Columbia	brome	N
Calypso bulbosa	Calypso bulbosa	calypso orchid	N
Camassia leichtlinii ssp. suksdorfii	Camassia leichtlinii	great camas	N
Camassia quamash vars. (azurea, maxima)	Camassia quamash	common camas	N
Campanula rotundifolia	Campanula rotundifolia	bluebells-of-Scotland	N
Campanula scouleri	Campanula scouleri	Scouler's bellflower	N
Cardamine oligosperma var. oligosperma	Cardamine oligosperma	little western bittercress	N
Cardamine pensylvanica	Cardamine pensylvanica Penns	ylvania bittercress	N
Carex deweyana var. deweyana	Carex deweyana	Dewey's sedge	N
Carex hendersonii	Carex hendersonii	Henderson's sedge	N
Carex inops ssp. inops	Carex pensylvanica long-st	olon sedge	N
Carex obnupta	Carex obnupta	slough sedge	N
Carex rossii	Carex rossii	Ross's sedge	N
Carex spp.	Carex spp.	sedge	N
Carex tumulicola	Carex tumulicola	foothill sedge	N
Castilleja attenuata	Orthocarpus attenuatus na	rro w-leaved owl-clover	N
Castilleja hispida ssp. hispida	Castilleja hispida	harsh paintbrush	N
Castilleja levisecta	Castilleja levisecta	golden paintbrush	N
Castilleja miniata ssp. dixonii	Castilleja miniata	scarlet paintbrush	N
Cerastium arvense ssp. strictum	Cerastium arvense	field chickweed	N
Cerastium glomeratum	Cerastium viscosum	sticky chickweed	E
Chamerion angustifolium	Epilobium angustifolium	fireweed	N

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Chimaphila menziesii	Chimaphila menziesii	little prince's pine	N
Chimaphila umbellata ssp. occidentalis	Chimaphila umbellata	pipsissewa	N
Cinna latifolia	Cinna latifolia	drooping woodreed	N
Circaea alpina ssp. pacifica	Circaea alpina	enchanter's nightshade	N
Cirsium arvense	Cirsium arvense Canada	thistle	E
Cirsium brevistylum	Cirsium brevistylum short-st	yled thistle	N
Cirsium vulgare	Cirsium vulgare	bull thistle	E
Clarkia amoena ssp. (caurina, lindleyi)	Clarkia amoena	farewell-to-spring	N
Clarkia purpurea ssp. quadrivulnera	Clarkia quadrivulnera	small-flowered clarkia	N
Claytonia perfoliata ssp. perfoliata	Montia perfoliata	miner's lettuce	N
Claytonia siberica var. sibirica	Montia sibirica	Siberian springbeauty	N
Clinopodium douglasii	Satureja douglasii	yerba buena	N
Collinsia grandiflora	Collinsia grandiflora	large-flowered blue-eyed mary	N
Collinsia parviflora	Collinsia parviflora	small-flowered blue-eyed mary	N
Collomia grandiflora	Collomia grandiflora large-flo	wered collomia	N
Collomia heterophylla	Collomia heterophylla varied-leaf	collomia	N
Corallorhiza maculata	Corallorhiza maculata	spotted coralroot	N
Corallorhiza striata	Corallorhiza striata	striped coralroot	N
Cornus nuttallii	Cornus nuttallii	Pacific dogwood	N
Cornus unalaschkensis	Cornus canadensis	western bunchberry	N
Corydalis scouleri	Corydalis scouleri Scouler's	corydalis	N
Corylus cornuta var. californica	Corylus cornuta	beaked hazelnut	N
Crataegus douglasii	Crataegus douglasii	black hawthorn	N
Crataegus monogyna	Crataegus monogyna	English hawthorn	E
Crepis capillaris	Crepis capillaris	smooth hawksbeard	E
Cryptantha intermedia	Cryptantha intermedia	common cryptantha	N
Cryptogramma acrostichoides	Cryptogramma crispa	American rockbrake	N
Cynosurus echinatus	Cynosurus echinatus	hedgehog dogtail	E
Cystopteris fragilis	Cystopteris fragilis	fragile fern	N
Cytisus scoparius	Cytisus scoparius	Scot's broom	E
Dactylis glomerata	Dactylis glomerata	orchard grass	E
Danthonia californica	Danthonia californica	California danthonia	N
Danthonia spicata	Danthonia spicata	poverty danthonia	N
Daucus carota	Daucus carota	Queen Anne's lace	E
Daucus pusillus	Daucus pusillus r	attlesnake weed	N
Delphinium menziesii ssp. menziesii	Delphinium menziesii	Menzies' larkspur	N
Delphinium nuttallii	Delphinium nuttallii	Nuttall's larkspur	N
Delphinium trolliifolium	Delphinium trolliifolium	Columbian larkspur	N
Dicentra formosa ssp. formosa	Dicentra formosa	Pacific bleedingheart	N

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Dichanthelium acuminatum var. fasciculatum	Panicum occidentale	acuminate panic grass	N
Dichanthelium oligosanthes var. scribnerianum	Panicum scribnerianum	Scribner's panic grass	N
Dichelostemma congestum	Brodiaea congesta	congested snakelily	N
Digitalis purpurea	Digitalis purpurea	foxglove	E
Distichlis spicata	Distichlis spicata	saltgrass	N
Dodecatheon hendersonii ssp. hendersonii	Dodecatheon hendersonii	Henderson's shooting star	N
Dodecatheon pulchellum	Dodecatheon pulchellum	handsome shooting star	N
Dryopteris arguta	Dryopteris arguta	coastal woodfern	N
Dryopteris expansa	Dryopteris austriaca	spreading woodfern	N
Elymus glaucus ssp. glaucus	Elymus glaucus	blue wildrye	N
Elymus repens	Agropyron repens	quackgrass	N
Elymus trachycaulus ssp. trachycaulus	Agropyron caninum	slender wheatgrass	N
Epilobium brachycarpum	Epilobium paniculatum	tall annual willow-herb	N
Epilobium ciliatum	Epilobium (glandulosum, watsonii)	common willow-herb	N
Epilobium minutum	Epilobium minutum	small-flowered willow-herb	N
Equisetum arvense	Equisetum arvense	field horsetail	N
Equisetum hyemale var. affine	Equisetum hyemale	scouring-rush	N
Equisetum telmateia var. braunii	Equisetum telmateia	giant horsetail	N
Erigeron annuus	Erigeron annuus	annual fleabane	N
Erigeron speciosus var. speciosus	Erigeron speciosus	showy fleabane	N
Eriophyllum lanatum var. lanatum	Eriophyllum lanatum	woolly sunflower	N
Erodium cicutarium	Erodium cicutarium	redstem stork's bill	E
Erysimum capitatum var. capitatum	Erysimum asperum	western wallflower	N
Erythronium oreganum var. oreganum	Erythronium oreganum	Oregon fawnlily	N
Festuca occidentalis	Festuca occidentalis	western fescue	N
Festuca roemeri	Festuca idahoensis	Roemer's fescue	N
Festuca rubra	Festuca rubra	red fescue	N/E
Festuca saximontana var. saximontana	Festuca ovina	Rocky Mountain fescue	N
Festuca subulata	Festuca subulata	bearded fescue	N
Festuca subuliflora	Festuca subuliflora	Coast Range fescue	N
Fragaria vesca ssp. bracteata	Fragaria vesca	woods strawberry	N
Fragaria virginiana ssp. platypetala	Fragaria virginiana	common strawberry	N
Frangula purshiana	Rhamnus purshiana	cascara	N
Fraxinus latifolia	Fraxinus latifolia	Oregon ash	N

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Fritillaria affinis var. affinis	Fritillaria lanceolata	chocolate lily	N
Galium aparine	Galium aparine	cleavers	N
Galium divaricatum	Galium parisiense	wall bedstraw	E
Galium triflorum	Galium triflorum	sweet-scented bedstraw	N
Gamochaeta purpurea	Gnaphalium purpureum	purple cudweed	N
Gaultheria shallon	Gaultheria shallon	salal	N
Geranium bicknellii	Geranium bicknellii Bicknell's	geranium	N
Geranium carolinianum var. carolinianum	Geranium carolinianum	Carolina geranium	N
Geranium columbinum	Geranium columbinum long-stalked	geranium	E
Geranium dissectum	Geranium dissectum cut-leaf	geranium	E
Geranium molle	Geranium molle	dovefoot geranium	E
Geranium robertianum	Geranium robertianum	herb robert	E
Geum macrophyllum var. macrophyllum	Geum macrophyllum	large-leaved avens	N
Geum triflorum	Geum triflorum	old man's whiskers	N
Gilia capitata ssp. capitata	Gilia capitata	bluehead gilia	N
Glechoma hederacea	Glechoma hederacea	ground-ivy	E
Goodyera oblongifolia	Goodyera oblongifolia rattlesnake-plant	ain	N
Grindelia integrifolia	Grindelia integrifolia var. integrifolia	Puget gumweed	N
Grindelia stricta var. stricta	Grindelia integrifolia var. macrophylla	Oregon gumweed	N
Hedera helix	Hedera helix	English ivy	E
Hemitomes congesta	Hemitomes congesta	gnome-plant	N
Heracleum maximum	Heracleum lanatum	cow-parsnip	N
Heterotheca villosa	Chrysopsis villosa	hairy goldenaster	N
Heuchera micrantha var. diversifolia	Heuchera micrantha	small-flowered alumroot	N
Hieracium albiflorum	Hieracium albiflorum w	hite-flowered hawkweed	N
Hieracium cynoglossoides	Hieracium cynoglossoides	houndstongue hawkweed	N
Hieracium scouleri var. scouleri	Hieracium scouleri	woolly-weed	N
Holcus lanatus	Holcus lanatus	common velvet grass	E
Holodiscus discolor	Holodiscus discolor	oceanspray	N
Hydrophyllum tenuipes	Hydrophyllum tenuipes	slender-stem waterleaf	N
Hypericum perforatum	Hypericum perforatum	common St. John's-wort	E
Hypochaeris radicata	Hypochaeris radicata	hairy cat's-ear	E
Ilex aquifolium	Ilex aquifolium	English holly	E
Iris tenax ssp. tenax	Iris tenax	Oregon iris	N
Juncus effusus	Juncus effusus	soft rush	N
Juncus tenuis	Juncus tenuis slender	rush	N
Juniperus scopulorum	Juniperus scopulorum Rocky	Mountain juniper	N
Koeleria macrantha	Koeleria cristata prairie	junegrass	N
Lamium purpureum	Lamium purpureum	purple dead-nettle	E
Lapsana communis	Lapsana communis	nipplewort	E
Lathyrus nevadensis ssp. lanceolatus var. pilosellus	Lathyrus nevadensis	Nuttall's peavine	N
Lathyrus polyphyllus	Lathyrus polyphyllus	leafy peavine	N
Leptosiphon bicolor	Linanthus bicolor var. bicolor	bicolored linanthus	N

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Leucanthemum vulgare	Chrysanthemum leucanthemum	oxeye daisy	E
Ligusticum apiifolium	Ligusticum apiifolium celer	y-leaf licorice-root	N
Lilium columbianum	Lilium columbianum Columbia	lily	N
Linnaea borealis ssp. longiflora	Linnaea borealis	twinflower	N
Listera caurina	Listera caurina	western twayblade	N
Listera cordata var. nephrophylla	Listera cordata	heart-leaved twayblade	N
Lolium perenne ssp. perenne	Lolium perenne	perennial ryegrass	E
Lomatium dissectum var. dissectum	Lomatium dissectum	fern-leaved lomatium	N
Lomatium martindalei	Lomatium martindalei	Martindale's lomatium	N
Lomatium nudicaule	Lomatium nudicaule	bare-stem lomatium	N
Lomatium triternatum var. triternatum	Lomatium triternatum	nine-leaf lomatium	N
Lomatium utriculatum	Lomatium utriculatum	spring-gold	N
Lonicera ciliosa	Lonicera ciliosa	orange honeysuckle	N
Lonicera hispidula	Lonicera hispidula hair	y honeysuckle	N
Lonicera involucrata var. involucrata	Lonicera involucrata	black twinberry	N
Lotus corniculatus	Lotus corniculatus garden	birdsfoot trefoil	E
Lotus denticulatus	Lotus denticulatus meado	w deervetch	N
Lotus micranthus	Lotus micranthus small-flow	ered deervetch	N
Lupinus albicaulis var. albicaulis	Lupinus albicaulis	sickle-keeled lupine	N
Lupinus bicolor ssp. bicolor	Lupinus bicolor	two-colored lupine	N
Lupinus densiflorus var. densiflorus	Lupinus microcarpus var. scopulorum	dense-flowered lupine	N
Lupinus lepidus	Lupinus lepidus var. lepidus	prairie lupine	N
Lupinus littoralis	Lupinus littoralis seashore	lupine	N
Lupinus spp.	Lupinus spp.	lupine	N
Luzula (comosa, multiflora ssp. multiflora var. multiflora)	Luzula campestris	wood-rush	N
Luzula fastigiata	Luzula parviflora forked	wood-rush	N
Lysichiton americanus	Lysichitum americanum	skunkcabbage	N
Madia gracilis	Madia gracilis	slender tarweed	N
Madia madioides	Madia madioides w	oodland tarweed	N
Mahonia aquifolium	Berberis aquifolium	tall Oregongrape	N
Mahonia nervosa	Berberis nervosa dwarf	Oregongrape	N
Maianthemum dilatatum	Maianthemum dilatatum	false lily-of-the-valley	N
Maianthemum racemosum ssp. amplexicaule	Smilacina racemosa	large false Solomon's seal	N
Maianthemum stellatum	Smilacina stellata	starry false Solomon's-seal	N
Malus fusca	Pyrus fusca	western crabapple	N
Malus sylvestris	Pyrus malus	cultivated apple	E

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Marah oreganus	Marah oreganus	Oregon manroot	N
Melica subulata	Melica subulata	Alaska oniongrass	N
Menziesia ferruginea	Menziesia ferruginea fool's	huckleberry	N
Microseris laciniata ssp. laciniata	Microseris laciniata	cut-leaf microseris	N
Microsteris gracilis var. humilior	Microsteris gracilis	pink microsteris	N
Mimulus guttatus	Mimulus guttatus	yellow monkey-flower	N
Minuartia michauxii var. michauxii	Arenaria stricta	Michaux's stitchwort	N
Mitella caulescens	Mitella caulescens leaf	y mitrewort	N
Moehringia macrophylla	Arenaria macrophylla big-	leaved sandwort	N
Monotropa hypopithys	Hypopitys monotropa	pinesap	N
Monotropa uniflora	Monotropa uniflora	Indian pipe	N
Montia parvifolia ssp. parvifolia	Montia parvifolia	little-leaf montia	N
Mycelis muralis	Lactuca muralis	wall lettuce	E
Myosotis discolor	Myosotis discolor	yellow-and-blue forget-me-not	E
Nemophila parviflora var. parviflora	Nemophila parviflora	small-flowered nemophila	N
Oemleria cerasiformis	Oemleria cerasiformis	Indian plum	N
Oplopanax horridus	Oplopanax horridum	devil's club	N
Opuntia fragilis	Opuntia fragilis	brittle prickly-pear	N
Orobanche uniflora	Orobanche uniflora naked	broomrape	N
Osmorhiza berteroi	Osmorhiza chilensis mountain	sweet-cicely	N
Oxalis oregana	Oxalis oregana	Oregon oxalis	N
Packera macounii	Senecio macounii	Puget groundsel	N
Parentucellia viscosa	Parentucellia viscosa	yellow parentucellia	E
Paxistima myrsinites	Pachistima myrsinites	Oregon boxwood	N
Penstemon ovatus	Penstemon ovatus broad-leaved	penstemon	N
Pentagrama triangularis ssp. triangularis	Pityrogramma triangularis	gold-back fern	N
Perideridia gairdneri ssp. borealis	Perideridia gairdneri	Gairdner's yampah	N
Petasites frigidus var. palmatus	Petasites frigidus	colts foot	N
Phacelia leptosepala	Phacelia hastata var. leptosepala	narrow-sepal phacelia	N
Phalaris arundinacea	Phalaris arundinacea	reed canarygrass	E
Philadelphus lewisii	Philadelphus lewisii	mockorange	N
Phleum pratense	Phleum pratense	common timothy	E
Physocarpus capitatus	Physocarpus capitatus	Pacific ninebark	N
Picea sitchensis	Picea sitchensis Sitka	spruce	N
Pinus contorta var. contorta	Pinus contorta var. contorta	lodgepole pine	N
Pinus monticola	Pinus monticola	western white pine	N
Pinus ponderosa	Pinus ponderosa ponderosa	pine	N
Piperia elegans ssp. elegans	Habenaria (elegans, greenei)	elegant rein-orchid	N
Piperia unalascensis	Habenaria unalaschensis Alaska	rein-orchid	N
Plantago lanceolata	Plantago lanceolata English	plantain	E

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Plantago maritima var. juncoides	Plantago maritima	seaside plantain	N
Plectritis congesta ssp. congesta	Plectritis congesta	rosy plectritis	N
Poa compressa	Poa compressa	Canadian bluegrass	E
Poa howellii	Poa howellii	Howell's bluegrass	N
Poa pratensis	Poa pratensis	Kentucky bluegrass	E
Poa secunda	Poa (sandbergii, nevadensis, scabrella)	one-sided bluegrass	N
Polygonum douglasii ssp. (douglasii, nuttallii, spergulariiforme)	Polygonum (douglasii, nuttallii, spergulariaeforme)	Douglas' knotweed	N
Polypodium glycyrrhiza	Polypodium glycyrrhiza	licorice fern	N
Polystichum imbricans ssp. imbricans	Polystichum munitum ssp. imbricans	imbricate sword fern	N
Polystichum munitum	Polystichum munitum var. munitum	sword fern	N
Populus balsamifera ssp. trichocarpa	Populus trichocarpa	black cottonwood	N
Potentilla glandulosa	Potentilla glandulosa	sticky cinquefoil	N
Potentilla gracilis var. gracilis	Potentilla gracilis	graceful cinquefoil	N
Prosartes hookeri var. oregana	Disporum hookeri	Hooker's fairybells	N
Prosartes smithii	Disporum smithii	Smith's fairybells	N
Prunella vulgaris ssp. lanceolata	Prunella vulgaris	self-heal	N
Prunus avium	Prunus avium	sweet cherry	E
Prunus emarginata var. mollis	Prunus emarginata	bitter cherry	N
Prunus virginiana var. demissa	Prunus virginiana	common chokecherry	N
Pseudotsuga menziesii var. menziesii	Pseudotsuga menziesii	Douglas-fir	N
Pteridium aquilinum var. pubescens	Pteridium aquilinum	bracken fern	N
Pyrola asarifolia	Pyrola asarifolia	common pink wintergreen	N
Pyrola picta	Pyrola picta	white-vein pyrola	N
Quercus garryana var. garryana	Quercus garryana	Oregon white oak	N
Ranunculus californicus	Ranunculus californicus	California buttercup	N
Ranunculus occidentalis var. occidentalis	Ranunculus occidentalis	western buttercup	N
Ranunculus repens	Ranunculus repens	creeping buttercup	E
Ranunculus uncinatus	Ranunculus uncinatus	little buttercup	N
Rhododendron macrophyllum	Rhododendron macrophyllum	Pacific rhododendron	N
Ribes bracteosum	Ribes bracteosum	stink currant	N
Ribes divaricatum var. divaricatum	Ribes divaricatum	coast black gooseberry	N
Ribes lacustre	Ribes lacustre	swamp currant	N

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Ribes sanguineum var. sanguineum	Ribes sanguineum	red-flowering currant	N
Rosa gymnocarpa	Rosa gymnocarpa	baldhip rose	N
Rosa nutkana	Rosa nutkana	nootka rose	N
Rosa pisocarpa	Rosa pisocarpa	clustered wild rose	N
Rubus armeniacus	Rubus discolor Himala	yan blackberry	E
Rubus laciniatus	Rubus laciniatus evergreen	blackberry	E
Rubus leucodermis	Rubus leucodermis blackcap		N
Rubus nivalis	Rubus nivalis	snow bramble	N
Rubus parviflorus var. parviflorus	Rubus parviflorus	thimbleberry	N
Rubus spectabilis var. spectabilis	Rubus spectabilis	salmonberry	N
Rubus ursinus ssp. macropetalus	Rubus ursinus	trailing blackberry	N
Rumex acetosella	Rumex acetosella	sheep sorrel	E
Rumex obtusifolius	Rumex obtusifolius	bitter dock	E
Salix hookeriana	Salix hookeriana	Hooker's willow	N
Salix scouleriana	Salix scouleriana	Scouler's willow	N
Sambucus nigra ssp. caerulea	Sambucus cerulea	blue elderberry	N
Sambucus racemosa var. racemosa	Sambucus racemosa	red elderberry	N
Sanicula bipinnatifida	Sanicula bipinnatifida	purple sanicle	N
Sanicula crassicaulis var. crassicaulis	Sanicula crassicaulis	Pacific sanicle	N
Sanicula crassicaulis var. tripartita	Sanicula crassicaulis	Pacific sanicle	N
Sanicula graveolens	Sanicula graveolens Sierra	sanicle	N
Saxifraga caespitosa	Saxifraga caespitosa tufted	saxifrage	N
Saxifraga integrifolia	Saxifraga integrifolia	early saxifrage	N
Sedum lanceolatum ssp. (lanceolatum, nesioticum)	Sedum lanceolatum	lance-leaved stonecrop	N
Sedum oreganum	Sedum oreganum	Oregon stonecrop	N
Sedum spathulifolium ssp. spathulifolium	Sedum spathulifolium	broad-leaved stonecrop	N
Selaginella wallacei	Selaginella wallacei Wallace'	s selaginella	N
Senecio jacobea	Senecio jacobea	tansy ragwort	E
Senecio sylvaticus	Senecio sylvaticus w	oodland ragwort	E
Sericocarpus rigidus	Aster curtus w	hite-top aster	N
Shepherdia canadensis	Shepherdia canadensis russet	buffaloberry	N
Sherardia arvensis	Sherardia arvensis blue	field-madder	E
Silene antirrhina	Silene antirrhina	sleepy catchfly	N
Silene menziesii ssp. menziesii	Silene menziesii	white catchfly	N
Silene spp.	Silene spp.	catchfly	
Sisyrinchium idahoense	Sisyrinchium angustifolium	Idaho blue-eyed grass	N
Solanum dulcamara	Solanum dulcamara bittersweet	nightshade	E
Solidago canadensis var. salebrosa	Solidago canadensis	Canadian goldenrod	N

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Solidago missouriensis var. tolmieana	Solidago missouriensis Missouri	goldenrod	N
Solidago simplex ssp. simplex var. simplex	Solidago spathulata var. neomexicana	dwarf goldenrod	N
Sonchus asper	Sonchus asper pr	ickly sow-thistle	E
Sorbus aucuparia	Sorbus aucuparia	European mountain-ash	E
Spiraea betulifolia var. lucida	Spiraea betulifolia	birch-leaf spirea	N
Spiraea douglasii	Spiraea douglasii	Douglas' spirea	N
Spiranthes romanzoffiana	Spiranthes romanzoffiana hooded	ladies'-tresses	N
Stachys chamissonis var. cooleyae	Stachys cooleyae	Cooley's hedge-nettle	N
Stellaria crispa	Stellaria crispa	crisped starwort	N
Stellaria media	Stellaria media	chickweed starwort	E
Streptopus amplexifolius var. amplexifolius	Streptopus amplexifolius	clasping-leaved twisted-stalk	N
Symphoricarpos albus var. laevigatus	Symphoricarpos albus	common snowberry	N
Symphoricarpos hesperius	Symphoricarpos mollis	spreading snowberry	N
Synthyris reniformis var. reniformis	Synthyris reniformis	snow-queen	N
Taraxacum officinale	Taraxacum officinale	common dandelion	E
Taxus brevifolia	Taxus brevifolia	Pacific yew	N
Teesdalia nudicaulis	Teesdalia nudicaulis	common shepherd's-cress	E
Tellima grandiflora	Tellima grandiflora fringecup		N
Thalictrum occidentale	Thalictrum occidentale	western meadowrue	N
Thuja plicata	Thuja plicata	western redcedar	N
Tiarella trifoliata var. laciniata	Tiarella laciniata	cutleaf foamflower	N
Tiarella trifoliata var. trifoliata	Tiarella trifoliata	threeleaf foamflower	N
Tolmiea menziesii	Tolmiea menziesii	youth-on-age	N
Toxicodendron diversilobum	Rhus diversiloba	poison-oak	N
Tragopogon dubius	Tragopogon dubius	yellow salsify	E
Trientalis borealis ssp. latifolia	Trientalis latifolia	western starflower	N
Trifolium bifidum	Trifolium bifidum	pinole clover	N
Trifolium campestre	Trifolium procumbens	hop clover	E
Trifolium dubium	Trifolium dubium suckling	clover	E
Trifolium microcephalum	Trifolium microcephalum small-headed	clover	N
Trifolium microdon	Trifolium microdon thimble	clover	N
Trifolium oliganthum	Trifolium oliganthum	few-flowered clover	N
Trifolium pratense	Trifolium pratense	red clover	E
Trifolium spp.	Trifolium spp.	clover	N
Trifolium willdenowii	Trifolium tridentatum tomcat	clover	N
Trillium ovatum ssp. ovatum	Trillium ovatum	western trillium	N
Trillium parviflorum	Trillium chloropetalum	small-flowered trillium	N
Trisetum canescens	Trisetum canescens	tall trisetum	N

Kartesz 2005 Name	Hitchcock & Cronquist 1973 Name	Common Name	Native/ Exotic
Trisetum canescens	Trisetum cernuum	nodding trisetum	N
Triteleia grandiflora var. howellii	Brodiaea howellii	Howell's brodiaea	N
Triteleia hyacinthina	Brodiaea hyacinthina h	yacinth brodiaea	N
Tsuga heterophylla	Tsuga heterophylla	western hemlock	N
Urtica dioica ssp. gracilis	Urtica dioica	stinging nettle	N
Vaccinium alaskaensis	Vaccinium alaskaense ova	-leaf huckleberry	N
Vaccinium caespitosum	Vaccinium occidentale dwa	rf huckleberry	N
Vaccinium ovatum	Vaccinium ovatum	evergreen huckleberry	N
Vaccinium parvifolium	Vaccinium parvifolium	red huckleberry	N
Vancouveria hexandra	Vancouveria hexandra	inside-out flower	N
Veratrum californicum var. caudatum	Veratrum californicum	California false hellebore	N
Veronica americana	Veronica americana Americ	an brooklime	N
Veronica arvensis	Veronica arvensis	wall speedwell	E
Veronica officinalis	Veronica officinalis	Paul's betony	E
Viburnum ellipticum	Viburnum ellipticum	oval-leaved viburnum	N
Vicia americana ssp. americana	Vicia americana	American vetch	N
Vicia hirsuta	Vicia hirsuta hair	y vetch	E
Vicia nigricans ssp. gigantea	Vicia gigantea	giant vetch	N
Vicia sativa	Vicia sativa	common vetch	E
Vicia spp.	Vicia spp.	vetch	N
Vicia villosa	Vicia cracca	woolly vetch	E
Viola adunca var. adunca	Viola adunca	early blue violet	N
Viola glabella	Viola glabella	pioneer violet	N
Viola howellii	Viola howellii	Howell's violet	N
Viola praemorsa ssp. praemorsa	Viola nuttallii	prairie violet	N
Viola sempervirens	Viola sempervirens evergre	en violet	N
Vulpia bromoides	Festuca bromoides	barren fescue	E
Vulpia microstachys	Festuca microstachys	Nuttall's fescue	N
Vulpia myuros	Festuca (megalura, myuros)	rat-tail fescue	E
Xerophyllum tenax	Xerophyllum tenax	beargrass	N
Zigadenus venenosus var. venenosus	Zigadenus venenosus	meadow death camas	N

Note: Names in parentheses separated by a comma indicate either taxon.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

Standard and Common Names and Codes for Species Listed in the Keys

Kartesz 2005 Name	Common Name	Code
Abies grandis	grand fir	ABGR
Acer circinatum	vine maple	ACCI
Acer macrophyllum	bigleaf maple	ACMA
Alnus rubra	red alder	ALRU
Amelanchier alnifolia	serviceberry	AMAL
Arbutus menziesii	Pacific madrone	ARME
Aspidotis densa	Indian's dream	ASDE
Athyrium filix-femina ssp. cyclosorum	lady-fern	ATFI
Betula papyrifera var. papyrifera	paper birch	BEPA
Blechnum spicant	deerfern	BLSP
Camassia leichtlinii ssp. suksdorfii	great camas	CALE
Camassia quamash	common camas	CAQU
Carex inops ssp. inops	long-stolon sedge	CAIN
Cerastium arvense ssp. strictum	field chickweed	CEAR
Chimaphila umbellata ssp. occidentalis	pipsissewa	CHUM
Circaea alpina ssp. pacifica	enchanter's nightshade	CIAL
Claytonia siberica var. sibirica	Siberian springbeauty	CLSI
Clinopodium douglasii	yerba buena	CLDO
Corylus cornuta var. californica	beaked hazelnut	COCO
Cytisus scoparius	Scot's broom	CYSC
Danthonia californica	California danthonia	DACA
Dryopteris expansa	spreading woodfern	DREX
Elymus glaucus	blue wildrye	ELGL
Erigeron speciosus var. speciosus	showy fleabane	ERSP
Eriophyllum lanatum var. lanatum	woolly sunflower	ERLA
Festuca occidentalis	western fescue	FEOC
Festuca roemeri	Roemer's fescue	FERO
Festuca rubra	red fescue	FERU
Fraxinus latifolia	Oregon ash	FRLA
Gaultheria shallon	salal	GASH
Grindelia stricta var. stricta	Oregon gumweed	GRST
Hieracium cynoglossoides	houndstongue hawkweed	HICY
Holodiscus discolor	oceanspray	HODI
Juniperus scopulorum	Rocky Mountain juniper	JUSC
Koeleria macrantha	prairie junegrass	KOMA
Lonicera hispidula	hairy honeysuckle	LOHI
Lupinus albicaulis var. albicaulis	sickle-keeled lupine	LUAL
Lupinus lepidus	prairie lupine	LULE
Mahonia aquifolium	tall Oregongrape	MAAQ
Mahonia nervosa	dwarf Oregongrape	MANE
Maianthemum stellatum	starry false Solomon's-seal	MAST
Oemleria cerasiformis	Indian plum	OECE
Oplopanax horridus	devil's club	OPHO
Oxalis oregana	Oregon oxalis	OXOR
Pinus contorta var. contorta	lodgepole pine	PICO
Pinus ponderosa	ponderosa pine	PIPO
Plectritis congesta ssp. congesta	rosy plectritis	PLCO
Polystichum munitum	sword fern	POMU
Pseudotsuga menziesii var. menziesii	Douglas-fir	PSME
Quercus garryana var. garryana	Oregon white oak	QUGA
Ranunculus occidentalis var. occidentalis	western buttercup	RAOC
Rhododendron macrophyllum	Pacific rhododendron	RHMA
Rosa gymnocarpa	baldhip rose	ROGY
Rubus spectabilis var. spectabilis	salmonberry	RUSP
Selaginella wallacei	Wallace's selaginella	SEWA
Sericocarpus rigidus	white-top aster	SERI
Sisyrinchium idahoense	Idaho blue-eyed grass	SIID
Solidago simplex ssp. simplex var. simplex	dune goldenrod	SOSI
Symphoricarpos albus var. laevigatus	common snowberry	SYAL
Symphoricarpos hesperius	spreading snowberry	SYHE
Synthyris reniformis var. reniformis	snow-queen	SYRE
Tellima grandiflora	fringecup	TEGR
Thuja plicata	western redcedar	THPL
Tiarella trifoliata var. laciniata	cutleaf foamflower	TITRLA
Tiarella trifoliata var. trifoliata	threeleaf foamflower	TITR
Toxicodendron diversilobum	poison-oak	TODI
Triteleia grandiflora var. howellii	Howell's brodiaea	TRGR
Tsuga heterophylla	western hemlock	TSHE
Urtica dioica ssp. gracilis	stinging nettle	URDI
Vaccinium ovatum	evergreen huckleberry	VAOV
Vaccinium parvifolium	red huckleberry	VAPA
Viburnum ellipticum	oval-leaved viburnum	VIEL

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf]

KEY TO PUGET TROUGH UPLAND PLANT ASSOCIATIONS
May 2006

Does not include riparian floodplain vegetation.

Instructions:

1. Select a relatively uniform area of vegetation and topography to key out. A representative 1/10 acre plot is a simple way to examine a stand, just be sure the plot does represent the stand of interest.
2. "Present" means the species is found on a representative 1/10 acre plot, i.e. it regularly occurs in the stand.
3. This is not a classic dichotomous key but an abbreviated form of a dichotomous key. Each line is mutually exclusive from the next line down in the key. If the stand or plot meets all the criteria in a line, then read to the right or (if blank) to the next indented line down. If the stand or plot does not meet the criteria in a line, then go to the next line down the page that is not indented from the current line.
4. A dominance type key precedes keys to the individual associations within the dominance types.
5. Percentage values in the key (e.g., 25%) refer to % crown cover, that is the vertical projection below the entire crown of the plant, do not subtract for spaces between leaves and branches.
6. Snowberry in the key refers to both species of snowberry, common and creeping, unless preceded by the species name.
7. "+" = add the crown cover of each of the species indicated, e.g. 7+22 = 29% cover, overlap between the species gets counted twice.
8. "Dominant successful regeneration" refers to the tree species that is most abundant in <5 inch dbh size classes (understory trees) and that has at least 30 individuals per acre of this size (at least 3 on a representative 1/10 acre plot).
9. "Olympic Mountains rainshadow" refers to a geographic and climatic area encompassing San Juan County, far western Skagit and Whatcom counties (Cypress, Guemes, Lummi, Fidalgo islands), northern and central Island County, northeastern Jefferson County (Miller and Quimper Peninsulas), and part of eastern Clallam County (Sequim Bay to Port Angeles).
10. **The key is not the classification.** After you have keyed out a stand, always read the association description of vegetation composition, geographic distribution, and physical environment. If it sounds like it fits in most regards, you have made a correct identification. If there are multiple inconsistencies between the stand and the description, the key probably was incorrect. In this case, you probably need to try the key again and follow slightly different leads or identify the stand by reading the descriptions.

Key to Dominance Types

Trees >25%

Oregon white oak >25% ..... Oregon white oak Woodland (p. 24)
Oregon white oak >50% of total tree cover ..... Oregon white oak Woodland (p. 24)

Ponderosa pine >25% and total tree cover <70% (open canopy woodland) .....Savanna (p. 24)
Ponderosa pine >50% of total tree cover and total tree cover <70%.....Savanna (p. 24)

Lodgepole (shore) pine >25% ..... Lodgepole pine – Douglas-fir Forest (p. 24)

Native deciduous broadleaf trees >75% of total tree cover..Red alder – bigleaf maple Forest (p. 25)

Western hemlock or western redcedar >10% .....
..... Douglas-fir – western hemlock – western redcedar Forest (p. 26)

Western hemlock or western redcedar the dominant successful tree regeneration (see item 8 above)..... Douglas-fir – western hemlock – western redcedar Forest (p. 26)

Grand fir >10%..... Douglas-fir – grand fir Forest (p. 26)

Pacific madrone >20%..... Douglas-fir – Pacific madrone Forest (p. 25)

Grand fir the dominant successful tree regeneration ..... Douglas-fir – grand fir Forest (p. 26)

Douglas-fir the dominant successful tree regeneration ..... Douglas-fir Forest (p. 25)

Oceanspray + baldhip rose + snowberry + serviceberry + beaked hazelnut >25%..... ..... Douglas-fir Forest (p. 25)

Salal >25% and oceanspray >10% ..... Douglas-fir Forest (p. 25)

Tall Oregongrape, western fescue, blue wildrye, long-stolon sedge, yerba buena, bigleaf sandwort, pipsissewa, hairy honeysuckle or poison-oak >1% or any three of these species present .... Douglas-fir Forest (p. 25)

Not as above..... Douglas-fir – western hemlock – western redcedar Forest (p. 26)

Trees <25%
- Shrubs <25%
  - Trees >10% and not confined to mesic microsites ..... Savanna (p. 24)
  - Trees <10% or confined to mesic microsites .....Grassland (p. 23)
- Shrubs >25% .....Shrubland - Unclassified (p. 135)

Grassland Key

Roemer's fescue >10%
- Rosy plectritis >5% ..... FERO-PLCO (p. 45)
- Great camas >5% ..... FERO-CALE (p. 39)
- Red fescue >5% and Indian's dream present ..... FERU-FERO-ASDE (p. 49)
- White-top aster, houndstongue hawkweed, prairie lupine, Idaho blue-eyed grass, or sickle-keeled lupine present ..... FERO-SERI (p. 47)
- Field chickweed present, and showy fleabane, dune goldenrod or Howell's brodiaea present; deep soils..... FERO-CAQU-CEAR (p. 41)
- Field chickweed, Wallace's selaginella, prairie junegrass, Indian's dream, or blue wildrye present; shallow soils.....FERO-(CEAR-KOMA) (p. 43)

Red fescue >5%
- Roemer's fescue >1% and Indian's dream present..... FERU-FERO-ASDE (p. 49)
- Great camas or Oregon gumweed present; located on bluffs or shallow soils near saltwater .... FERU-(GRST-CALE) (p. 51)
- California danthonia >10% ..... DACA-ERLA (p. 33)

California danthonia >10%..... DACA-ERLA (p. 33)

Roemer's fescue, red fescue (native varieties), and California danthonia each <5% ....Non-native or unclassified herbaceous vegetation (p. 138)

Savanna Key

Roemer's fescue or California oatgrass >5%, or long-stolon sedge + blue wildrye >25%
- Ponderosa pine the dominant tree ..... PIPO/CAIN-FERO (p. 57)
- Oregon white oak the dominant tree ..... QUGA/FERO (p. 119)
- Douglas-fir the dominant tree ..... PSME Savanna (p. 59)

Roemer's fescue and California oatgrass each <5% and long-stolon sedge + blue wildrye <25% ..... Non-native or Douglas-fir Forest (p. 138 or 25)

Oregon white oak Woodland Key

Oval-leaf viburnum + poison-oak >10% and each present ..... QUGA/VIEL/TODI (p. 129)

Common snowberry >10%
- Douglas-fir >25% and sword fern present ..... QUGA-PSME/SYAL/POMU (p. 125)
- Oregon ash >25% ..... QUGA-(FRLA)/SYAL (p. 123)
- Sword fern + enchanter's nightshade + Siberian springbeauty + starry solomon's seal >1%
  - Riparian or wetland fringe site ..... QUGA-(FRLA)/SYAL (p. 123)
  - Douglas-fir >10% or Douglas-fir stumps numerous, not a riparian or wetland fringe site ..... QUGA-PSME/SYAL/POMU (p. 125)
  - Poison-oak and oceanspray each >10% ..... QUGA/VIEL/TODI (p. 129)
- Long-stolon sedge or blue wildrye >1% ..... QUGA/SYAL/CAIN (p. 127)
- Common snowberry >50% or Indian plum >25% ..... QUGA-(FRLA)/SYAL (p. 123)
- Tall Oregongrape, long-stolon sedge, or blue wildrye present ..... QUGA/SYAL/CAIN (p. 127)

Common snowberry <10%
- Scot's broom >25% ..... Non-native
- Tall Oregongrape >25% ..... QUGA/SYAL/CAIN (p. 127)
- Long-stolon sedge, Roemer's fescue, red fescue, or blue wildrye >10% and common camas or western buttercup present ..... QUGA/CAIN-(CAQU) (p. 119)
- Non-native grasses dominate understory ..... Non-native

Not as above ..... try with half the values in the key, review association descriptions

Lodgepole pine – Douglas-fir Forest Key

Salal >10% ..... PICO-PSME/GASH (p. 53)

Dwarf Oregongrape >5% ..... PICO-PSME/MANE (p. 55)

Not as above ..... try with half the values in the key, review association descriptions

Red alder – bigleaf maple Forest Key

Site has wetland soils or is subject to influence of riverine flooding ..... Not part of this classification, refer to other publications

Paper birch >10%.....BEPA-ALRU/POMU (p. 35)
Sword fern >10%
Fringecup present and located on a steep slope or landslide deposit .....ACMA-ALRU/POMU-TEGR (p. 31)
Fringecup absent or not located on a steep slope or landslide deposit .....ALRU/POMU (p. 37)

Not as above ..... review association descriptions, may be non-native or unclassified

Douglas-fir – Pacific madrone Forest Key

Evergreen huckleberry >5%..... PSME-ARME/VAOV (p. 73)
Salal >10% .....PSME-ARME/GASH (p. 69)
Oceanspray, common snowberry, hairy honeysuckle or western fescue >1% .....PSME-ARME/HODI/LOHI (p. 71)

Not as above ..... review association descriptions, may be non-native or part of Douglas-fir – western hemlock – western redcedar Forest (p. 26)

Douglas-fir Forest Key

Sword fern >60% .....PSME/COCO/POMU-TITR (p. 75)

Salal >10%
Sword fern >5% .....PSME/GASH/POMU (p. 81)
Oceanspray, tall Oregongrape, baldhip rose, or creeping snowberry present.....PSME/GASH-HODI (p. 79)

Sword fern >10%.....
Lady-fern, spreading woodfern, foamflower, or stinging nettle >3% or any two >1% .....PSME/COCO/POMU-TITR (p. 75)
Beaked hazelnut + snowberry >10% and each present..... PSME/COCO-SYMPH/POMU (p. 77)

Sword fern >5% and vine maple + beaked hazelnut > snowberry ..... PSME/COCO-SYMPH/POMU (p. 77)

Snowberry >10%
Spreading snowberry >10% ..... PSME/SYMPH-AMAL (p. 91)
Beaked hazelnut, starry solomon's seal, enchanter's nightshade, snow-queen or long-stolon sedge present.....PSME/SYMPH-AMAL (p. 91)
Oceanspray and common snowberry each >10%..... PSME/HODI-SYAL (p. 83)

Starry solomon's seal, enchanter's nightshade, snow-queen or long-stolon sedge present..... PSME/SYMPH-AMAL (p. 91)
Spreading snowberry >5%.....PSME/SYMPH-AMAL (p. 91)
Beaked hazelnut + snowberry > baldhip rose + western fescue .....PSME/SYMPH-AMAL (p. 91)

Baldhip rose, oceanspray, or western fescue >1%..... PSME/ROGY-HODI (p. 87)

Not as above .....
try with half the values in the key, review association descriptions and non-native types, if it does not fit association descriptions for this dominance type, try Douglas-fir – western hemlock – western redcedar Forest Key (p. 26)

Douglas-fir – grand fir Forest Key

Salal >10%
- Beaked hazelnut or vine maple >5% and sword fern >5%.....PSME-ABGR/COCO/POMU (p. 61)
- Oceanspray or baldhip rose >1% ..... PSME-ABGR/GASH (p. 65)

Sword fern >5%
- Beaked hazelnut or vine maple >10%.....PSME-ABGR/COCO/POMU (p. 61)
- Oceanspray >10% ..... PSME-ABGR/HODI/POMU (p. 67)

Oceanspray >10% and common snowberry >5% and sword fern present . PSME-ABGR/HODI/POMU (67)

Western fescue >1%..... PSME-ABGR/FEOC (p. 63)

Douglas-fir – western hemlock – western redcedar Forest Key

Devils club >10%..... THPL-TSHE/OPHO/POMU (p. 133)

Oregon oxalis and sword fern each >5%.....PSME-THPL/OXOR (p. 95)

Site located in Olympic Mountains rainshadow and western hemlock <25% and western redcedar + grand fir > western hemlock

- Sword fern >35% .....THPL-ABGR/POMU (p. 131)

- Salal + Pacific rhododendron >10%
  - Sword fern >5%.....PSME-THPL/GASH-MANE/POMU (p. 93)
  - Pacific rhododendron >5%.....PSME-THPL/RHMA (p. 97)
  - Oceanspray or dwarf Oregongrape present..... PSME-THPL-(ABGR)/GASH (p. 89)

- Sword fern >10%
  - Dwarf Oregongrape or salal >10%.....PSME-THPL/GASH-MANE/POMU (p. 93)
  - Foamflower, lady-fern, or spreading woodfern >1% .....THPL-A13BGR/POMU (p. 131)
  - Dwarf Oregongrape >5% .....PSME-THPL/GASH-MANE/POMU (p. 93)

- Dwarf Oregongrape >5%
  - Sword fern >5%.....PSME-THPL/GASH-MANE/POMU (p. 93)
  - Sword fern <5%..... PSME-THPL-(ABGR)/GASH (p. 89)

Site located outside Olympic Mountains rainshadow or western hemlock >25% or western hemlock > western redcedar + grand fir

- Sword fern >50% or lady-fern >3% .....TSHE-PSME/POMU-DREX (p. 135)

- Sword fern >10%
  - Evergreen huckleberry >10%..... PSME-TSHE/VAOV/POMU (p. 117)
  - Salal >10% .....PSME-TSHE/GASH/POMU (p. 103)
  - Spreading woodfern + ladyfern + foamflower + deerfern >5% or > dwarf Oregongrape + oceanspray.....TSHE-PSME/POMU-DREX (p. 135)
  - Salmonberry > dwarf Oregongrape + oceanspray.....TSHE-PSME/POMU-DREX (p. 135)
  - Oceanspray or common snowberry >5%..... PSME-TSHE/HODI/POMU (p. 135)
  - Dwarf Oregongrape >5% ..... PSME-TSHE/MANE-POMU (p. 109)

Evergreen huckleberry >5%
Sword fern >3%..... PSME-TSHE/VAOV/POMU (p. 117)
Pacific rhododendron >5%..... PSME-TSHE/RHMA-VAOV (p. 111)
Rhododendron <5% ..... PSME-TSHE/VAOV (p. 115)

Pacific rhododendron >5% .....PSME-THPL/RHMA (p. 97)

Salal >10%
Sword fern >3%.....PSME-TSHE/GASH/POMU (p. 103)
Oceanspray > 3% or > dwarf Oregongrape ..... PSME-TSHE/GASH-HODI (p. 99)
Dwarf Oregongrape, red huckleberry, or vine maple presentPSME-TSHE/GASH-MANE(101)

Dwarf Oregongrape >5%
Cutleaf foamflower (var. *laciniata*) >5% .....PSME-TSHE/TITRLA (p. 113)
Sword fern >3%..... PSME-TSHE/MANE-POMU (p. 109)
Salal >5% ..... PSME-TSHE/GASH-MANE (p. 101)
Cutleaf foamflower >1% .....PSME-TSHE/TITRLA (p. 113)
Cutleaf foamflower <1% .....PSME-TSHE/MANE (p. 107)

Cutleaf foamflower >1% ..... PSME-TSHE/TITRLA (p. 113)

Dwarf Oregongrape >1% or only indicator species present.....PSME-TSHE/MANE (p. 107)

Understory Indicator species all absent (those listed in this key) and mosses dominate and understory not limited by too dense of tree canopy .....PSME-TSHE/MANE (p. 107)

Not as above.....try with half the values in the key, review association descriptions

Standard and Common Names and Codes for Species listed in the keys

Kartesz 2005 Name Abies grandis	**Common Name** grand fir	**4-letter Code** ABGR
Acer circinatum	vine maple	ACCI
Acer macrophyllum	bigleaf maple	ACMA
Alnus rubra	red alder	ALRU
Amelanchier alnifolia	serviceberry	AMAL
Arbutus menziesii	Pacific madrone	ARME
Aspidotis densa	Indian's dream	ASDE
Athyrium filix-femina ssp cyclosorum	lady-fern	ATFI
Betula papyrifera var papyrifera	paper birch	BEPA
Blechnum spicant	deerfern	BLSP
Camassia leichtlinii ssp suksdorfii	great camas	CALE
Camassia quamash	common camas	CAQU
Carex inops ssp inops	long-stolon sedge	CAIN
Cerastium arvense ssp strictum	field chickweed	CEAR
Chimaphila umbellata ssp occidentalis	pipsissewa	CHUM
Circaea alpina ssp pacifica	enchanter's nightshade	CIAL
Claytonia siberica var sibirica	Siberian springbeauty	CLSI
Clinopodium douglasii	yerba buena	CLDO
Corylus cornuta var californica	beaked hazelnut	COCO
Cytisus scoparius	Scot's broom	CYSC
Danthonia californica	California danthonia	DACA
Dryopteris expansa	spreading woodfern	DREX
Elymus glaucus	blue wildrye	ELGL
Erigeron speciosus var speciosus	showy fleabane	ERSP

Eriophyllum lanatum var lanatum	woolly sunflower	ERLA
Festuca occidentalis	western fescue	FEOC
Festuca roemeri	Roemer's fescue	FERO
Festuca rubra	red fescue	FERU
Fraxinus latifolia	Oregon ash	FRLA
Gaultheria shallon	salal	GASH
Grindelia stricta var stricta	Oregon gumweed	GRST
Hieracium cynoglossoides	houndstongue hawkweed	HICY
Holodiscus discolor	oceanspray	HODI
Juniperus scopulorum	Rocky Mountain juniper	JUSC
Koeleria macrantha	prairie junegrass	KOMA
Lonicera hispidula	hairy honeysuckle	LOHI
Lupinus albicaulis var albicaulis	sickle-keeled lupine	LUAL
Lupinus lepidus	prairie lupine	LULE
Mahonia aquifolium	tall Oregongrape	MAAQ
Mahonia nervosa	dwarf Oregongrape	MANE
Maianthemum stellatum	starry false Solomon's-seal	MAST
Oemleria cerasiformis	Indian plum	OECE
Oplopanax horridus	devil's club	OPHO
Oxalis oregana	Oregon oxalis	OXOR
Pinus contorta var contorta	lodgepole pine	PICO
Pinus ponderosa	ponderosa pine	PIPO
Plectritis congesta ssp congesta	rosy plectritis	PLCO
Polystichum munitum	sword fern	POMU
Pseudotsuga menziesii var menziesii	Douglas-fir	PSME
Quercus garryana var garryana	Oregon white oak	QUGA
Ranunculus occidentalis var occidentalis	western buttercup	RAOC
Rhododendron macrophyllum	Pacific rhododendron	RHMA
Rosa gymnocarpa	baldhip rose	ROGY
Rubus spectabilis var spectabilis	salmonberry	RUSP
Selaginella wallacei	Wallace's selaginella	SEWA
Sericocarpus rigidus	white-top aster	SERI
Sisyrinchium idahoense	Idaho blue-eyed grass	SIID
Solidago simplex ssp simplex var simplex	dune goldenrod	SOSI
Symphoricarpos albus var laevigatus	common snowberry	SYAL
Symphoricarpos hesperius	spreading snowberry	SYHE
Synthyris reniformis var reniformis	snow-queen	SYRE
Tellima grandiflora	fringecup	TEGR
Thuja plicata	western redcedar	THPL
Tiarella trifoliata var laciniata	cutleaf foamflower	TITRLA
Tiarella trifoliata var trifoliata	threeleaf foamflower	TITR
Toxicodendron diversilobum	poison-oak	TODI
Triteleia grandiflora var howellii	Howell's brodiaea	TRGR
Tsuga heterophylla	western hemlock	TSHE
Urtica dioica ssp gracilis	stinging nettle	URDI
Vaccinium ovatum	evergreen huckleberry	VAOV
Vaccinium parvifolium	red huckleberry	VAPA
Viburnum ellipticum	oval-leaved viburnum	VIEL

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

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ACER MACROPHYLLUM - ALNUS RUBRA / POLYSTICHUM MUNITUM - TELLIMA GRANDIFLORA

Bigleaf maple - red alder / sword fern - fringecup

Abbreviated Name: ACMA-ALRU/POMU-TEGR

Sample size = 18 plots

DISTRIBUTION: Occurs mostly around shorelines of Puget Sound and adjacent marine waters. Also in western end of the Columbia River Gorge, Skamania and Clark counties, in adjacent northwestern Oregon, and probably in southwestern BC (Fraser Lowland). May occur rarely elsewhere in the Puget Trough of Washington.

GLOBAL/STATE STATUS: G2G3S2. Occurs in a naturally limited habitat that has been considerably impacted by development and non-native species invasions. These threats continue. Most remaining examples are small, fragmented, and degraded to varying degrees by non-native plant species.

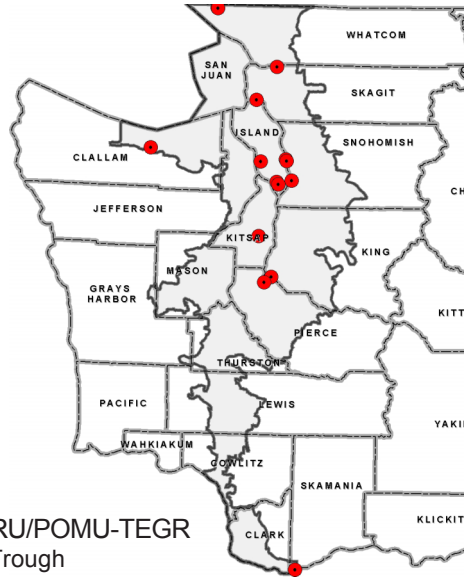
ID TIPS: Dominated by bigleaf maple or red alder Located on very steep slopes, landslide deposits or coastal bluffs.Fringecup usually provides >1% cover

ENVIRONMENT: Typically located on steep slopes, usually adjacent to saltwater. The sites are moderately moist to very moist and appear to be nutrient-rich. All aspects are represented, though northerly to easterly aspects are more common. Soils are not well represented by existing soil maps because of the complexity of these coastal bluff deposits. Parent materials likely include glacial till, advance glacial outwash, and glacial lake and marine sediments. Seeps are frequent on these slopes, resulting in locally wetter microsites. Soil texture is probably quite variable from loamy sand to silty clay loam.

Precipitation: 26-73 inches (mean 39)
Elevation: 20-600 feet
Aspect/slope: various/ slope 36-110% (mean 80)
Slope position: mid, lower, upper
Special: landslide deposits, glacial bluffs

Vegetation Composition Table (selected species):
Con = constancy , the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
bigleaf maple	Acer macrophyllum	94	56
red alder	Alnus rubra	83	36
Douglas-fir	Pseudotsuga menziesii var. menziesii	50	15
western redcedar	Thuja plicata	33	4
western hemlock	Tsuga heterophylla	17	11
Shrubs and Dwarf-shrubs			
trailing blackberry	Rubus ursinus var. macropetalus	100	6
red elderberry	Sambucus racemosa var. racemosa	72	11
oceanspray	Holodiscus discolor	67	11
thimbleberry	Rubus parviflorus	61	9
salmonberry	Rubus spectabilis var. spectabilis	56	15
Indian plum	Oemleria cerasiformis	44	6
blackcap	Rubus leucodermis	39	3
dwarf Oregongrape	Mahonia nervosa	39	3
common snowberry	Symphoricarpos albus var. laevigatus	33	15
beaked hazelnut	Corylus cornuta var. californica	33	13
baldhip rose	Rosa gymnocarpa	33	4
vine maple	Acer circinatum	6	30
Graminoids			
Columbia brome	Bromus vulgaris	67	2
Dewey's sedge	Carex deweyana var. deweyana	39	2
Forbs and Ferns			
sword fern	Polystichum munitum	100	33
fringecup	Tellima grandiflora	89	9
stinging nettle	Urtica dioica ssp. gracilis	67	12
licorice fern	Polypodium glycyrrhiza	50	1
Siberian springbeauty	Claytonia siberica var. siberica	44	6
cleavers	Galium aparine	44	3
spreading woodfern	Dryopteris expansa	39	3
giant horsetail	Equisetum telmateia var. braunii	22	7
Hooker's fairybells	Prosartes hookeri var. oregana	22	6
large false Solomon's seal	Maianthemum racemosum ssp. amplexicaule	22	6
cow-parsnip	Heracleum maximum	17	15



Plot locations
of ACMA-ALRU/POMU-TEGR
in the Puget Trough

Bigleaf maple - red alder / sword fern - fringecup

DISTURBANCE/SUCCESSION: Mass movements (landslides) favor the establishment and maintenance of deciduous trees on these sites. This community type is strongly associated with this natural process. Bigleaf maple appears capable of surviving small or slow mass movements, and sprouts vigorously after major damage to a mature stem, unlike the conifers and alder. Fire and wind also affect these forests. Conifers would be expected to increase in abundance in the face of long-term substrate stability, but this does not appear typical of these sites.

VEGETATION: Dominated by bigleaf maple and/or red alder; the former is usually more abundant than the latter. Douglas-fir occurs in about half of the stands but is subordinate in importance to the broadleaf species. Western hemlock or western redcedar sometimes occur in relatively small amounts, usually in the understory or subcanopy. The understory is characterized by an abundance of sword fern, and presence of fringecup, which averages 9% cover. A shrub layer is usually present, but varies considerably in composition. Shrub species that occur as dominants or co-dominants include oceanspray, salmonberry, red elderberry, and, less frequently, beaked hazelnut, common snowberry, or vine maple. Other species usually present include stinging nettle, Columbia brome, thimbleberry, trailing blackberry, and licorice fern (an epiphyte).

CLASSIFICATION NOTES: Also described by Chappell (2001). Its relationship to alder communities on landslides in adjacent mountainous ecoregions is unclear.

MANAGEMENT NOTES: Non-native English ivy (*Hedera helix*) and Himalayan blackberry (*Rubus discolor*) are prolific invaders in this association. Many other non-natives can occur. Development on land above the bluffs on which this association occurs can impact rates and types of mass movement processes.

BIODIVERSITY NOTES: Chain-fern (*Woodwardia fimbriata*), a state sensitive species, occurs in this plant association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

DANTHONIA CALIFORNICA – ERIOPHYLLUM LANATUM

California danthonia – woolly sunflower

Abbreviated Name: DACA-ERLA

Sample size = 7 plots

DISTRIBUTION: This grassy bald association occurs in the San Juan Islands of San Juan and Skagit County, Chuckanut Mountain in western Whatcom County, foothills of southeastern Thurston County, and the western Columbia Gorge, Skamania County. It also occurs in the adjacent Georgia Basin of British Columbia and may occur in the Willamette Valley of Oregon.

GLOBAL/STATE STATUS: GNRS1. There are very few known occurrences with fair or better integrity in Washington and they are highly threatened by invasion and increase of non-native species. Other threats include tree invasion with fire suppression, development, and recreational impacts.

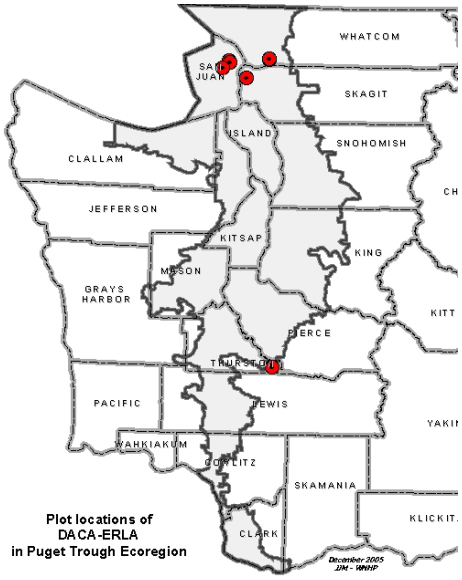
ID TIPS: Dominated or co-dominated by California danthonia and Roemer's fescue absent or low in cover (less than 10%). Slopes with shallow soils (rock outcrops usually present or nearby).

ENVIRONMENT: These sites are very dry. Occurs primarily on moderate to steep mid- to upper slopes, with southern to western aspects. Soils are shallow over sedimentary, igneous, or metamorphic bedrock. Rock outcrops (often covered with mosses) are typically present within or adjacent to this association. Has been rarely found on serpentine soils. Occurs at relatively high elevations for the Puget Trough. Occurs mostly in dry climatic areas (Olympic Mountain rainshadow).
Precipitation: 31-55 inches (mean 42)
Elevation: 700 to 1500 feet
Aspect/slope: E to W/ 26-78% slope (mean 49)
Slope position: mid, upper
Soil series: rock outcrop, rock land, Guemes variant

DISTURBANCE/SUCCESSION: Historically, many of the balds where this association occurs were more extensive than currently due to indigenous human burning practices. Some sites where this association currently exists appear to be marginal for Douglas-fir establishment and growth to maturity due to extreme summer drought conditions, except at edges or moist microsites. Overall there is considerable likelihood that many of these sites, in the absence of fire, could be eventually converted to coniferous woodlands or forest, especially small ones. Heavy browsing by deer at some sites appears

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Shrubs and Dwarf-shrubs	Kartesz 2005 Name	Con	Cov
baldhip rose	Rosa gymnocarpa	43	+
trailing blackberry	Rubus ursinus ssp. macropetalus	43	+
common snowberry	Symphoricarpos albus var. laevigatus	43	+
Graminoids			
California danthonia	Danthonia californica	100	45
blue wildrye	Elymus glaucus	100	3
silver hairgrass	Aira caryophyllea	86	7
barren fescue	Vulpia bromoides	86	6
prairie junegrass	Koeleria macrantha	71	11
early hairgrass	Aira praecox	71	1
soft brome	Bromus hordeaceus	57	19
California brome	Bromus carinatus	57	15
long-stolon sedge	Carex inops ssp inops	57	15
wood-rush	Luzula (comosa, multiflora ssp. multiflora)	57	9
rat-tail fescue	Vulpia myuros	57	4
Kentucky bluegrass	Poa pratensis	29	18
red fescue	Festuca rubra	29	13
Lemmon's needlegrass	Achnatherum lemmonii var. lemmonii	29	13
Forbs and Ferns			
woolly sunflower	Eriophyllum lanatum var. lanatum	86	8
yarrow	Achillea millefolium var. occidentalis	86	6
small-headed clover	Trifolium microcephalum	86	5
Indian's dream	Aspidotis densa	57	6
field chickweed	Cerastium arvense ssp. strictum	57	4
meadow death camas	Zigadenus venenosus var. venenosus	57	2
spring-gold	Lomatium utriculatum	43	6
cleavers	Galium aparine	43	1
Wallace's selaginella	Selaginella wallacei	43	1
Hooker's onion	Allium acuminatum	43	+
harvest brodiaea	Brodiaea coronaria ssp. coronaria	43	+
few-flowered clover	Trifolium oliganthum	43	+



California danthonia – woolly sunflower

to be retarding succession to woodland by limiting the size of Douglas-fir saplings. Historic grazing by domestic ungulates on some of these sites may have locally increased the prevalence of this association because California danthonia appears to be more tolerant of such grazing than Roemer's fescue.

VEGETATION: This is grassland, dominated or co-dominated by the bunchgrass California danthonia. Other native graminoids that are occasionally codominant with the danthonia are long-stolon sedge, prairie Junegrass, California brome, and red fescue (nativity of latter questionable). Frequent native herbaceous species include blue wildrye, yarrow, woolly sunflower, small-headed clover, prairie Junegrass, wood-rush, Indian's dream, field chickweed, meadow death-camas, California brome, and long-stolon sedge. Common non-native species are silver hairgrass, barren fescue, early hairgrass, and rat-tail fescue.

CLASSIFICATION NOTES: This association has not been previously described in the literature. It is closely related to two associations recognized by NatureServe (2005): DACA Valley Grassland and FERO-CEAR-KOMA, and is probably best considered a subassociation of one of them. DACA Valley Grassland is described primarily from the Willamette Valley.

MANAGEMENT NOTES: Monitoring of Douglas-fir establishment and removal of Douglas-fir saplings is recommended in order to prevent gradual forest encroachment. Scot's broom (*Cytisus scoparius*), a nitrogen fixing non-native shrub, is a potential severe threat that should be monitored and controlled. Native species composition is at least locally threatened by increase and expansion of non-native grasses. Recreational projects such as new trails, as well as timber harvest activities and road-building, should avoid high-quality examples of this association because of the potential for spread of non-native species and relatively fragile soils.

BIODIVERSITY NOTES: A butterfly considered vulnerable in Washington, Vancouver ringlet (*Coenonympha tullia insulana*), has been recorded in this plant association and grassy balds are important habitat for many butterfly species. Many probably declining plant species are found in this plant association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

BETULA PAPYRIFERA - ALNUS RUBRA / POLYLSTICHUM MUNITUM

Paper birch - red alder / sword fern

Abbreviated Name: BEPA-ALRU/POMU

Sample size = 5 plots

DISTRIBUTION: Known only from the Fraser Lowland and adjacent hills in Whatcom County. Possible in Skagit County and adjacent BC.

GLOBAL/STATE STATUS: GNRS1. Rare and local. There are few stands. Most stands are small, set in agricultural landscapes, and are the result of regeneration after timber harvest. Only one known relatively high-integrity occurrence.

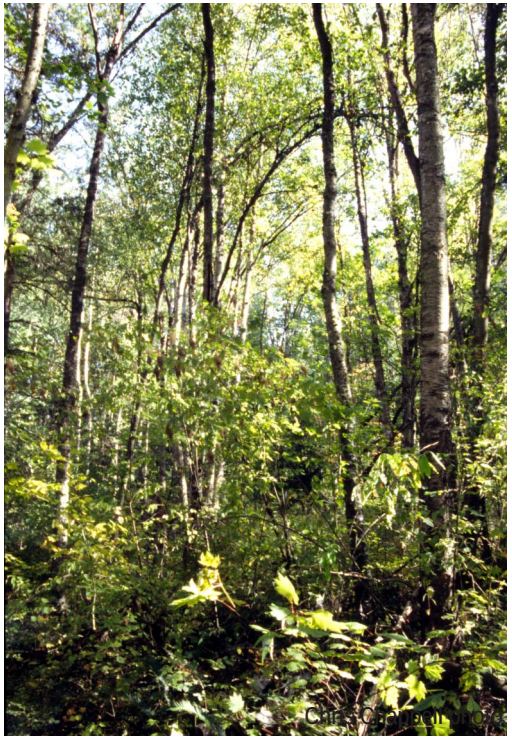
ID TIPS: Dominated by paper birch or paper birch and red alder. Sword fern usually at least prominent.

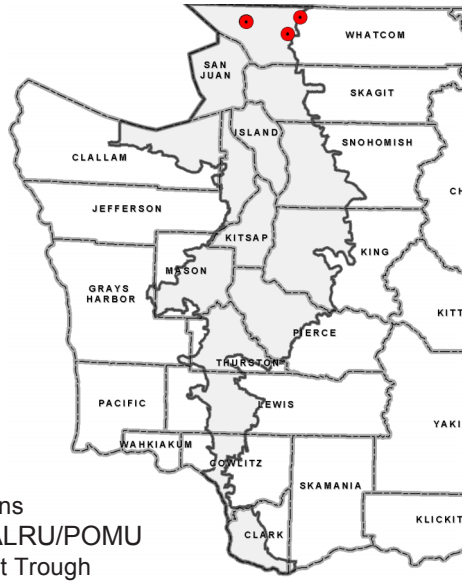
ENVIRONMENT: Sites are moist to very moist and appear to be relatively nutrient-rich. Most sites are on flat or slightly undulating plains, with some on adjacent foothills. Soil texture varies from gravelly loam to silty clay loam, with silt loam most common. Soils are somewhat poorly drained to well drained.
Precipitation: 42-59 inches (mean 46)
Elevation: 20 to 500 feet, maybe higher
Aspect/slope: mostly flat/ slope 0-21%
Slope position: plain, short
Soil series: Skipopa, Whatcom, Nati

DISTURBANCE/SUCCESSION: This is an early- to mid-successional association that can regenerate after fire, windthrow, or timber harvest. Birch and alder are short-lived (about 100-140 years) and prolific wind-borne seed producers. Birch also sprouts vigorously after fire or cutting. If conifers establish in the understory, then they are expected to dominate after the birch and alder die in the absence of further disturbance.

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found.
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
paper birch	Betula papyrifera var. commutata	100	44
red alder	Alnus rubra	80	38
Douglas-fir	Pseudotsuga menziesii var. menziesii	80	7
cascara	Frangula purshiana	80	3
bigleaf maple	Acer macrophyllum	60	20
grand fir	Abies grandis	60	7
black cottonwood	Populus balsamifera ssp. trichocarpa	60	5
western hemlock	Tsuga heterophylla	40	11
western redcedar	Thuja plicata	40	10
Shrubs and Dwarf-shrubs			
common snowberry	Symphoricarpos albus var. laevigatus	100	15
Indian plum	Oemleria cerasiformis	100	13
salmonberry	Rubus spectabilis var. spectabilis	100	12
vine maple	Acer circinatum	80	33
red elderberry	Sambucus racemosa var. racemosa	80	6
trailing blackberry	Rubus ursinus var. macropetalus	60	22
oceanspray	Holodiscus discolor	40	8
swamp currant	Ribes lacustre	40	2
dwarf Oregongrape	Mahonia nervosa	40	2
orange honeysuckle	Lonicera ciliosa	40	2
Graminoids			
Dewey's sedge	Carex deweyana var. deweyana	60	4
Forbs and Ferns			
sword fern	Polystichum munitum	100	21
spreading woodfern	Dryopteris expansa	60	6
false lily-of-the-valley	Maianthemum dilatatum	60	5
bracken fern	Pteridium aquilinum var. pubescens	40	7
lady-fern	Athyrium filix-femina ssp. cyclosorum	40	2
fringecup	Tellima grandiflora	40	+
western trillium	Trillium ovatum ssp. ovatum	40	+





Plot locations
of BEPA-ALRU/POMU
in the Puget Trough

Paper birch - red alder / sword fern

VEGETATION: Dominated by paper birch or a mix of birch and red alder. Bigleaf maple, cascara, Douglas-fir, and grand fir are frequently present and the maple is sometimes co-dominant. Western hemlock and western redcedar are sometimes prominent. Understory is characterized by sword fern, which is prominent to dominant. A variable shrub layer of common snowberry, salmonberry, Indian plum, vine maple, and/or trailing blackberry is present, each of which is sometimes co-dominant. Other species usually present include red elderberry, Dewey's sedge, spreading woodfern, and false lily-of-the-valley.

CLASSIFICATION NOTES: Bortel (1976) described multiple paper birch community types from Whatcom County that have some affinity to this association. Not yet recognized by NatureServe (2005).

MANAGEMENT NOTES: English ivy (*Hedera helix*) and herb Robert (*Geranium robertianum*) are non-native invaders of most immediate concern. If no conifer is present in the stand, succession in the absence of disturbance could lead to shrub dominance. This association requires disturbance of some kind for long-term persistence.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

ALNUS RUBRA / POLYSTICHUM MUNITUM

Red alder / sword fern

Abbreviated Name: ALRU/POMU

Sample size = 5 plots

DISTRIBUTION: Probably occurs throughout most of the Puget Trough ecoregion and in adjacent ecoregions. The vast majority of existing examples are not of natural origin.

GLOBAL/STATE STATUS: G4S4. Probably more abundant and widespread now than in pre-settlement times. Almost all remaining examples are the result of regeneration after timber harvest. Current timber value of red alder poses some degree of threat to natural occurrences of this association.

ID TIPS: Dominated by red alder with a sword fern understory. Located on upland sites that are not landslides, coastal bluffs, or riparian floodplains or terraces.

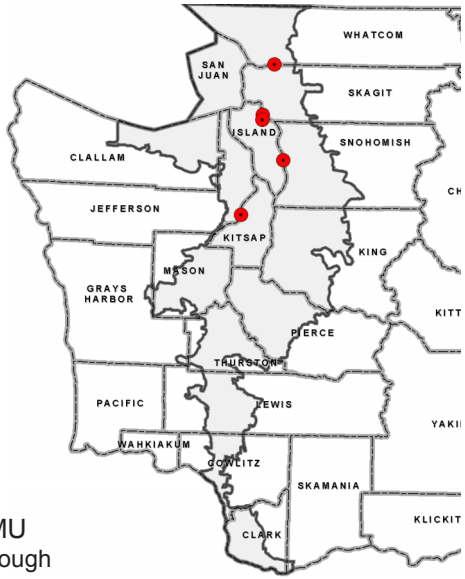
ENVIRONMENT: Sites are moist to very moist and relatively nutrient-rich. Parent materials include glacial till, glacial lake and marine sediments, volcanic ash, and colluvium. Slopes are usually gentle to moderate, northerly and easterly aspects are probably more common.
Precipitation: 27-60 inches (mean 38), undoubtedly greater also
Elevation: sea level to 1600 feet
Aspect/slope: various/ slope 3-48% (mean 17)
Slope position: all except ridgetops
Soil series: various, includes Whidbey, Cathcart

DISTURBANCE/SUCCESSION: This is an early- to mid-seral association that can regenerate after fire, windthrow, or timber harvest. Red alder is prolific after disturbance that exposes mineral soil, and it has therefore thrived on productive sites where conifer forest have been harvested and herbicides were not applied. Alder is short-lived (about 100 years). If conifers establish in the understory, then they are expected to dominate after the alder dies in the absence of further disturbance.

VEGETATION: Dominated by red alder. Western hemlock is usually present in relatively small amounts, mainly in the understory. Douglas-fir occurs in about half the stands and has substantial cover, usually in the subcanopy. Bigleaf maple can also

Vegetation Composition Table (selected species):
Con = constancy , the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
red alder	Alnus rubra	100	82
western hemlock	Tsuga heterophylla	80	2
Douglas-fir	Pseudotsuga menziesii var. menziesii	40	12
bigleaf maple	Acer macrophyllum	20	13
grand fir	Abies grandis	20	8
Shrubs and Dwarf-shrubs			
salmonberry	Rubus spectabilis var. spectabilis	100	33
trailing blackberry	Rubus ursinus ssp. macropetalus	80	8
red huckleberry	Vaccinium parvifolium	80	7
red elderberry	Sambucus racemosa var. racemosa	60	4
swamp currant	Ribes lacustre	60	2
oceanspray	Holodiscus discolor	40	7
dwarf Oregongrape	Mahonia nervosa	40	6
Graminoids			
Dewey's sedge	Carex deweyana var. deweyana	80	2
nodding trisetum	Trisetum canescens	60	2
Columbia brome	Bromus vulgaris	60	1
blue wildrye	Elymus glaucus	40	2
bearded fescue	Festuca subulata	40	2
Forbs and Ferns			
sword fern	Polystichum munitum	100	57
spreading woodfern	Dryopteris expansa	80	5
Siberian springbeauty	Claytonia siberica var. siberica	60	13
stinging nettle	Urtica dioica ssp. gracilis	60	8
bracken fern	Pteridium aquilinum var. pubescens	60	6
threeleaf foamflower	Tiarella trifoliata var. trifoliata	60	6
lady-fern	Athyrium filix-femina ssp. cycolosorum	60	3
sweet-scented bedstraw	Galium triflorum	60	1
enchanter's nightshade	Circaea alpina ssp. pacifica	40	4
fringecup	Tellima grandiflora	40	+
western starflower	Trientalis borealis ssp. latifolia	40	+
Pacific bleedingheart	Dicentra formosa ssp. formosa	20	3



Plot locations
of ALRU/POMU
in the Puget Trough

Red alder / sword fern

be prominent. Understory is characterized by dominance of sword fern. Salmonberry is almost always present and usually forms a prominent to dominant shrub layer Other species usually present include trailing blackberry, red elderberry, red huckleberry, swamp currant, Dewey's sedge, spreading woodfern, Siberian springbeauty ladyfern, stinging nettle, bracken fern, threeleaf foamflower, and sweet-scented bedstraw.

CLASSIFICATION NOTES: This association has been recognized in general by Franklin and Dyrness (1973), and described specifically from the Puget Trough by Chappell (2001). Somewhat similar associations have been described from riparian floodplains (e.g., Diaz and Mellen 1996), but they typically have higher abundance of moisture-loving species like youth-on-age (*Tolmiea menzeisii*).

MANAGEMENT NOTES: English ivy (*Hedera helix*), a non-native species, can cause major changes in this association. Herb Robert (*Geranium robertianum*) is another non-native invader that is of concern. Sites that support this vegetation are likely to be very productive for conifer growth. If conifers are absent from the stand, succession without any disturbance could lead to shrub dominance.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

FESTUCA ROEMERI – CAMASSIA LEICHTLINII

Roemer's fescue – great camas
Abbreviated Name: FERO-CALE
Synonym: *Festuca idahoensis* var. *roemeri – Camassia leichtlinii*

Sample size = 3 plots

DISTRIBUTION: This association is only known from small islands in San Juan County.

GLOBAL/STATE STATUS: GNRS1. Known from only three islands. There are only two known occurrences large enough to be of conservation significance. It was probably more extensive historically. Threats include invasion and increase of non-native species as well as invasion of trees with lack of fire. One occurrence is well protected and managed.

ID TIPS: Dominated or co-dominated by Roemer's fescue. Great camas co-dominant or at least 5 percent cover.

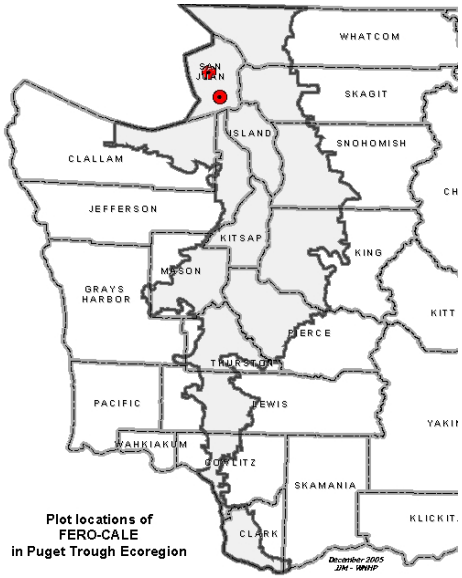
ENVIRONMENT: These sites are probably dry to very dry Occurs on gentle slopes or flats on small islands (small coastal prairies). Soils can be shallow over bedrock or deeper gravelly sandy glacial outwash. Occurs only in dry climatic areas.
Precipitation: 23-29 inches
Elevation: sea level to 50 feet
Aspect/slope: variable/ <5%
Slope position: short, plain
Soil series: rock outcrop, San Juan

DISTURBANCE/SUCCESSION: Douglas-fir is able to establish on at least some of these sites in the absence of fire. The shrub common snowberry is frequent and tends to increase over time in the absence of fire. There is considerable likelihood that these sites, in the absence of fire, could convert to shrublands, coniferous woodlands or forest. This association may have occurred more frequently on small coastal prairies in the San Juan Islands historically.

VEGETATION: This is a lush grassland or mixed grass-forb community. It is dominated or co-dominated by the bunchgrass Roemer's fescue. The forb, great camas, is always prominent to co-dominant. American vetch, barestem lomatium, field chickweed, and meadow death-camas are also typically abundant.

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Shrubs and Dwarf-shrubs	Kartesz 2005 Name	Con	Cov
common snowberry	Symphoricarpos albus var. laevigatus	67	+
Graminoids			
Roemer's fescue	Festuca roemeri	100	62
common velvet grass	Holcus lanatus	100	9
soft brome	Bromus hordeaceus	100	6
Kentucky bluegrass	Poa pratensis	67	9
barren fescue	Vulpia bromoides	67	6
early hairgrass	Aira praecox	67	2
long-stolon sedge	Carex inops ssp. inops	67	2
red fescue	Festuca rubra	67	2
wood-rush	Luzula (comosa, multiflora ssp. multiflora)	67	2
silver hairgrass	Aira caryophyllea	67	+
Sitka brome	Bromus sitchensis	33	18
blue wildrye	Elymus glaucus	33	13
Forbs and Ferns			
great camas	Camassia leichtlinii ssp. suksdorfii	100	21
American vetch	Vicia americana ssp. americana	100	19
bare-stem lomatium	Lomatium nudicaule	100	13
field chickweed	Cerastium arvense ssp. strictum	100	10
meadow death camas	Zigadenus venenosus var. venenosus	100	9
hairy cat's-ear	Hypochaeris radicata	100	6
yarrow	Achillea millefolium var. occidentalis	100	5
chocolate lily	Fritillaria affinis var. affinis	100	1
sheep sorrel	Rumex acetosella	100	1
western buttercup	Ranunculus occidentalis var. occidentalis	67	8
Hooker's onion	Allium acuminatum	67	4
harsh paintbrush	Castilleja hispida ssp. hispida	67	3
Oregon fawnlily	Erythronium oreganum var. oreganum	67	3
cleavers	Galium aparine	67	2
yellow-and-blue forget-me-not	Myosotis discolor	67	2
common vetch	Vicia sativa	67	2
Alaska rein-orchid	Piperia unalascensis	67	+
thimble clover	Trifolium microdon	67	+
English plantain	Plantago lanceolata	33	20



Yarrow, chocolate lily, harsh paintbrush, western buttercup, Hooker's onion, long-stolon sedge, wood-rush, red fescue, and Oregon fawn-lily are other frequent native herbs. Frequent non-native species include soft brome, common velvetgrass, Kentucky bluegrass, barren fescue, hairy cat's-ear, and common vetch.

CLASSIFICATION NOTES: This association has not been previously described in the literature. It is considered a variation of FERU-(CALE-GRST) by NatureServe (2005).

MANAGEMENT NOTES: Monitoring and control of Douglas-fir and common snowberry encroachment is recommended in order to prevent loss of the association through successional processes. Scot's broom (*Cytisus scoparius*), a nitrogen fixing non-native shrub, is a potential severe threat that should be monitored and controlled. Native species composition is also threatened by non-native grasses. Recreational projects such as trails and camping areas should avoid high-quality examples of this association because of the potential for spread of non-native species and other impacts.

BIODIVERSITY NOTES: State threatened California buttercup (*Ranunculus californicus*) occurs in this plant association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

FESTUCA ROEMERI – CAMASSIA QUAMASH – CERASTIUM ARVENSE

Roemer's fescue – common camas – field chickweed

Abbreviated Name: FERO-CAQU-CEAR

Synonym: *Festuca idahoensis* var. *roemeri – Camassia quamash – Cerastium arvense*

Sample size = 3 plots

DISTRIBUTION: This association occurs as tiny remnants of formerly larger prairies on Whidbey Island, Island Co., San Juan Island, San Juan Co., and the Quimper Peninsula, Jefferson Co.

GLOBAL/STATE STATUS: GNRSH. Known from only three tiny non-functional remnants of formerly large prairies. It was probably much more extensive historically. All three sites are protected and can be used as seed sources for restoration of largely extirpated prairies.

ID TIPS: Dominated or co-dominated by Roemer's fescue. Gentle slopes or flats with relatively deep glacial-origin soils in the northern Puget Trough. Field chickweed and common camas always present; showy fleabane, Howell's brodiaea, or dune goldenrod usually present. Great camas absent.

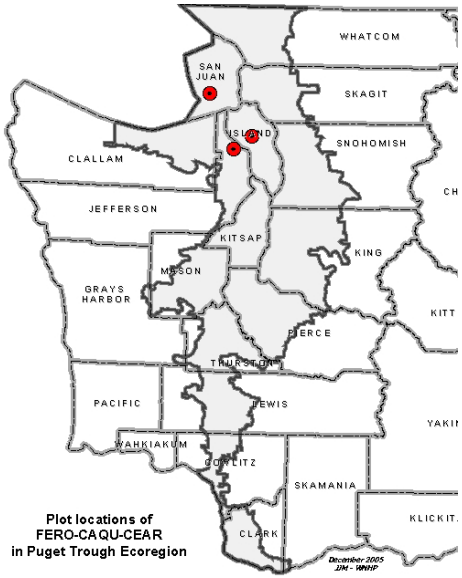
ENVIRONMENT: These sites appear to be moderately dry Occurs on gentle slopes or flats, part of rolling or planar glacial landforms. Soils may be deep sandy loam outwash or somewhat shallow gravelly loam glacial till. Occurs only in the Olympic Mountains rainshadow.
Precipitation: 21-25 inches
Elevation: 80-210 feet
Aspect/slope: variable/ 0-7%
Slope position: plain, upper
Soil series: San Juan, Townsend

DISTURBANCE/SUCCESSION: Historically maintained as open prairie by indigenous burning practices. Douglas-fir is able to establish on these sites in the absence of fire. The shrubs common snowberry and Nootka rose are frequent and tend to increase over time in the absence of fire. These sites are likely to convert to shrublands, coniferous woodlands or forest without fire.

VEGETATION: This is a grassland dominated or co-dominated by the bunchgrass Roemer's fescue. Long-stolon sedge or foothill

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Shrubs and Dwarf-shrubs	Kartesz 2005 Name	Con	Cov
common snowberry	Symphoricarpos albus var. laevigatus	100	3
tall Oregongrape	Mahonia aquifolium	67	2
nootka rose	Rosa nutkana	67	+
Graminoids			
Roemer's fescue	Festuca roemeri	100	70
Kentucky bluegrass	Poa pratensis	100	23
long-stolon sedge	Carex inops ssp. inops	67	17
California danthonia	Danthonia californica	67	8
wood-rush	Luzula (comosa, multiflora ssp. multiflora)	67	8
common velvet grass	Holcus lanatus	67	4
Canadian bluegrass	Poa compressa	67	3
silver hairgrass	Aira caryophyllea	67	2
prairie junegrass	Koeleria macrantha	67	2
foothill sedge	Carex tumulicola	33	8
Forbs and Ferns			
common camas	Camassia quamash	100	10
sheep sorrel	Rumex acetosella	100	6
western buttercup	Ranunculus occidentalis var. occidentalis	100	4
field chickweed	Cerastium arvense ssp. strictum	100	3
bracken fern	Pteridium aquilinum var. pubescens	100	3
common dandelion	Taraxacum officinale	100	+
English plantain	Plantago lanceolata	67	8
woolly sunflower	Eriophyllum lanatum var. lanatum	67	6
hairy cat's-ear	Hypochaeris radicata	67	6
spring-gold	Lomatium utriculatum	67	6
dune goldenrod	Solidago simplex ssp. simplex var. simplex	67	4
meadow death camas	Zigadenus venenosus var. venenosus	67	4
yarrow	Achillea millefolium var. occidentalis	67	3
showy fleabane	Erigeron speciosus var. speciosus	67	3
common vetch	Vicia sativa	67	3
chocolate lily	Fritillaria affinis var. affinis	67	2
cleavers	Galium aparine	67	2
suckling clover	Trifolium dubium	33	20
Menzies' fiddleneck	Amsinckia menziesii	33	8
old man's whiskers	Geum triflorum	33	8
common shepherd's-cress	Teesdalia nudicaulis	33	8
Howell's brodiaea	Triteleia grandiflora var. howellii	33	8



Roemer's fescue – common camas – field chickweed

sedge are typically prominent. The forb common camas is always present and sometimes very prominent. Western buttercup, bracken fern, and field chickweed are also consistently present. The shrubs common snowberry, tall Oregongrape, and Nootka rose are often present. Non-native Kentucky bluegrass is consistently prominent to co-dominant. Many other native and non-native species are sometimes present.

CLASSIFICATION NOTES: This association has not been previously described in the literature. It is intermediate in composition between FERO-CEAR-KOMA (dry grassy balds) and FERO-SERI (South Puget prairies on deep soil).

MANAGEMENT NOTES: Monitoring and control of Douglas-fir, Nootka rose, and common snowberry encroachment is recommended in order to prevent loss of the association through successional processes. Scot's broom (*Cytisus scoparius*), a nitrogen fixing non-native shrub, is a potential severe threat that should be monitored and controlled. Native species composition is also threatened by increase and expansion of non-native grasses.

BIODIVERSITY NOTES: This association is functionally extinct as an intact ecosystem. However, it retains value as a seed source and template for restoration of northern Puget Trough dry prairies.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

FESTUCA ROEMERI – (CERASTIUM ARVENSE – KOELERIA MACRANTHA)

Roemer's fescue – (field chickweed – prairie Junegrass)
Abbreviated Name: FERO-(CEAR-KOMA)
Synonym: *Festuca idahoensis var. roemeri – (Cerastium arvense – Koeleria cristata)*

Sample size = 29 plots

DISTRIBUTION: The most frequent of the native grassy bald associations in the Puget Trough occurs in the San Juan Islands, Fidalgo Island, northern Whidbey Island, foothills of the northern and eastern Olympic Mountains, and southeastern Thurston County. County distribution includes San Juan, Skagit, Island, Clallam, Mason, and Thurston. It also occurs in the adjacent Georgia Basin of British Columbia and in the western Columbia Gorge, Skamania County .

GLOBAL/STATE STATUS: G2S1. There are 12 known occurrences with fair or better integrity in Washington and they are highly threatened by invasion and increase of non-native species. Some occurrences face other threats including effects of fire suppression, development, road-building, timber harvest, and recreational impacts.

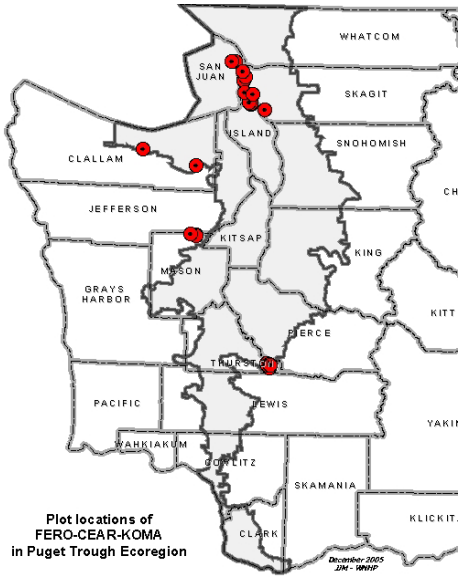
ID TIPS: Dominated or co-dominated by Roemer's fescue. Slopes with shallow soils (rock outcrops usually present or adjacent). Red fescue, great camas, and rosy plectritis absent or less than 5 percent cover . Field chickweed, prairie Junegrass, Wallace's selaginella, Indian's dream, or blue wildrye usually present.

ENVIRONMENT: These sites are very dry . Occurs primarily on moderate to steep mid- to upper slopes, with southern to western aspects. Soils are shallow over sediment ary, igneous, or met amorphic bedrock. Rock outcrops (often covered with mosses) are typically present within or directly adjacent to the association. Soils are loam in texture (also sandy loam), with variable amounts of coarse fragments. Can occur on serpentine soils. Rarely occurs directly adjacent to saltwater shorelines. More frequent in dry climatic areas (Olympic Mountain rainshadow), but can occur in wet areas under the appropriate site conditions.
Precipitation: 28-80 inches (mean 41)
Elevation: sea level to 1870 feet
Aspect/slope: E to W/16-80% slope (mean 45)
Slope position: mid, upper, short
Soil series: rock outcrop, lithic haploxerolls, rough stony land, rock land, Guemes variant?

DISTURBANCE/SUCCESSION: Historically, some of the balds where this association occurs were more extensive due to indigenous human burning practices. Other sites may not be much different in size than in the past (especially those in more montane areas). Most sites where

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	38	1
Shrubs and Dwarf-shrubs			
tall Oregongrape	Mahonia aquifolium	52	5
kinnikinnick	Arctostaphylos uva-ursi	21	12
Graminoids			
Roemer's fescue	Festuca roemeri	100	49
prairie Junegrass	Koeleria macrantha	76	4
silver hairgrass	Aira caryophyllea	76	3
wood-rush	Luzula (comosa, multiflora ssp. multiflora)	66	2
early hairgrass	Aira praecox	52	7
soft brome	Bromus hordeaceus	52	4
California danthonia	Danthonia californica	48	11
blue wildrye	Elymus glaucus	48	3
California brome	Bromus carinatus	31	11
thin bentgrass	Agrostis pallens	24	10
Forbs and Ferns			
yarrow	Achillea millefolium var. occidentalis	90	6
woolly sunflower	Eriophyllum lanatum var. lanatum	86	6
field chickweed	Cerastium arvense ssp. strictum	69	3
meadow death camas	Zigadenus venenosus var. venenosus	59	6
chocolate lily	Fritillaria affinis var affinis	59	1
Wallace's selaginella	Selaginella wallacei	55	8
small-flowered deervetch	Lotus micranthus	55	1
spring-gold	Lomatium utriculatum	52	5
Hooker's onion	Allium acuminatum	45	2
common camas	Camassia quamash	41	6
common strawberry	Fragaria virginiana ssp. platypetala	41	5
self-heal	Prunella vulgaris ssp. lanceolata	38	3
rattlesnake weed	Daucus pusillus	38	1
small-flowered willow-herb	Epilobium minutum	38	+
sheep sorrel	Rumex acetosella	34	3
cleavers	Galium aparine	34	2
farewell-to-spring	Clarkia amoena	31	3
harsh paintbrush	Castilleja hispida ssp. hispida	31	1
Indian's dream	Aspidotis densa	24	5



Roemer's fescue – (field chickweed – prairie Junegrass)

this association currently exists appear to be marginal for Douglas-fir establishment and growth to maturity due to extreme summer drought conditions, except at edges or moist microsites. Overall there is a possibility that some of these sites, in the absence of fire, could be eventually converted to coniferous woodlands or forest, especially small ones or ones with more abundant moist microsites.

VEGETATION: This is grassland, dominated or co-dominated by the bunchgrass Roemer's fescue. The evergreen shrub tall Oregongrape (is <0.5 m tall in this association) occurs in about half the plots with a maximum of 20 percent cover . The dwarf-shrub kinnikinnick is occasionally prominent. Frequent native herbaceous species include prairie Junegrass, wood-rush, yarrow , woolly sunflower , field chickweed, meadow death-camas, chocolate lily , small-flowered deervetch, and spring-gold. Wallace's selaginella (habit similar to a moss) is usually present on small rock outcrops within the association. The native grasses California danthonia, California brome, and thin bentgrass sometimes contribute subst antial cover. Mosses and lichens typically cover the space between grasses and forbs. Common non-native species are silver hairgrass, early hairgrass, soft brome, and sheep sorrel.

CLASSIFICATION NOTES: This association has not been previously described in the literature. The NatureServe (2005) description of the type includes what are herein referred to as FERU-FERO-ASDE and DACA-ERLA.

MANAGEMENT NOTES: Monitoring of Douglas-fir establishment and the removal of Douglas-fir saplings is recommended in order to prevent gradual forest encroachment. Scot's broom (*Cytisus scoparius*), a nitrogen fixing non-native shrub, is a potential severe threat that should be monitored and controlled. Native species composition is at least locally threatened by increase and expansion of non-native grasses. Recreational projects such as new trails, as well as timber harvest activities and road-building, should avoid high-quality examples of this association because of the potential for spread of non-native species and relatively fragile soils.

BIODIVERSITY NOTES: Rare species found in this association include a butterfly, Taylor's checkerspot (*Euphydryas editha taylori*), federal/state candidate, and two plants, white meconella (*Meconella oregana*), state threatened, and common bluecup (*Githopsis specularoides*), state sensitive. Grassy balds are important habitat for many butterflies. Many probably declining plant species are found in this plant association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

FESTUCA ROEMERI – PLECTRITIS CONGESTA

Roemer's fescue – rosy plectritis

Abbreviated Name: FERO-PLCO

Synonym: *Festuca idahoensis var. roemeri – Plectritis congesta*

Sample size = 9 plots

DISTRIBUTION: This grassy bald association occurs mostly around the periphery of the Puget Trough on foothills of the Olympic Mountains and in southeasternThurston County. It occurs occasionally in the San Juan Islands and vicinity and near Camas, Clark County. County distribution includes San Juan, Skagit, Clallam, Mason, Thurston, and Clark. It may also occur in the adjacent Georgia Basin of British Columbia.

GLOBAL/STATE STATUS: GNRS1. There are very few known occurrences and they are highly threatened by invasion and increase of non-native species, and to a lesser degree, by invasion of trees. Other threats include development, road-building, timber harvest, and recreational impacts.

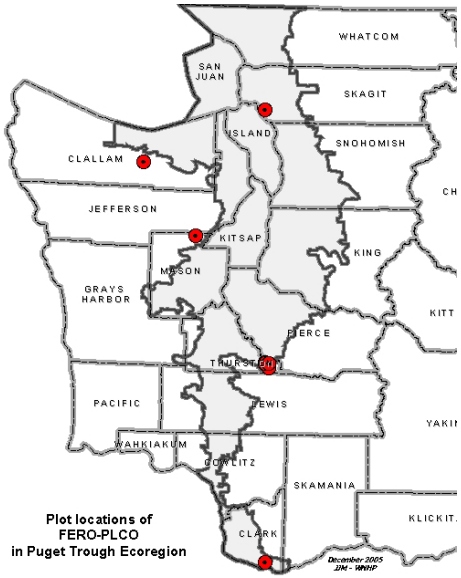
ID TIPS: Dominated or co-dominated by Roemer's fescue. Slopes with shallow soils (rock outcrops usually present or adjacent). Rosy plectritis has greater than 5 percent cover

ENVIRONMENT: These sites are moist in the spring but very dry later in the summer. They consist of the partially shaded portions or edges of balds or seasonally moist (but not as wet as some) microsites within more extensive balds. Occurs primarily on mid- to upper slopes, with southern to western aspects. Soils are shallow over sedimentary or volcanic bedrock. Rock outcrops (often covered with mosses) are typically present within or directly adjacent to the association. Soils are mostly loam in texture, but can be gravelly or sandy. This association is more common in moderate to high precipitation climates.
Precipitation: 29-73 inches (mean 56)
Elevation: sea level to 1700 feet
Aspect/slope: ESE to WNW/ 11-96% slope (mean 42)
Slope position: upper, mid
Soil series: rock outcrop

DISTURBANCE/SUCCESSION: Historically, some of the balds where this association occurs were more extensive than currently due to indigenous human burning practices. Other sites may not be much different in size than in the past (especially those in more montane areas). Douglas-fir may be able to

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Graminoids	**Kartesz 2005 Name**	**Con**	**Cov**
Roemer's fescue	Festuca roemeri	100	45
soft brome	Bromus hordeaceus	67	5
California danthonia	Danthonia californica	67	4
common velvet grass	Holcus lanatus	56	6
California brome	Bromus carinatus	56	4
silver hairgrass	Aira caryophyllea	56	4
wood-rush	Luzula (comosa, multiflora ssp. multiflora)	56	2
blue wildrye	Elymus glaucus	44	3
barren fescue	Vulpia bromoides	33	6
rat-tail fescue	Vulpia myuros	33	6
hedgehog dogtail	Cynosurus echinatus	22	12
Forbs and Ferns			
rosy plectritis	Plectritis congesta ssp. congesta	100	20
farewell-to-spring	Clarkia amoena	89	3
rattlesnake weed	Daucus pusillus	89	2
cleavers	Galium aparine	78	3
common camas	Camassia quamash	67	5
small-flowered deervetch	Lotus micranthus	67	3
Wallace's selaginella	Selaginella wallacei	56	3
large-flowered blue-eyed mary	Collinsia grandiflora	44	17
yarrow	Achillea millefolium var. occidentalis	44	2
slender tarweed	Madia gracilis	44	2
meadow death camas	Zigadenus venenosus var. venenosus	44	2
tall annual willow-herb	Epilobium brachycarpum	44	+
self-heal	Prunella vulgaris ssp. lanceolata	33	11
hyacinth brodiaea	Triteleia hyacinthina	33	6
field chickweed	Cerastium arvense ssp. strictum	33	4
licorice fern	Polypodium glycyrrhiza	33	3
early saxifrage	Saxifraga integrifolia	33	2
common vetch	Vicia sativa	33	2
sticky chickweed	Cerastium glomeratum	33	1
gold-back fern	Pentagrama triangularis ssp. triangularis	33	1
chocolate lily	Fritillaria affinis var. affinis	33	+
hairy cat's-ear	Hypochaeris radicata	22	11



establish on these sites in the absence of fire, particularly shaded edges. Overall there is considerable likelihood that these sites, in the absence of fire, could be eventually converted to coniferous woodlands or forest.

VEGETATION: This is grassland or mixed grass-forb dominance, dominated or co-dominated by the bunchgrass Roemer's fescue. The forb rosy plectritis is always prominent to co-dominant. Large-flowered blue-eyed mary is prominent to co-dominant in about half the plots, and self-heal in one-third of them. Frequent native herbaceous species include farewell-to-spring, rattlesnake weed, cleavers, common camas, small-flowered deervetch, California danthonia, California brome, and wood-rush. Wallace's selaginella (habit similar to a moss) is usually present on small rock outcrops within the association. Mosses and lichens typically cover the space between grasses and forbs. Frequent non-native species are soft brome, common velvetgrass, and silver hairgrass. Hairy cat's-ear and hedgehog dogtail occasionally contribute substantial cover.

CLASSIFICATION NOTES: This association has not been previously described in the literature.

MANAGEMENT NOTES: Monitoring of Douglas-fir establishment and removal of Douglas-fir saplings is recommended in order to prevent gradual forest encroachment. Scot's broom (*Cytisus scoparius*), a nitrogen fixing non-native shrub, is a potential severe threat that should be monitored and controlled. Native species composition is threatened by increase and expansion of non-native grasses. Recreational projects such as new trails, as well as timber harvest activities and road-building, should avoid high-quality examples of this association because of the potential for spread of non-native species and relatively fragile soils.

BIODIVERSITY NOTES: Federal/state candidate Taylor's checkerspot (*Euphydryas editha taylori*), a butterfly, and state sensitive common bluecup (*Githopsis specularoides*), a plant, are known to occur in this association.Many more common, though probably declining, plant species are strongly associated with this plant association. Grassy balds are important habitat for many native butterfly species.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

FESTUCA ROEMERI - SERICOCARPUS RIGIDUS

Roemer's fescue - white-top aster
Abbreviated Name: FERO-SERI
Synonym: *Festuca idahoensis var. roemeri - Aster curtus*

Sample size = 20 plots

DISTRIBUTION: This association represents most of what remains of native prairies in the southern Puget Sound area. Historically, there were probably other native prairie associations in this area. It is located in southwestern Pierce CountyThurston County, and the Chehalis River valley in the far eastern end of Grays Harbor County. It probably formerly also occurred in Lewis County in the vicinity of Centralia, and may have occurred on prairie soils in Mason County.

GLOBAL/STATE STATUS: G1S1. There are less than 20 remaining occurrences and they are highly threatened by invasion of non-native species, fire suppression, and development.

ID TIPS: Dominated or co-dominated by Roemer's fescue. White-top aster, houndstongue hawkweed, prairie lupine, Idaho blue-eyed grass, or sickle-keeled lupine usually present. Level or mounded topography on glacial outwash in southern Puget Sound area.

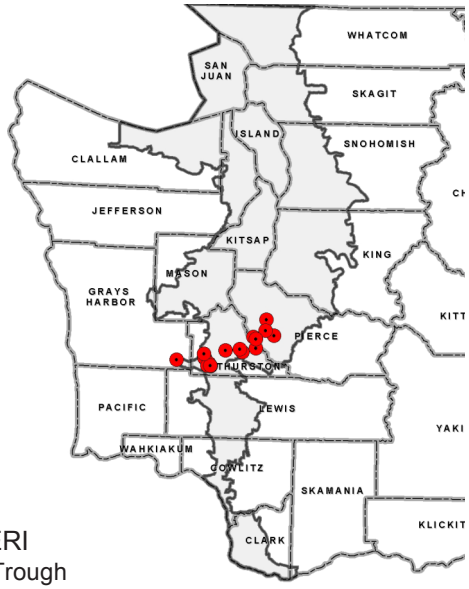
ENVIRONMENT: These sites are moderately dry and appear to be relatively nutrient-rich. Occurs on flat or mounded (Mima mounds) plains of recessional glacial outwash. Soils are deep and excessively drained, typically gravelly or extremely gravelly sandy loam in texture.
Precipitation: 38-64 inches (mean 50)
Elevation: 50-560 feet
Aspect/slope: level or mounded
Slope position: plains
Soil series: Spanaway, Spanaway-Nisqually complex

DISTURBANCE/SUCCESSION: Historically maintained as open prairie by indigenous human burning practices. In the absence of fire or other control, Douglas-fir commonly establishes and a forest eventually develops. Douglas-fir savanna or woodland can be an intermediate stage of succession.

VEGETATION: This grassland is dominated or co-dominated by the bunchgrass Roemer's fescue. The most abundant native forb

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (less than 0.5% cover).

Shrubs and Dwarf-shrubs	Kartesz 2005 Name	Con	Cov
Scot's broom	Cytisus scoparius	84	5
Graminoids			
Roemer's fescue	Festuca roemeri	100	48
long-stolon sedge	Carex inops ssp. inops	89	6
colonial bentgrass	Agrostis capillaris	79	8
wood-rush	Luzula (comosa, multiflora ssp. multiflora)	79	1
Kentucky bluegrass	Poa pratensis	68	4
California danthonia	Danthonia californica	68	2
common velvet grass	Holcus lanatus	58	1
sweet vernalgrass	Anthoxanthum odoratum	53	5
prairie junegrass	Koeleria macrantha	53	1
silver hairgrass	Aira caryophyllea	37	2
Forbs and Ferns			
hairy cat's-ear	Hypochaeris radicata	95	8
woolly sunflower	Eriophyllum lanatum var. lanatum	95	4
common camas	Camassia quamash var. azurea	89	7
white-top aster	Sericocarpus rigidus	84	3
houndstongue hawkweed	Hieracium cynoglossoides	84	2
oxeye daisy	Leucanthemum vulgare	79	4
common shepherd's-cress	Teesdalia nudicaulis	79	1
common St. John's-wort	Hypericum perforatum	79	1
yarrow	Achillea millefolium var. occidentalis	79	1
sheep sorrel	Rumex acetosella	74	1
English plantain	Plantago lanceolata	68	3
western buttercup	Ranunculus occidentalis var. occidentalis	68	1
bracken fern	Pteridium aquilinum var. pubescens	63	5
common strawberry	Fragaria virginiana ssp. platypetala	63	3
graceful cinquefoil	Potentilla gracilis var. gracilis	63	2
early blue violet	Viola adunca var. adunca	53	3
self-heal	Prunella vulgaris ssp. lanceolata	53	1
spring-gold	Lomatium utriculatum	53	1
cut-leaf microseris	Microseris laciniata ssp. laciniata	53	1
meadow death camas	Zigadenus venenosus var. venenosus	53	1
prairie lupine	Lupinus lepidus	53	+
Idaho blue-eyed grass	Sisyrinchium idahoense	37	+
sickle-keeled lupine	Lupinus albicaulis var. albicaulis	32	4



Plot locations of FERO-SERI in the Puget Trough

Roemer's fescue - white-top aster

is usually common camas, though its cover varies dramatically according to season. Bracken fern can also be very prominent but is less frequent. Important native indicators for this association that help to distinguish it from others are white-top aster, houndstongue hawkweed, prairie lupine, and Idaho blue-eyed grass. Mosses and lichens often cover the space between grasses and forbs, though with regular fires they are less abundant. Yarrow, long-stolon sedge, woolly sunflower, California danthonia, spring-gold, western buttercup and graceful cinquefoil have high constancy. Common non-native species are tall oatgrass, colonial bentgrass, Scot's broom, Kentucky bluegrass, hairy cat's-ear, common shepherd's-cress, common St.-Johns-wort, common velvetgrass, English plantain, and sheep sorrel. Puget balsamroot and sickle-keeled lupine are relatively infrequent but occasionally high in cover.

CLASSIFICATION NOTES: Chappell and Crawford (1997) also describe this association. Lang (1961), Giles (1970), del Moral and Deardorff (1976), and Dorner (1999) all describe portions or aspects of this vegetation.

MANAGEMENT NOTES: Maintenenance of grassland structure requires active control of invasive trees (e.g., Douglas-fir) and shrubs (e.g., Scot's broom) via burning, mowing, or other means. In addition, the enrichment of soils by Scot's broom, a nitrogen fixer, appears to facilitate non-native herbaceous species invasion. Native species composition is threatened by apparent ongoing increase and expansion of non-native grasses (especially tall oatgrass).

BIODIVERSITY NOTES: The following listed or candidate species for federal or state status (endangered, threatened, sensitive) are found in this plant association: western pocket gopher (*Thomomys mazama*), Taylor's checkerspot (*Euphydryas editha taylori*), mardon skipper (*Polites mardon*), Puget blue (*Plebejus icarioides blackmorei*), valley silverspot (*Speyeria zerene bremnerii*), Oregon vesper sparrow (*Pooecetes gramineus affinis*), golden paintbrush (*Castilleja levisecta*), rose checkermallow (*Sidalcea malviflora* ssp *virgata*), and white-top aster. Many more common, though probably declining, plant species are strongly associated with this vegetation type.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

FESTUCA RUBRA – FESTUCA ROEMERI – ASPIDOTIS DENSA

Red fescue – Roemer's fescue – Indian's dream
Abbreviated Name: FERU-FERO-ASDE
Synonym: *Festuca rubra - Festuca idahoensis* var. *roemeri – Aspidotis densa*

Sample size = 6 plots

DISTRIBUTION: This grassy bald association occurs on islands in western Skagit County.

GLOBAL/STATE STATUS: GNRS1. There are only 5 known occurrences. Threats include invasion and increase of non-native species, recreational use, and perhaps tree invasion with fire suppression.

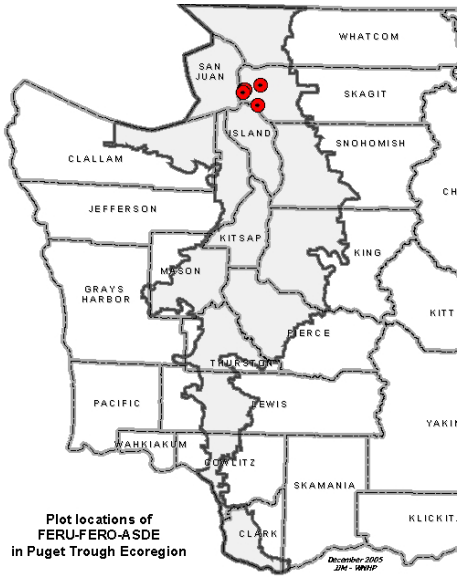
ID TIPS: Typically co-dominated by a mix of red fescue (always >5% cover) and Roemer's fescue (at least 1% cover). Slopes with shallow soils (rock outcrops usually present or adjacent). Indian's dream present. Rocky Mountain juniper is usually present.

ENVIRONMENT: These sites are very dry Occurs only on serpentine soils and usually near saltwater shorelines. Occurs on moderate to steep slopes, with southern to western aspects. Soils are shallow over serpentinite or peridotite. Rock outcrops (often covered with mosses) are typically present within or directly adjacent to the association. Soils are loam in texture, often with abundant coarse fragments. Occurs only in dry climatic areas.
Precipitation: 27-30 inches
Elevation: sea level to 570 feet (mean 149)
Aspect/slope: SE to WSW/47-68% slope
Slope position: mid, upper, lower
Soil series: lithic haploxerolls, rock outcrop, Guemes variant
Special: serpentine

DISTURBANCE/SUCCESSION: Historically, some of the balds where this association occurs (and probably this association also) were more extensive than currently due to indigenous human burning practices. Many sites where this association currently exists appear to be marginal for Douglas-fir establishment and growth to maturity due to extreme summer drought conditions, except at edges or moist microsites. Overall there is a possibility that some of these sites, in the absence of fire, could be eventually converted to coniferous woodlands or forest, especially small ones or ones with abundant moist microsites. Some of the islands where this association occurs have heavy deer browsing which limits growth of seedling/sapling Douglas-fir and may have other unknown effects.

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	83	6
Rocky Mountain juniper	Juniperus scopulorum	67	4
Shrubs and Dwarf-shrubs			
tall Oregongrape	Mahonia aquifolium	50	+
Graminoids			
red fescue	Festuca rubra	100	31
Roemer's fescue	Festuca roemeri	100	20
prairie Junegrass	Koeleria macrantha	100	6
silver hairgrass	Aira caryophyllea	100	3
wood-rush	Luzula (comosa, multiflora ssp. multiflora)	100	2
early hairgrass	Aira praecox	100	1
blue wildrye	Elymus glaucus	67	5
California brome	Bromus carinatus	67	4
barren fescue	Vulpia bromoides	67	4
slender wheatgrass	Elymus trachycaulus ssp. trachycaulus	50	4
cheatgrass	Bromus tectorum	33	7
rat-tail fescue	Vulpia myuros	33	2
Forbs and Ferns			
Wallace's selaginella	Selaginella wallacei	100	14
yarrow	Achillea millefolium var. occidentalis	100	12
Indian's dream	Aspidotis densa	100	5
field chickweed	Cerastium arvense ssp. strictum	100	4
meadow death camas	Zigadenus venenosus var. venenosus	83	5
Hooker's onion	Allium acuminatum	67	3
Oregon gumweed	Grindelia stricta var. stricta	67	2
small-flowered willow-herb	Epilobium minutum	67	+
western buttercup	Ranunculus occidentalis var. occidentalis	67	+
sheep sorrel	Rumex acetosella	50	+
Michaux's stitchwort	Minuartia michauxii var. michauxii	33	2
bull thistle	Cirsium vulgare	33	2
clover	Trifolium spp	33	2
harvest brodiaea	Brodiaea coronaria ssp. coronaria	33	+
chocolate lily	Fritillaria affinis var. affinis	33	+
elegant rein-orchid	Piperia elegans ssp. elegans	33	+
lance-leaved stonecrop	Sedum lanceolatum ssp. nesioticum	33	+
tomcat clover	Trifolium willdenowii	33	+



Red fescue – Roemer's fescue – Indian's dream

VEGETATION: This is a grassland. It is dominated or co-dominated by native red fescue (*Festuca rubra* var. *littoralis* Vasey ex Beal) and/or Roemer's fescue, both of which are always present. The fern Indian's dream is always present. Frequent native herbaceous species include yarrow, prairie Junegrass, wood-rush, field chickweed, meadow death-camas, blue wildrye, California brome, Oregon gumweed, small-flowered willow-herb, and western buttercup. Wallace's selaginella (habit similar to a moss) is present and often prominent. Douglas-fir and Rocky Mountain juniper are usually present in small amounts. The evergreen shrub tall Oregongrape (<0.5 m tall in this association) occurs in half the plots. The most common non-native species are silver hairgrass, early hairgrass, barren fescue, and sheep sorrel.

CLASSIFICATION NOTES: This association has not been previously described in the literature. It is considered a variant of FERO-CEAR-KOMA by NatureServe (2005).

MANAGEMENT NOTES: Monitoring of Douglas-fir establishment and removal of Douglas-fir saplings is recommended in order to prevent gradual forest encroachment. Scot's broom (*Cytisus scoparius*), a nitrogen fixing non-native shrub, is a potential severe threat that should be monitored and controlled. Native species composition is at least locally threatened by increase and expansion of non-native grasses.Recreational projects such as new trails should avoid high-quality examples of this association because of the potential for spread of non-native species and relatively fragile soils.

BIODIVERSITY NOTES: Some of the plant species found on serpentine soils may have developed unique physiological and/or genetic adaptations to the chemical and hydrologic stresses of those soils. The data indicate that there are three vascular plant species (Rocky Mountain juniper, Indian's dream and slender wheatgrass) occurring in this association that are more common on these soils than elsewhere, and there may be other vascular or non-vascular species with a similar occurrence pattern. Many plant species that are likely to be declining are strongly associated with this plant association. Grassy balds are important habitat for many butterflies.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

FESTUCA RUBRA – (GRINDELIA STRICTA – CAMASSIA LEICHTLINII)

Red fescue – (Oregon gumweed – great camas)
Abbreviated Name: FERU-(GRST-CALE)
Synonym: *Festuca rubra – (Grindelia integrifolia var. macrophylla – Camassia leichtlinii)*

Sample size = 18 plots

DISTRIBUTION: This association occurs in San Juan County on western Whidbey Island (Island Co.), and islands of western Skagit and western Whatcom counties. It probably occurred historically, and could still occur rarely in northeastern Clallam and northeastern Jefferson counties. It also occurs in the adjacent Georgia Basin of British Columbia.

GLOBAL/STATE STATUS: G1S1. There are nine known occurrences in Washington of fair to good integrity. It was probably more extensive historically. Threats include invasion and increase of non-native species, invasion of trees and shrubs with lack of fire, development, and recreational impacts.

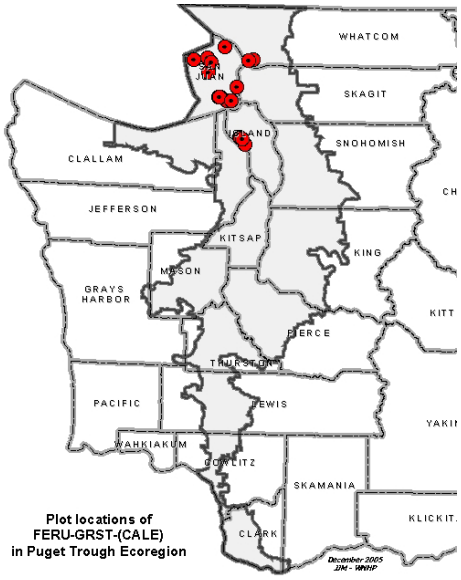
ID TIPS: Dominated or co-dominated by native varieties of red fescue. Roemer's fescue absent or rare. Located on bluffs or shallow soils near saltwater. Oregon gumweed or great camas present. Indian's dream absent.

ENVIRONMENT: These sites are very dry. Found only near saltwater shorelines on shallow soils over bedrock or on steep glacial bluffs. Soils on the glacial bluffs are very sandy and/or gravelly in texture. Slopes can be nearly flat to very steep. Aspect is most often south to west but is variable. Found in only relatively dry climatic areas (Olympic Mountains rainshadow).
Precipitation: 21-33 inches
Elevation: sea level to 100 feet
Aspect/slope: variable, mostly S to W/ 3-92% (mean 35%)
Slope position: short, lower, plain, mid, ridgetop
Soil series: rock land, rock outcrop, rough broken land, San Juan
Special: near saltwater (saltspray)

DISTURBANCE/SUCCESSION: Historically, some of the balds where this association occurs were more extensive than currently due to indigenous human burning. Other sites may not be much different in size than in the past. Many sites where this association currently exists appear to be marginal for Douglas-fir establishment and growth to maturity due to extreme summer drought

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	33	1
Shrubs and Dwarf-shrubs			
Nootka rose	Rosa nutkana	56	2
Graminoids			
red fescue	Festuca rubra	100	37
soft brome	Bromus hordeaceus	78	5
silver hairgrass	Aira caryophyllea	67	2
common velvet grass	Holcus lanatus	61	6
early hairgrass	Aira praecox	61	3
wood-rush	Luzula (comosa, multiflora ssp. multiflora)	56	1
rip-gut brome	Bromus rigidus	50	8
Kentucky bluegrass	Poa pratensis	44	6
barren fescue	Vulpia bromoides	39	6
rat-tail fescue	Vulpia myuros	39	2
blue wildrye	Elymus glaucus	33	7
Forbs and Ferns			
field chickweed	Cerastium arvense ssp. strictum	89	4
hairy cat's-ear	Hypochaeris radicata	89	3
yarrow	Achillea millefolium var. occidentalis	83	4
Oregon gumweed	Grindelia stricta var. stricta	83	4
sheep sorrel	Rumex acetosella	67	3
English plantain	Plantago lanceolata	61	5
great camas	Camassia leichtlinii ssp. suksdorfii	56	11
Hooker's onion	Allium acuminatum	56	2
American vetch	Vicia americana ssp. americana	39	6
tomcat clover	Trifolium willdenowii	39	1
bare-stem lomatium	Lomatium nudicaule	33	9
Wallace's selaginella	Selaginella wallacei	33	3
meadow death camas	Zigadenus venenosus var. venenosus	33	1



Red fescue – (Oregon gumweed – great camas)

conditions, except at edges or moist microsites. The shrubs common snowberry and Nootka rose can occur and sometimes increase over time in the absence of fire. Overall there is considerable likelihood that, in the absence of fire, some of these sites will eventually convert to shrublands, coniferous woodlands or forest.

VEGETATION: This is a grassland or mixed grass-forb community. It is dominated or co-dominated by native red fescue (*Festuca rubra* var. *littoralis* Vasey ex Beal). The forb great camas is often present and can be prominent to co-dominant. Other frequent herbaceous species include Oregon gumweed, field chickweed, yarrow, Hooker's onion, and wood-rush. Frequent non-native species include hairy cat's-ear, soft brome, common velvetgrass, silver hairgrass, early hairgrass, rip-gut brome, sheep sorrel, and English plantain.

CLASSIFICATION NOTES: This association has not been described in the literature. Nature Serve (2005) calls it FERU-(CALE-GRST) and includes what is herein referred to as FERO-CALE.

MANAGEMENT NOTES: Monitoring and control of Douglas-fir, Nootka rose, and common snowberry encroachment is recommended in order to prevent loss of the association through successional processes. Scot's broom (*Cytisus scoparius*), a nitrogen fixing non-native shrub, is a potential severe threat that should be monitored and controlled. Native species composition is threatened by increase and expansion of non-native grasses. Recreational projects should avoid high-quality examples of this association because of the potential for spread of non-native species and other impacts.

BIODIVERSITY NOTES: Golden paintbrush (*Castilleja levisecta*), federal threatened/state endangered, state threatened California buttercup (*Ranunculus californicus*), state sensitive slender crazyweed (*Oxytropis campestris* var. *gracilis*), and state candidate brittle prickly-pear (*Opuntia fragilis*) occur in this plant association. Many probably declining plant species are found in this plant association.

Chappell, C.B. 2006. Upland plant associations of thePuget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PINUS CONTORTA VAR. *CONTORTA* - *PSEUDOTSUGA MENZIESII* / *GAULTHERIA SHALLON*

Lodgepole pine - Douglas-fir / salal

Abbreviated Name: PICO-PSME/GASH

Sample size = 17 plots

DISTRIBUTION: San Juan, western Skagit (Cypress and Fidalgo islands) and Mason counties. Probably also occurs in southwestern BC.

GLOBAL/STATE STATUS: G1G2S1. Largely dependent on a specific fire regime or landscape-level fire mosaic. Very few occurrences of relatively good quality remain (5 are known). Continued fire suppression is a long-term threat that will likely result in loss of this association on most sites as lodgepole pine dies out in succession.

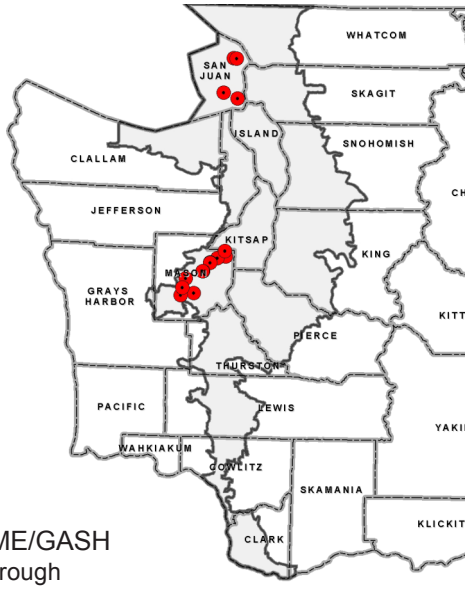
ID TIPS: Dominated or co-dominated by lodgepole pine with Douglas-fir at least present. Understory dominated or co-dominated by salal. Located in the Puget Trough.

ENVIRONMENT: These sites are dry to moderately dry and appear to be relatively nutrient-poor Occurs on gravelly sandy loam outwash deposits, glacial till, and sedimentary residuum. Soil depth can be quite shallow Occurs on variable aspects, including flat terrain.
Precipitation: 21-77 inches (mean 62)
Elevation: 80-2300 feet
Aspect/slope: ENE to NW/ 0-50% slope (mean 7)
Slope position: plain, mid, upper, short
Soil series: Everett (Grove), Shelton, Pickett, Roche, rock outcrop

DISTURBANCE/SUCCESSION: On most sites except the very driest, this association is an early- to mid-seral successional stage that will progress in the absence of disturbance (probably between stand age 100 and 250 years) to dominance by Douglas-fir and/or western hemlock (PSME/GASH-HODI, PSME-TSHE/GASH-HODI, PSME-TSHE/VAOV, and PSME-TSHE/RHMA-VAOV associations). This association would have likely been maintained in a shifting mosaic on the landscape by high-severity fires. Some of these stands may have grown up on what were, in pre-Western settlement times, open Douglas-fir savannas.

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found.
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
lodgepole pine	Pinus contorta var. contorta	100	42
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	32
western hemlock	Tsuga heterophylla	35	1
western white pine	Pinus monticola	29	2
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	100	61
trailing blackberry	Rubus ursinus var. macropetalus	76	1
baldhip rose	Rosa gymnocarpa	71	2
evergreen huckleberry	Vaccinium ovatum	65	12
dwarf Oregongrape	Mahonia nervosa	53	4
oceanspray	Holodiscus discolor	35	3
pipsissewa	Chimaphila umbellata ssp. occidentalis	24	3
tall Oregongrape	Mahonia aquifolium	24	1
Pacific rhododendron	Rhododendron macrophyllum	18	11
spreading snowberry	Symphoricarpos hesperius	18	6
Forbs and Ferns			
bracken fern	Pteridium aquilinum var. pubescens	82	6
rattlesnake-plantain	Goodyera oblongifolia	53	+
twinflower	Linnaea borealis ssp. longiflora	47	2
western starflower	Trientalis borealis ssp. latifolia	29	+
beargrass	Xerophyllum tenax	18	7



Plot locations
of PICO-PSME/GASH
in the Puget Trough

Lodgepole pine - Douglas-fir / salal

VEGETATION: Forest dominated or co-dominated by lodgepole pine, with Douglas-fir typically co-dominant or at least prominent in the sapling layer. Western hemlock is present in some stands, mainly as saplings or small trees. The understory is dominated by salal, often with evergreen huckleberry, or occasionally Pacific rhododendron, prominent to co-dominant. Baldhip rose and trailing blackberry are usually present. The herb layer is poorly developed and consists mainly of bracken fern. In Mason Co., beargrass is occasionally present to prominent.

CLASSIFICATION NOTES: Not previously described in the literature. NatureServe (2005) currently lists this association as PICO/GASH.

MANAGEMENT NOTES: On most sites, this association is dependent on a landscape fire regime that no longer exists. The need for high-severity fire to maintain the association probably rules out prescribed fire as a management tool. The future outlook appears doubtful for the long-term survival of the association with natural processes. Perhaps semi-natural occurrences could be created by allowing natural regeneration on clearcuts with potential for the type, and not cutting out the pine during thinning.

BIODIVERSITY NOTES: A subspecies of butterfly, the Shelton elfin (*Insicalia eryphon sheltonensis*), depends on lodgepole pine for food and is limited in Washington to Mason, Kitsap, and Pacific counties. State candidate Vancouver ground-cone (*Boschniakia hookeri*) has been recorded in this plant association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PINUS CONTORTA VAR. *CONTORTA - PSEUDOTSUGA MENZIESII / MAHONIA NERVOSA*

Lodgepole pine - Douglas-fir / dwarf Oregongrape
Abbreviated Name: PICO-PSME/MANE
Synonym: *Pinus contorta* var. *contorta* – *Pseudotsuga menziesii / Berberis nervosa*

Sample size = 6 plots

DISTRIBUTION: Known only from Orcas Island, San Juan County.

GLOBAL/STATE STATUS: GNRS1. Largely dependent on a specific fire regime or landscape-level fire mosaic. There are only two known occurrences. Continued fire suppression is a long-term threat that will likely result in loss of this association as lodgepole pine dies out in succession.

ID TIPS: Dominated or co-dominated by lodgepole pine with Douglas-fir at least present. Understory dominated or co-dominated by dwarf Oregongrape with little to no salal.

ENVIRONMENT: These sites are moderately dry to mesic and appear to be nutrient-medium. Sites occupied are flats to moderate slopes on various aspects, typically in relatively dry topographic positions. Parent material is sedimentary residuum, locally mixed with glacial till. Occurs on sites mapped as very gravelly silt loam.

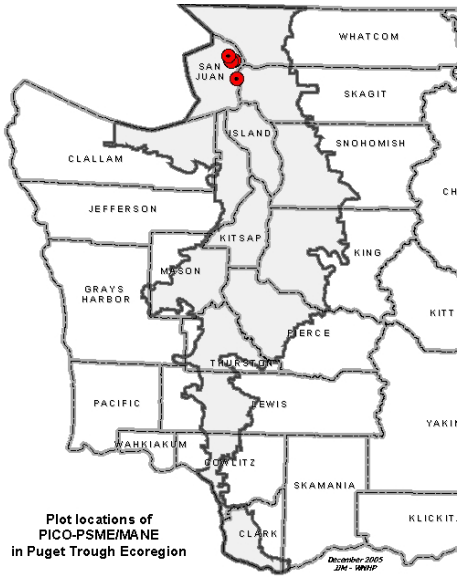
Precipitation: 38-46 inches (mean 44)
Elevation: 1000-2200 feet
Aspect/slope: various/ 2-33% slope (mean 19)
Slope position: upper, ridge, plain
Soil series: Pickett

DISTURBANCE/SUCCESSION: This association is an early- to mid-seral successional stage that will progress in the absence of disturbance (probably between stand age 100 and 200 years) to dominance by Douglas-fir and western hemlock (PSME-TSHE/MANE). This association would have likely been maintained in a shifting mosaic on the landscape by high-severity fires.

VEGETATION: Forest dominated or co-dominated by lodgepole pine, with Douglas-fir typically co-dominant or at least prominent in the sapling layer. Western hemlock is usually present to

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
lodgepole pine	Pinus contorta var. contorta	100	63
Douglas-fir	Pseudotsuga menziesii	100	36
western hemlock	Tsuga heterophylla	83	8
Shrubs and Dwarf-shrubs			
dwarf Oregongrape	Mahonia nervosa	100	8
baldhip rose	Rosa gymnocarpa	100	3
little prince's pine	Chimaphila menziesii	67	+
tall Oregongrape	Mahonia aquifolium	33	+
oceanspray	Holodiscus discolor	33	3
salal	Gaultheria shallon	33	2
Graminoids			
Columbia brome	Bromus vulgaris	33	4
western fescue	Festuca occidentalis	33	3
Forbs and Ferns			
bracken fern	Pteridium aquilinum	100	6
twinflower	Linnaea borealis	50	21
western starflower	Trientalis borealis ssp. latifolia	50	+
Scouler's bellflower	Campanula scouleri	33	4



Plot locations of
PICO-PSME/MANE
in Puget Trough Ecoregion

Lodgepole pine - Douglas-fir / dwarf Oregongrape

prominent in the understory or subcanopyThe shrub layer is sparse to moderate, with dwarf Oregongrape always present and usually prominent to co-dominant. Baldhip rose and little prince's pine are usually present. The herb layer is variable in expression. Half the plots have a well-developed herb layer dominated by twinflower. Bracken fern is present to prominent in all plots. Western starflower is sometimes present as well.

CLASSIFICATION NOTES: Not previously described in the literature. NatureServe will recognize this association in the future.

MANAGEMENT NOTES: On most sites, this association is dependent on a landscape fire regime that no longer exists. The known occurrences are well protected from logging and development, but in the long-term will be threatened by lack of fire. Prescribed fire could be considered as a management tool that would maintain a semblance of natural processes and the continuation of this seral stage on the landscape.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PINUS PONDEROSA / CAREX INOPS - FESTUCA ROEMERI

Ponderosa pine / long-stolon sedge - Roemer's fescue
Abbreviated Name: PIPO/CAIN-FERO
Synonym: *Pinus ponderosa / Carex pensylvanica - Festuca idahoensis* var. *roemeri*

Sample size = 5 plots

DISTRIBUTION: Occurs only in southwestern Pierce County

GLOBAL/STATE STATUS: GNRS1. Only one or two occurrences remain in a very small area. Condition of remaining vegetation is marginal, but is improving in some areas with active management. Primary threats are Douglas-fir encroachment and non-native species increase.

ID TIPS: Woodland or savanna dominated by ponderosa pine with herbaceous dominated understory (or mix of Scot's broom and herbs) and significant native understory component. Long-stolon sedge and/or Roemer's fescue are co-dominant to dominant.

ENVIRONMENT: Sites are moderately dry and appear to be relatively nutrient-rich. Occurs only on gravelly-sandy outwash plains.
Precipitation: 43-46 inches
Elevation: 280-340 feet
Aspect/slope: Flat or slightly undulating
Slope position: plain
Soil series: Spanaway

DISTURBANCE/SUCCESSION: Fire-associated. Prior to Western settlement, this vegetation was undoubtedly burned frequently with low-severity fires. Tree density within these woodlands has increased with fire suppression, as has the abundance of Douglas-fir. In the absence of fire or active management, most of these stands will be invaded by Douglas-fir and/or shrubs (snowberry, Scot's broom), and will likely to convert to conifer forest or non-native understory vegetation. Adjacent dense stands of Douglas-fir with some ponderosa pine are a result of that conversion to forest. Conversely, a few stands have established relatively recently on what was formerly treeless prairie.

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found.
+ = trace (< 0.5% cover).

Trees	**Kartesz 2005 Name**	Con	Cov
ponderosa pine	Pinus ponderosa	100	25
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	7
Oregon white oak	Quercus garryana var. garryana	40	+
Shrubs and Dwarf-shrubs			
Scot's broom	Cytisus scoparius	100	22
tall Oregongrape	Mahonia aquifolium	80	+
Graminoids			
long-stolon sedge	Carex inops ssp. inops	100	25
Roemer's fescue	Festuca roemeri	80	30
tall oatgrass	Arrhenatherum elatius	80	5
Kentucky bluegrass	Poa pratensis	60	14
common velvet grass	Holcus lanatus	60	1
colonial bentgrass	Agrostis capillaris	40	6
blue wildrye	Elymus glaucus	40	2
Forbs and Ferns			
common St. John's-wort	Hypericum perforatum	100	4
English plantain	Plantago lanceolata	100	3
western buttercup	Ranunculus occidentalis var. occidentalis	100	1
yarrow	Achillea millefolium var. occidentalis	100	1
common camas	Camassia quamash var. azurea	60	20
hairy cat's-ear	Hypochaeris radicata	60	11
common shepherd's-cress	Teesdalia nudicaulis	60	2
common strawberry	Fragaria virginiana ssp. platypetala	60	2
cleavers	Galium aparine	60	+
woolly sunflower	Eriophyllum lanatum var. lanatum	40	6
oxeye-daisy	Leucanthemum vulgare	40	6
bracken fern	Pteridium aquilinum var. pubescens	40	3
spring-gold	Lomatium utriculatum	40	3
self-heal	Prunella vulgaris ssp. lanceolata	40	2
cut-leaf microseris	Microseris laciniata ssp. laciniata	40	2
chocolate lily	Fritillaria affinis var. affinis	40	2
prairie violet	Viola praemorsa ssp. praemorsa	40	+
white-top aster	Sericocarpus rigidus	20	8

Plot locations
of PIPO/CAIN-FERO
in the Puget Trough

Ponderosa pine / long-stolon sedge - Roemer's fescue

VEGETATION: Woodland or savanna (10-70% tree crown cover) dominated by ponderosa pine. The understory is dominated by herbaceous vegetation, or a mix of herbs and non-native Scot's broom. All stands are dominated or co-dominated by long-stolon sedge or Roemer's fescue. The non-native Kentucky bluegrass is often prominent to co-dominant. Native shrubs are usually present only in small amounts; Scot's broom is often co-dominant to dominant in extant stands. The most abundant native forb, in terms of cover, is common camas, though it is not consistently present. Yarrow, western buttercup, common strawberry and cleavers are usually present. Many other prairie-associated plant species are possible.

CLASSIFICATION NOTES: This association has not been previously described. Not recognized by NatureServe (2005).

MANAGEMENT NOTES: Maintenance of this association requires active control (e.g., prescribed fire, cutting, herbicides) of Douglas-fir and Scot's broom. Care should be taken to avoid disturbances so intense that they facilitate loss of native understory or massive increase of non-native herbs. Native species composition is also threatened by apparent ongoing increase and expansion of non-native grasses (e.g., tall oatgrass).

BIODIVERSITY NOTES: State sensitive white-top aster (*Aster curtus*) occurs in this association. Many unlisted plant species associated with this vegetation are probably declining in the Puget Trough. State threatened western gray squirrel (*Sciurus griseus*) probably uses this association as part of its larger habitat needs.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII SAVANNA

Douglas-fir savanna

Abbreviated Name: PSME savanna

This vegetation cover type is not a recognized plant association. It is characterized by grassland or herbaceous-dominated vegetation with a sparse tree layer of Douglas-fir (typically 10-30% cover of trees). Such vegetation structures have not been quantitatively sampled within the ecoregion. Vegetation composition appears to be similar to prairies or grassy balds with the addition of the scattered tree layer, greater abundance of shade-loving species, e.g., long-stolon sedge, and presence of a few forest-associated species (Chappell and Crawford 1997). This cover type occurs on prairies in the South Puget Sound and occasionally on shallow-soiled grassy balds. Douglas-fir savannas were probably a component of the pre-Western settlement landscape due to the tree's moderate fire resistance (Chappell and Crawford 1997). Douglas-fir savannas appear to often be an intermediate stage in succession, in the absence of fire, between open grasslands and woodlands/forests dominated by Douglas-fir. Because of this, management for them is potentially problematic. Like prairies, they are very prone to threats from non-native plant species.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII – ABIES GRANDIS / CORYLUS CORNUTA / POLYSTICHUM MUNITUM

Douglas-fir – grand fir / beaked hazelnut / sword fern

Abbreviated Name: PSME-ABGR/COCO/POMU

Sample size = 6 plots

DISTRIBUTION: This association occurs in the southern Puget Trough and into the Willamette Valley and its foothills in Oregon. Known only from Lewis, Cowlitz, and Clark counties in Washington. Probably also occurs in Skamania County.

GLOBAL/STATE STATUS: GNRS1. The few known occurrences in Washington are either small and/or have been significantly degraded by past logging. Development and non-native species are threats.

ID TIPS: Grand fir occupies >10% cover or is the dominant successful tree regeneration, with little to no western hemlock or western redcedar present. Beaked hazelnut always present and either it or vine maple >5% cover. Sword fern >5% cover. See key.

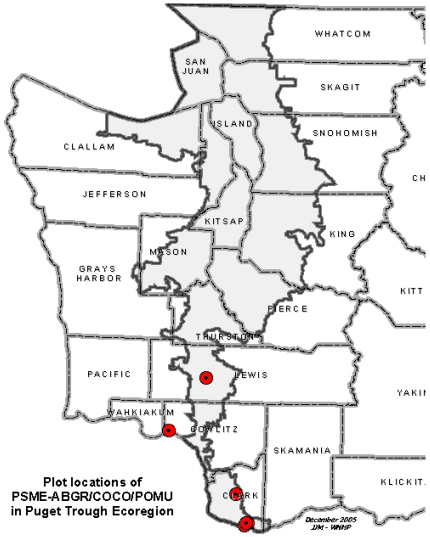
ENVIRONMENT: These sites are mesic to moist and appear to be relatively nutrient-rich. Sites are flat to steep, with varying aspect. Most plots are on mid to lower slopes. Parent materials include weathered volcanic residuum and ancient glacial drift. Soil texture is relatively fine: often clay loam. All mapped soil types are free of restrictive layers.
Precipitation: 46-63 inches (mean 51)
Elevation: 120-600 feet
Aspect/slope: various/ 0-68% (mean 42)
Slope position: mid, lower, plain
Soil series: Olympic, Prather

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance and most stands probably originated after fire. Some stands show evidence of past low- to moderate-severity fire (underburns). Many stands are located in landscapes that formerly supported prairies maintained by NativeAmerican burning practices. Some of these may have the potential to support hemlock or redcedar in the long-term absence of disturbance.

VEGETATION: Canopy typically dominated by Douglas-fir. Grand fir is always present, typically dominates tree regeneration, and

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	61
bigleaf maple	Acer macrophyllum	100	32
grand fir	Abies grandis	100	15
western hemlock	Tsuga heterophylla	50	5
cascara	Frangula purshiana	50	1
western redcedar	Thuja plicata	33	3
Shrubs and Dwarf-shrubs			
beaked hazelnut	Corylus cornuta var. californica	100	20
trailing blackberry	Rubus ursinus ssp. macropetalus	100	5
vine maple	Acer circinatum	83	23
dwarf Oregongrape	Mahonia nervosa	83	12
red huckleberry	Vaccinium parvifolium	67	2
English holly	Ilex aquifolium	67	2
red elderberry	Sambucus racemosa var. racemosa	50	8
salal	Gaultheria shallon	50	5
baldhip rose	Rosa gymnocarpa	50	2
Indian plum	Oemleria cerasiformis	33	6
oceanspray	Holodiscus discolor	33	2
thimbleberry	Rubus parviflorus var. parviflorus	17	13
Graminoids			
Columbia brome	Bromus vulgaris	50	3
Dewey's sedge	Carex deweyana var. deweyana	33	2
Alaska oniongrass	Melica subulata	33	2
Forbs and Ferns			
sword fern	Polystichum munitum	100	52
sweet-scented bedstraw	Galium triflorum	100	3
inside-out flower	Vancouveria hexandra	83	12
western trillium	Trillium ovatum ssp. ovatum	83	+
Hooker's fairybells	Prosartes hookeri var. oregana	67	1
spreading woodfern	Dryopteris expansa	67	1
western starflower	Trientalis borealis ssp. latifolia	67	1
vanillaleaf	Achlys triphylla	50	5
licorice fern	Polypodium glycyrrhiza	50	1
fringecup	Tellima grandiflora	50	+
large false Solomon's seal	Maianthemum racemosum ssp. amplexicaule	33	6
slender-stem waterleaf	Hydrophyllum tenuipes	33	4
Siberian springbeauty	Claytonia siberica var sibirica	33	4
Columbia windflower	Anemone deltoidea	33	2



Douglas-fir – grand fir / beaked hazelnut / sword fern

sometimes co-dominates the canopy. Bigleaf maple typically forms a prominent to co-dominant lower tree canopy layer Beaked hazelnut always forms a prominent to dominant tall shrub layer, usually with co-dominant vine maple. Lower shrub layers are more variable in species and cover: dwarf Oregongrape is often prominent and trailing blackberry is always at least present. Other frequent shrubs include red huckleberry salal, red elderberry, and balhip rose. Sword fern dominates the herb layer Inside-out flower is usually prominent. Sweet-scented bedstraw, Hooker's fairybells, western trillium, spreading woodfern, western starflower, and vanillaleaf are other frequently occurring herbs.

CLASSIFICATION NOTES: Described by Chappell (1997, 2001) as part of PSME-(ABGR)/COCO/POMU. NatureServe (2005) lists it as a part of PSME/COCO/POMU.

MANAGEMENT NOTES: These sites appear to be quite productive for tree growth. Non-native English ivy (*Hedera helix*) does well on these sites and if present can quickly overwhelm the native understory. Herb Robert (*Geranium robertianum*) is another threatening invasive for this association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII – ABIES GRANDIS / FESTUCA OCCIDENTALIS

Douglas-fir – grand fir / western fescue
Abbreviated Name: PSME-ABGR/FEOC

Sample size = 6 plots

DISTRIBUTION: Known only from San Juan County

GLOBAL/STATE STATUS: G2S2. There are very few good condition occurrences of this association and it occupies small areas and a small geographic range. Though it is rare and local, this type may be more common than it was during the pre-Western settlement era because of increases in area due to fire suppression and succession. It may also occur in British Columbia.

ID TIPS: Grand fir occupies >10% cover or is the dominant tree regeneration and western hemlock and western redcedar are either absent or minor in importance. Western fescue >1%. Salal, sword fern, and snowberry relatively minor or absent. Understory usually dominated or co-dominated by herbaceous vegetation. Refer to key.

ENVIRONMENT: These sites are dry and appear to be poor to medium in nutrients. Slopes are usually gentle to moderate. Upper slopes are most common. Parent materials are glacial till or residuum. Soils are likely to be somewhat shallow. Found only in dry climatic areas.

Precipitation: 21-29 inches (mean 25)
Elevation: sea level - 650 feet
Aspect/slope: various/ 3-54% (mean 19)
Slope position: upper, mid, plain, short
Soil series: Roche, Rockland, Pickett

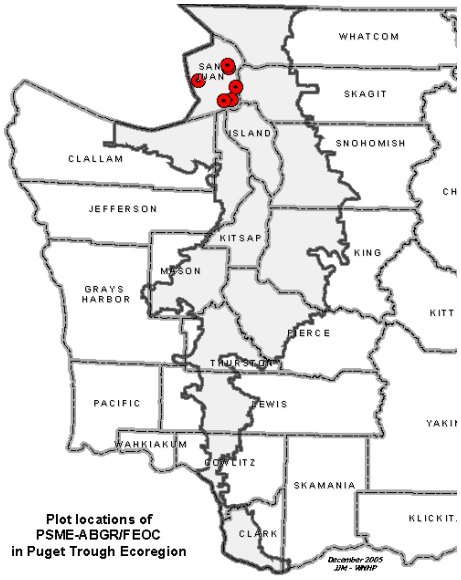
DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Grand fir is expected to increase over time in the absence of disturbance. Evidence suggests that many of these stands were Douglas-fir savannas prior to fire suppression and have increased dramatically in tree density since pre-Western settlement.

VEGETATION: Canopy is dominated by Douglas-fir or co-dominated by that species and grand fir. Grand fir is always

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	59
grand fir	Abies grandis	100	30
Pacific madrone	Arbutus menziesii	50	2
Shrubs and Dwarf-shrubs			
baldhip rose	Rosa gymnocarpa	100	5
hairy honeysuckle	Lonicera hispidula	83	2
oceanspray	Holodiscus discolor	50	6
common snowberry	Symphoricarpos albus var. laevigatus	50	2
trailing blackberry	Rubus ursinus ssp. macropetalus	50	1
dwarf Oregongrape	Mahonia nervosa	33	15
orange honeysuckle	Lonicera ciliosa	33	+
Graminoids			
western fescue	Festuca occidentalis	100	8
Columbia brome	Bromus vulgaris	83	2
Alaska oniongrass	Melica subulata	83	12
Coast Range fescue	Festuca subuliflora	33	3
Forbs and Ferns			
western starflower	Trientalis borealis ssp. latifolia	100	6
mountain sweet-cicely	Osmorhiza berteroi	100	1
cleavers	Galium aparine	83	3
bracken fern	Pteridium aquilinum var. pubescens	67	5
sword fern	Polystichum munitum	67	2
sweet-scented bedstraw	Galium triflorum	67	1
rattlesnake-plantain	Goodyera oblongifolia	67	1
wall lettuce	Mycelis muralis	50	1
pathfinder	Adenocaulon bicolor	50	+
small-flowered nemophila	Nemophila parviflora var. parviflora	50	+
Pacific sanicle	Sanicula crassicaulis var. crassicaulis	50	+
twinflower	Linnaea borealis ssp. longiflora	33	8
Scouler's bellflower	Campanula scouleri	33	+
woods strawberry	Fragaria vesca ssp. bracteata	33	+
white-flowered hawkweed	Hieracium albiflorum	33	+
hairy cat's-ear	Hypochaeris radicata	33	+


Chris Chappell photo



Plot locations of PSME-ABGR/FEOC in Puget Trough Ecoregion

Douglas-fir – grand fir / western fescue

present and often dominates tree regeneration. Douglas-fir regeneration can also be numerous. The shrub layer is usually sparse to moderate in density. Baldhip rose and hairy honeysuckle are usually present. Oceanspray, trailing blackberry, and common snowberry are in half the plots. Dwarf Oregongrape dominates the understory of one plot. The herb layer is usually well developed. Western fescue and Alaska oniongrass are usually prominent to co-dominant. Western fescue is always present. Western starflower (occasionally prominent), Columbia brome, mountain sweet-cicely, cleavers, bracken fern (occasionally prominent), sword fern, sweet-scented bedstraw, and rattlesnake-plantain are usually present.

CLASSIFICATION NOTES: Not previously described in the literature. Chappell (1997) considered it part of PSME-ABGR/SYAL/MESU. NatureServe (2005) currently considers it part of PSME-ABGR/SYAL/MESU, though it is slated to be elevated to an association called PSME-ABGR/FEOC-MESU.

MANAGEMENT NOTES: These sites appear to be relatively low in productivity for tree growth.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII – ABIES GRANDIS / GAULTHERIA SHALLON

Douglas-fir – grand fir / salal

Abbreviated Name: PSME-ABGR/GASH

Sample size = 10 plots

DISTRIBUTION: In Washington, this association occurs in the San Juan Islands, islands in western Skagit County, northern and central Whidbey Island, and possibly the far northeastern Olympic Peninsula. It probably also occurs in adjacent British Columbia on the Gulf Islands and southeastern Vancouver Island, but is recognized as part of a broader unit there.

GLOBAL/STATE STATUS: GNRS1. There are less than 5 high-quality occurrences known in Washington. Much of the area of this type has been displaced or degraded by development. The vast majority of stands have been significantly impacted by past timber harvest. Development is an ongoing threat. The type has a limited geographic range.

ID TIPS: Grand fir occupies >10% cover or is the dominant tree regeneration and western hemlock and western redcedar are either absent or minor in importance. Salal occupies >10% cover. If present, sword fern occupies <10% cover. Beaked hazelnut and vine maple are absent.

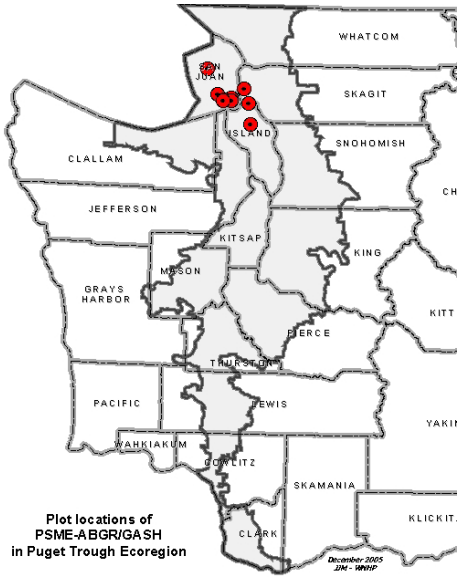
ENVIRONMENT: These sites are moderately dry to perhaps mesic and appear to be relatively nutrient-poor. Slopes are usually gentle, occasionally moderate in steepness. Aspect is variable. Mid slopes are typical. Parent materials are most often glacial till, but also include glacial drift without a restrictive layer. Stony or gravelly loams are most typical. All plots are within about 1 mile of saltwater shorelines at low elevations. Found only in dry climatic areas.

Precipitation: 21-29 inches (mean 24)
Elevation: sea level - 250 feet
Aspect/slope: various/ 3-44% (mean 13)
Slope position: mid, plain, lower, upper
Soil series: Roche, Keystone, Swinomish

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Grand fir will increase over

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	47
grand fir	Abies grandis	100	34
Scouler's willow	Salix scouleriana	60	3
western redcedar	Thuja plicata	40	7
Pacific yew	Taxus brevifolia	30	9
Sitka spruce	Picea sitchensis	20	13
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	100	62
oceanspray	Holodiscus discolor	100	20
baldhip rose	Rosa gymnocarpa	90	6
trailing blackberry	Rubus ursinus ssp. macropetalus	60	2
orange honeysuckle	Lonicera ciliosa	40	2
common snowberry	Symphoricarpos albus var. laevigatus	30	4
Graminoids			
western fescue	Festuca occidentalis	80	2
Coast Range fescue	Festuca subuliflora	40	1
Forbs and Ferns			
sword fern	Polystichum munitum	60	6
bracken fern	Pteridium aquilinum var. pubescens	60	2
western starflower	Trientalis borealis ssp. latifolia	30	5
sweet-scented bedstraw	Galium triflorum	30	1



time in the absence of disturbance, Douglas-fir decreases, though still remains prominent after hundreds of years. Some of these stands may have been Douglas-fir savannas prior to fire suppression. Depending on seed sources, Pacific madrone or lodgepole pine could regenerate abundantly on these sites after a major disturbance and persist until sometime in the middle of the sere.

VEGETATION: Canopy is dominated by Douglas-fir or co-dominated by that species and grand fir. Grand fir dominates tree regeneration or a lower canopy layer. Sitka spruce is occasionally prominent. Western redcedar is sometimes present in small amounts. Salal dominates the understory. Oceanspray usually forms a prominent to co-dominant tall shrub layer. Baldhip rose and trailing blackberry are usually present. The herb layer is poorly developed. Western fescue, bracken fern, and sword fern are usually present in small amounts.

CLASSIFICATION NOTES: Not previously described in the literature. Chappell (1997) considered it part of PSME-THPL/GASH-HODI. NatureServe (2005) does not currently recognize it, but will probably include it in the near future as a part of PSME-(THPL-ABGR)/MANE-GASH.

MANAGEMENT NOTES: Stands that have not been previously harvested, especially mature and old-growth, should be considered for conservation status. These sites appear to be moderately low in productivity for tree growth.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - ABIES GRANDIS / HOLODISCUS DISCOLOR / POLYSTICHUM MUNITUM

Douglas-fir - grand fir / oceanspray / sword fern

Abbreviated Name: PSME-ABGR/HODI/POMU

Sample size = 7 plots

DISTRIBUTION: Known only from San Juan County and a limited area of Clallam County in the vicinity of Sequim. May occur also in northern Island County and in adjacent B.C.

GLOBAL/STATE STATUS: G1?S1. There is only one known relatively good-quality occurrence of this association and several small fragments.

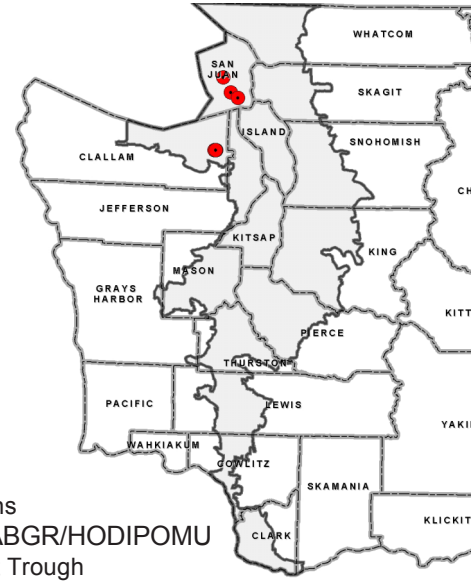
ID TIPS: Grand fir >10% cover or the dominant tree regeneration and little to no western hemlock or western redcedar present. Oceanspray provides >10% cover and either sword fern or common snowberry >5% cover. Swordfern and common snowberry are always present; salal is absent or low in abundance.

ENVIRONMENT: These sites are moderately dry and appear to be relatively nutrient-rich. They are all located in dry climates at low elevations and are most concentrated in areas with the lowest mean annual precipitation in the ecoregion. Usually occurs on plains or short gentle slopes that tend to face toward the north. Parent material is glacial till, glacial outwash, and reworked glacial till and marine sediment. Soil texture is stony loam, loamy sand, or fine sandy loam.
Precipitation: 20-28 inches (mean 22)
Elevation: 30-200 feet
Aspect/slope: W to NE/ 0-22% slope (mean 9)
Slope position: plain, short, mid
Soil series: Roche, Dick, Cassolary

DISTURBANCE/SUCCESSION: In the pre-Western settlement landscape, a moderate-severity fire regime likely prevailed (variable severity, intermediate frequency), probably resulting in more open stands on average. Some stands may have been savannas in the past maintained by more frequent burning. Disturbance by windstorms tends to be relatively more common in this association than most others, and grand fir tends to increase after wind disturbance. Grand fir usually dominates tree regeneration, but

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found.
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	48
grand fir	Abies grandis	100	33
western hemlock	Tsuga heterophylla	29	4
Sitka spruce	Picea sitchensis	14	8
Shrubs and Dwarf-shrubs			
oceanspray	Holodiscus discolor	100	23
common snowberry	Symphoricarpos albus var. laevigatus	100	14
baldhip rose	Rosa gymnocarpa	100	9
trailing blackberry	Rubus ursinus ssp. macropetalus	86	6
orange honeysuckle	Lonicera ciliosa	71	3
coast black gooseberry	Ribes divaricatum	71	1
tall Oregongrape	Mahonia aquifolium	57	1
spreading snowberry	Symphoricarpos hesperius	43	5
Indian plum	Oemleria cerasiformis	43	3
serviceberry	Amelanchier alnifolia	43	1
dwarf Oregongrape	Mahonia nervosa	29	22
Graminoids			
Columbia brome	Bromus vulgaris	100	4
Alaska oniongrass	Melica subulata	71	10
western fescue	Festuca occidentalis	71	6
Coast Range fescue	Festuca subuliflora	57	6
Forbs and Ferns			
sword fern	Polystichum munitum	100	9
western starflower	Trientalis borealis ssp. latifolia	86	5
cleavers	Galium aparine	86	4
sweet-scented bedstraw	Galium triflorum	71	3
mountain sweet-cicely	Osmorhiza berteroi	57	1
bracken fern	Pteridium aquilinum var. pubescens	43	5
yerba buena	Clinopodium douglasii	43	2
pathfinder	Adenocaulon bicolor	43	2
Siberian springbeauty	Claytonia siberica var. siberica	43	1
American vetch	Vicia americana ssp. americana	43	1
Pacific sanicle	Sanicula crassicaulis var. crassicaulus	43	+
twinflower	Linnaea borealis ssp. longiflora	29	4



Plot locations
of PSME-ABGR/HODIPOMU
in the Puget Trough

Douglas-fir - grand fir / oceanspray / sword fern

Douglas-fir regeneration also occurs under a variety of conditions. Grand fir will increase in the absence of disturbance.

VEGETATION: Forest typically co-dominated by Douglas-fir and grand fir. Grand fir always at least dominates tree regeneration or is prominent in the canopy. The understory is always dominated or co-dominated by oceanspray, with common snowberry usually co-dominant and always present. Dwarf Oregongrape occasionally co-dominates. Baldhip rose is prominent. Other very frequent woody plants are trailing blackberry, orange honeysuckle, and coast black gooseberry. The herb layer is less developed than the shrub layer. Most prominent in terms of cover are sword fern and Alaska oniongrass. Western fescue, Columbia brome, western starflower, cleavers, sweet-scented bedstraw, and mountain sweet-cicely are usually present.

CLASSIFICATION NOTES: Chappell (1997) called it part of PSME-ABGR/SYAL/MESU. NatureServe (2005) currently considers it part of PSME-ABGR/SYAL/MESU, though its name will change to PSME-ABGR/HODI/MESU in the near future. The broader type also includes what is herein called PSME-ABGR/FEOC. The latter has less shrub cover and sword fern, and more grass cover than PSME-ABGR/HODI/POMU.

MANAGEMENT NOTES: Stands that have not been previously harvested or mature and old-growth stands, even if they have been disturbed by thinning, should be considered for conservation status. Sites that have already been harvested may be well suited to uneven-aged management.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - ARBUTUS MENZIESII / GAULTHERIA SHALLON

Douglas-fir - Pacific madrone / salal

Abbreviated Name: PSME-ARME/GASH

Sample size = 22 plots

DISTRIBUTION: Occurs in the northern and central portions of the Puget Trough, including San Juan, Skagit, Island, King, Kitsap, Clallam, Whatcom, Jefferson, Pierce and Thurston counties. May occur in Snohomish and Mason counties. Also occurs in southwestern BC and reported to occur around the southern Willamette Valley of Oregon.

GLOBAL/STATE STATUS: G3S2. There are probably less than 20 relatively good quality occurrences in Washington (11 are known). Most sites have been altered by past timber harvest or fragmentation. Development/conversion is a significant threat and fungal diseases are also a potential threat.

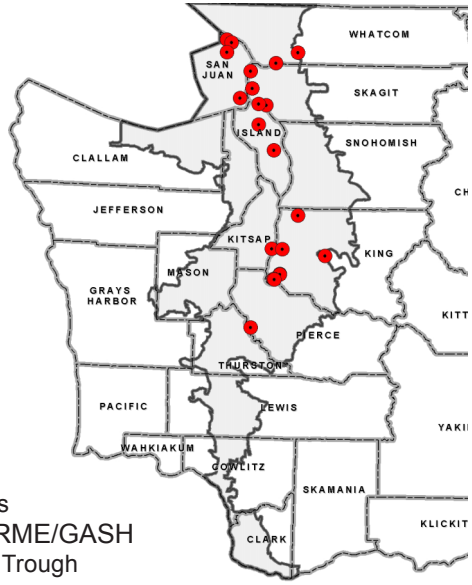
ID TIPS: Dominated or co-dominated by Pacific madrone. Western hemlock, western redcedar and grand fir absent or present in small amounts (<10% cover). Understory dominated by salal. Evergreen huckleberry absent or present in small amounts (<5% cover).

ENVIRONMENT: These sites are dry and appear to be relatively nutrient-poor. Most frequent on sunny slopes adjacent to saltwater shorelines. Occurs on a variety of soils, including shallow-to-bedrock residuum, glacial till, glacial outwash, glacial sands, colluvium, and serpentine. Usually found on moderate to steep slopes, especially those with sunny aspects (S to W). More common in relatively dry climatic areas (Olympic Mountains rainshadow).
Precipitation: 21-68 inches (mean 37)
Elevation: 20-1200 feet
Aspect/slope: ENE to WNW/ 5-118% slope (mean 40)
Slope position: mid, upper, lower, short, plain
Soil series: Roche, Alderwood, andic xerochrepts, Fidalgo, Guemes, Keystone, lithic haploxerolls, rock outcrop

DISTURBANCE/SUCCESSION: In the pre-Western settlement landscape, a moderate-severity fire regime likely prevailed (variable severity, intermediate frequency). Madrone resprouts after fire or cutting, and is capable of living for a few hundred

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Pacific madrone	Arbutus menziesii	100	58
Douglas-fir	Pseudotsuga menziesii var. menziesii	73	49
Scouler's willow	Salix scouleriana	45	5
grand fir	Abies grandis	18	4
lodgepole pine	Pinus contorta var. contorta	18	4
western redcedar	Thuja plicata	14	2
western hemlock	Tsuga heterophylla	9	2
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	100	62
baldhip rose	Rosa gymnocarpa	91	3
oceanspray	Holodiscus discolor	77	11
trailing blackberry	Rubus ursinus var. macropetalus	68	3
dwarf Oregongrape	Mahonia nervosa	45	8
common snowberry	Symphoricarpos albus var. laevigatus	45	3
serviceberry	Amelanchier alnifolia	41	3
tall Oregongrape	Mahonia aquifolium	41	+
beaked hazelnut	Corylus cornuta var. califronica	36	21
hairy honeysuckle	Lonicera hispidula	36	6
orange honeysuckle	Lonicera ciliosa	36	4
evergreen huckleberry	Vaccinium ovatum	14	3
Forbs and Ferns			
bracken fern	Pteridium aquilinum var. pubescens	73	3
sword fern	Polystichum munitum	55	1



Plot locations
of PSME-ARME/GASH
in the Puget Trough

Douglas-fir - Pacific madrone / salal

years. Madrone dominance, and Douglas-fir subordinance or even absence, is favored by repeated high-severity fires, clearcut logging followed by natural regeneration, or selective logging of Douglas-fir. Douglas-fir is likely to increase in abundance without disturbance, but does not appear to be excluding or out-competing madrone, even when madrone is overtopped, because the canopy of fir remains relatively open on these dry sites. Fungal diseases (*Natrassia* canker, *Fusicoccum* branch dieback), which may be non-native, appear to be facilitating at least local decline in madrone.

VEGETATION: Forest dominated or co-dominated by Pacific madrone, usually with Douglas-fir co-dominant. Madrone often forms a subcanopy below taller Douglas-fir. Small amounts of more shade-tolerant conifers (grand fir, hemlock, redcedar) may be present. The understory is dominated by salal. Oceanspray is usually a prominent tall shrub, and beaked hazelnut is sometimes prominent to co-dominant over the salal. Baldhip rose and trailing blackberry are usually present. The poorly developed herb layer usually has small amounts of bracken fern and, less commonly, sword fern.

CLASSIFICATION NOTES: Also described by Chappell and Giglio (1999) and Chappell (1997, 2001). Fonda and Bernardi (1976) described same community from Sucia Island and a closely related type (ARME-PICO/GASH) with lodgepole pine co-dominant (only 1 sample stand). Chappell (1997), Chappell and Giglio (1999), and NatureServe (2004) consider PSME-ARME/VAOV part of PSME-ARME/GASH.

MANAGEMENT NOTES: Experimentation with prescribed fire may be warranted, especially where fungal diseases are resulting in madrone decline. More research on management strategies focused on the diseases is recommended.

BIODIVERSITY NOTES: The fruit of madrone is highly sought-after by birds in the fall and early winter.

Chappell, C.B. 2006. Upland plant associations of the PugetTrough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - ARBUTUS MENZIESII / HOLODISCUS DISCOLOR / LONICERA HISPIDULA

Douglas-fir - Pacific madrone / oceanspray / hairy honeysuckle

Abbreviated Name: PSME-ARME/HODI/LOHI

Sample size = 31 plots

DISTRIBUTION: Occurs primarily in the Olympic Mountains rainshadow, including San Juan and portions of Clallam, Jefferson, Island, Skagit, and Whatcom counties. Also occurs in King and southeastern Thurston counties and in southwestern BC.

GLOBAL/STATE STATUS: G2G3S2. There are estimated to be no more than 25 relatively high quality occurrences (13 currently known). Most examples are small, or degraded by development, logging, or non-native plant species. Development, non-native species, and fungal diseases are threats.

ID TIPS: Dominated or co-dominated by Pacific madrone. Understory dominated or co-dominated by oceanspray, hairy honeysuckle, common snowberry, and/or western fescue. Salal always <10% cover.

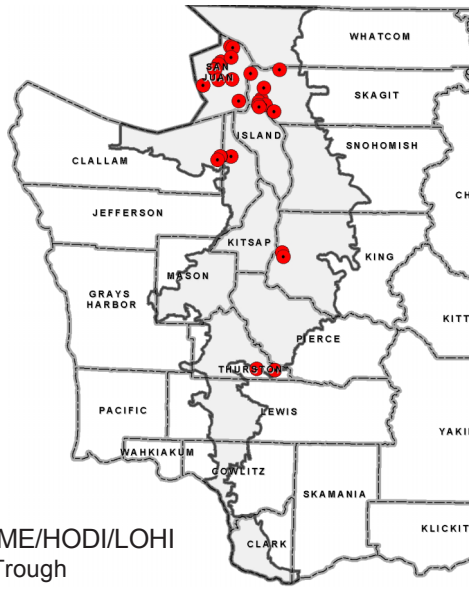
ENVIRONMENT: These sites are typically very dry and appear to be poor to medium in relative nutrient status. Includes some of the driest sites that support forest in the ecoregion. Most frequent on sunny slopes adjacent to saltwater. Occurs most frequently on soils that are shallow to bedrock (outcrops often visible on plot), but also on glacial till, glacial outwash, and glacial drift sands. Usually found on moderate to steep slopes, especially southwestern aspects. More frequent in dry climatic areas (Olympic Mountains rainshadow).
Precipitation: 21-52 inches (mean 31)
Elevation: 20-900 feet
Aspect/slope: E to WNW/ 0-88% slope (mean 45)
Slope position: all except bottoms
Soil series: Rock outcrop, Fidalgo, Hoypus, Rockland, Clallam, dystric xerorthents, Guemes, lithic haploxerolls, lithic xerochrepts, Rainier, rough stony land

DISTURBANCE/SUCCESSION: In the pre-settlement landscape, a moderate-severity fire regime likely prevailed (variable severity, intermediate frequency). Madrone resprouts after fire or cutting, and is capable of living for a few hundred years. Madrone domi-

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found; Cov = cover , the mean crown cover of the species in plots where it was found. + = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Pacific madrone	Arbutus menziesii	100	52
Douglas-fir	Pseudotsuga menziesii var. menziesii	94	48
western redcedar	Thuja plicata	10	6
Rocky Mountain juniper	Juniperus scopulorum	10	2
Shrubs and Dwarf-shrubs			
oceanspray	Holodiscus discolor	90	18
hairy honeysuckle	Lonicera hispidula	87	11
baldhip rose	Rosa gymnocarpa	81	9
common snowberry	Symphoricarpos albus var. laevigatus	74	16
tall Oregongrape	Mahonia aquifolium	68	4
orange honeysuckle	Lonicera ciliosa	58	3
trailing blackberry	Rubus ursinus var. macropetalus	55	4
salal	Gaultheria shallon	48	8
serviceberry	Amelanchier alnifolia	48	3
dwarf Oregongrape	Mahonia nervosa	39	11
Graminoids			
western fescue	Festuca occidentalis	68	9
blue wildrye	Elymus glaucus	61	4
Columbia brome	Bromus vulgaris	48	3
Alaska oniongrass	Melica subulata	35	5
Forbs and Ferns			
sword fern	Polystichum munitum	52	1
cleavers	Galium aparine	42	1
Nuttall's peavine	Lathyrus nevadensis ssp. lanceolatus var. pilosellus	35	3
western starflower	Trientalis borealis ssp. latifolia	35	2
woods strawberry	Fragaria vesca ssp. bracteata	32	2
small-flowered alumroot	Heuchera micrantha var. diversifolia	32	+
rattlesnake-plantain	Goodyera oblongifolia	29	2
broad-leaved stonecrop	Sedum spathulifolium ssp. spathulifolium	26	2
American vetch	Vicia americana ssp. americana	26	1
yerba buena	Cinopodium douglasii	16	5
harsh paintbrush	Castilleja hispida ssp. hispida	16	+

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].



Plot locations of PSME-ARME/HODI/LOHI in the Puget Trough

Douglas-fir - Pacific madrone / oceanspray / hairy honeysuckle

nance, and Douglas-fir subordinance or even absence, is favored by repeated high-severity fires, clearcut logging followed by natural regeneration, or selective logging of Douglas-fir. Douglas-fir is likely to increase in abundance without disturbance, but does not appear to be excluding or out-competing madrone on these dry sites, even when madrone is overtopped. Fungal diseases (*Natrassia* canker, *Fusicoccum* branch dieback), which may be non-native, appear to be facilitating at least local decline in madrone. Heavy deer browsing on some islands results in dominance by grasses, especially western fescue.

VEGETATION: Forest, or less commonly woodland, dominated or co-dominated by Pacific madrone, typically with Douglas-fir co-dominant. Madrone often forms a subcanopy below taller Douglas-fir. The understory is a somewhat variable mixture of deciduous shrubs and herbs. Oceanspray, hairy honeysuckle, and common snowberry are usually present and often prominent to co-dominant. Baldhip rose and western fescue are usually prominent. The latter may dominate in heavily browsed stands. Dwarf Oregongrape is present in less than half the stands, but when present is prominent to co-dominant. Tall Oregongrape, orange honeysuckle, and blue wildrye are also frequent. Several forbs may be present but usually not in very large amounts.

CLASSIFICATION NOTES: Roemer (1972) described this association from BC and called it ARME-PSME. Chappell (1997) and Chappell and Giglio (1999) described this type and called it PSME-ARME/LOHI. Fonda and Bernardi (1976) describe a similar community type they called PSME-ARME/VIAM (*Vicia americana*) from Sucia Island. Herein, PSME-ARME/VIAM is considered a local variant of PSME-ARME/HODI/LOHI. NatureServe (2005) calls this type PSME-ARME/VIAM after Fonda's name, but will in future call it PSME-ARME/HODI.

MANAGEMENT NOTES: Experimentation with prescribed fire may be warranted, especially where fungal diseases are resulting in madrone decline. More research on management strategies focused on the diseases is recommended.

BIODIVERSITY NOTES: The fruit of madrone is highly sought-after by birds in the fall and early winter. State candidate yerba de selva (*Whipplea modesta*) has been recorded in this plant association.

PSEUDOTSUGA MENZIESII - ARBUTUS MENZIESII / VACCINIUM OVATUM

Douglas-fir - Pacific madrone / evergreen huckleberry
Abbreviated Name: PSME-ARME/VAOV

Sample size = 9 plots

DISTRIBUTION: Known to occur only in western Pierce, northern Thurston, and Mason counties. Possible in Kitsap, King, and Jefferson counties.

GLOBAL/STATE STATUS: GNRS1. A naturally rare type of very restricted range. There are only 4 known relatively good quality occurrences. Most stands have been altered by past timber harvest or fragmentation. Fungal diseases are a potential threat.

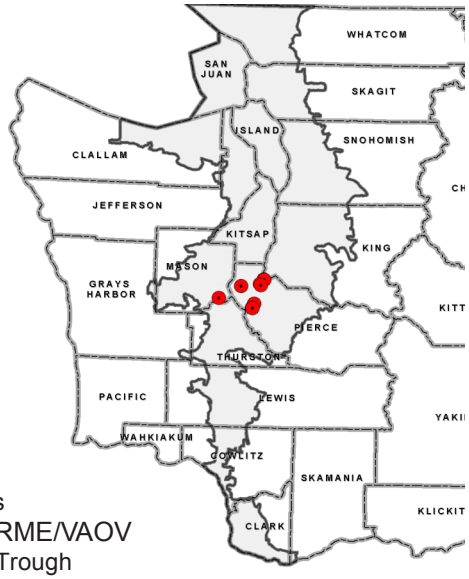
ID TIPS: Dominated or co-dominated by Pacific madrone. Western hemlock, western redcedar and grand fir absent or present in small amounts (<10% cover). Understory dominated or co-dominated by evergreen huckleberry (minimum 5% cover).

ENVIRONMENT: These sites are moderately dry to dry and appear to be relatively nutrient-poor Most frequent on sunny slopes adjacent to saltwater. Occurs on glacial till and glacial drift sands. Usually found on moderate to steep slopes, especially those with sunny aspects (south to west).
Precipitation: 40-54 inches (mean 44)
Elevation: 20-300 feet
Aspect/slope: SE to WNW/ 5-90% slope (mean 38)
Slope position: all except bottoms
Soil series: Alderwood, Harstine, Shelton, xerochrepts

DISTURBANCE/SUCCESSION: In the pre-Western settlement landscape, a moderate-severity fire regime likely prevailed (variable severity, intermediate frequency). Madrone resprouts after fire or cutting, and is capable of living for a few hundred years. Madrone dominance, and Douglas-fir subordinance or even absence, should be favored by repeated high-severity fires, clearcut logging followed by natural regeneration, or selective logging of Douglas-fir Douglas-fir is likely to increase in abundance without disturbance, but does not appear to be excluding or out-competing madrone, even when madrone is overtopped, because the canopy of fir remains relatively open on these sites, which are steep, dry, or are located

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found; Cov = cover, the mean crown cover of the species in plots where it was found; + = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Pacific madrone	Arbutus menziesii	100	57
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	52
Scouler's willow	Salix scouleriana	44	2
western hemlock	Tsuga heterophylla	33	4
western redcedar	Thuja plicata	22	4
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	100	53
evergreen huckleberry	Vaccinium ovatum	100	41
beaked hazelnut	Corylus cornuta var. californica	78	5
oceanspray	Holodiscus discolor	78	5
hairy honeysuckle	Lonicera hispidula	78	2
dwarf Oregongrape	Mahonia nervosa	56	3
red huckleberry	Vaccinium parvifolium	56	2
baldhip rose	Rosa gymnocarpa	56	1
serviceberry	Amelanchier alnifolia	44	2
common snowberry	Symphoricarpos albus var. laevigatus	44	1
poison-oak	Toxicodendron diversilobum	22	2
Forbs and Ferns			
bracken fern	Pteridium aquilinum var. pubescens	100	3
sword fern	Polystichum munitum	67	1
spotted coralroot	Corallorhiza maculata	33	+



Plot locations
of PSME-ARME/VAOV
in the Puget Trough

Douglas-fir - Pacific madrone / evergreen huckleberry

adjacent to sunny shorelines. Fungal diseases (*Natrassia* canker, *Fusicoccum* branch dieback), which may be non-native, appear to be facilitating at least local decline in madrone.

VEGETATION: Forest dominated or co-dominated by Pacific madrone, typically with Douglas-fir co-dominant (all stands seen to date). Madrone often forms a subcanopy below taller Douglas-fir. Small amounts of western hemlock or western redcedar may be present. The understory is usually dominated by salal and evergreen huckleberry. Oceanspray, beaked hazelnut, and hairy honeysuckle are usually present. The poorly developed herb layer usually has small amounts of bracken fern and, less commonly, sword fern.

CLASSIFICATION NOTES: Also described by Chappell (1997). NatureServe (2005), Chappell and Giglio (1999), and Chappell (2001) consider PSME-ARME/VAOV part of PSME-ARME/GASH.

MANAGEMENT NOTES: Experimentation with prescribed fire may be warranted, especially where fungal diseases are resulting in madrone decline. More research on management strategies focused on the diseases is recommended.

BIODIVERSITY NOTES: The fruit of madrone is highly sought-after by birds in the fall and early winter.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII / CORYLUS CORNUTA / POLYSTICHUM MUNITUM – TIARELLA TRIFOLIATA

Douglas-fir / beaked hazelnut / sword fern – threeleaf foamflower

Abbreviated Name: PSME/COCO/POMU-TITR

Sample size = 9 plots

DISTRIBUTION: This association occurs from southwestern Pierce County south in the Puget Trough and perhaps into the Willamette Valley of Oregon. Occurs in Pierce,Thurston, Lewis, and Clark counties.

GLOBAL/STATE STATUS: GNRS2? Natural-origin occurrences are very rare due to historic logging. Development and non-native species are threats. There is uncertainty about the pre-settlement abundance of this type.

ID TIPS: Dominated by Douglas-fir, with little to no western hemlock, western redcedar, or grand fir present. Beaked hazelnut dominates tall shrub layer. Sword fern dominates herb layer, either with >60% cover, or with lesser amounts of lady-fern, spreading woodfern, stinging nettle, or foamflower also present.

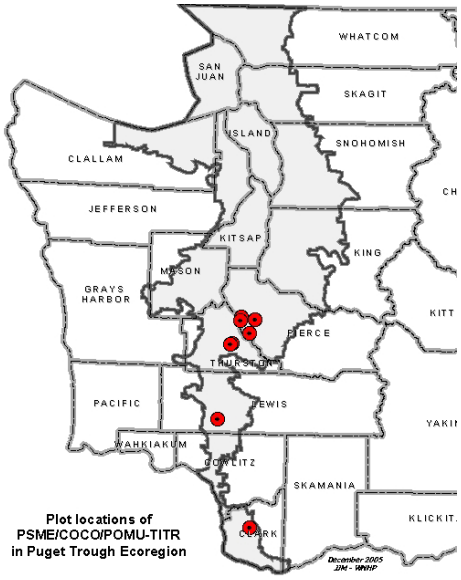
ENVIRONMENT: These sites are moist to very moist and appear to be relatively nutrient-rich. Sites are flat to moderately sloping, with varying aspect. Most plots are on glacial outwash plains or short slopes. Parent materials include sandy glacial outwash, alluvium, and ancient glacial drift. Soil texture ranges from silty clay loam to loamy sand. All mapped soil types are free of restrictive layers.
Precipitation: 41-53 inches (mean 45)
Elevation: 200-400 feet
Aspect/slope: various/ 0-40% (mean 17)
Slope position: plain, short, lower, mid
Soil series: Nisqually, Fitch, Prather, Washougal

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Because this association is found primarily in landscapes that had significant amounts of fire-maintained prairies, it is likely that the absence of shade-tolerant conifers is due more to the fire history associated with prairie landscapes than with the inability of the shade-tolerant conifers to grow on these relatively moist sites. Some stands actually grow on soils that formerly supported prairies (Nisqually series) and are

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	71
bigleaf maple	Acer macrophyllum	67	27
cascara	Frangula purshiana	56	1
western hemlock	Tsuga heterophylla	33	1
Shrubs and Dwarf-shrubs			
beaked hazelnut	Corylus cornuta var. californica	100	21
common snowberry	Symphoricarpos albus var. laevigatus	100	5
trailing blackberry	Rubus ursinus ssp. macropetalus	89	7
dwarf Oregongrape	Mahonia nervosa	89	6
baldhip rose	Rosa gymnocarpa	89	1
red elderberry	Sambucus racemosa var. racemosa	78	4
red huckleberry	Vaccinium parvifolium	78	3
Indian plum	Oemleria cerasiformis	78	2
vine maple	Acer circinatum	44	9
serviceberry	Amelanchier alnifolia	44	2
tall Oregongrape	Mahonia aquifolium	44	2
English holly	Ilex aquifolium	44	2
salmonberry	Rubus spectabilis var .spectabilis	33	5
Graminoids			
Columbia brome	Bromus vulgaris	89	2
Dewey's sedge	Carex deweyana var. deweyana	78	2
Coast Range fescue	Festuca subuliflora	44	3
Forbs and Ferns			
sword fern	Polystichum munitum	100	53
sweet-scented bedstraw	Galium triflorum	100	2
threeleaf foamflower	Tiarella trifoliata var. trifoliata	78	4
inside-out flower	Vancouveria hexandra	67	12
bracken fern	Pteridium aquilinum var. pubescens	67	4
pathfinder	Adenocaulon bicolor	67	+
western trillium	Trillium ovatum ssp. ovatum	67	+
enchanter's nightshade	Circaea alpina ssp. pacifica	56	3
Siberian springbeauty	Claytonia siberica var. sibirica	56	2
western starflower	Trientalis borealis ssp. latifolia	56	1
stinging nettle	Urtica dioica ssp. gracilis	44	2
wall lettuce	Mycelis muralis	44	+
twinflower	Linnaea borealis ssp. longiflora	33	6
lady-fern	Athyrium filix-femina ssp. cyclosorum	33	4
Hooker's fairybells	Prosartes hookeri var. oregana	33	2
spreading woodfern	Dryopteris expansa	33	+


Chris Chappell photo



Douglas-fir / beaked hazelnut / sword fern – threeleaf foamflower

a result of tree invasion on former prairies. Tree regeneration is usually largely absent or sparse in this association.

VEGETATION: Canopy dominated by Douglas-fir. Bigleaf maple usually forms a prominent to co-dominant lower tree canopy layer. Sword fern almost always dominates the understory and is taller than average in this association. Beaked hazelnut forms a prominent to dominant tall shrub layer. Other frequent shrubs are common snowberry, trailing blackberry, Indian plum, dwarf Oregongrape, baldhip rose, red elderberry and red huckleberry. Inside-out flower is usually present and often prominent. Sweet-scented bedstraw, Columbia brome, Dewey's sedge, threeleaf foamflower, enchanter's nightshade, western trillium, Siberian springbeauty and pathfinder are other frequent herbs.

CLASSIFICATION NOTES: Described by Chappell (1997, 2001) as part of PSME-(ABGR)/COCO/POMU. NatureServe (2005) lists it as a part of PSME/COCO/POMU.

MANAGEMENT NOTES: These sites appear to be quite productive for tree growth. Non-native English ivy (*Hedera helix*) does well on these sites and if present can quickly overwhelm the native understory. Herb Robert (*Geranium robertianum*) is another threatening invasive for this association.

BIODIVERSITY NOTES: State sensitive tall bugbane (*Cimicifuga elata*) occurs in this plant association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII / CORYLUS CORNUTA – SYMPHORICARPOS (ALBUS, HESPERIUS) / POLYSTICHUM MUNITUM

Douglas-fir / beaked hazelnut – snowberry / sword fern
Abbreviated Name: PSME/COCO-SYMPH/POMU
Synonym: *Pseudotsuga menziesii / Corylus cornuta – Symphoricarpos (albus, mollis) / Polystichum munitum*

Sample size = 34 plots

DISTRIBUTION: This association occurs primarily from western Pierce County and central Mason County south in the Puget Trough and into the W illamette Valley and it s foothills in Oregon. It rarely occurs elsewhere in the Puget Trough (e.g., one plot from Whatcom County). Occurs mostly in Pierce, Thurston, Mason, Lewis, Cowlitz, and Clark counties.

GLOBAL/STATE STATUS: GNRS2. There are few relatively high-quality occurrences (4 are known) and they are relatively small. Almost all occurrences have been significantly degraded by logging or non-native species, or have resulted from fire suppression. Development and non-native species are threats. There is uncertainty about the pre-settlement abundance of this type because of the combination of losses from development and increases with fire suppression.

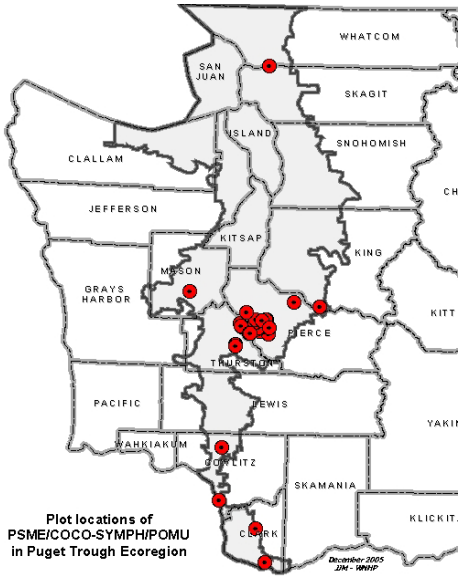
ID TIPS: Dominated by Douglas-fir , with little to no western hemlock, western redcedar, or grand fir present. Beaked hazelnut and snowberry species almost always present, the two together typically >10% cover. Sword fern >5% cover . See key.

ENVIRONMENT: These sites are moderately dry to mesic and appear to be relatively nutrient-rich. Sites are flat to moderately sloping (rarely steep), with varying aspect. Most plots are on glacial outwash plains or upper to mid slopes. Parent materials include gravelly glacial outwash, old lacustrine and alluvial sediments, and old volcanic residuum. Soil texture ranges from gravelly loamy sand to stony clay loam. Coarse fragments are often but not always abundant. All mapped soil types are free of restrictive layers.
Precipitation: 41-70 inches (mean 45)
Elevation: 40-650 feet
Aspect/slope: various/ 0-65% (mean 24)
Slope position: plain, upper , mid, ridgetop, short, lower
Soil series: Spanaway, Everett, Fitch, Olympic, Dystric xerochrept s, Ovall, Seaquest, Hesson, Xerochrepts, Schneider

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Many stands grow on soils that formerly

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	74
bigleaf maple	Acer macrophyllum	65	21
cascara	Frangula purshiana	35	+
Shrubs and Dwarf-shrubs			
trailing blackberry	Rubus ursinus ssp. macropetalus	97	20
beaked hazelnut	Corylus cornuta var. californica	94	24
baldhip rose	Rosa gymnocarpa	88	2
orange honeysuckle	Lonicera ciliosa	79	5
common snowberry	Symphoricarpos albus var. laevigatus	76	9
spreading snowberry	Symphoricarpos hesperius	71	8
oceanspray	Holodiscus discolor	71	6
Indian plum	Oemleria cerasiformis	71	4
dwarf Oregongrape	Mahonia nervosa	68	21
serviceberry	Amelanchier alnifolia	65	2
tall Oregongrape	Mahonia aquifolium	62	1
red huckleberry	Vaccinium parvifolium	56	3
salal	Gaultheria shallon	44	5
vine maple	Acer circinatum	38	21
Graminoids			
Columbia brome	Bromus vulgaris	79	4
Coast Range fescue	Festuca subuliflora	68	2
Forbs and Ferns			
sword fern	Polystichum munitum	100	17
sweet-scented bedstraw	Galium triflorum	100	3
western starflower	Trientalis borealis ssp. latifolia	91	2
twinflower	Linnaea borealis ssp. longiflora	65	8
pathfinder	Adenocaulon bicolor	56	1
bracken fern	Pteridium aquilinum var. pubescens	50	4
starry false Solomon's-seal	Maianthemum stellatum	50	2
cleavers	Galium aparine	50	2
Hooker's fairybells	Prosartes hookeri var. oregana	47	1
woods strawberry	Fragaria vesca ssp. bracteata	47	1
western trillium	Trillium ovatum ssp. ovatum	47	+
inside-out flower	Vancouveria hexandra	44	11
mountain sweet-cicely	Osmorhiza berteroi	44	1
yerba buena	Clinopodium douglasii	38	2
big-leaved sandwort	Moehringia macrophylla	35	2



Douglas-fir / beaked hazelnut – snowberry / sword fern

supported prairies (Spanaway series) but have been invaded by trees. Most stands are located in landscapes that formerly supported prairies maintained by Native American burning practices. It is possible that some of these stands could support more shade-tolerant conifers in the absence of long-term disturbance. The high mean cover of trailing blackberry, an increaser with ground disturbance, in our plots is probably due to the fact that a majority of the plots were from stands that had been disturbed by thinning activities and/or military training on Fort Lewis.

VEGETATION: Canopy dominated by Douglas-fir. Bigleaf maple usually forms a prominent to co-dominant lower tree canopy layer. Douglas-fir is sometimes regenerating under its own canopy in these stands. Beaked hazelnut almost always forms a prominent to dominant tall shrub layer, occasionally mixed with co-dominant vine maple and usually with presence of oceanspray. Lower shrub layers are often dominated or co-dominated by trailing blackberry (an increaser with disturbance), spreading snowberry, common snowberry, and/or dwarf Oregongrape. Other frequent shrubs and vines are orange honeysuckle, Indian plum, baldhip rose, serviceberry, and tall Oregongrape. Sword fern is always prominent to dominant in the herb layer. Sweet-scented bedstraw, western starflower, Columbia brome, Coast Range fescue, twinflower, and pathfinder are frequently occurring herbs. Inside-out flower is sometimes prominent.

CLASSIFICATION NOTES: Described by Chappell (1997, 2001) as part of PSME-(ABGR)/COCO/POMU. NatureServe (2005) lists it as a part of PSME/COCO/POMU, but this classification will soon be revised to recognize it as a unique type.

MANAGEMENT NOTES: These sites appear to be moderately productive for tree growth. Stands previously disturbed or resultant from fire suppression are good candidates for selective logging techniques. Non-native English ivy (*Hedera helix*) does well on these sites and if present can quickly overwhelm the native understory. Herb Robert (*Geranium robertianum*) is another threatening invasive for this association.

BIODIVERSITY NOTES: This association, because of its local abundance and close association with southern Puget Sound prairies and oak woodlands, is undoubtedly part of the habitat of the state threatened western gray squirrel (*Sciurus griseus*), which requires conifers in close proximity to oak and water.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII / GAULTHERIA SHALLON - HOLODISCUS DISCOLOR

Douglas-fir / salal - oceanspray

Abbreviated Name: PSME/GASH-HODI

Sample size = 35 plots

DISTRIBUTION: Most frequent in the Olympic Moutains rainshadow (especially San Juan, western Skagit and Island counties), this association occurs, at least sporadically, more or less throughout the PugetTrough. Also occurs in southwestern BC.

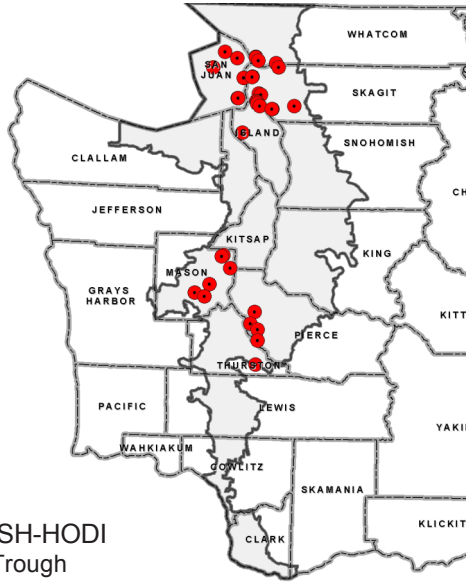
GLOBAL/STATE STATUS: G2G3S2. Few occurrences of relatively good quality remain (17 are known in Washington). Most examples have been altered by past timber harvest.

ID TIPS: Dominated by Douglas-fir with little to no western hemlock, western redcedar, or grand fir present. Understory dominated by salal, with sword fern, if present, less than 5% cover. Oceanspray abundant, or western fescue or other dry-site indicator present. (Refer to Key)

ENVIRONMENT: These are mostly either moderately dry sites within dry climatic zones or very dry sites elsewhere, and they appear to be relatively nutrient-poor Occurs most frequently on soils that are relatively shallow to bedrock (outcrops sometimes visible on sample plots), but also on glacial outwash, glacial till and other parent materials. Most soils where it occurs have high coarse fragment content (gravel or stones)Aspects are more commonly south to west, but include the entire spectrum. Most frequent in dry climatic areas (Olympic Mountains rainshadow).
Precipitation: 21-70 inches (mean 40)
Elevation: 50-2300 feet
Aspect/slope: all/ 3-84% slope (mean 33)
Slope position: upper, mid, short, plain, ridgetop, lower
Soil series: Rock outcrop, Everett (Grove), Pickett, Roche, Fidalgo, andic xerochrepts, lithic haploxerolls, Guemes, Hoypus, Lystair, Keystone, dystric xerochrepts

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found; Cov = cover , the mean crown cover of the species in plots where it was found; + = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	73
Pacific madrone	Arbutus menziesii	31	4
western hemlock	Tsuga heterophylla	26	2
lodgepole pine	Pinus contorta var. contorta	23	9
western redcedar	Thuja plicata	17	3
Grand fir	Abies grandis	14	2
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	100	58
baldhip rose	Rosa gymnocarpa	97	3
oceanspray	Holodiscus discolor	89	14
dwarf Oregongrape	Mahonia nervosa	89	7
trailing blackberry	Rubus ursinus var. macropetalus	74	3
red huckleberry	Vaccinium parvifolium	49	2
orange honeysuckle	Lonicera ciliosa	49	2
serviceberry	Amelanchier alnifolia	40	2
tall Oregongrape	Mahonia aquifolium	40	1
beaked hazelnut	Corylus cornuta var. californica	31	10
hairy honeysuckle	Lonicera hispidula	29	2
common snowberry	Symphoricarpos albus var. laevigatus	29	1
evergreen huckleberry	Vaccinium ovatum	20	8
spreading snowberry	Symphoricarpos hesperius	20	3
pipsissewa	Chimaphila umbellata ssp. occidentalis	14	3
Graminoids			
western fescue	Festuca occidentalis	60	2
Coast Range fescue	Festuca subuliflora	26	2
Forbs and Ferns			
sword fern	Polystichum munitum	77	2
bracken fern	Pteridium aquilinum var. pubescens	60	5
western starflower	Trientalis borealis ssp. latifolia	54	1
twinflower	Linnaea borealis ssp. longiflora	43	3
rattlesnake-plantain	Goodyera oblongifolia	43	1
licorice fern	Polypodium glycyrrhiza	34	+



Plot locations of PSME/GASH-HODI in the Puget Trough

Douglas-fir / salal - oceanspray

DISTURBANCE/SUCCESSION: In the pre-Western settlement landscape, a moderate-severity fire regime likely prevailed (variable severity, intermediate frequency). Douglas-fir regeneration is especially abundant after fires, but also occurs at other times. More shade-tolerant conifers are largely absent and do not appear capable of becoming important in late-seral stands under present conditions. If a lodgepole pine seed source is available after a high-severity fire, the PICO-PSME/GASH association is likely to develop.

VEGETATION: Forest dominated by Douglas-fir. Western hemlock, grand fir, or western redcedar are occasionally present in small amounts, mainly as regeneration. The understory is dominated by salal. Oceanspray usually forms a prominent tall shrub layer. Baldhip rose, dwarf Oregongrape, and trailing blackberry are important shrubs that are usually present. Beaked hazelnut is sometimes prominent. The herb layer is usually rather depauperate. Western fescue, sword fern, bracken fern, and western starflower are often present in small amounts. Western fescue, serviceberry, tall Oregongrape, pipsissewa, and other dry-site indicators are more frequent in this association than in closely related associations with more hemlock and redcedar

CLASSIFICATION NOTES: Also described in Chappell (1997, 2001). Fonda and Bernardi (1976) described the same type and called it PSME/GASH on Sucia Island. Chappell (1997) also recognized a PSME/GASH-VAOV association, which has here been subsumed into PSME/GASH-HODI and PICO-PSME/GASH. On the Olympic National Forest, a somewhat similar, but more montane, association is called PSME/GASH (Henderson et al. 1989).

MANAGEMENT NOTES: Stands that have not been previously harvested, especially mature and old-growth, should be considered for conservation status. Timber productivity is likely to be low on these sites. Sites that have already been harvested would be well suited to uneven-aged management.

BIODIVERSITY NOTES: State candidate yerba de selva (*Whipplea modesta*) has been recorded in this plant association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII / GAULTHERIA SHALLON / POLYSTICHUM MUNITUM

Douglas-fir / salal / sword fern

Abbreviated Name: PSME/GASH/POMU

Sample size = 20 plots

DISTRIBUTION: This association occurs sporadically in much of the Puget Trough. It appears to be most abundant in the South Puget Sound prairie landscape of southwestern Pierce and Thurston counties. It is also known from Mason County, Cowlitz County, and islands in western Skagit County. It probably occurs elsewhere in the Puget Trough and, depending on the resolution of classification issues, possibly elsewhere in lowland western Washington and western Oregon.

GLOBAL/STATE STATUS: GNRS3S5Q. We are uncertain at this point how best to classify this unit on a statewide basis (see Classification Notes). Therefore its rank is relatively uncertain. If we were to consider it strictly a Puget Trough dry site type, its rank would be relatively higher (vulnerable) because of few good-quality occurrences. If we consider it to include naturally-regenerated second-growth in a broader area, it would be more secure. As for the Puget Trough, most occurrences have been significantly degraded by logging, and development is a threat.

ID TIPS: Dominated by Douglas-fir, with little to no western hemlock, western redcedar, or grand fir present. Salal occupies >10% cover and sword fern >5% cover. Presence and abundance of dry/warm site indicators like oceanspray, beaked hazelnut, western fescue, bigleaf sandwort, and serviceberry can help distinguish this type from related early-seral variants of Douglas-fir-western hemlock types.

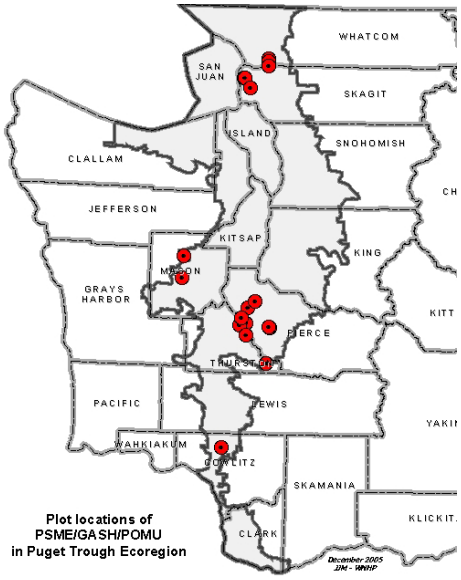
ENVIRONMENT: These sites are moderately dry to mesic and appear to be relatively nutrient-rich. Sites are flat to fairly steep, with aspect more of ten southerly to westerly. The plots represent a variety of slope positions, including plateaus/plains. Parent materials are variable, including glacial till, glacial outwash, and various bedrock (including ultramafics). Soil textures are loam to loamy sand, usually with abundant coarse fragments.

Precipitation: 27-79 inches (mean 43)
Elevation: 120-1500 feet
Aspect/slope: S to W, various/ 0-74% (mean 25)
Slope position: plain, mid, upper, lower, short

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	77
bigleaf maple	Acer macrophyllum	40	11
cascara	Frangula purshiana	40	2
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	100	43
trailing blackberry	Rubus ursinus ssp. macropetalus	85	8
oceanspray	Holodiscus discolor	80	14
dwarf Oregongrape	Mahonia nervosa	80	10
baldhip rose	Rosa gymnocarpa	75	3
red huckleberry	Vaccinium parvifolium	75	2
beaked hazelnut	Corylus cornuta var. californica	70	20
orange honeysuckle	Lonicera ciliosa	65	3
common snowberry	Symphoricarpos albus var. laevigatus	55	10
spreading snowberry	Symphoricarpos hesperius	40	7
serviceberry	Amelanchier alnifolia	30	3
Graminoids			
Coast Range fescue	Festuca subuliflora	55	2
western fescue	Festuca occidentalis	35	2
Columbia brome	Bromus vulgaris	30	2
Forbs and Ferns			
sword fern	Polystichum munitum	100	10
bracken fern	Pteridium aquilinum var. pubescens	70	7
sweet-scented bedstraw	Galium triflorum	60	2
western starflower	Trientalis borealis ssp. latifolia	60	2
twinflower	Linnaea borealis ssp. longiflora	50	5
big-leaved sandwort	Moehringia macrophylla	40	1
rattlesnake-plantain	Goodyera oblongifolia	40	+
licorice fern	Polypodium glycyrrhiza	30	1

Douglas-fir / salal / sword fern



Soil series: Everett, Dystric xerochrepts, Seaquest, Hesson, Xerochrepts, Alderwood, Guemes, Andic xerochrepts, Fidalgo, Rainier, Pheeny, Cagey, Typic udorthents

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. The few old-growth stands show evidence of past low- to moderate-severity fire (underburns). Most stands are young or mature in age, and many of our samples were disturbed by past logging activities (especially on Fort Lewis). Most stands are located in landscapes that formerly supported prairies or savannas maintained by Native American burning practices. It is probable that some of these stands could support more shade-tolerant conifers in the absence of long-term disturbance.

VEGETATION: Canopy dominated by Douglas-fir or occasionally co-dominated as well by bigleaf maple. Douglas-fir is sometimes regenerating under its own canopy in these stands. Salal dominates or co-dominates the understory . Oceanspray and/or beaked hazelnut usually form a prominent to co-dominant t all shrub layer. Trailing blackberry (an increaser with disturbance), dwarf Oregongrape, and common snowberry are often prominent in the shrub or dwarf-shrub layers. Other frequent shrubs and vines are baldhip rose, red huckleberry , and orange honeysuckle. Sword fern is always prominent to dominant in the herb layer; bracken fern is of ten prominent. Sweet-scented bedstraw , western st arflower, Coast Range fescue, and twinflower are frequently occurring herbs.

CLASSIFICATION NOTES: First described by Chappell (2001). Without a better sample of naturally-regenerated post-logging stands in western Washington lowlands, it is difficult at this point to be certain about the classification of this unit. It may very well be part of a larger association that includes many young seral stands. NatureServe (2005) does not recognize this association, but it is slated to be included in the future in a new global PSME/GASH-MANE/POMU association, which is broader in concept than this Puget Trough unit.

MANAGEMENT NOTES: These sites appear to be moderately productive for tree growth. S tands previously disturbed may be good candidates for selective logging techniques. Non-native English ivy (*Hedera helix*) may be a threat on some of these sites.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII / HOLODISCUS DISCOLOR - SYMPHORICARPOS ALBUS

Douglas-fir / oceanspray - common snowberry

Abbreviated Name: PSME/HODI-SYAL

Sample size = 8 plots

DISTRIBUTION: Occurs in the Olympic Mountains rainshadow, including San Juan and portions of Skagit, Island, and Clallam counties. May very rarely occur elsewhere in the Puget Trough.

GLOBAL/STATE STATUS: G1S1. Small global range. Very few occurrences of relatively good quality remain (7 are known). Most examples have been altered by past timber harvest or fragmentation.

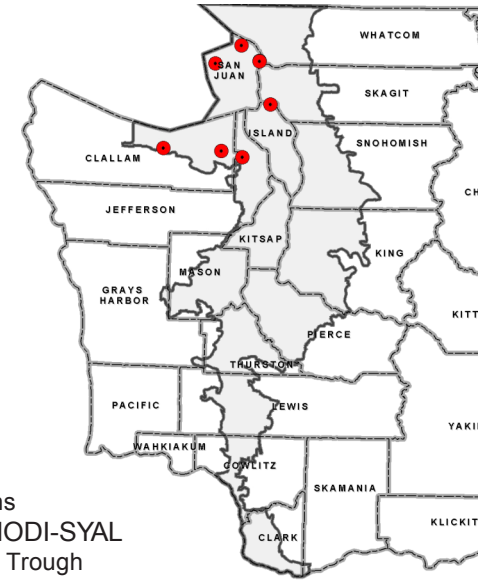
ID TIPS: Dominated by Douglas-fir, with little to no western hemlock, western redcedar, or grand fir present. Understory dominated by oceanspray and common snowberry. Baldhip rose usually prominent, western fescue usually present, beaked hazelnut absent. Sword fern less than 5% cover

ENVIRONMENT: These sites are moderately dry and appear to be medium to rich in relative nutrient status. Parent materials include glacial till, sedimentary residuum, and reworked glacial drift and marine sediment. Soils are often mapped as complexes with rock outcrop, but outcrops do not usually occur on plots representing this type. All sites have gentle to moderate slopes. Appears to occur exclusively in dry climatic areas (Olympic Mountains rainshadow).
Precipitation: 20-40 inches (mean 30)
Elevation: 50-650 feet
Aspect/slope: all/ 10-35% slope (mean 20)
Slope position: short, upper, mid, ridgetop, lower
Soil series: Pickett, Roche, Cassolary, Terbies, rough stony land

DISTURBANCE/SUCCESSION: In the pre-Western settlement landscape, a moderate-severity fire regime likely prevailed (variable severity, intermediate frequency), probably resulting in more open stands on average. Douglas-fir regeneration occurs under a variety of conditions. More shade-tolerant conifers are largely absent and do not appear capable of becoming important in late-seral stands under present conditions. On some islands, heavy deer browsing on deciduous shrubs probably prevents the development of this association.

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	64
Pacific madrone	Arbutus menziesii	25	6
western redcedar	Thuja plicata	25	2
grand fir	Abies grandis	13	3
western hemlock	Tsuga heterophylla	13	+
Shrubs and Dwarf-shrubs			
oceanspray	Holodiscus discolor	100	49
common snowberry	Symphoricarpos albus var. laevigatus	100	21
baldhip rose	Rosa gymnocarpa	88	12
trailing blackberry	Rubus ursinus var. macropetalus	88	4
orange honeysuckle	Lonicera ciliosa	63	5
tall Oregongrape	Mahonia aquifolium	63	2
dwarf Oregongrape	Mahonia nervosa	50	2
serviceberry	Amelanchier alnifolia	38	7
Rocky Mountain maple	Acer glabrum var. douglasii	25	11
Nootka rose	Rosa nutkana	25	6
spreading snowberry	Symphoricarpos hesperius	25	6
coast black gooseberry	Ribes divaricatum	25	3
Graminoids			
western fescue	Festuca occidentalis	88	3
Columbia brome	Bromus vulgaris	75	8
Alaska oniongrass	Melica subulata	75	6
Coast Range fescue	Festuca subuliflora	38	1
Forbs and Ferns			
cleavers	Galium aparine	88	7
western starflower	Trientalis borealis ssp. latifolia	88	3
sword fern	Polystichum munitum	75	2
mountain sweet-cicely	Osmorhiza berteroi	63	1
yerba buena	Clinopodium douglasii	50	7
woods strawberry	Fragaria vesca ssp. bracteata	50	4
Pacific sanicle	Sanicula crassicaulis var. crassicaulis	50	2
Nuttall's peavine	Lathyrus nevadensis ssp. lanceolatus var. pilosellus	38	5
licorice fern	Polypodium glycyrrhiza	38	1



Plot locations
of PSME/HODI-SYAL
in the Puget Trough

Douglas-fir / oceanspray - common snowberry

VEGETATION: Forest or woodland dominated by Douglas-fir Grand fir or western redcedar are occasionally present in small amounts, mainly as regeneration. Pacific madrone is occasionally prominent. A dense, relatively tall, deciduous shrub layer is typical with oceanspray dominating. Common snowberry is always at least prominent to, more often, co-dominant. Baldhip rose is always present and usually prominent to co-dominant. Rocky Mountain maple is occasionally prominent. Trailing blackberry, tall Oregongrape, and orange honeysuckle are other frequent woody plants. The herb layer can be relatively diverse and includes frequent occurrence of western fescue, Columbia brome, Alaska oniongrass, cleavers, western starflower, mountain sweet-cicely, sword fern, yerba buena, woods strawberry and Pacific sanicle.

CLASSIFICATION NOTES: This association was described as PSME/SYAL from Sucia Island (Fonda and Bernardi 1976) and as PSME/SYAL-HODI Chappell (1997). NatureServe (1995) name is PSME/SYAL-HODI, soon to be PSME/HODI-SYAL. This association was considered part of PSME-(ABGR)/SYAL-HODI association in the Fort Lewis classification (Chappell 2001).

MANAGEMENT NOTES: Stands that have not been previously harvested, especially mature and old-growth, should be considered for conservation status. Sites that have already been harvested may be well suited to uneven-aged management.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - JUNIPERUS SCOPULORUM / FESTUCA (ROEMERI, RUBRA) - ASPIDOTIS DENSA

Douglas-fir - Rocky Mountain juniper / fescue - Indian's dream

Abbreviated Name: PSME-JUSC/FEST-ASDE

Synonym: *Pseudotsuga menziesii - Juniperus scopulorum / Festuca (idahoensis, rubra) - Aspidotis densa*

Sample size = 8 plots

DISTRIBUTION: Occurs only on a few islands in western Skagit County. Best developed on Cypress Island.

GLOBAL/STATE STATUS: GNRS1. Less than 5 occurrences exist in a very small global range. Continuing increase in density of these woodlands is probably a threat in some areas.

ID TIPS: Open canopy Douglas-fir, or less commonly madrone. Understory dominated by Roemer's or red fescue. Rocky Mountain juniper or Indian's dream present. Occurs on serpentine soils.

ENVIRONMENT: Sites are dry to very dry and relatively nutrient-poor. Occurs mostly on serpentine-influenced soils. Slopes tend to be southerly or westerly. Parent materials can include colluvium, residuum, and possibly glacial till (latter would be mixed with one of former). Soils are probably quite shallow under existing stands.
Precipitation: 27-30 inches
Elevation: 150-1350 feet
Aspect/slope: SE to NW; 35-60
Slope position: upper, mid, ridgetop
Soil series: Guemes, dystric xerochrepts, lithic haploxerols
Special: Serpentine

DISTURBANCE/SUCCESSION: Tree density has increased with fire suppression and may be continuing to increase in some of these woodlands. Probably was more extensive in pre-Western settlement landscape than currently due to more frequent fires. Shallow and harsh soils probably help limit pace of succession toward forest in absence of fire. Heavy deer browsing on some islands probably retards tree establishment and growth, and therefore succession to forest, as well.

VEGETATION: Woodland or open forest usually dominated by Douglas-fir.; occasionally dominated by Pacific madrone with Douglas-fir present. Rocky Mountain juniper is usually present as

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found; Cov = cover , the mean crown cover of the species in plots where it was found; + = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var menziesii	100	31
Rocky Mountain juniper	Juniperus scopulorum	88	9
lodgepole pine	Pinus contorta var. contorta	75	8
Pacific madrone	Arbutus menziesii	63	16
Shrubs and Dwarf-shrubs			
baldhip rose	Rosa gymnocarpa	75	3
tall Oregongrape	Mahonia aquifolium	75	2
hairy h oneysuckle	Lonicera hispidula	50	3
Graminoids			
blue wildrye	Elymus glaucus	100	8
early hairgrass	Aira praecox	75	4
red fescue	Festuca rubra	63	21
California brome	Bromus carinatus	63	3
Roemer's fescue	Festuca roemeri	50	20
western fescue	Festuca occidentalis	50	11
prairie junegrass	Koeleria macrantha	38	6
silver hairgrass	Aira caryophyllea	38	2
wood-rush	Luzula (comosa, multiflora ssp. multiflora)	38	1
Forbs and Ferns			
Indian's dream	Aspidotis densa	75	4
yarrow	Achillea millefolium var. occidentalis	63	2
meadow death camas	Zigadenus venenosus var. venenosus	63	1
western starflower	Trientalis borealis ssp. latifolia	50	1
early blue violet	Viola adunca var. adunca	38	2
Hooker's onion	Allium acuminatum	35	+
field chickweed	Cerastium arvense ssp. strictum	25	4
Wallace's selaginella	Selaginella wallacei	25	3
woolly sunflower	Eriophyllum lanatum var. lanatum	25	+
common strawberry	Fragaria virginiana ssp. platypetala	25	+
Pacific sanicle	Sanicula crassicaulus	25	+

Plot locations
of PSME-JUSC/FEST-ASDE
in the Puget Trough

Douglas-fir - Rocky Mountain juniper / fescue - Indian's dream

a small tree. Lodgepole pine is often present to co-dominant. The understory is dominated or co-dominated by the grasses Roemer's and/or red fescue. The nativity of red fescue in this habitat is uncertain. Blue wildrye is consistently present. Western fescue is prominent in half the plots. Other herbs usually present include Indian's dream (a fern), California brome, yarrow, early hairgrass, and death camas. Shrubs are usually present only in small amounts, with tall Oregongrape and baldhip rose being frequent.

CLASSIFICATION NOTES: This association has not been previously described and is not recognized by NatureServe (2005). We are not certain about the identity of the dominant fescue (Roemer's or red) on some of our plots.

MANAGEMENT NOTES: Especially in areas without heavy deer browse on Douglas-fir seedlings and saplings, it may be necessary to remove small Douglas-fir in order to maintain or restore woodland with herbaceous understory. Care should be taken to avoid disturbances so intense that they facilitate loss of native understory or massive increase of non-native herbs. Prescribed burning is a management tool that merits further research and evaluation.

BIODIVERSITY NOTES: Some of the plant species found on serpentine soils may have developed unique physiological and/or genetic adaptations to the chemical and hydrologic stresses of those soils. There are two vascular plant species in the Puget Trough, Rocky Mountain juniper and Indian's dream, that the data indicate are more common on these soils than elsewhere, and there may be other vascular or non-vascular species with a similar occurrence pattern.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII / ROSA GYMNOCARPA - HOLODISCUS DISCOLOR

Douglas-fir / baldhip rose - oceanspray
Abbreviated Name: PSME/ROGY-HODI

Sample size = 26 plots

DISTRIBUTION: Occurs in the Olympic Mountains rainshadow, including San Juan, and portions of Skagit, Whatcom, and Clallam counties. Also occurs in southwestern BC and in the northeastern Olympic Mountains.

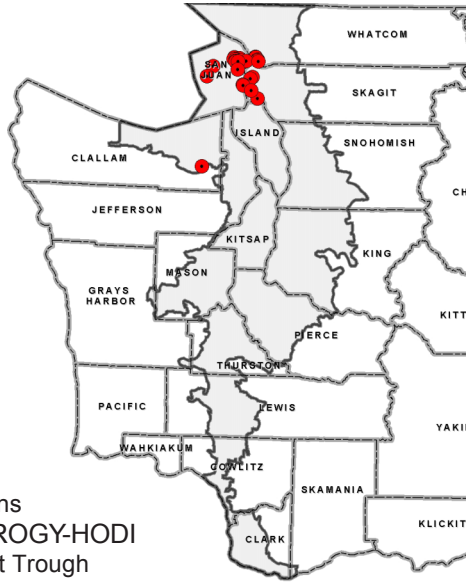
GLOBAL/STATE STATUS: G2G3S2. Restricted natural range and relatively specific environmental range. Few occurrences of relatively good quality remain (12 are known in WA, though there are undoubtedly more in the Olympic Mountains). Most examples have been altered by past timber harvest.

ID TIPS: Dominated by Douglas-fir with little to no western hemlock, western redcedar, or grand fir present. Understory dominated by baldhip rose, oceanspray dwarf Oregongrape and/ or western fescue. Sword fern, salal, and common snowberry, if present, less than 5% cover

ENVIRONMENT: These sites are very dry and appear to be relatively poor to medium in nutrient status: they are some of the driest sites that support forest in the ecoregion. The vast majority of sites have soils that are shallow to residual bedrock, with outcrops usually visible on the plot. Other parent materials include glacial till and colluvium. Aspects are more commonly south to west, but include the entire spectrum. Occurs exclusively in dry climatic areas (Olympic rainshadow). The majority of these sites are located at elevations greater than 600 feet.
Precipitation: 24-45 inches (mean 35)
Elevation: 90-1800 feet
Aspect/slope: all/ 5-112% slope (mean 51)
Slope position: upper, mid, ridgetop, lower
Soil series: rock outcrop, Pickett, Roche, Guemes, andic xerochrepts, lithic haploxerolls, rockland

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found; Cov = cover , the mean crown cover of the species in plots where it was found; + = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	76
western hemlock	Tsuga heterophylla	35	2
lodgepole pine	Pinus contorta var. contorta	27	8
Pacific madrone	Arbutus menziesii	23	2
grand fir	Abies grandis	19	2
Shrubs and Dwarf-shrubs			
baldhip rose	Rosa gymnocarpa	100	6
oceanspray	Holodiscus discolor	81	16
dwarf Oregongrape	Mahonia nervosa	69	15
tall Oregongrape	Mahonia aquifolium	50	3
common snowberry	Symphoricarpos albus var. laevigatus	50	2
trailing blackberry	Rubus ursinus ssp. macropetalus	46	1
hairy honeysuckle	Lonicera hispidula	27	3
Graminoids			
western fescue	Festuca occidentalis	88	8
Columbia brome	Bromus vulgaris	73	3
Alaska oniongrass	Melica subulata	65	4
Coast Range fescue	Festuca subuliflora	50	3
blue wildrye	Elymus glaucus	46	3
red fescue	Festuca rubra	12	5
Forbs and Ferns			
western starflower	Trientalis borealis ssp. latifolia	77	2
cleavers	Galium aparine	65	1
licorice fern	Polypodium glycyrrhiza	58	+
bracken fern	Pteridium aquilinum var. pubescens	54	3
big-leaved sandwort	Moehringia macrophylla	54	3
sword fern	Polystichum munitum	50	3
wall lettuce	Mycelis muralis	46	1
woods strawberry	Fragaria vesca ssp. bracteata	38	1
white-flowered hawkweed	Hieracium albiflorum	31	+
broad-leaved stonecrop	Sedum spathulifolium ssp. spathulifolium	23	4
Scouler's bellflower	Campanula scouleri	23	3



Plot locations
of PSME/ROGY-HODI
in the Puget Trough

Douglas-fir / baldhip rose - oceanspray

DISTURBANCE/SUCCESSION: In the pre-Western settlement landscape, a moderate-severity fire regime likely prevailed (variable severity, intermediate frequency) resulting in more open stands. Some of these sites may have been savannas prior to 1850. Douglas-fir regeneration occurs under many conditions and is especially abundant after fires. More shade-tolerant conifers are largely absent and do not appear capable of becoming important in late-seral stands under present conditions. If a lodgepole pine seed source is available after a high-severity fire, lodgepole pine may become locally dominant. Heavy deer browsing on many sites results in reduction or elimination of oceanspray and apparently an increase in grass cover

VEGETATION: Forest or woodland dominated by Douglas-fir Western hemlock is occasionally present in small amounts, mainly as regeneration. Lodgepole pine is also occasionally present to prominent. Baldhip rose is always present and often prominent in the understory. Oceanspray and dwarf Oregongrape are often prominent to dominant. Western fescue is usually prominent to co-dominant in the herb layer. Other common herbs include Columbia brome,Alaska oniongrass, Coast Range fescue, western starflower, cleavers, licorice fern, bracken fern, and big-leaved sandwort.

CLASSIFICATION NOTES: Chappell (1997) split this association into two closely related associations, PSME/ROGY/FEOC and PSME/HODI/MESU. This association also occurs on the Olympic National Forest (Henderson et al. 1989). In the near future, NatureServe name will become PSME/HODI-ROGY/FEOC.

MANAGEMENT NOTES: Stands that have not been previously harvested, especially mature and old-growth, should be considered for conservation status. Timber productivity is very low on these sites.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII – THUJA PLICATA – (ABIES GRANDIS) / GAULTHERIA SHALLON

Douglas-fir – western redcedar – (grand fir) / salal
Abbreviated Name: PSME-THPL-(ABGR)/GASH

Sample size = 29 plots

DISTRIBUTION: In Washington, this association occurs only in the Olympic rainshadow area of San Juan, western Skagit, western Whatcom, eastern Clallam, northeastern Jefferson, and central to northern Island counties. It also occurs in adjacent British Columbia on the Gulf Islands and southeastern Vancouver Island.

GLOBAL/STATE STATUS: G2S1. There are only 8 high-quality occurrences known in Washington. Much of the area of this type has been displaced or degraded by development. The vast majority of stands have been significantly impacted by past timber harvest. Development is an ongoing threat. The type also has a limited geographic range.

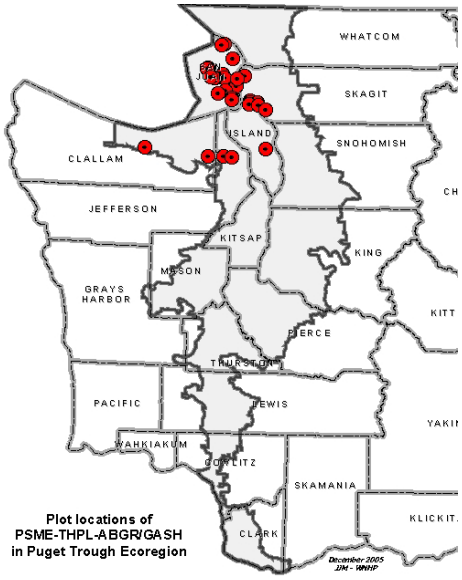
ID TIPS: Located in the Olympic rainshadow *and* western hemlock <25% cover *and* the combined cover of western redcedar and grand fir is greater than that of hemlock. Western redcedar almost always occupies >10% cover or is the dominant tree regeneration. Salal occupies >10% cover or dwarf Oregongrape occupies >5% cover. Sword fern is absent or occupies <5% cover.

ENVIRONMENT: These sites are moderately dry to mesic and appear to be relatively nutrient-poor. Sites are typically gently to moderately sloping. Aspect is more often northerly or easterly. Mid to upper slopes are most frequent. Parent materials are most often glacial till or residuum, but also include colluvium and glacial outwash. Stony or gravelly loams are most typical, with sandy loams also important. Coarse fragments are usually abundant. Occurs in dry climatic areas.

Precipitation: 21-46 inches (mean 28)
Elevation: sea level - 1250 feet
Aspect/slope: N to E, various/ 5-64% (mean 20)
Slope position: mid, upper, plain, short, lower
Soil series: Roche, Fidalgo, Alderwood, Catla, Dick, Guemes, Pickett, Rough stony land, Terbies, Tukey

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	54
western redcedar	Thuja plicata	97	42
grand fir	Abies grandis	72	15
western hemlock	Tsuga heterophylla	52	8
Scouler's willow	Salix scouleriana	31	4
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	93	44
oceanspray	Holodiscus discolor	76	10
baldhip rose	Rosa gymnocarpa	72	3
dwarf Oregongrape	Mahonia nervosa	59	9
red huckleberry	Vaccinium parvifolium	55	3
orange honeysuckle	Lonicera ciliosa	41	1
trailing blackberry	Rubus ursinus ssp. macropetalus	31	1
Rocky Mountain maple	Acer glabrum var. douglasii	10	10
Graminoids			
Coast Range fescue	Festuca subuliflora	48	2
western fescue	Festuca occidentalis	38	2
Forbs and Ferns			
sword fern	Polystichum munitum	79	1
western starflower	Trientalis borealis ssp. latifolia	48	1



Douglas-fir – western redcedar – grand fir / salal

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Western redcedar, and if present, grand fir, increase over time in the absence of disturbance, Douglas-fir decreases, though still remains prominent after hundreds of years. When western hemlock occurs in this association, it appears to be less competitive than redcedar and grand fir, and to survive less well in the long-term, probably due to its lesser drought-tolerance. Depending on seed sources, Pacific madrone or lodgepole pine could regenerate abundantly on these sites after a major disturbance and persist until sometime in the middle of the sere.

VEGETATION: Canopy is usually dominated by Douglas-fir, but occasionally by western redcedar and/or grand fir. Western redcedar is almost always present and grand fir is usually present. Western redcedar and/or grand fir dominates tree regeneration. Western hemlock is sometimes present in small amounts and occasionally prominent in the understory or lower canopy layers. Salal is almost always present and typically dominates the understory, but on occasion dwarf Oregongrape dominates. Oceanspray usually forms a prominent tall shrub layer. Baldhip rose, dwarf Oregongrape, and red huckleberry are usually present in the shrub layer. The herb layer is poorly developed. Sword fern is usually present in small amounts (<5% cover). Western starflower and Coast Range fescue are found in about half the plots.

CLASSIFICATION NOTES: Fonda and Bernardi (1976) described this association from Sucia Island and called it THPL-PSME/GASH. Chappell (1997) called it PSME-THPL/GASH-HODI. NatureServe (2005) currently calls it THPL/GASH, but will in the near future call it part of PSME-(THPL-ABGR)/MANE-GASH.

MANAGEMENT NOTES: Stands that have not been previously harvested, especially mature and old-growth, should be considered for conservation status. These sites appear to be moderately low in productivity for tree growth. Pacific madrone or lodgepole pine can be important on these sites early in succession, but would be expected to be out-competed and/or die out within about 100 years.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII / SYMPHORICARPOS (ALBUS, HESPERIUS) - AMELANCHIER ALNIFOLIA

Douglas-fir / snowberry - serviceberry
Abbreviated Name: PSME/SYMPH-AMAL
Synonym: *Pseudotsuga menziesii / Symphoricarpos (albus, mollis) - Amelanchier alnifolia*

Sample size = 30 plots

DISTRIBUTION: Occurs in the southern Puget Sound area in the vicinity of historic prairies, including portions of Pierce and Thurston, possibly Grays Harbor and Lewis, counties. Not recorded elsewhere.

GLOBAL/STATE STATUS: GNRS4. Probably 20-100 occurrences exist. This association has probably increased dramatically since pre-Western settlement era.

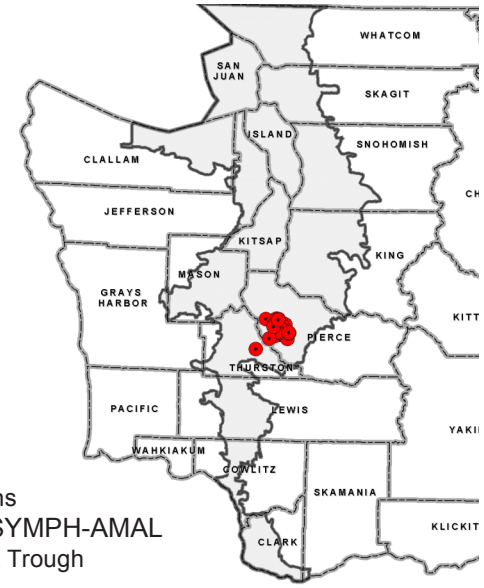
ID TIPS: Dominated by Douglas-fir, with little to no western hemlock, western redcedar, or grand fir present. Swordfern present but providing <10% cover Usually co-dominated by one or both of the snowberry species. One or more of the following usually present: long-stolon sedge, woods strawberry blue wildrye, yerba buena, snow-queen, tall Oregongrape, enchanter's nightshade (*Circaea alpina*), and starry false Solomon's seal.

ENVIRONMENT: These sites are moderately dry and appear to be relatively nutrient-rich. Parent material is gravelly sandy glacial outwash. Most sites are flat plains, though also occurs on gentle ridgetops or slopes. Soils usually have a very well-developed A horizon due to their development under grasslands.
Precipitation: 39-45 inches (mean 41)
Elevation: 200-450 feet
Aspect/slope: various/ 0-16% slope (mean 2)
Slope position: plain, ridgetop, mid, short
Soil series: Spanaway, Fitch, Everett

DISTURBANCE/SUCCESSION: In the pre-Western settlement landscape, this association was probably quite rare or even absent. The vast majority of this association formed after the cessation of frequent Native American burning about 150 years ago and the subsequent invasion of grasslands or savannas by Douglas-fir. Douglas-fir is usually the dominant tree regeneration. More shade-tolerant and fire-sensitive conifers like western

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found; Cov = cover , the mean crown cover of the species in plots where it was found; + = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	80
Orgeon white oak	Quercus garryana var. garryana	67	4
bigleaf maple	Acer macrophyllum	40	7
Shrubs and Dwarf-shrubs			
common snowberry	Symphoricarpos albus var. laevigatus	97	12
trailing blackberry	Rubus ursinus ssp. macropetalus	93	19
spreading snowberry	Symphoricarpos hesperius	90	13
serviceberry	Amelanchier alnifolia	90	4
tall Oregongrape	Mahonia aquifolium	87	1
orange honeysuckle	Lonicera ciliosa	80	7
Indian plum	Oemleria cerasiformis	80	5
baldhip rose	Rosa gymnocarpa	77	1
beaked hazelnut	Corylus cornuta var. californica	73	13
dwarf Oregongrape	Mahonia nervosa	57	5
oceanspray	Holodiscus discolor	53	11
Scot's broom	Cytisus scoparius	50	1
Graminoids			
Columbia brome	Bromus vulgaris	97	5
Alaska oniongrass	Melica subulata	53	4
long-stolon sedge	Carex inops ssp. inops	43	6
Coast Range fescue	Festuca subuliflora	33	3
Forbs and Ferns			
sword fern	Polystichum munitum	100	4
sweet-scented bedstraw	Galium triflorum	80	2
sweet-cicely	Osmorhiza berteroi	63	1
western starflower	Trientalis borealis ssp. latifolia	60	1
pathfinder	Adenocaulon bicolor	53	1
woods strawberry	Fragaria vesca ssp. bracteata	53	1
wall lettuce	Mycelis muralis	50	5
cleavers	Galium aparine	50	2
yerba buena	Clinopdium douglasii	50	2
rattlesnake-plantain	Goodyera oblongifolia	50	+
twinflower	Linnaea borealis var. longiflora	40	14
starry false Solomon's-seal	Maianthemum stellatum	40	5
snow-queen	Synthris reniformis var. reniformis	37	2
Siberian springbeauty	Claytonia siberica var. siberica	33	3
bracken fern	Pteridium aquilinum var. pubescens	30	5



Plot locations
of PSME/SYMPH-AMAL
in the Puget Trough

Douglas-fir / snowberry - serviceberry

hemlock are largely absent. Trailing blackberry typically increases with ground disturbance and its great abundance in this association may be a function of the prevalence of such activities on military reservations where the data were collected. Most stands where data were collected for this association had been disturbed by past thinning activities.

VEGETATION: Forest dominated by Douglas-fir. Oregon white oak is often present in small amounts and bigleaf maple is occasionally prominent. The understory is rather variable in composition. It is usually co-dominated by common snowberry, creeping snowberry, and trailing blackberry. Beaked hazelnut, oceanspray and twinflower are less frequently found co-dominating. Other frequent species include serviceberry, tall Oregongrape, orange honeysuckle, Indian plum, baldhip rose, dwarf Oregongrape, Columbia brome, sword fern, sweet-scented bedstraw, mountain sweet-cicely, and western starflower. See ID tips section also.

CLASSIFICATION NOTES: This association was described as PSME/SYMPH by Chappell (2001). Not currently recognized by NatureServe (2005), but will be added in the near future.

MANAGEMENT NOTES: Well suited to management for Douglas-fir regeneration under a thinned canopy or using uneven-aged management. This association appears to be moderately productive for tree growth.

BIODIVERSITY NOTES: This association, because of its local abundance and close association with southern Puget Sound prairies and oak woodlands, is undoubtedly part of the habitat of the state threatened western gray squirrel (*Sciurus griseus*), which requires conifers in close proximity to oak and water.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII – THUJA PLICATA / GAULTHERIA SHALLON – MAHONIA NERVOSA / POLYSTICHUM MUNITUM

Douglas-fir – western redcedar / salal – dwarf Oregongrape / sword fern
Abbreviated Name: PSME-THPL/GASH-MANE/POMU
Synonym: *Pseudotsuga menziesii – Thuja plicata / Gaultheria shallon – Berberis nervosa / Polystichum munitum*

Sample size = 16 plots

DISTRIBUTION: In Washington, this association occurs only in the Olympic rainshadow area of San Juan, western Skagit, western Whatcom (Lummi Island), eastern Clallam, northeastern Jefferson, and central to northern Island counties. It also occurs in adjacent British Columbia on the Gulf Islands and southeastern Vancouver Island.

GLOBAL/STATE STATUS: G1S1. Throughout its range much of this association has been converted to residential development and agriculture, or if not, then almost all the remainder has been heavily disturbed by past logging. It has a very limited global range. There are only about 5 high-quality occurrences known in Washington, all of which are relatively small. Threats include non-native species and further development.

ID TIPS: Located in the Olympic rainshadow*and* western hemlock <25% cover*and* the combined cover of western redcedar and grand fir is greater than that of hemlock. Western redcedar always occupies >10% cover or is the dominant tree regeneration. Salal occupies >10% cover or dwarf Oregongrape occupies >5% cover. Sword fern occupies >5% cover

ENVIRONMENT: These sites are moderately dry to mesic and appear to be relatively nutrient-rich. Sites are flat to fairly steep (usually gentle) on a variety of aspects. Slope positions tend to be neutral with regard to moisture. Parent materials apparently all have restrictive layers of till or bedrock and include glacial till, residuum (including ultramafics), and colluvium. Soil textures range from silt loam to sandy loam (loam most common), with abundant gravelly or stony components. Found mostly in areas with a very dry climate.

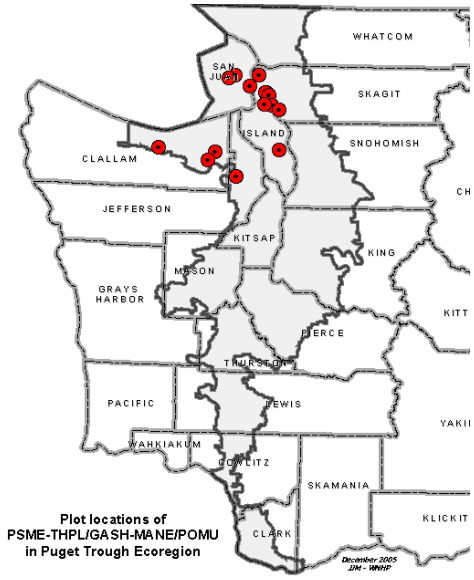
Precipitation: 20-40 inches (mean 29)
Elevation: sea level - 600 feet
Aspect/slope: various/ 0-70% (mean 22)

Douglas-fir – western redcedar / salal – dwarf Oregongrape / sword fern

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	**Kartesz 2005 Name**	**Con**	**Cov**
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	50
western redcedar	Thuja plicata	100	40
western hemlock	Tsuga heterophylla	75	12
grand fir	Abies grandis	56	28
bigleaf maple	Acer macrophyllum	38	12
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	88	24
dwarf Oregongrape	Mahonia nervosa	75	16
red huckleberry	Vaccinium parvifolium	75	3
oceanspray	Holodiscus discolor	69	4
trailing blackberry	Rubus ursinus ssp. macropetalus	69	2
baldhip rose	Rosa gymnocarpa	56	2
orange honeysuckle	Lonicera ciliosa	50	1
English holly	Ilex aquifolium	31	+
Indian plum	Oemleria cerasiformis	31	+
Rocky Mountain maple	Acer glabrum var. douglasii	13	13
Graminoids			
Coast Range fescue	Festuca subuliflora	56	3
Columbia brome	Bromus vulgaris	31	+
Forbs and Ferns			
sword fern	Polystichum munitum	100	13
western starflower	Trientalis borealis ssp. latifolia	69	3
sweet-scented bedstraw	Galium triflorum	56	1
twinflower	Linnaea borealis ssp. longiflora	50	3
threeleaf foamflower	Tiarella trifoliata var. trifoliata	50	1
bracken fern	Pteridium aquilinum var. pubescens	31	1
spreading woodfern	Dryopteris expansa	31	+

Douglas-fir – western redcedar / salal – dwarf Oregongrape / sword fern



Plot locations of PSME-THPL/GASH-MANE/POMU in Puget Trough Ecoregion

Douglas-fir – western redcedar / salal – dwarf Oregongrape / sword fern

Slope position: mid, short, lower, plain, upper
Soil series: Fidalgo, Roche, Whistle, Terbies, Guemes, Bow, Beausite, Alderwood

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Western redcedar, and if present, grand fir, increase over time in the absence of disturbance, Douglas-fir decreases, though still remains prominent after hundreds of years. When western hemlock occurs in this association, it appears to be less competitive than redcedar and grand fir, and to survive less well in the long-term, probably due to its lesser drought-tolerance.

VEGETATION: Canopy dominated by Douglas-fir, western redcedar (always present), and/or grand fir. Western redcedar and/or grand fir dominates tree regeneration. Western hemlock is usually present in small amounts, and can be prominent in the understory or lower canopy layers. Bigleaf maple is sometimes prominent in the lower canopy. Salal and/or dwarf Oregongrape dominate or co-dominate the understory. Rocky Mountain maple is occasionally prominent as a tall shrub or small tree. Other shrubs frequently present are red huckleberry, oceanspray, trailing blackberry and baldhip rose. Sword fern is always prominent to dominant in the herb layer but never reaches very high cover values (usually <35%). Western starflower, sweet-scented bedstraw, Coast Range fescue, twinflower, and foamflower are frequently occurring herbs.

CLASSIFICATION NOTES: A very similar association was first described in the U.S. by Chappell (1997) under the name PSME-THPL/GASH/POMU. NatureServe (2005) does not currently recognize this association, but will in the near future under the name THPL-PSME-ABGR/MANE/POMU.

MANAGEMENT NOTES: Stands that have not been previously harvested should be considered for conservation status. These sites appear to be moderately productive for tree growth. Non-native English ivy (*Hedera helix*) is probably a threat to this association if it becomes established.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - THUJA PLICATA / OXALIS OREGANA

Douglas-fir - western redcedar / Oregon oxalis
Abbreviated Name: PSME-THPL/OXOR

Sample size = 7 plots

DISTRIBUTION: Within the Puget Trough, occurs infrequently in southern Pierce, Lewis, Cowlitz, Clark, and possibly Thurston, counties. Occurs more commonly in the western Cascades of southern Washington. Also occurs in northwestern Oregon, in the Willapa Hills and perhaps on the southern Olympic Peninsula.

GLOBAL/STATE STATUS: G3G4S2. Rare in the PugetTrough. Development and non-native species are threats in the Puget Trough. Somewhat more common in the southwestern Cascades, and much more common in Oregon, where most natural-origin stands have been harvested.

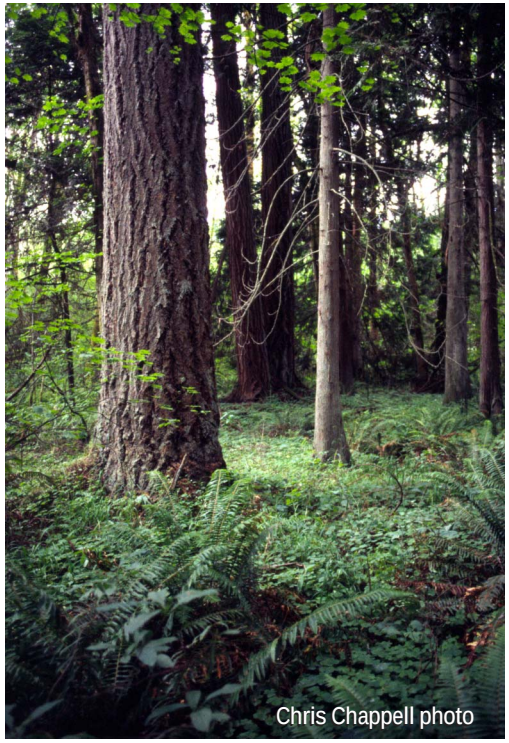
ID TIPS: Oregon oxalis and sword fern each provide >5% cover and typically co-dominate the understory Devils club <10% cover if present.

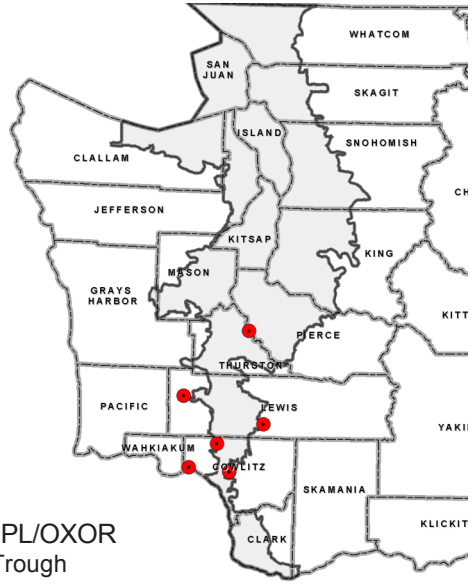
ENVIRONMENT: These sites are moist to very moist and appear to be relatively nutrient-rich. Slopes are mostly gentle to moderate and aspect is northerly or easterly All samples are from lower slopes or riparian terraces. Parent materials include ancient basaltic residuum, alluvium, and glaciofluvial sediments. Silt loam and silty clay loam were the mapped soil textures. Mean annual precipitation is high for the Puget Trough.
Precipitation: 46-90 inches (mean 64)
Elevation: 40-1000 feet
Aspect/slope: NNW to SE/ 0-65% (mean 30)
Slope position: lower, bottom (terrace)
Soil series: Olympic, Cinebar, Olequa, Puyallup

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance, though on riparian terraces flooding will also be important. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Hemlock and/or redcedar increase over time in absence of disturbance, Douglas-fir decreases. Young stands may have little hemlock or redcedar Red alder may regenerate abundantly after disturbance if a seed

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	52
western redcedar	Thuja plicata	100	37
western hemlock	Tsuga heterophylla	86	19
bigleaf maple	Acer macrophyllum	71	25
cascara	Frangula purshiana	57	+
grand fir	Abies grandis	43	6
Shrubs and Dwarf-shrubs			
vine maple	Acer circinatum	86	18
red huckleberry	Vaccinium parvifolium	71	7
red elderberry	Sambucus racemosa var. racemosa	71	2
trailing blackberry	Rubus ursinus ssp. macropetalus	57	+
salal	Gaultheria shallon	57	2
dwarf Oregongrape	Mahonia nervosa	43	4
beaked hazelnut	Corylus cornuta var. californica	43	3
Indian plum	Oemleria cerasiformis	43	2
salmonberry	Rubus spectabilis var. spectabilis	43	1
devils club	Oplopanax horridus	14	3
Forbs and Ferns			
Oregon oxalis	Oxalis oregana	100	39
sword fern	Polystichum munitum	100	34
western trillium	Trillium ovatum ssp. ovatum	86	1
spreading woodfern	Dryopteris expansa	71	4
inside-out flower	Vancouveria hexandra	71	2
Siberian springbeauty	Claytonia siberica var. siberica	71	+
lady-fern	Athyrium filix-femina ssp. cyclosorum	57	3
sweet-scented bedstraw	Galium triflorum	57	+
Pacific bleedingheart	Dicentra formosa ssp. formosa	43	4
Columbia windflower	Anemone deltoidea	43	1
Smith's fairybells	Prosartes smithii	43	1
slender-stem waterleaf	Hydrophyllum tenuipes	43	+
clasping-leaved twisted-stalk	Streptopus amplexifolius var. amplexifolius	43	+





Plot locations of PSME-THPL/OXOR in the Puget Trough

Douglas-fir - western redcedar / Oregon oxalis

source is present and mineral soil is exposed. Alder will typically die out after 80-100 years. Salmonberry and several forbs may increase in abundance after ground surface disturbance.

VEGETATION: Forest co-dominated by Douglas-fir, western redcedar, and sometimes western hemlock also. Western hemlock or western redcedar typically dominate tree regeneration. Bigleaf maple usually forms a prominent to co-dominant lower canopy layer. Sword fern and Oregon oxalis co-dominate the understory. Vine maple usually forms a prominent to dominant tall shrub layer. Red huckleberry, red elderberry, inside-out flower, spreading woodfern, Siberian springbeauty, western trillium, trailing blackberry, salal, sweet-scented bedstraw, and lady-fern are usually present.

CLASSIFICATION NOTES: Described by Chappell (1997) as TSHE/POMU-OXOR and by Chappell (2001) as PSME-TSHE/POMU-OXOR. This association correlates with NatureServe (2005) types that are currently called TSHE/OXOR-POMU and TSHE/OXOR. Future changes in NatureServe classification will recognize this association as part of PSME-TSHE/POMU-OXOR, whch also includes the very similar TSHE/POMU-OXOR from Gifford Pinchot National Forest (Topik et al 1986) and TSHE-OXOR from northwestern Oregon (McCain and Diaz 2002a&b). Related types (including one named TSHE/POMU-OXOR) on Olympic National Forest (Henderson et al. 1989) differ in associated understory species from the Puget Trough type and have much less Douglas-fir. We consider these more maritime types to be a different association than our PSME-THPL/OXOR.

MANAGEMENT NOTES: Red alder can regenerate abundantly after logging of this association. These sites are very productive for tree growth. Non-native English ivy (*Hedera helix*) does well on these sites and if present can quickly overwhelm the native understory. Herb Robert (*Geranium robertianum*) is another threatening invasive for this association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - THUJA PLICATA / RHODODENDRON MACROPHYLLUM

Douglas-fir - western redcedar / Pacific rhododendron
Abbreviated Name: PSME-THPL/RHMA

Sample size = 14 plots

DISTRIBUTION: Occurs in the northern Puget Trough, including Jefferson, Clallam, Island, and possibly Skagit (Cypress Island) counties. Closely similar types that we consider part of the same association occur in the eastern Olympic Mountains and in the Oregon Cascades.

GLOBAL/STATE STATUS: G4S4. Within the Puget Trough, the vast majority of stands have been harvested in the past and there are very few good quality occurrences. In the adjacent Olympic Mountains, the more montane version of this association is relatively common and in better condition.

ID TIPS: Pacific rhododendron and salal co-dominate the understory. Rhododendron always provides >5% cover Evergreen huckleberry provides <5% and sword fern <3% cover

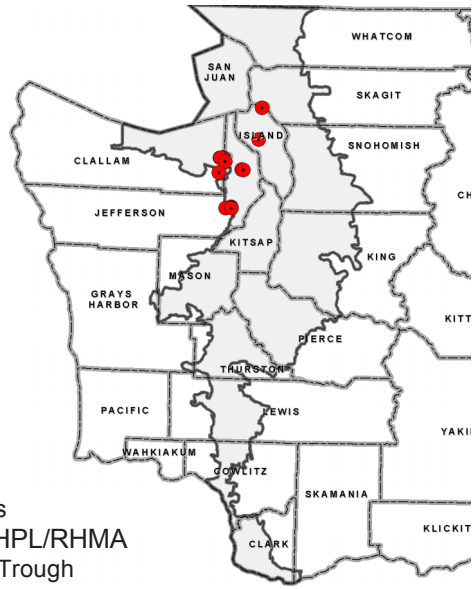
ENVIRONMENT: These sites are moderately dry and appear to be very nutrient-poor. Parent materials include glacial till, glacial outwash, residuum, and colluvium. Soil texture is usually gravelly or very gravelly sandy loam. This association is most common in areas with relatively low annual precipitation.
Precipitation: 23-64 inches (mean 37)
Elevation: 100-1000 feet
Aspect/slope: various/ 0-47% (mean 14%)
Slope position: plain, mid, ridgetop, upper, short
Soil series: Catla, Hoypus, Triton, Olete, Louella, Beausite

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Western hemlock and/or redcedar increase over time in absence of disturbance, Douglas-fir decreases. Young stands may have little hemlock or redcedar Pacific madrone can become more important after fire.

VEGETATION: Douglas-fir tends to dominate the uppermost canopy layer. Western redcedar or western hemlock (the former more commonly) usually either co-dominate the canopy with Douglas-fir or dominate tree regeneration. Pacific rhododendron

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	70
western redcedar	Thuja plicata	93	46
western hemlock	Tsuga heterophylla	71	23
Pacific madrone	Arbutus menziesii	29	8
Shrubs and Dwarf-shrubs			
Pacific rhododendron	Rhododendron macrophyllum	100	24
salal	Gaultheria shallon	100	22
dwarf Oregongrape	Mahonia nervosa	86	6
oceanspray	Holodiscus discolor	57	5
evergreen huckleberry	Vaccinium ovatum	50	2
red huckleberry	Vaccinium parvifolium	50	1
baldhip rose	Rosa gymnocarpa	43	1
trailing blackberry	Rubus ursinus var. macropetalus	29	1
Forbs and Ferns			
bracken fern	Pteridium aquilinum var. pubescens	21	3
sword fern	Polystichum munitum	21	+



Plot locations
of PSME-THPL/RHMA
in the Puget Trough

Douglas-fir - western redcedar / Pacific rhododendron

and salal typically co-dominate the shrub layer Dwarf Oregongrape is usually present and occasionally co-dominant. Oceanspray is often present and sometimes prominent. Evergreen huckleberry and red huckleberry are present in small amounts in about half the plots. The herb layer is low in diversity and cover.

CLASSIFICATION NOTES: Described originally by Chappell (1997) as PSME-TSHE/RHMA-GASH. NatureServe (2005) currenty considers it part of PSME-TSHE/RHMA-VAOV-GASH and TSHE/RHMA; in the near future it will be part of much broader PSME-TSHE/RHMA. In the Olympic National Forest and northwestern Oregon Cascades, the TSHE/RHMA-GASH association is very similar (Henderson et al. 1989, McCain and Diaz 2002b).

MANAGEMENT NOTES: Stands that have not been previously harvested or mature and old-growth stands, even if they have been disturbed by thinning, should be considered for conservation status. These sites are low productivity for tree growth.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII – TSUGA HETERPHYLLA / GAULTHERIA SHALLON – HOLODISCUS DISCOLOR

Douglas-fir – western hemlock / salal – oceanspray

Abbreviated Name: PSME-TSHE/GASH-HODI

Sample size = 13 plots

DISTRIBUTION: This association occurs mostly on the north-east Olympic Peninsula (Clallam and Jefferson counties), and in western Whatcom, western Skagit, and Island counties. Elsewhere in the Puget Trough, it is uncommon to rare and may be absent entirely from Kitsap, Mason, and Clark counties. It also occurs in the northern and eastern Olympic Mountains.

GLOBAL/STATE STATUS: G2G3S2S3. There are less than 10 known high-quality occurrences, with perhaps additional ones in the Olympic Mountains. At least within the Puget Trough, the vast majority of stands have been significantly degraded by past logging. Ongoing threats include development and effects of fragmentation.

ID TIPS: Salal occupies >10% cover and oceanspray occupies >3% cover or is more abundant than dwarf Oregongrape. Sword fern, evergreen huckleberry, and Pacific rhododendron are absent or in low abundance (refer to key).

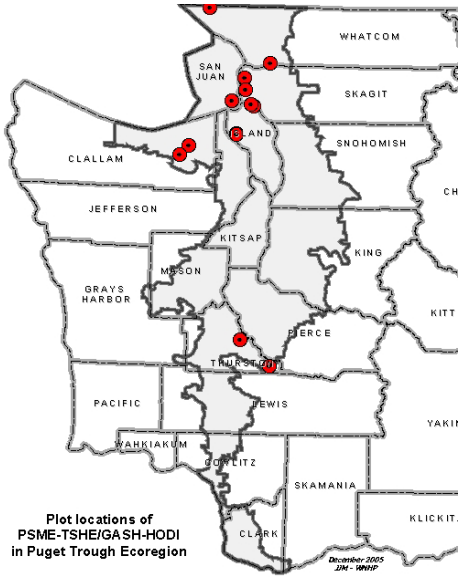
ENVIRONMENT: These sites are moderately dry to slightly dry and appear to be relatively nutrient-poor. Sites are flat to moderately sloping and mostly on sunny aspects (Southeast to West). Slope position is mostly plain/plateau or mid-slope. Parent material is mostly glacial till, outwash, or drift. Soil textures are mostly loam to loamy sand with abundant coarse fragments. This association is more common in dry climatic zones than in other climates.

Precipitation: 20-54 inches (mean 32)
Elevation: sea level - 1500 feet
Aspect/slope: SE to W, various/ 0-48% (mean 15)
Slope position: mid, plain, short, upper
Soil series: Baldhill, Clallam, Everett, Guemes, Hoypus, Keystone, Revel, Roche, Swinomish,Tenino

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Western hemlock and/or

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	65
western hemlock	Tsuga heterophylla	100	23
western redcedar	Thuja plicata	85	10
grand fir	Abies grandis	54	12
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	100	55
oceanspray	Holodiscus discolor	100	9
red huckleberry	Vaccinium parvifolium	62	6
dwarf Oregongrape	Mahonia nervosa	62	4
trailing blackberry	Rubus ursinus ssp. macropetalus	62	2
baldhip rose	Rosa gymnocarpa	54	4
orange honeysuckle	Lonicera ciliosa	38	2
Graminoids			
western fescue	Festuca occidentalis	46	+
Forbs and Ferns			
bracken fern	Pteridium aquilinum var. pubescens	77	2
sword fern	Polystichum munitum	69	1
twinflower	Linnaea borealis ssp. longiflora	31	6
western starflower	Trientalis borealis ssp. latifolia	31	1



Douglas-fir – western hemlock / salal – oceanspray

western redcedar increase over time in the absence of disturbance, Douglas-fir decreases, though still remains prominent after hundreds of years. Young stands may have little hemlock or redcedar.

VEGETATION: This is a forest where Douglas-fir tends to dominate the uppermost canopy layer. Western hemlock is typically prominent to co-dominant and tends to dominate tree regeneration. Western redcedar (usually) and grand fir (sometimes) can be prominent to co-dominant as well. The well-developed shrub layer is dominated by salal. Oceanspray is always present and often prominent as a tall shrub layer. Red huckleberry, dwarf Oregongrape, trailing blackberry and baldhip rose are other frequently occurring shrubs. The herb layer is not well developed and usually has small amounts of sword fern and bracken fern. Western fescue is present in about half the plots.

CLASSIFICATION NOTES: Also described by Chappell (1997, 2001). NatureServe (2005) classification will soon be revised to recognize this as an association. This association is the Puget lowland equivalent of TSHE/GASH-HODI on Olympic National Forest (Henderson et al. 1989).

MANAGEMENT NOTES: Stands that have not been previously harvested, especially old-growth and mature stands, should be considered for conservation status. These sites appear to be moderately low in productivity for tree growth.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII – TSUGA HETERPHYLLA / GAULTHERIA SHALLON – MAHONIA NERVOSA

Douglas-fir – western hemlock / salal – dwarf Oregongrape
Abbreviated Name: PSME-TSHE/GASH-MANE
Synonym: *Pseudotsuga menziesii – Tsuga heterophylla / Gaultheria shallon – Berberis nervosa*

Sample size = 14 plots

DISTRIBUTION: This widespread association occurs uncommonly throughout much of the Puget Trough ecoregion. Area of greatest historic abundance appears to have been the eastern portion of the ecoregion in Snohomish, King, and Pierce counties. Also occurs in adjacent ecoregions within Washington and in northwestern Oregon and southwestern British Columbia.

GLOBAL/STATE STATUS: G4S4. Natural-origin occurrences in the Puget Trough are rare due to historic logging and much of the type has been converted to development. In adjacent ecoregions, it is more common and has been less impacted by development and logging.

ID TIPS: Salal typically occupies >10% cover and always >5%. Oregongrape, red huckleberry, or vine maple usually present. Sword fern, evergreen huckleberry, oceanspray, and Pacific rhododron are absent or in low abundance (refer to key).

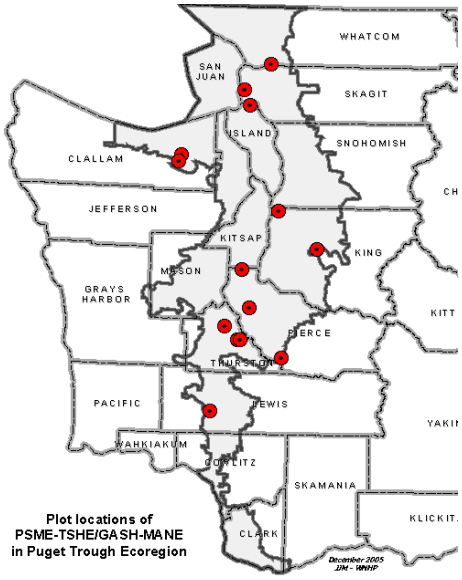
ENVIRONMENT: These sites are moderately dry to mesic and appear to be relatively nutrient-poor Sampled sites are flat to gently sloping, on a variety of aspects. Slope position is most frequently plain/plateau and does not include lower slopes or bottoms (mesic to dry positions). Parent material is most often glacial till (with restrictive soil layer), but also includes glacial outwash and probably other types. Soil textures are mostly gravelly or very gravelly loams or sandy loams.

Precipitation: 27-62 inches (mean 44)
Elevation: 100 - 1900 feet
Aspect/slope: various/ 0-15% (mean 8)
Slope position: plain, mid, upper, short, ridge
Soil series: Everett, Neilton, Alderwood, Elwha, Hoypus, Kapowsin, Revel, Salkum, Sinclair, Swinomish, Tenino, Whidbey

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	67
western hemlock	Tsuga heterophylla	79	38
western redcedar	Thuja plicata	57	19
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	100	43
red huckleberry	Vaccinium parvifolium	93	4
dwarf Oregongrape	Mahonia nervosa	86	12
trailing blackberry	Rubus ursinus ssp. macropetalus	64	2
baldhip rose	Rosa gymnocarpa	57	1
oceanspray	Holodiscus discolor	43	2
vine maple	Acer circinatum	14	11
Forbs and Ferns			
bracken fern	Pteridium aquilinum var. pubescens	71	3
sword fern	Polystichum munitum	71	2
twinflower	Linnaea borealis ssp. longiflora	43	9
western starflower	Trientalis borealis ssp. latifolia	43	+



Douglas-fir – western hemlock / salal – dwarf Oregongrape

moderate-severity fire (underburns). Western hemlock and/or western redcedar increase over time in the absence of disturbance, Douglas-fir decreases, though still remains prominent after hundreds of years. Young stands may have little hemlock or redcedar.

VEGETATION: This is a forest where Douglas-fir tends to dominate the uppermost canopy layer Western hemlock or western redcedar often co-dominate the canopy with Douglas-fir or dominate tree regeneration. The well-developed shrub layer is dominated by salal. Dwarf Oregongrape is usually present to prominent, occasionally co-dominant. Vine maple is occasionally prominent to co-dominant as a very tall shrub, especially in moist climatic areas near the edge of the ecoregion. Other frequently occurring shrubs and vines are trailing blackberry, red huckleberry, and baldhip rose. The typically depauperate herb layer usually has small amounts of sword fern and bracken fern. Twinflower is sometimes prominent.

CLASSIFICATION NOTES: Also described by Chappell (1997, 2001). NatureServe classification will soon be revised to include this type as part of much broader association with same name as this one. This association is similar to TSHE/GASH-BENE of Mount Baker-Snoqualmie and Olympic National Forests (Henderson et al. 1989 & 1992) and TSHE/BENE-GASH of Gifford Pinchot National Forest (Topik et al. 1986).

MANAGEMENT NOTES: Stands that have not been previously harvested should be considered for conservation status. These sites appear to be moderately low in productivity for tree growth.

Chappell, C.B. 2006. Upland plant associations of thePuget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII – TSUGA HETERPHYLLA / GAULTHERIA SHALLON / POLYSTICHUM MUNITUM

Douglas-fir – western hemlock / salal / sword fern

Abbreviated Name: PSME-TSHE/GASH/POMU

Sample size = 32 plots

DISTRIBUTION: This widespread association occurs throughout most of the Puget Trough ecoregion. Also occurs in adjacent ecoregions within Washington and in northwestern Oregon and southwestern British Columbia.

GLOBAL/STATE STATUS: G4G5S4. Natural-origin occurrences in the Puget Trough are rare due to historic logging. In adjacent ecoregions it has been less impacted by development and logging.

ID TIPS: Salal occupies >10% cover and sword fern occupies >3% cover. Evergreen huckleberry is absent or <5% cover

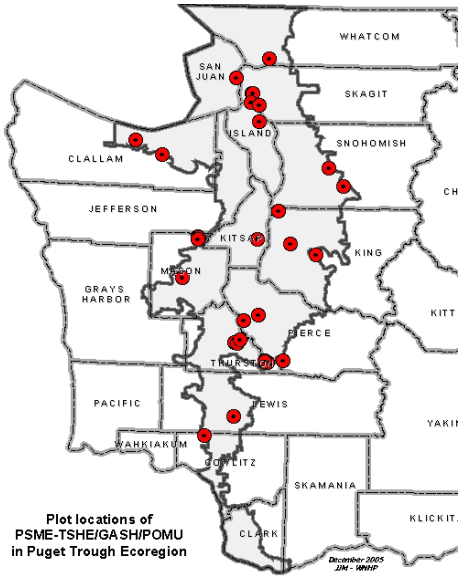
ENVIRONMENT: These sites are moderately dry to mesic and appear to be relatively nutrient-rich. Sites are flat to very steep. West to East-southeast aspects are most common, sunnier aspects are less frequent. A variety of slope positions and parent materials are represented. Soil textures are mostly loams, sandy loams, or loamy sands and usually have abundant gravel or stones.

Precipitation: 27-79 inches (mean 49)
Elevation: sea level - 1700 feet
Aspect/slope: W to ESE, various/ 0-90% (mean 30)
Slope position: mid, short, lower, plain, upper, ridge
Soil series: Baldhill, Everett, Fidalgo, Hoodsport, Winston, Andic xerochrepts, Elwa, Lynnwood, Olympic, Ovall, Phenney, Schneider, Tenino, Terbies, Typic udorthents, Whidbey, Whistle, Wilkeson

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Western hemlock and/or western redcedar increase over time in the absence of disturbance, Douglas-fir decreases, though still remains prominent after hundreds of years. Young stands may have little hemlock or redcedar. Red alder can become established after disturbance if the ground is scarified and a seed source is present.

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	60
western hemlock	Tsuga heterophylla	88	24
western redcedar	Thuja plicata	84	25
bigleaf maple	Acer macrophyllum	50	16
cascara	Frangula purshiana	34	+
Shrubs and Dwarf-shrubs			
salal	Gaultheria shallon	100	37
trailing blackberry	Rubus ursinus ssp. macropetalus	94	4
red huckleberry	Vaccinium parvifolium	91	4
dwarf Oregongrape	Mahonia nervosa	81	11
oceanspray	Holodiscus discolor	72	5
baldhip rose	Rosa gymnocarpa	72	1
beaked hazelnut	Corylus cornuta var. californica	53	9
orange honeysuckle	Lonicera ciliosa	34	1
vine maple	Acer circinatum	25	13
Graminoids			
Coast Range fescue	Festuca subuliflora	47	1
western fescue	Festuca occidentalis	19	+
Forbs and Ferns			
sword fern	Polystichum munitum	100	16
bracken fern	Pteridium aquilinum var. pubescens	81	3
western starflower	Trientalis borealis ssp. latifolia	78	1
sweet-scented bedstraw	Galium triflorum	72	2
twinflower	Linnaea borealis ssp. longiflora	69	5
western trillium	Trillium ovatum ssp. ovatum	47	+
evergreen violet	Viola sempervirens	31	1



Plot locations of PSME-TSHE/GASH/POMU in Puget Trough Ecoregion

Douglas-fir – western hemlock / salal / sword fern

VEGETATION: This is a forest where Douglas-fir tends to dominate the uppermost canopy layer. Western hemlock or western redcedar often co-dominate the canopy with Douglas-fir or dominate tree regeneration. Bigleaf maple sometimes forms a prominent to co-dominant lower canopy layer. The well-developed shrub layer is dominated by salal. Dwarf Oregongrape is usually present to prominent, occasionally co-dominant. Vine maple is occasionally prominent to co-dominant as a very tall shrub. Other frequently occurring shrubs and vines are trailing blackberry, red huckleberry, oceanspray, and baldhip rose. Beaked hazelnut is common in the southern half of the ecoregion. Sword fern dominates the herb layer. Bracken fern, western starflower, sweet-scented bedstraw, and twinflower are also frequent.

CLASSIFICATION NOTES: Also described by Chappell (1997, 2001). NatureServe classification will soon be revised to include this type as part of much broader PSME-TSHE/GASH/POMU. This association is similar to TSHE/POMU-GASH of Mount Baker-Snoqualmie National Forest (Henderson et al. 1992) and TSHE/GASH/POMU of Olympic National Forest (Henderson et al. 1989).

MANAGEMENT NOTES: Stands that have not been previously harvested should be considered for conservation status. These sites appear to be moderately productive for tree growth. Non-native English ivy (*Hedera helix*) is probably a threat to this association if it becomes established.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII – TSUGA HETERPHYLLA / HOLODISCUS DISCOLOR / POLYSTICHUM MUNITUM

Douglas-fir – western hemlock / oceanspray / sword fern

Abbreviated Name: PSME-TSHE/HODI/POMU

Sample size = 11 plots

DISTRIBUTION: This association occurs mostly in the Olympic rainshadow area of Island and San Juan counties, and probably also Clallam Co. Most significant occurrences are on Orcas Island and central to northern Whidbey Island. It also occurs rarely elsewhere in the Puget Trough, with plots from southeast Thurston Co. and Lewis Co.A similar association occurs in southwestern British Columbia.

GLOBAL/STATE STATUS: G2G3S1. There are 5 relatively good-condition occurrences known in Washington. Much of the area of this type has been displaced or degraded by development or agriculture. The vast majority of stands have been significantly impacted by past timber harvest. Development is an ongoing threat.

ID TIPS: Oceanspray or common snowberry occupy >10% cover and sword fern occupies >10% cover Salal and evergreen huckleberry are absent or <10% cover Refer to key.

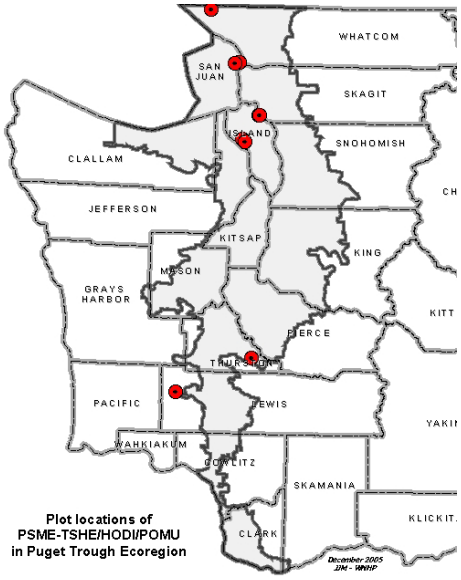
ENVIRONMENT: These sites are slightly dry to slightly moist and appear to be relatively nutrient-rich. Sites are flat to steep. Northerly to easterly aspects are characteristic. Most often found on topographic plains or short slopes. Parent materials include sedimentary bedrock, glacial till, and alluvium. Soil textures vary from silt loams to sandy loams, typically with abundant gravel or stones. Occurs primarily in dry climatic zones, often at higher elevations within these zones.

Precipitation: 22-57 inches (mean 35)
Elevation: 100 - 700 feet
Aspect/slope: WNW to SE/ 0-80% (mean 23)
Slope position: short, plain, lower, upper, mid
Soil series: Pickett, Whidbey, Andic xerochrepts, Casey, Baldhill, Cloquato

DISTURBANCE/SUCCESSION: Fire and wind are important natural disturbances. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Blowdown from wind storms is much in evidence in many stands on Whidbey Island

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	63
western hemlock	Tsuga heterophylla	73	26
grand fir	Abies grandis	55	16
Pacific yew	Taxus brevifolia	36	4
western redcedar	Thuja plicata	27	22
red alder	Alnus rubra	27	12
Shrubs and Dwarf-shrubs			
oceanspray	Holodiscus discolor	100	24
trailing blackberry	Rubus ursinus ssp. macropetalus	100	8
baldhip rose	Rosa gymnocarpa	91	4
dwarf Oregongrape	Mahonia nervosa	73	15
common snowberry	Symphoricarpos albus var. laevigatus	73	9
orange honeysuckle	Lonicera ciliosa	64	3
red elderberry	Sambucus racemosa var. racemosa	64	1
Indian plum	Oemleria cerasiformis	45	6
salal	Gaultheria shallon	45	2
red huckleberry	Vaccinium parvifolium	36	9
vine maple	Acer circinatum	27	10
beaked hazelnut	Corylus cornuta var. californica	18	14
Graminoids			
Columbia brome	Bromus vulgaris	64	12
Coast Range fescue	Festuca subuliflora	55	4
nodding trisetum	Trisetum canescens	45	6
Alaska oniongrass	Melica subulata	36	6
Forbs and Ferns			
sword fern	Polystichum munitum	100	24
sweet-scented bedstraw	Galium triflorum	100	3
western starflower	Trientalis borealis ssp. latifolia	91	2
bracken fern	Pteridium aquilinum var. pubescens	82	4
wall lettuce	Mycelis muralis	64	2
spreading woodfern	Dryopteris expansa	64	1
threeleaf foamflower	Tiarella trifoliata var. trifoliata	55	4
twinflower	Linnaea borealis ssp. longiflora	36	2
pathfinder	Adenocaulon bicolor	36	1
cutleaf foamflower	Tiarella trifoliata var. laciniata	27	10
Hooker's fairybells	Prosartes hookeri var. oregana	9	13



Douglas-fir – western hemlock / oceanspray / sword fern

(all of which are relatively close to saltwater shorelines). Grand fir may increase in importance with blowdown. Western hemlock, grand fir, and/or western redcedar increase over time in the absence of fire, Douglas-fir decreases, though still remains prominent after hundreds of years.Young stands may have little hemlock. Red alder increases with ground disturbance and canopy opening. With a seed source, red alder sometimes regenerates abundantly after logging. Conifers will become dominant after stand age 70-100 years if alder dominates early. On Orcas Island, the PSME-TSHE/TITRLA association appears to be a function of heavy deer browsing on sites that could support PSME-TSHE/HODI/POMU.

VEGETATION: Douglas-fir dominates or co-dominates the canopy. Western hemlock, grand fir, or western redcedar can co-dominate the canopy. Tree regeneration layers are dominated by western hemlock, grand fir, and/or western redcedar. Hemlock is usually present, redcedar only occasionally. Red alder is occasionally prominent. The well-developed shrub layer is usually dominated or co-dominated by oceanspray which is always present. Dwarf Oregongrape and common snowberry are usually present and often prominent to co-dominant. Vine maple is occasionally prominent to co-dominant. Other frequently occurring shrubs and vines are trailing blackberry, baldhip rose, orange honeysuckle, and red elderberry. Sword fern dominates or co-dominates the herb layer. Columbia brome is usually present and sometimes prominent to co-dominant. Cutleaf foamflower is occasionally prominent. Sweet-scented bedstraw, western starflower, bracken fern, wall lettuce, spreading woodfern, Coast Range fescue, and threeleaf foamflower are frequent present.

CLASSIFICATION NOTES: Also described by Chappell (1997). NatureServe (2005) does not currently recognize this association, but will in the future under the name PSME-(TSHE)/HODI/POMU.

MANAGEMENT NOTES: Stands that have not been previously harvested should be considered for conservation status. Non-native English ivy (*Hedera helix*) and herb Robert (*Geranium robertianum*) are threats to this association. Non-native foxglove (*Digitalis purpurea*) has increased dramatically in some stands in response to blowdown.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII – TSUGA HETERPHYLLA / MAHONIA NERVOSA

Douglas-fir – western hemlock / dwarf Oregongrape
Abbreviated Name: PSME-TSHE/MANE
Synonym: *Pseudotsuga menziesii – Tsuga heterophylla / Berberis nervosa*

Sample size = 17 plots

DISTRIBUTION: Within the Puget Trough, this association is most common on Orcas Island, San Juan Co. It also occurs uncommonly in Whatcom, Skagit, northern Island, and fringes of the ecoregion in Clallam and Jefferson counties. It is absent or rare elsewhere in the ecoregion. Also occurs in adjacent ecoregions within Washington and in northwestern Oregon.

GLOBAL/STATE STATUS: G4S4. Natural-origin occurrences in the Puget Trough are rather rare due to historic logging. In adjacent ecoregions, it is more common and has been less impacted by logging.

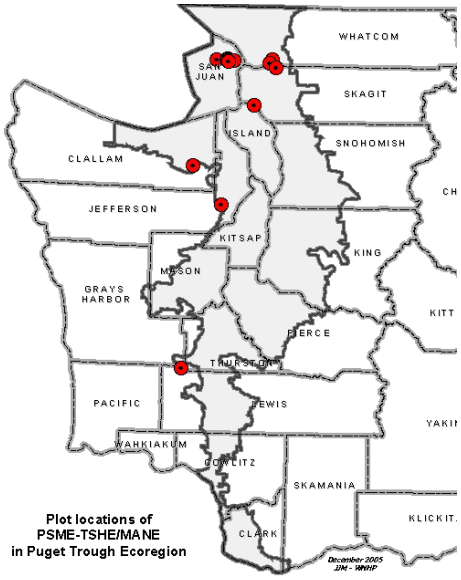
ID TIPS: Dwarf Oregongrape typically occupies >5% cover or is present with little other understory vegetation. Salal occupies <5% cover, sword fern <3% cover, and cutleaf foamflower <1% cover. Refer to key.

ENVIRONMENT: These sites are moderately to slightly dry and appear to be nutrient-medium. Sites are usually on moderate to steep slopes and a variety of aspects. Slope position is most often mid- to upper slopes. Most sites have a restrictive soil layer of bedrock or cemented till. Parent materials include residuum, colluvium, glacial till, volcanic ash, and glacial outwash. Soil textures range from silt loam to loamy sand, often with a significant coarse fragment content. If the soil texture is fine (silt loam), then the soil is characterized as very gravelly. Sites where it occurs are usually at a moderate to high elevation for the ecoregion (mean elevation is 1193 feet) and are probably cooler than average.

Precipitation: 28-67 inches (mean 45)
Elevation: 170 - 2150 feet
Aspect/slope: various/ 6-73% (mean 31)
Slope position: mid, upper, short, plain, lower
Soil series: Pickett, Louella, Hoypus, Melbourne, Nati, Revel, Rinker, Triton

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	94	66
western hemlock	Tsuga heterophylla	94	47
western redcedar	Thuja plicata	41	29
Shrubs and Dwarf-shrubs			
dwarf Oregongrape	Mahonia nervosa	82	17
red huckleberry	Vaccinium parvifolium	47	3
baldhip rose	Rosa gymnocarpa	35	3
beaked hazelnut	Corylus cornuta var. californica	6	20
vine maple	Acer circinatum	6	13
Graminoids			
Coast Range fescue	Festuca subuliflora	41	2
western fescue	Festuca occidentalis	29	3
Forbs and Ferns			
western starflower	Trientalis borealis ssp. latifolia	47	1
sword fern	Polystichum munitum	47	1
bracken fern	Pteridium aquilinum var. pubescens	41	2



Douglas-fir – western hemlock / dwarf Oregongrape

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Western hemlock and/or western redcedar increase over time in the absence of disturbance, Douglas-fir decreases, though still remains prominent after hundreds of years. Young stands may have little hemlock or redcedar.

VEGETATION: This is a forest where Douglas-fir tends to dominate the uppermost canopy layer. Western hemlock is usually co-dominant and dominates tree regeneration. Western redcedar is sometimes prominent to co-dominant. The shrub layer ranges from sparse to moderately dense and is usually dominated by dwarf Oregongrape, which is the most frequent understory species. Red huckleberry is sometimes present. Vine maple or beaked hazelnut are rarely prominent to co-dominant. The poorly developed herb layer shows no species with over 50% constancy. Western starflower, sword fern, bracken fern, and Coast Range fescue are sometimes present in small amounts. Occasionally the understory is nearly devoid of vascular plants and dominated by mosses.

CLASSIFICATION NOTES: Also described by Chappell (1997). NatureServe classification will soon be revised to include this type as part of much broader association with same name as this one. This association is similar to TSHE/BENE of Mount Baker-Snoqualmie and Olympic National Forests (Henderson et al. 1989 & 1992) and Gifford Pinchot National Forest (Topik et al. 1986). A few plots on Orcas Island with very little vascular plant understory and abundant mosses (*Hylocomium splendens, Eurychium oreganum,* and/or *Rhytidiopsus robusta*) were included here though they could be considered a separate association.

MANAGEMENT NOTES: Stands that have not been previously harvested, especially old-growth and mature stands, should be considered for conservation status. These sites appear to be moderately low in productivity for tree growth.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - TSUGA HETEROPHYLLA / MAHONIA NERVOSA - POLYSTICHUM MUNITUM

Douglas-fir - western hemlock / dwarf Oregongrape - sword fern
Abbreviated Name: PSME-TSHE/MANE-POMU
Synonym: *Pseudotsuga menziesii - Tsuga heterophylla / Berberis nervosa - Polystichum munitum*

Sample size = 45 plots

DISTRIBUTION: This association occurs throughout most of the Puget Trough. May be absent or rare on the Kitsap Peninsula and in much of Mason County. Also occurs in adjacent ecoregions and in northwestern Oregon.

GLOBAL/STATE STATUS: G4S3S4. Natural-origin occurrences in the Puget Trough are rare due to historic logging. In adjacent ecoregions it has been less impacted by development and logging.

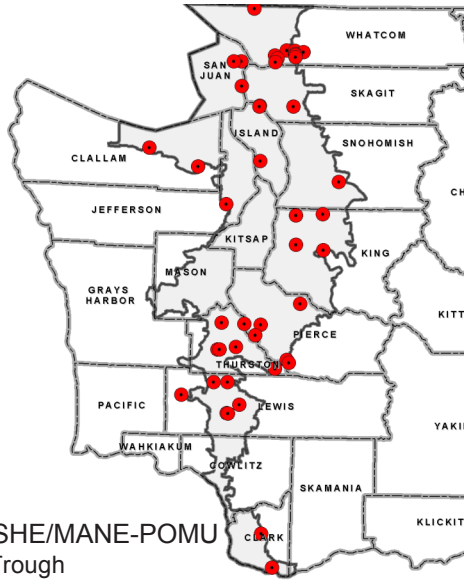
ID TIPS: Dwarf Oregongrape and sword fern usually co-dominate the understory. Dwarf Oregongrape provides >5% and sword fern >3% cover. Dwarf Oregongrape more abundant than the combination of lady-fern, spreading woodfern, threeleaf foamflower, deerfern, and salmonberry.

ENVIRONMENT: These sites are moderately moist and appear to be relatively nutrient-rich. A variety of topography and soils are represented. Aspect is more commonly toward the north. Parent materials can include residuum, glacial till and outwash, and colluvium, among others. Soil texture is variable: most frequent is gravelly loam, gravelly sandy loam, or silt loam.
Precipitation: 24-88 inches (mean 48)
Elevation: 90-1560 feet
Aspect/slope: various/ 0-91% (mean 31)
Slope position: mid, short, lower, plain, upper, bottom
Soil series: Ahl, Alderwood, andic xerochrepts, Baldhill, Barneston, Buckpeak, Cathcart, Centralia, Cinebar, Everett, Indianola, Kapowsin, Kitsap, Louella, Nati, Neilton, Olympic, Pickett, Prather, Roche, Shelton, Skipopa, Terbies, Tokul, Whatcom, Whidbey, Wilkeson, xerochrepts, Yelm

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Hemlock and/or redcedar increase over time in absence of disturbance, Douglas-fir decreases. Young stands may have little hemlock or redcedar

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	48
western hemlock	Tsuga heterophylla	87	38
western redcedar	Thuja plicata	82	35
bigleaf maple	Acer macrophyllum	60	19
grand fir	Abies grandis	22	7
Shrubs and Dwarf-shrubs			
dwarf Oregongrape	Mahonia nervosa	100	18
red huckleberry	Vaccinium parvifolium	80	3
trailing blackberry	Rubus ursinus var. macropetalus	78	1
salal	Gaultheria shallon	73	3
vine maple	Acer circinatum	49	15
beaked hazelnut	Corylus cornuta var. californica	42	5
baldhip rose	Rosa gymnocarpa	40	1
Graminoids			
Coast Range fescue	Festuca subuliflora	33	1
Forbs and Ferns			
sword fern	Polystichum munitum	100	23
sweet-scented bedstraw	Galium triflorum	62	2
western starflower	Trientalis borealis ssp. latifolia	62	2
bracken fern	Pteridium aquilinum var. pubescens	49	1
western trillium	Trillium ovatum ssp. ovatum	47	1
spreading woodfern	Dryopteris expansa	42	1
vanillaleaf	Achlys triphylla	36	3
twinflower	Linnaea borealis ssp. longiflora	31	3
inside-out flower	Vancouveria hexandra	29	5
threeleaf foamflower	Tiarella trifoliata var. trifoliata	29	1



Plot locations of PSME-TSHE/MANE-POMU in the Puget Trough

Douglas-fir - western hemlock / dwarf Oregongrape - sword fern

Red alder may regenerate abundantly after disturbance if a seed source is present and mineral soil is exposed. Alder will typically die out after 80-100 years.

VEGETATION: This is a forest where Douglas-fir tends to dominate the uppermost canopy layer. Western hemlock or western redcedar often co-dominate the canopy with Douglas-fir or dominate tree regeneration. Bigleaf maple often forms a prominent to co-dominant lower canopy layer. Sword fern and dwarf Oregongrape usually co-dominate the understory. Vine maple forms a prominent to co-dominant tall shrub layer on about half the plots. Red huckleberry, trailing blackberry, salal, sweet-scented bedstraw, and western starflower are frequent. Inside-out flower is present to prominent on about ¼ of plots, especially from Lewis County south.

CLASSIFICATION NOTES: Also described by Chappell (1997, 2001). NatureServe (2005) names currently include TSHE/POMU and PSME-TSHE/POMU: parts of each of them would be classified as this association. In the near future, NatureServe will recognize PSME-TSHE/MANE-POMU as distinct and include with it the very similar TSHE/POMU-BENE of Mount Baker-Snoqualmie National Forest (Henderson et al. 1992), and TSHE/BENE/POMU of Olympic National Forest (Henderson et al. 1989) and Gifford Pinchot National Forest (Topik et al. 1986).

MANAGEMENT NOTES: Red alder can regenerate abundantly after logging of this association. These sites appear to be relatively productive for tree growth. Non-native English ivy (*Hedera helix*) does well on these sites and if present can quickly overwhelm the native understory. Herb Robert (*Geranium robertianum*) is another threatening invasive for this association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - TSUGA HETEROPHYLLA / RHODODENDRON MACROPHYLLUM - VACCINIUM OVATUM

Douglas-fir - western hemlock / Pacific rhododendron - evergreen huckleberry

Abbreviated Name: PSME-TSHE/RHMA-VAOV

Sample size = 28 plots

DISTRIBUTION: Endemic to the Puget Trough in Washington. Occurs in Kitsap, Mason, Jefferson, and Island counties.

GLOBAL/STATE STATUS: G2S2. There are only 5 known relatively good quality occurrences, and there are likely to be very few others in existence. The vast majority of stands have been harvested in the past. Development has also impacted this type and continues to be a threat.

ID TIPS: Evergreen huckleberry and Pacific rhododendron each provide >5% cover, and sword fern <3% cover. Salal usually co-dominates with evergreen huckleberry and rhododendron.

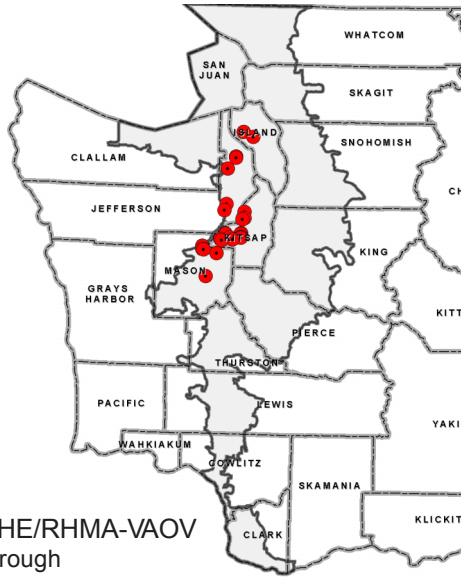
ENVIRONMENT: These sites are moderately dry and appear to be relatively nutrient-poor. Slope and aspect is quite variable. Parent material is usually glacial till, but also includes glacial outwash and volcanic residuum. Soil texture is usually gravelly or very gravelly sandy loam. This association occurs on sites with a very wide range of precipitation for this ecoregion, though it is most common in areas with greater than about 45 inches of mean annual precipitation.
Precipitation: 22-77 inches (mean 52)
Elevation: 60-1200 feet
Aspect/slope: all/ 0-90% (mean 21%)
Slope position: short, upper, plain, mid, lower
Soil series: Shelton, Alderwood, Grove, Hoypus, Clallam, dystric xerorthents, typic udorthents, Carlsborg, Fidalgo, Kilchis, Hoodsport, Triton

Douglas-fir - western hemlock / Pacific rhododendron - evergreen huckleberry

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	58
western hemlock	Tsuga heterophylla	86	37
western redcedar	Thuja plicata	79	13
western white pine	Pinus monticola	50	15
Pacific madrone	Arbutus menziesii	14	5
Shrubs and Dwarf-shrubs			
evergreen huckleberry	Vaccinium ovatum	100	26
Pacific rhododendron	Rhododendron macrophyllum	100	25
salal	Gaultheria shallon	96	31
dwarf Oregongrape	Mahonia nervosa	54	4
red huckleberry	Vaccinium parvifolium	43	1
oceanspray	Holodiscus discolor	18	3
Forbs and Ferns			
bracken fern	Pteridium aquilinum var. pubescens	43	3
sword fern	Polystichum munitum	32	2
rattlesnake-plantain	Goodyera oblongifolia	21	+

Douglas-fir - western hemlock / Pacific rhododendron - evergreen huckleberry



Plot locations of PSME-TSHE/RHMA-VAOV in the Puget Trough

Douglas-fir - western hemlock / Pacific rhododendron - evergreen huckleberry

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Western hemlock and/or western redcedar increase over time in absence of disturbance, Douglas-fir decreases. Young stands may have little hemlock or redcedar. If a high-severity fire occurs where there is a lodgepole pine seed source, the post-fire association may convert to PICO-PSME/GASH. Pacific madrone can also become more important in early-successional stands after fire.

VEGETATION: Douglas-fir tends to dominate the uppermost canopy layer. Western hemlock or western redcedar usually either co-dominate the canopy with Douglas-fir or dominate tree regeneration. Western white pine is present in about half the plots and is occasionally prominent to co-dominant (the latter only seen in young previously-logged stands). Evergreen huckleberry, Pacific rhododendron, and salal typically co-dominate the well-developed shrub layer. The herb layer is low in diversity and cover Dwarf Oregongrape, bracken fern, and red huckleberry are often present.

CLASSIFICATION NOTES: Described originally by Chappell (1997). NatureServe (2005) calls it PSME-TSHE/RHMA-VAOV-GASH and also includes part of the PSME-THPL/RHMA association that is described herein. Future NatureServe name will be PSME-TSHE/RHMA-VAOV.

MANAGEMENT NOTES: Stands that have not been previously harvested, especially mature and old-growth, should be considered for conservation status. These sites appear to be low or moderately low productivity for tree growth.

BIODIVERSITY NOTES: State candidate Vancouver ground-cone (*Boschniakia hookeri*) has been recorded in this plant association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - TSUGA HETEROPHYLLA / TIARELLA TRIFOLIATA VAR. *LACINIATA*

Douglas-fir - western hemlock / cutleaf foamflower
Abbreviated Name: PSME-TSHE/TITRLA

Sample size = 16 plots

DISTRIBUTION: Occurs only on Orcas Island, San Juan County

GLOBAL/STATE STATUS: GNRS2. Very small range. There are very few occurrences covering a relatively small area. Appears to be associated with heavy deer browsing and therefore may not have been a pre-Western settlement type. There is significant representation of this association in established natural areas. Non-native species and development are threats.

ID TIPS: Cutleaf foamflower >1% cover and more abundant than sword fern. Salal absent or low in abundance.

ENVIRONMENT: These sites are moderately moist to moist and appear to be relatively nutrient-rich. Slopes are gentle to moderate and aspect is variable. Mid-slopes are the most common topographic position. Parent material is sedimentary residuum with some admixture of glacial till. Mapped soil texture is gravelly silt loam.
Precipitation: 33-46 inches (mean 40)
Elevation: 250-1500 feet
Aspect/slope: All/ 2-40% (mean 17)
Slope position: mid, lower, plain
Soil series: Pickett

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. All old-growth stands show evidence of past low- to moderate-severity fires (underburns). Hemlock and/or redcedar increase over time in absence of disturbance, Douglas-fir decreases. Red alder may regenerate abundantly after disturbance if a seed source is present and mineral soil is exposed, and ALRU/PTAQ can develop after an intense disturbance. Alder will typically die out after 80-100 years without disturbance. Understory composition appears to be controlled by heavy deer browsing, with deciduous shrubs (especially oceanspray) and sword fern depressed relative to grasses and forbs. Under less heavy deer browsing pressure, the PSME-TSHE/HODI/POMU association would probably develop on many of these sites.

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover). .

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	55
western hemlock	Tsuga heterophylla	100	51
red alder	Alnus rubra	44	4
western redcedar	Thuja plicata	25	28
grand fir	Abies grandis	19	3
Shrubs and Dwarf-shrubs			
baldhip rose	Rosa gymnocarpa	81	5
dwarf Oregongrape	Mahonia nervosa	56	9
oceanspray	Holodiscus discolor	38	3
swamp currant	Ribes lacustre	38	1
Graminoids			
Coast Range fescue	Festuca subuliflora	56	8
Columbia brome	Bromus vulgaris	44	6
Alaska oniongrass	Melica subulata	38	6
nodding trisetum	Trisetum canescens	31	13
western fescue	Festuca occidentalis	19	6
Forbs and Ferns			
cutleaf foamflower	Tiarella trifoliata var. laciniata	100	16
bracken fern	Pteridium aquilinum var. pubescens	88	6
sweet-scented bedstraw	Galium triflorum	75	6
sword fern	Polystichum munitum	75	2
threeleaf foamflower	Tiarella trifoliata var. trifoliata	75	2
western starflower	Trientalis borealis ssp. latifolia	63	3
stinging nettle	Urtica dioica ssp. gracilis	44	1
twinflower	Linnaea borealis ssp. longiflora	38	12
big-leaved sandwort	Moehringia macrophylla	31	+
wall lettuce	Mycelis muralis	25	11
Scouler's bellflower	Campanula scouleri	19	20

Plot locations
of PSME-TSHE/TITRLA
in the Puget Trough

Douglas-fir - western hemlock / cutleaf foamflower

VEGETATION: Forest co-dominated by Douglas-fir and western hemlock. Western redcedar is only present on ¼ of plots, but is often co-dominant when present. Western hemlock typically dominates tree regeneration. The shrub layer is usually not well developed, though dwarf Oregongrape occasionally provides high cover. Dwarf Oregongrape and baldhip rose are usually present. Grasses are often abundant, though rather variable in composition. Coast Range fescue, Columbia brome, Alaska oniongrass, and nodding trisetum are the most common grasses. The understory is typically dominated or co-dominated by cutleaf foamflower. A number of other herbs may also be co-dominant including the grasses, Scouler's bellflower, and twinflower. Other herbs usually present are bracken fern, sweet-scented bedstraw, sword fern, threeleaf foamflower, and western starflower. The non-native wall lettuce is occasionally prominent.

CLASSIFICATION NOTES: Also described by Chappell (1997). Not recognized by NatureServe (2005), but will be in future.

MANAGEMENT NOTES: Red alder can regenerate abundantly after logging of this association. These sites are probably quite productive for tree growth. Non-native foxglove (*Digitalis purpurea*) is abundant in some areas where it has supplanted native understory; its invasion appears to be facilitated by windthrow. English ivy (*Hedera helix*) probably does well on these sites and if present can overwhelm the native understory and kill trees.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - TSUGA HETEROPHYLLA / VACCINIUM OVATUM

Douglas-fir - western hemlock / evergreen huckleberry
Abbreviated Name: PSME-TSHE/VAOV

Sample size = 38 plots

DISTRIBUTION: Endemic to the Puget Trough ecoregion. Occurs only in the central Puget Trough, including Kitsap, western Pierce, northern Thurston, Mason, Jefferson, and Island counties. Also reported to occur rarely in southwestern BC.

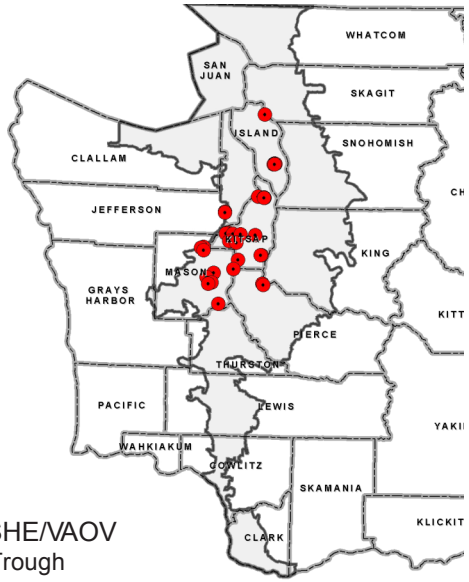
GLOBAL/STATE STATUS: G2S2. There are only 8 known relatively good quality occurrences in Washington, and there are likely to be very few others in existence. The vast majority of stands have been altered by past timber harvest. Development has also significantly impacted this association and continues to be a threat.

ID TIPS: Evergreen huckleberry provides >5% cover, Pacific rhododendron <5% cover, and sword fern <3% cover. Salal usually co-dominates with evergreen huckleberry.

ENVIRONMENT: These sites are moderately dry and appear to be relatively nutrient-poor. Slope and aspect is quite variable: east and west aspects are best represented in the plots. Parent material is usually glacial till, but also includes glacial outwash and volcanic residuum. About 90% of plots were on soils mapped as having a restrictive layer of hardpan or bedrock. Soil texture is usually gravelly or very gravelly sandy loam. This association is most common in portions of the ecoregion with over 45 inches of mean annual precipitation.
Precipitation: 27-70 inches (mean 49)
Elevation: 40-1200 feet
Aspect/slope: all/ 0-67% (mean 15%)
Slope position: short, plain, upper, mid, ridgetop
Soil series: Shelton, Alderwood, Harstine, Whidbey, Grove, Swinomish, Hoodsport, Hoypus, Kilchis, Poulsbo, Ragnar, Salkum, Sinclair

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	60
western hemlock	Tsuga heterophylla	89	37
western redcedar	Thuja plicata	82	9
western white pine	Pinus monticola	45	14
Shrubs and Dwarf-shrubs			
evergreen huckleberry	Vaccinium ovatum	100	28
salal	Gaultheria shallon	97	27
dwarf Oregongrape	Mahonia nervosa	53	3
red huckleberry	Vaccinium parvifolium	42	2
trailing blackberry	Rubus ursinus var. macropetalus	32	+
Pacific rhododendron	Rhododendron macrophyllum	16	3
Forbs and Ferns			
bracken fern	Pteridium aquilinum var. pubescens	68	2
sword fern	Polystichum munitum	37	1
twinflower	Linnaea borealis ssp. longiflora	16	4
western starflower	Trientalis borealis ssp. latifolia	16	+



Plot locations
of PSME-TSHE/VAOV
in the Puget Trough

Douglas-fir - western hemlock / evergreen huckleberry

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Western hemlock and/or western redcedar increase over time in absence of disturbance, Douglas-fir decreases. Young stands may have little hemlock or redcedar. If a high-severity fire occurs where there is a lodgepole pine seed source, the PICO-PSME/GASH association may become established after the fire. Pacific madrone can also become important in early-successional stands after fire.

VEGETATION: Douglas-fir tends to dominate the uppermost canopy layer. Western hemlock, or infrequently western redcedar, typically either co-dominates the canopy or dominates tree regeneration. Western white pine is present in about half the plots and is occasionally prominent to co-dominant (the latter only seen in young previously-logged stands). Evergreen huckleberry and salal typically co-dominate the well-developed shrub layer. The herb layer is low in diversity and cover Bracken fern and dwarf Oregongrape are frequently present.

CLASSIFICATION NOTES: Also described by Chappell (1997, 2001). A few plots were sampled by Henderson et al. (1989) and called TSHE/GASH-VAOV.

MANAGEMENT NOTES: Stands that have not been previously harvested, especially mature and old-growth, should be considered for conservation status. These sites appear to be moderate or moderately low productivity for tree growth.

BIODIVERSITY NOTES: State candidate Vancouver ground-cone (*Boschniakia hookeri*) has been recorded in this plant association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

PSEUDOTSUGA MENZIESII - TSUGA HETEROPHYLLA / VACCINIUM OVATUM / POLYSTICHUM MUNITUM

Douglas-fir – western hemlock / evergreen huckleberry / sword fern

Abbreviated Name: PSME-TSHE/VAOV/POMU

Sample size = 9 plots

DISTRIBUTION: In Washington, occurs only in the central Puget Trough, including Kitsap, western Pierce, northern Thurston, Mason, Jefferson, and probably southern Island, counties. Also occurs in the central Coast Range of Oregon.

GLOBAL/STATE STATUS: G3S1. There are less than 10 known occurrences in Washington, and most of these are small in extent and marginal in condition. Most stands have been harvested in the past. Development has also impacted this type and continues to be a threat.

ID TIPS: Evergreen huckleberry >5% cover and sword fern >3% cover. Salal and evergreen huckleberry usually dominate.

ENVIRONMENT: These sites are moderately moist and appear to be medium to rich in relative nutrient status. Slope and aspect is variable, but usually not too steep. Parent material is usually glacial till, but also includes glacial outwash sands. Soil texture is usually gravelly or sandy. Annual precipitation is moderate to high for the Puget Trough ecoregion.
Precipitation: 37-66 inches (mean 51)
Elevation: 40-900 feet
Aspect/slope: all/ 2-48%(mean 25% slope)
Slope position: short, upper, mid, lower, ridgetop
Soil series: Alderwood, Harstine, Hoodsport, Indianola, Ragnar, Triton

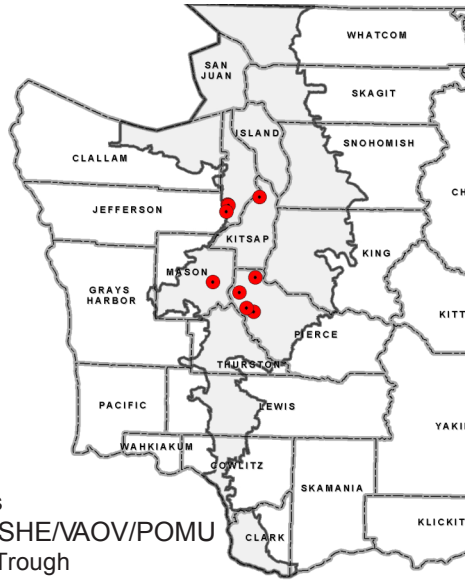
DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Western hemlock and/or redcedar increase over time in absence of disturbance, Douglas-fir decreases, though still remains prominent after hundreds of years. Young stands may have little hemlock or redcedar

Douglas-fir – western hemlock / evergreen huckleberry / sword fern

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Douglas-fir	Pseudotsuga menziesii var. menziesii	100	56
western redcedar	Thuja plicata	100	35
western hemlock	Tsuga heterophylla	100	27
bigleaf maple	Acer macrophyllum	56	5
Shrubs and Dwarf-shrubs			
evergreen huckleberry	Vaccinium ovatum	100	26
salal	Gaultheria shallon	100	18
red huckleberry	Vaccinium parvifolium	89	3
dwarf Oregongrape	Mahonia nervosa	78	6
trailing blackberry	Rubus ursinus var. macropetalus	67	1
oceanspray	Holodiscus discolor	44	4
beaked hazelnut	Corylus cornuta var. californica	33	7
Pacific rhododendron	Rhododendron macrophyllum	22	11
Forbs and Ferns			
sword fern	Polystichum munitum	100	12
western starflower	Trientalis borealis ssp. latifolia	78	1
twinflower	Linnaea borealis ssp. longiflora	44	4
bracken fern	Pteridium aquilinum var. pubescens	44	4
sweet-scented bedstraw	Galium triflorum	33	+

Douglas-fir – western hemlock / evergreen huckleberry / sword fern



Plot locations of PSME-TSHE/VAOV/POMU in the Puget Trough

Douglas-fir – western hemlock / evergreen huckleberry / sword fern

VEGETATION: Douglas-fir tends to dominate the uppermost canopy layer. Western hemlock or western redcedar often co-dominate the canopy or dominate tree regeneration. Bigleaf maple is often present. Evergreen huckleberry and salal typically co-dominate the shrub layer. Pacific rhododendron is occasionally prominent to co-dominant. Sword fern dominates the herb layer and is usually prominent. Red huckleberry, trailing blackberry, dwarf Oregongrape, and western starflower are usually present.

CLASSIFICATION NOTES: Also described by Chappell (1997). Chappell (2001) considered this part of PSME-TSHE/GASH/POMU. NatureServe (2005) name is TSHE/VAOV, which is described by Hemstrom and Logan (1986) and McCain and Diaz (2002a) for the Oregon Coast Range. Future NatureServe name will be PSME-TSHE/VAOV/POMU.

MANAGEMENT NOTES: Stands that have not been previously harvested, especially mature and old-growth, should be considered for conservation status. Red alder can regenerate abundantly after logging of this association, especially if bare ground is exposed. These sites appear to be relatively productive for tree growth. Non-native English ivy (*Hedera helix*) probably does well on these sites and is a severe threat if it becomes established.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

QUERCUS GARRYANA / CAREX INOPS - (CAMASSIA QUAMASH)

Oregon white oak / long-stolon sedge - (common camas)
Abbreviated Name: QUGA/CAIN-(CAQU)
Synonym: *Quercus garryana / Carex pensylvanica – (Camassia quamash)*

Sample size = 15 plots

DISTRIBUTION: Occurs in San Juan, Whatcom, Pierce, and Thurston counties, as well as in southwestern BC. Probably extirpated from Clallam, Island, Mason, King, Lewis, Grays Harbor, Cowlitz, and Clark counties. Similar communities occur in the western Columbia Gorge, Skamania County

GLOBAL/STATE STATUS: G1S1. There are only 5 known fair- to good-condition occurrences remaining in Washington. Those that remain are highly threatened by non-native species, conifer encroachment, and development.

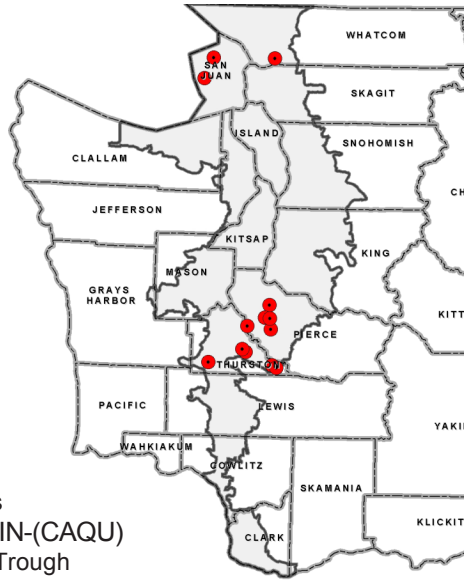
ID TIPS: Woodland (>25% tree crown cover) dominated by Oregon white oak. Herbaceous dominated understory with significant native understory component. Long-stolon sedge usually co-dominant, common camas or western buttercup usually present.

ENVIRONMENT: These sites are dry to very dry and appear to be relatively nutrient-rich. Occurs on slopes with sunny aspects (southeast to west) and shallow soils over bedrock, or on coarse-textured gravelly outwash plains.
Precipitation: 30-53 inches (mean 45)
Elevation: 150-1400 feet
Aspect/slope: SE to W/ 0-82% slope (mean 21)
Slope position: plain, mid, upper, ridgetop, shoulder
Soil series: Spanaway, rock outcrop, rockland, andic xerochrepts, Everett

DISTURBANCE/SUCCESSION: In the pre-Western settlement landscape (with much more frequent fires) these sites may have supported a mix of oak savanna, grasslands, and oak woodland similar to existing. In the absence of the former fire regime or active management, most of these stands are being invaded by Douglas-fir trees and/or shrubs (snowberry, Scot's broom), and are likely to convert to QUGA/SYAL/CAIN, QUGA-PSME/SYAL/POMU, or non-native understory. Stands on shallow soils appear more resistant to successional changes that lead to conversion to conifer forest.

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (less than 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Oregon white oak	Quercus garryana var. garryana	100	54
Douglas-fir	Pseudotsuga menziesii var. menziesii	60	6
Shrubs and Dwarf-shrubs			
Scot's broom	Cytisus scoparius	67	10
common snowberry	Symphoricarpos albus var. laevigatus	73	7
tall Oregongrape	Mahonia aquifolium	73	5
serviceberry	Amelanchier alnifolia	53	3
Indian plum	Oemleria cerasiformis	33	2
hairy honeysuckle	Lonicera hispidula	20	25
kinnnikinnick	Arctostaphylos uva-ursi	20	6
Graminoids			
long-stolon sedge	Carex inops ssp. inops	93	24
Kentucky bluegrass	Poa pratensis	93	19
blue wildrye	Elymus glaucus	73	12
wood-rush	Luzula (comosa, multiflora ssp. multiflora)	53	2
Roemer's fescue	Festuca roemeri	40	6
California brome	Bromus carinatus	40	6
California danthonia	Danthonia californica	40	3
colonial bentgrass	Agrostis capillaris	33	12
red fescue	Festuca rubra	20	21
orchard grass	Dactylis glomerata	20	18
Forbs and Ferns			
common St. John's-wort	Hypericum perforatum	67	4
cleavers	Galium aparine	67	3
yarrow	Achillea millefolium var. occidentalis	60	4
English plantain	Plantago lanceolata	60	2
western buttercup	Ranunculus occidentalis var. occidentalis	60	2
common camas	Camassia quamash (vars. azurea, maxima)	53	6
hairy cat's-ear	Hypochaeris radicata	53	2
Pacific sanicle	Sanicula crassicaulis var. crassicaulis	47	2
early blue violet	Viola adunca var. adunca	47	1
chocolate lily	Fritillaria affinis var. affinis	47	+
meadow death camas	Zigadenus venenosus var. venenosus	33	1
cut-leaf microseris	Microseris laciniata ssp. laciniata	27	2
woods strawberry	Fragaria vesca ssp. bracteata	27	2
white-top aster	Sericocarpus rigidus	27	+
common strawberry	Fragaria virgininiana ssp. platypetala	20	3
Nuttall's larkspur	Delphinium nuttallii	13	6
spring-gold	Lomatium utriculatum	13	4
houndstongue hawkweed	Hieracium cynoglossoides	13	2
Henderson's shootingstar	Dodecatheon hendersonii	7	18
Puget balsamroot	Balsamorhiza deltoidea	7	13



Plot locations
of QUGA/CAIN-(CAQU)
in the Puget Trough

Oregon white oak / long-stolon sedge - (common camas)

VEGETATION: Woodland, or open forest, dominated by Oregon white oak. The understory is usually dominated by herbaceous vegetation. Most commonly long-stolon sedge and the non-native Kentucky bluegrass are co-dominant. Blue wildrye is usually present and often co-dominant as well. Roemer's fescue may be present in excellent condition sites. Red fescue, orchardgrass, and colonial bentgrass can also be prominent to co-dominant. A relatively low-growing shrub layer varies from absent to prominent. Common snowberry, tall Oregongrape, Scot's broom, and serviceberry are usually present. A variety of native and non-native forbs can be present. The most abundant native forb in terms of cover is common camas, though it is not consistently present. Yarrow, western buttercup, and cleavers are usually present. Other prairie-associated plant species are possible.

CLASSIFICATION NOTES: Currently known as QUGA/CAQU Forest by NatureServe (2005). Chappell and Crawford (1997) describe same association from South Puget Sound area. In BC, Erickson (1996) recognizes multiple community types that have affinities to this association. More data analysis is needed to determine if somewhat similar communities on shallow soils in the western Columbia River Gorge (Western Cascades) are part of this association.

MANAGEMENT NOTES: Maintenance of this association requires monitoring and in many cases active control (e.g., prescribed fire, cutting, herbicides) of Douglas-fir, Scot's broom, and snowberry. Care should be taken to avoid disturbances so intense that they facilitate loss of native understory or massive increase of non-native herbs. Native species composition is also threatened by apparent ongoing increase and expansion of non-native grasses (e.g., tall oatgrass).

BIODIVERSITY NOTES: State sensitive white-top aster (*Aster curtus*) occurs in this association in southern Puget Sound area. State candidate slender-billed white-breasted nuthatch (*Sitta carolinensis aculeata*) is dependent on oak habitat and appears to prefer more open oak woodlands like this. State threatened western gray squirrel (*Sciurus griseus*) requires oak woodland as one component of its habitat, and probably uses this association. Many unlisted plant species associated with this vegetation are probably declining in the Puget Trough.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

QUERCUS GARRYANA / FESTUCA ROEMERI

Oregon white oak / Roemer's fescue
Abbreviated Name: QUGA/FERO
Synonym: *Quercus garryana / Festuca idahoensis* var. *roemeri*

DISTRIBUTION: This association is currently known only from Fort Lewis, southwestern Pierce Co. In the pre-European settlement era, it was probably more widespread and likely occurred in Thurston, Lewis, Clark, San Juan, Clallam, and Island counties.

GLOBAL/STATE STATUS: G1S1. Known from only two small occurrences. It was probably much more extensive historically

ID TIPS: Savanna dominated by a sparse tree layer (10-30% cover of trees) of Oregon white oak and a herbaceous layer of Roemer's fescue.

ENVIRONMENT: Currently known only from gravelly sandy loam glacial outwash plain (Spanaway series) in a moderate precipitation zone.

DISTURBANCE/SUCCESSION: Historically maintained as savanna by indigenous burning practices. The known occurrences are regularly burned via military activities. In the absence of regular fire, Oregon white oak could become denser and Douglas-fir is likely to establish. These sites are likely to eventually convert to conifer forest without fire.

VEGETATION: This is a grassland with a sparse tree layer, also known as savanna. This is the only true "oak savanna" association recognized in western Washington, though the term "oak savanna" is often used to refer to oak woodlands with a herbaceous understory, e.g., QUGA/CAIN-CAQU association.This association is dominated or co-dominated by the bunchgrass Roemer's fescue and has a sparse tree layer of Oregon white oak (10-30% cover). This type has not been quantitatively sampled. Composition of remaining occurrences is likely to be similar to FERO-SERI with the addition or greater abundance of shade-loving species like long-stolon sedge and blue wildrye.

CLASSIFICATION NOTES: This association has not been previously described in the literature.

MANAGEMENT NOTES: Frequent fires, ignited by military training activities, maintain the only existing occurrences of this association. In the absence of fire, there is potential for increase in the density of oaks and shrubs, and establishment of conifers, all of which threaten the continued existence of the association. Scot's broom, Himalayan blackberry, and non-native grasses are also threats and may need to be controlled. This type is likely to be a restoration target because of its presumed former prevalence.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

QUERCUS GARRYANA - (FRAXINUS LATIFOLIA) / SYMPHORICARPOS ALBUS

Oregon white oak - (Oregon ash) / common snowberry
Abbreviated Name: QUGA-(FRLA)/SYAL

Sample size = 21 plots

DISTRIBUTION: Occurs only in the southern half of the Puget Trough, including Pierce, Thurston, Grays Harbor, Lewis, Cowlitz, and Clark counties. Also occurs in Willamette and Umpqua valleys, Oregon.

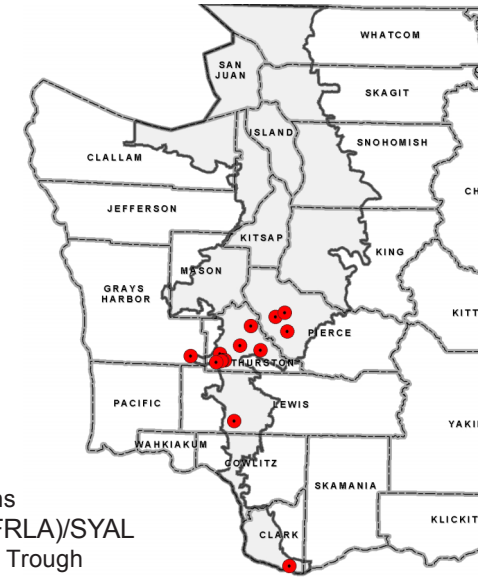
GLOBAL/STATE STATUS: G2S1S2. There are only 6 known relatively high-quality occurrences and probably less than 20 occurrences total in existence in Washington. Most examples have been degraded by non-native species or development. Threats include succession, development/conversion, and non-native species.

ID TIPS: Dominated by Oregon white oak or co-dominated by oak and Oregon ash. Common snowberry dominates understory. Oregon ash, sword fern, or moist-site forbs (see Vegetation section) are typically present. Site is usually riparian or wetland fringe.

ENVIRONMENT: These sites are moderately dry to moderately moist and appear to be relatively nutrient-rich. Typically occurs as a riparian strip parallel to streams or as a fringe around wetlands, and occupies a transitional area between prairies or former prairies and wetter habitats. Two plots on deep, gravel-free, loamy fine sands (Nisqually Series) were placed in this unit because of vegetative similarities, but were not associated with wetlands or streams. Some sites are probably temporarily flooded during at least some winters and all riparian and wetland sites are probably seasonally sub-irrigated to saturated. Occurs on glacial outwash plains and mixed material of glaciofluvial and sedimentary origin. These sites are relatively flat or gently sloping.
Precipitation: 43-65 inches (mean 48)
Elevation: 50-450 feet
Aspect/slope: All/ 0-16% slope (mean 4)
Slope position: plain, bottom, terrace, short
Soil series: Spanaway, Lacamas, McKenna, Nisqually
Special: riparian or wetland

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Orgeon white oak	Quercus garryana var. garryana	100	75
Oregon ash	Fraxinus latifolia	52	22
Douglas-fir	Pseudotsuga menziesii var. menzeisii	19	11
Shrubs and Dwarf-shrubs			
common snowberry	Symphoricarpos albus var. laevigatus	100	58
serviceberry	Amelanchier alnifolia	90	12
Indian plum	Oemleria cerasiformis	90	10
tall Oregongrape	Mahonia aquifolium	62	3
trailing blackberry	Rubus ursinus var. macropetalus	52	5
orange honeysuckle	Lonicera ciliosa	43	3
oval-leaved viburnum	Viburnum ellipticum	19	6
beaked hazelnut	Corylus cornuta var. californica	14	21
Graminoids			
Kentucky bluegrass	Poa pratensis	33	4
long-stolon sedge	Carex inops ssp. inops	24	3
Forbs and Ferns			
cleavers	Galium aparine	52	6
sword fern	Polystichum munitum	48	4
mountain sweet-cicely	Osmorhiza berteroi	48	+
licorice fern	Polypodium glycyrrhiza	43	+
Siberian springbeauty	Claytonia siberica var. siberica	38	8
small-flowered nemophila	Nemophila parviflora var. parviflora	33	4
enchanter's nightshade	Circaea alpina ssp. pacifica	29	6
starry false Solomon's-seal	Maianthemum stellatum	24	5
small-flowered trillium	Trillium parviflorum	24	+
fringecup	Tellima grandiflora	19	4
pioneer violet	Viola glabella	14	+



Plot locations
of QUGA-(FRLA)/SYAL
in the Puget Trough

Oregon white oak - (Oregon ash) / common snowberry

DISTURBANCE/SUCCESSION: If a seed source is present, Douglas-fir and Oregon ash are likely to increase in abundance over time in the absence of disturbance. In pre-Western settlement times, some existing sites may have been seasonally wet prairie swales maintained by burning (Salstrom et al. 2005), and riparian oak communities undoubtedly burned at least occasionally if not somewhat frequently Because of this, their understory composition was probably different, perhaps less shrubby. Winter flooding may be an important process on some of these sites.

VEGETATION: Forest, or less commonly woodland, dominated by Oregon white oak, and sometimes co-dominated by Oregon ash. Douglas-fir is occasionally prominent. The understory is always dominated by a substantial layer of common snowberry. The tall shrubs serviceberry and Indian plum are usually prominent.Tall Oregongrape is usually present; beaked hazelnut is occasionally prominent. The herb layer tends to be rather sparse with cleavers the most frequent species. Sword fern or one of the moist-site forbs (starry false Solomon's seal, Siberian springbeauty, enchanter's nightshade, fringecup, small-flowered trillium, pioneer violet) is usually present.

CLASSIFICATION NOTES: Chappell and Crawford (1997) describe same association as QUGA/SYAL/moist forb.

MANAGEMENT NOTES: Where Douglas-fir are present or establishing, their removal should be considered for long-term maintenance of the association. The potential for increases in non-natives with ground disturbance should be weighed when making decisions about tree removal. Little is known about the effects of fire on this association.

BIODIVERSITY NOTES: State threatened western gray squirrel (*Sciurus griseus*) requires oak woodland in proximity to water sources and therefore this association should be prime habitat. State candidate slender-billed white-breasted nuthatch (*Sitta carolinensis aculeata*) is dependent on oak woodland habitat and formerly occurred in this association at Scatter Creek. This appears to be an important habitat for the state sensitive small-flowered trillium (*Trillium parviflorum*), where it occurs relatively frequently

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

QUERCUS GARRYANA - PSEUDOTSUGA MENZIESII / SYMPHORICARPOS ALBUS / POLYSTICHUM MUNITUM

Oregon white oak - Douglas-fir / common snowberry / sword fern
Abbreviated Name: QUGA-PSME/SYAL/POMU

Sample size = 20 plots

DISTRIBUTION: Occurs almost throughout the range of oak within the Puget Trough, including San Juan, Pierce, Thurston, Clallam, Mason, Lewis, Cowlitz, Grays Harbor and Clark counties. Globally, occurs from southwestern BC to the Willamette Valley, Oregon.

GLOBAL/STATE STATUS: G4S3. There are probably fewer than 100 occurrences in Washington and relatively few of them are high-quality. This type is inherently unstable due to sucessional processes, and is probably more abundant in the current landscape than it was 150 years ago. Threats include succession and development/conversion.

ID TIPS: Co-dominated by Oregon white oak and Douglas-fir, or dominated by oak with numerous Douglas-fir stumps. Common snowberry prominent in the understory and sword fern or moist-site forbs present. Beaked hazelnut more common in this association than other oak associations.

ENVIRONMENT: These sites vary in their moisture status. Most are moderately dry to dry but a few appear to be moderately moist due to close proximity to streams or other water sources. Likely to be relatively nutrient-rich. Occurs on glacial outwash plains, glacial till and moraines, gravelly alluvium, and shallow or rocky soil over bedrock. Occurs on a variety of aspects and slopes.
Precipitation: 31-61 inches (mean 49)
Elevation: 100-550 feet
Aspect/slope: All/ 0-53% slope (mean 14)
Slope position: plain, mid, upper, short
Soil series: Spanaway, rockland, Lauren, Tumwater, Everett

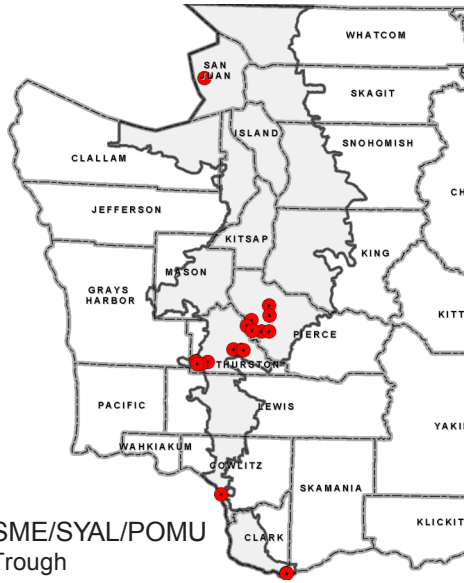
DISTURBANCE/SUCCESSION: This type is mostly an intermediate successional stage between oak-dominated communities [e.g. QUGA/CAIN-CAQU, QUGA/SYAL/CAIN, QUGA/VIEL-TODI, QUGA-(FRLA)/SYAL] and various Douglas-fir forest types. Douglas-fir is expected to increase in abundance over time and eventually out-compete the oak. In the pre-Western settlement landscape, this type is hypothesized to have been relatively rare.

Oregon white oak - Douglas-fir / common snowberry / sword fern

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Oregon white oak	Quercus garryana var. garryana	100	63
Douglas-fir	Pseudotsuga menziesii var. menziesii	90	37
Oregon ash	Fraxinus latifolia	40	3
bigleaf maple	Acer macrophyllum	30	7
grand fir	Abies grandis	5	18
Shrubs and Dwarf-shrubs			
common snowberry	Symphoricarpos albus var. laevigatus	100	27
trailing blackberry	Rubus ursinus var. macropetalus	95	9
tall Oregongrape	Mahonia aquifolium	90	3
Indian plum	Oemleria cerasiformis	85	11
serviceberry	Amelanchier alnifolia	80	13
beaked hazelnut	Corylus cornuta var. californica	70	11
baldhip rose	Rosa gymnocarpa	70	2
orange honeysuckle	Lonicera ciliosa	65	6
oceanspray	Holodiscus discolor	55	7
oval-leaved viburnum	Viburnum ellipticum	30	12
spreading snowberry	Symphoricarpos hesperius	25	7
vine maple	Acer circinatum	15	20
poison-oak	Toxicodendron diversilobum	15	3
Graminoids			
Alaska oniongrass	Melica subulata	55	3
Forbs and Ferns			
sword fern	Polystichum munitum	95	9
licorice fern	Polypodium glycyrrhiza	65	3
cleavers	Galium aparine	60	5
big-leaved sandwort	Moehringia macrophylla	55	6
mountain sweet-cicely	Osmorhiza berteroi	50	2
small-flowered nemophila	Nemophila parviflora var. parviflora	45	3
woods strawberry	Fragaria vesca ssp. bracteata	45	2
sweet-scented bedstraw	Galium triflorum	45	2
western starflower	Trientalis borealis ssp. latifolia	45	1
starry false Solomon's-seal	Maianthemum stellatum	40	9
Siberian springbeauty	Claytonia siberica var. siberica	35	4
yerba buena	Clinopodium douglasii	35	1
enchanter's nightshade	Circaea alpina ssp. pacifica	25	7
inside-out flower	Vancouveria hexandra	20	8
pioneer violet	Viola glabella	20	2

Oregon white oak - Douglas-fir / common snowberry / sword fern



Plot locations of QUGA-PSME/SYAL/POMU in the Puget Trough

Oregon white oak - Douglas-fir / common snowberry / sword fern

Sword fern and a number of other species more characteristic of Douglas-fir forest are more common in this association than in the other oak associations. This distinctive understory composition is what places some stands into this association, even though the Douglas-fir overstory has been removed by logging.

VEGETATION: Forest typically co-dominated by Oregon white oak and Douglas-fir, or dominated by oak with Douglas-fir stumps from logging. The understory is rather variable but always has common snowberry and sword fern or moist-site forbs (e.g., starry false Solomon's seal). Typically, snowberry is prominent to co-dominant. Many other shrubs are usually present including trailing blackberry, tall Oregongrape, Indian plum, serviceberry beaked hazelnut and baldhip rose. Oval-leaf viburnum or vine maple are usually absent, but occasionally prominent to co-dominant. Sword fern is usually prominent. Other herbs usually present are Alaska oniongrass, licorice fern (epiphytic), cleavers, and big-leaved sandwort.

CLASSIFICATION NOTES: Chappell and Crawford (1997) describe this association from the southern Puget Sound area. This association is called PSME-QUGA/SYAL in NatureServe (2005). On Fort Lewis, Thysell and Carey (2001) noted what they called a Douglas-fir-oak/moist herb type (site type 2) that is probably within the range of variation of the QUGA-PSME/SYAL/POMU association.

MANAGEMENT NOTES: Maintenance of this association over the long-term would be difficult due to the propensity for Douglas-fir to increase and out-compete oak. Thinning or complete removal of Douglas-fir may be advisable in order to conserve and enhance oak component. Logging should be done with a "light touch" in order to minimize damage to oaks and minimize increase of non-native understory species. Prescribed fire may be a beneficial management tool in some situations.

BIODIVERSITY NOTES: State threatened western gray squirrel (*Sciurus griseus*) requires oak and conifer in proximity to one another and undoubtedly uses this association. State sensitive small-flowered trillium (*Trillum parviflorum*) and state threatened western wahoo (*Euonymus occidentalis*) have been recorded in this association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

QUERCUS GARRYANA / SYMPHORICARPOS ALBUS / CAREX INOPS

Oregon white oak / common snowberry / long-stolon sedge
Abbreviated Name: QUGA/SYAL/CAIN
Synonym: *Quercus garryana / Symphoricarpos albus / Carex pensylvanica*

Sample size = 21 plots

DISTRIBUTION: Occurs more or less throughout the range of oak within the Puget Trough, including San Juan, Pierce, Thurston, Island, Clallam, Mason, Lewis, Grays Harbor and Clark counties. Occurs in southwestern BC also.

GLOBAL/STATE STATUS: G2S2. Most examples are very small or otherwise degraded. Few occurrences of good quality remain. Those that remain are highly threatened by non-native species, conifer encroachment, and development.

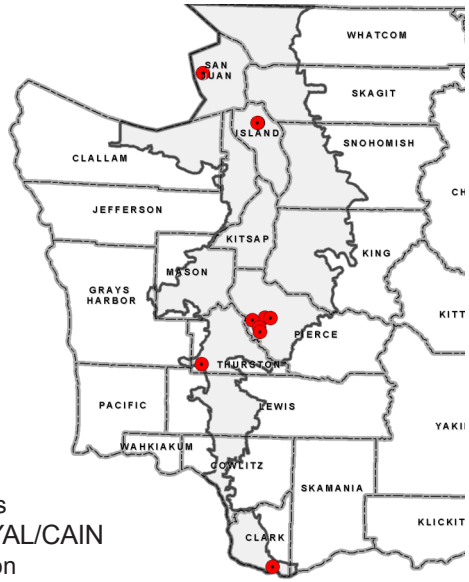
ID TIPS: Dominated by Oregon white oak. Common snowberry or tall Oregongrape dominate the understory and long-stolon sedge or other grassland/savanna herb species are present. Sword fern and moist-site herbs are absent or less abundant than grassland/savanna species.

ENVIRONMENT: These sites are dry to very dry and appear to be relatively nutrient-rich. Occurs on deep-soil coarse-textured glacial outwash plains, shallow soils over bedrock, or coarse-textured glacial till. Most common on flats or sunny aspects (south to west), but does occur on other aspects as well.
Precipitation: 21-54 inches (mean 42)
Elevation: 90-400 feet
Aspect/slope: S to NW/ 0-40% slope (mean 1)
Slope position: plain, mid, upper, short
Soil series: Spanaway, rockland, Hoypus, Nisqually

DISTURBANCE/SUCCESSION: In most stands, this association is probably the result of an increase of native understory shrubs in QUGA/CAIN-CAQU, or of oak invasion onto former prairies or savannas, in the absence of periodic fires. In the pre-Western settlement landscape, this type is hypothesized to have been rare or absent. In the absence of fire or active management, most of these stands are being invaded by Douglas-fir trees and are likely to convert to QUGA-PSME/SYAL/POMU and eventually to conifer forest.

Vegetation Composition Table (selected species):
Con = constancy , the percent of plot s within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover). .

Trees	Kartesz 2005 Name	Con	Cov
Oregon white oak	Quercus garryana var. garryana	100	60
Douglas-fir	Pseudotsuga menziesii var. menziesii	38	9
Oregon ash	Fraxinus latifolia	29	6
Pacific madrone	Arbutus menziesii	10	2
Shrubs and Dwarf-shrubs			
common snowberry	Symphoricarpos albus var. laevigatus	95	37
tall Oregongrape	Mahonia aquifolium	86	9
Scot's broom	Cytisus scoparius	76	9
serviceberry	Amelanchier alnifolia	76	8
Indian plum	Oemleria cerasiformis	48	4
trailing blackberry	Rubus ursinus var. macropetalus	43	5
oceanspray	Holodiscus discolor	29	14
beaked hazelnut	Corylus cornuta var. californica	14	9
Graminoids			
Kentucky bluegrass	Poa pratensis	86	13
long-stolon sedge	Carex inops ssp. inops	81	12
blue wildrye	Elymus glaucus	76	5
tall oatgrass	Arrhenatherum elatius	43	4
Forbs and Ferns			
common St. John's-wort	Hypericum perforatum	76	3
cleavers	Galium aparine	57	2
Nuttall's peavine	Lathyrus nevadensis ssp. lanceolatus var. pilosellus	52	3
yarrow	Achillea millefolium var. occidentalis	33	1
hairy cat's-ear	Hypochaeris radicata	29	+
common shepherd's-cress	Teesdalia nudicaulis	29	1
big-leaved sandwort	Moehringia macrophylla	24	5
sword fern	Polystichum munitum	19	2



Plot locations of QUGA/SYAL/CAIN in Washington

Oregon white oak / common snowberry / long-stolon sedge

VEGETATION: Woodland or forest dominated by Oregon white oak. The understory is dominated by medium-tall shrubs, most often common snowberry. Tall Oregongrape is usually present and occasionally dominates or co-dominates. Scot's broom and serviceberry are other very frequent shrubs. Oceanspray is occasionally co-dominant. Long-stolon sedge and the non-native Kentucky bluegrass are usually prominent in the herb layer. Blue wildrye, common St-Johns-wort, and cleavers are usually present. Other prairie-associated plant species may be present. Sword fern and moist-site forbs are rare or absent.

CLASSIFICATION NOTES: Chappell and Crawford (1997) describe this association from the southern Puget Sound area. In BC, Erickson (1996) recognizes multiple community types that have affinities to this association. On Fort Lewis (Pierce and Thurston counties), Thysell and Carey (2001), noted what they called an oak/native shrub type (site type 1) that may be intermediate in character between QUGA/CAIN/SYAL and QUGA-PSME/SYAL/POMU.

MANAGEMENT NOTES: Maintenance of this association requires monitoring and active control of Douglas-fir. Reintroduction of fire into this association should reduce shrub cover over time, and if sufficient native seed and viable tubers are in the soil, reestablishment of the even more imperiled, and more important from a conservation perspective, QUGA/CAIN-CAQU association appears to be possible. However, if native herbaceous component in the soil has been removed by past heavy grazing or too long a period of shrub suppression, then fire may facilitate a conversion of understory to non-native grasses and forbs.

BIODIVERSITY NOTES: State candidate slender-billed white-breasted nuthatch (*Sitta carolinensis aculeata*) is dependent on oak woodland habitat. State threatened western gray squirrel (*Sciurus griseus*) requires oak woodland as one component of its habitat, and probably uses this association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

QUERCUS GARRYANA / VIBURNUM ELLIPTICUM / TOXICODENDRON DIVERSILOBUM

Oregon white oak / oval-leaf viburnum / poison-oak
Abbreviated Name: QUGA/VIEL/TODI
Synonym: *Qurecus garryana / Viburnum ellipticum / Rhus diversiloba*

Sample size = 14 plots

DISTRIBUTION: Occurs primarily near the Columbia River in Clark, Cowlitz, and western Skamania counties. One outlier plot is located in southeastern Thurston County. Also occurs in a small area on the Oregon side of the Columbia River

GLOBAL/STATE STATUS: G1S1. Very small global range. There are fewer than 20 occurrences total and only two in Washington are known to be relatively high-quality Most examples are very small and/or have been degraded. Threats include development/conversion and non-native species.

ID TIPS: Dominated by Oregon white oak. Oval-leaf viburnum and poison-oak are usually co-dominant: one of them is always >10% cover. Occurs on shallow or rocky soils.

ENVIRONMENT: These sites are dry to very dry and appear to be relatively nutrient-rich. Occurs on shallow-to-bedrock or extremely stony soils, many of which are derived from Columbia River basalt. Often occurs on talus. Usually found on a moderate to steep slope and a sunny aspect (especially southwest).
Precipitation: 46-69 inches (mean 50)
Elevation: 20-750 feet
Aspect/slope: SE to NW / 3-75% slope (mean 41)
Slope position: upper, mid, short, terrace, ridgetop, lower
Soil series: rockland, rock outcrop, Olympic, xerorthents

DISTURBANCE/SUCCESSION: Douglas-fir is likely to increase in abundance over time in the absence of disturbance. Some of these areas may not have been forested until after post-settlement fire suppression. Because of this, and the rarity of the type, it is unclear to what extent this association occurred in the pre-Western settlement landscape.

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
Oregon white oak	Quercus garryana var. garryana	100	77
Douglas-fir	Pseudotsuga menziesii var. menziesii	50	6
Shrubs and Dwarf-shrubs			
common snowberry	Symphoricarpos albus var. laevigatus	100	19
poison-oak	Toxicodendron diversiloba	93	23
oceanspray	Holodiscus discolor	93	14
oval-leaved viburnum	Viburnum ellipticum	86	27
serviceberry	Amelanchier alnifolia	86	9
Indian plum	Oemleria cerasiformis	86	9
tall Oregongrape	Mahonia aquifolium	79	5
trailing blackberry	Rubus ursinus var. macropetalus	71	3
baldhip rose	Rosa gymnocarpa	64	2
Graminoids			
Alaska oniongrass	Melica subulata	50	3
blue wildrye	Elymus glaucus	50	3
Forbs and Ferns			
cleavers	Galium aparine	86	6
woods strawberry	Fragaria vesca ssp. bracteata	86	5
licorice fern	Polypodium glycyrrhiza	79	4
small-flowered nemophila	Nemophila parviflora var. parviflora	79	2
Nuttall's peavine	Lathyrus nevadensis ssp. lanceolatus var. pilosellus	71	2
yerba buena	Clinopodium douglasii	57	9
big-leaved sandwort	Moehringia macrophylla	57	7
fringecup	Tellima grandiflora	57	3
miner's lettuce	Claytonia perfoliata ssp. perfoliata	50	13
coastal woodfern	Dryopteris arguta	50	5
broad-leaved penstemon	Penstemon ovatus	36	6
enchanter's nightshade	Circaea alpina ssp. pacifica	36	6

THUJA PLICATA – ABIES GRANDIS / POLYSTICHUM MUNITUM

Western redcedar – grand fir / sword fern
Abbreviated Name: THPL-ABGR/POMU

Sample size = 10 plots

DISTRIBUTION: In Washington, this association is known to occur only in San Juan, western Skagit, and far eastern Clallam (Sequim area) counties. It is possible in northern Island and northeastern Jefferson counties. It also occurs in adjacent British Columbia on the Gulf Islands and southeastern Vancouver Island.

GLOBAL/STATE STATUS: G1S1. Throughout its range much of this association has been converted to residential development and agriculture and almost all the remainder has been heavily disturbed by past logging. It has a very limited global range. There are fewer than 5 high-quality occurrences known in Washington. Threats include non-native species and further development.

ID TIPS: Located in the Olympic rainshadow *and* western hemlock <25% cover *and* the combined cover of western redcedar and grand fir is greater than that of hemlock. Western redcedar always occupies >10% cover or is the dominant tree regeneration. Sword fern dominates the understory and usually occupies >35% cover. See key.

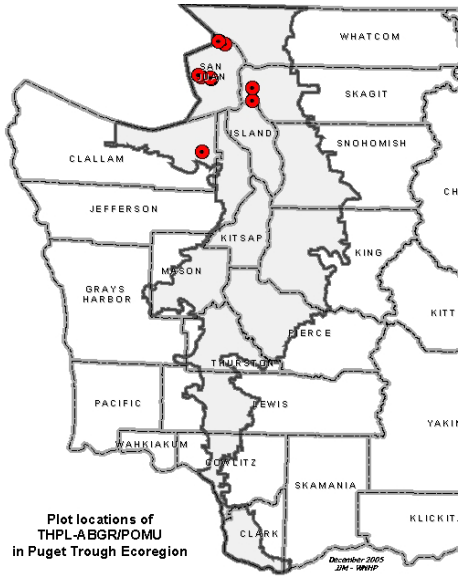
ENVIRONMENT: These sites are moist to very moist and appear to be relatively nutrient-rich. Sites are flat to steep (usually gentle) on a variety of aspects. It is more often found on lower slopes or bottoms and not on upper slopes or ridges. Mapped parent material is mostly glacial till, but also includes old alluvium. Soil textures are loam or sandy loam, usually with a gravelly or stony component. Found only in dry climatic areas.

Precipitation: 20-31 inches (mean 28)
Elevation: sea level - 600 feet
Aspect/slope: various/ 0-80% (mean 20)
Slope position: lower, bottom, plain, mid
Soil series: Roche, Sequim, Swinomish, Catla

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Western redcedar, and if present, grand fir, increase over time in the absence of distur-

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
western redcedar	Thuja plicata	100	46
Douglas-fir	Pseudotsuga menziesii var. menziesii	90	31
grand fir	Abies grandis	80	20
bigleaf maple	Acer macrophyllum	60	21
red alder	Alnus rubra	50	12
Douglas' maple	Acer glabrum var. douglasii	20	17
western hemlock	Tsuga heterophylla	20	2
Shrubs and Dwarf-shrubs			
common snowberry	Symphoricarpos albus var. laevigatus	70	2
trailing blackberry	Rubus ursinus var. macropetalus	60	11
oceanspray	Holodiscus discolor	60	3
baldhip rose	Rosa gymnocarpa	60	2
salal	Gaultheria shallon	60	2
red huckleberry	Vaccinium parvifolium	60	1
thimbleberry	Rubus parviflorus	40	4
salmonberry	Rubus spectabilis	40	4
Indian plum	Oemleria cerasiformis	30	3
Forbs and Ferns			
sword fern	Polystichum munitum	100	50
spreading woodfern	Dryopteris expansa	70	2
western starflower	Trientalis borealis ssp. latifolia	60	4
bracken fern	Pteridium aquilinum var. pubescens	60	2
sweet-scented bedstraw	Galium triflorum	60	1
mountain sweet-cicely	Osmorhiza berteroi	40	+
threeleaf foamflower	Tiarella trifoliata var. trifoliata	20	7



Western redcedar – grand fir / sword fern

bance, Douglas-fir decreases. Red alder may regenerate abundantly after disturbance if a seed source is present and mineral soil is exposed. This can result in conversion of this association to ALRU/POMU. Alder will typically die out after 80-100 years.

VEGETATION: Canopy is usually dominated by western redcedar (always present), Douglas-fir, and/or grand fir. Western redcedar and/or grand fir dominates tree regeneration. This is one of the few Puget associations where western redcedar is usually more dominant than Douglas-fir. Bigleaf maple is often prominent to co-dominant. Red alder is sometimes prominent. Western hemlock is occasionally present to prominent. Rocky Mountain maple is occasionally prominent as a subcanopy tree. Shrub layers are generally sparse to moderate in density. Trailing blackberry is often prominent; oceanspray, baldhip rose, common snowberry, salal and red huckleberry are frequently present. Sword fern always dominates the well-developed herb layer and is often relatively dense and tall in stature. Spreading woodfern, western starflower, sweet-scented bedstraw, and bracken fern are frequent herbs.

CLASSIFICATION NOTES: First described in the U.S. by Fonda and Bernardi (1976) from Sucia Island. Chappell (1997) and NatureServe (2005) both recognize it.

MANAGEMENT NOTES: Stands that have not been previously harvested, or mature to old stands, should be considered for conservation status. These sites appear to be very productive for tree growth. Non-native English ivy (*Hedera helix*) is certainly a threat to this association if it becomes established. Herb Robert (*Geranium robertianum*) is another threatening non-native because of its potential impacts on the forb layer.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

THUJA PLICATA - TSUGA HETEROPHYLLA / OPLOPANAX HORRIDUS / POLYSTICHUM MUNITUM

Western redcedar - western hemlock / devils club / sword fern

Abbreviated Name: THPL-TSHE/OPHO/POMU

Sample size = 7 plots

DISTRIBUTION: Occurs infrequently more or less throughout the Puget Trough, except for the Olympic Mountain rainshadow, where it appears to be absent. Occurs more commonly in adjacent ecoregions. Also occurs in northwestern Oregon and southwestern BC.

GLOBAL/STATE STATUS: G4S4. Very few good quality occurrences remain in the Puget Trough due to past logging activities. Non-native species are a threat in the Puget Trough. Much more common in adjacent ecoregions.

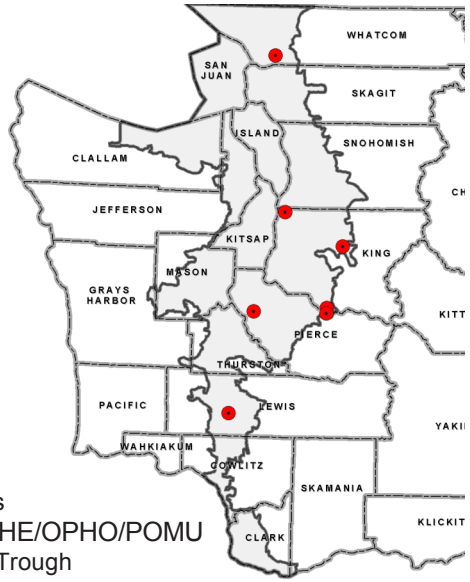
ID TIPS: Devils club provides >10% cover

ENVIRONMENT: These sites are very moist and appear to be relatively nutrient-rich. Sub-irrigation is typical of devils club sites. Slopes are variable. Aspect is northerly. Lower slopes are the most common landform, though it also occurs on riparian terraces (not sampled for this work). Parent materials include glacial till, glaciofluvial and glaciolacustrine sediments. Mapped soil textures tend toward loam or silt loam.
Precipitation: 37-59 inches (mean 50)
Elevation: 150-850 feet
Aspect/slope: NW to NE/ 6-70% (mean 37)
Slope position: lower, mid, bottom
Soil series: Lacamas, Ovall, Squalicum, Tokul, Lemolo, Kitsap

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance, though on riparian terraces flooding will also be important. Most stands show evidence of past fires. Hemlock and/or redcedar increase over time in absence of disturbance, Douglas-fir decreases. Red alder may regenerate abundantly after disturbance if a seed source is present and mineral soil is exposed. Alder will typically die out after 80-100 years without disturbance. Salmonberry may increase in abundance after ground surface disturbance. Due to their wetness and probable shallow rooting depth, these sites are probably more prone to windthrow than most.

Vegetation Composition Table (selected species):
Con = constancy, the percent of plots within which each species was found;
Cov = cover, the mean crown cover of the species in plots where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
western redcedar	Thuja plicata	100	31
western hemlock	Tsuga heterophylla	86	42
Douglas-fir	Pseudotsuga menziesii var. menziesii	86	22
bigleaf maple	Acer macrophyllum	86	7
red alder	Alnus rubra	29	6
Shrubs and Dwarf-shrubs			
devils club	Oplopanax horridus	100	23
salmonberry	Rubus spectabilis var. spectabilis	86	17
red elderberry	Sambucus racemosa var. racemosa	71	6
red huckleberry	Vaccinium parvifolium	71	5
trailing blackberry	Rubus ursinus ssp. macropetalus	57	+
vine maple	Acer circinatum	57	8
Indian plum	Oemleria cerasiformis	57	2
Graminoids			
small-flowered wood-rush	Luzula fastigiata	43	+
Forbs and Ferns			
sword fern	Polystichum munitum	100	34
lady-fern	Athyrium filix-femina ssp. cyclosorum	100	12
sweet-scented bedstraw	Galium triflorum	100	1
threeleaf foamflower	Tiarella trifoliata var. trifoliata	86	6
spreading woodfern	Dryopteris expansa	86	3
youth-on-age	Tolmiea menziesii	71	6
Siberian springbeauty	Claytonia siberica var. siberica	57	1
licorice fern	Polypodium glycyrrhiza	57	+
clasping-leaved twisted-stalk	Streptopus amplexifolius var. amplexifolius	57	+
western trillium	Trillium ovatum ssp. ovatum	57	+
slender-stem waterleaf	Hydrophyllum tenuipes	43	5
Pacific bleedingheart	Dicentra formosa ssp. formosa	43	2



Plot locations
of THPL-TSHE/OPHO/POMU
in the Puget Trough

Western redcedar - western hemlock / devils club / sword fern

VEGETATION: Forest or woodland with canopy dominated or co-dominated by western redcedar and usually western hemlock also. Douglas-fir is usually prominent to co-dominant as well but averages less cover here than in other Puget Trough conifer forests. Western hemlock or western redcedar typically dominate tree regeneration. Bigleaf maple usually forms a scattered to prominent lower canopy layer. The shrub layer is co-dominated by devils club and usually salmonberry also. Other common shrubs are red elderberry, red huckleberry, vine maple, and Indian plum. Sword fern dominates the herb layer. Lady-fern is usually prominent. Sweet-scented bedstraw, threeleaf foamflower, spreading woodfern, and youth-on-age are usually present to occasionally prominent.

CLASSIFICATION NOTES: Also described as TSHE/OPHO (Chappell 1997) and TSHE-(THPL)/OPHO/POMU (Chappell 2001, NatureServe 2005). Future NatureServe name will be TSHE-(PSME)/OPHO/POMU. This association is similar to TSHE/OPHO/POMU in Gifford Pinchot National Forest (Topik et al 1986), TSHE/OPHO in Olympic National Forest (Henderson et al. 1989), and TSHE/OPHO-ATFI in Mt. Baker-Snoqualmie National Forest (Henderson et al. 1992). This Puget Trough variant of the widespread association has greater abundance of western redcedar than the others.

MANAGEMENT NOTES: Red alder can regenerate abundantly after logging of this association. These sites are probably moderately productive for tree growth. Non-native English ivy (*Hedera helix*) does well on these sites and if present can quickly overwhelm the native understory. Herb Robert (*Geranium robertianum*) is another threatening invasive for this association.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

TSUGA HETEROPHYLLA - PSEUDOTSUGA MENZIESII / POLYSTICHUM MUNITUM - DRYOPTERIS EXPANSA

western hemlock - Douglas-fir / sword fern - spreading woodfern

Abbreviated Name: TSHE-PSME/POMU-DREX

Synonym: *Tsuga heterophylla - Pseudotsuga menziesii / Polystichum munitum - Dryopteris austriaca*

Sample size = 63 plots

DISTRIBUTION: This association occurs throughout the Puget Trough. Relatively rare in San Juan County where it is largely replaced by THPL-ABGR/POMU. Also occurs in adjacent western Washington ecoregions and in southwestern BC.

GLOBAL/STATE STATUS: G3G4S3. Natural-origin occurrences in the Puget Trough are rare due to historic logging. Development and non-native species are threats in the Puget Trough. More common in adjacent ecoregions where most natural-origin stands have been harvested.

ID TIPS: If located within the Olympic Mountains rainshadow (see Introduction), western hemlock must be >25% cover or more abundant than western redcedar and grand fir. Sword fern dominates understory with little to no salal, evergreen huckleberry, Pacific rhododendron, or dwarf Oregongrape. Spreading woodfern, lady-fern, threeleaf foamflower, salmonberry and deerfern cumulatively more abundant than dwarf Oregongrape and oceanspray.

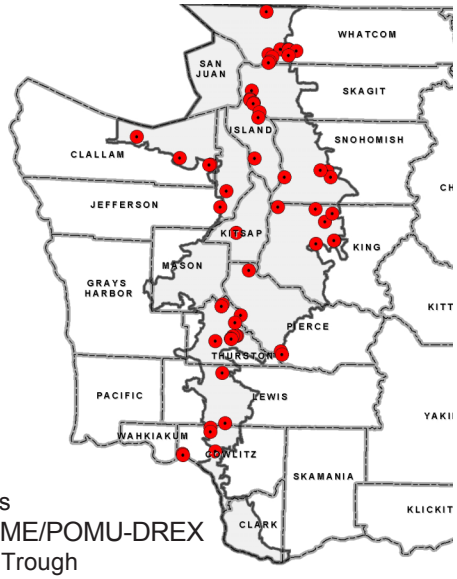
ENVIRONMENT: These sites are moist to very moist and appear to be relatively nutrient-rich. A variety of topography and soils are represented. Aspect is more commonly northerly or easterly. Lower slopes predominate. Also present on riparian terraces, which were rarely sampled for this work. Parent materials are variable. Silt loam and gravelly loam were the most commonly mapped soil textures, though a wide variety of textures occurs on these sites. This type is rare in dry climatic zones.

Precipitation: 26-90 inches (mean 50)
Elevation: 50-1600 feet
Aspect/slope: all/ 0-80% (mean 28)
Slope position: lower, mid, short, plain, bottom, upper
Soil series: Ahl, Alderwood, andic xerochrepts, aquic fluvoquents, Barneston, Buckpeak, Cagey, Chuckanut, dystric xerorthents, Elwha, Hoodsport, Hoogdal, Indianola, Kilchis, Kitsap, Laxton, Louella, Nati, Nisqually, Olympic, Revel, Scamman, Schneider, Skipopa, Squalicum, Swinomish, Terbies, Tokul, Whidbey, Whistle, Wilkeson, Yelm

Vegetation Composition Table (selected species):
Con = const ancy, the percent of plots within which each species was found;
Cov = cover , the mean crown cover of the species in plot s where it was found;
+ = trace (< 0.5% cover).

Trees	Kartesz 2005 Name	Con	Cov
western hemlock	Tsuga heterophylla	96	36
Douglas-fir	Pseudotsuga menziesii var. menziesii	94	45
western redcedar	Thuja plicata	81	33
bigleaf maple	Acer macrophyllum	73	18
red alder	Alnus rubra	44	9
grand fir	Abies grandis	32	14
Shrubs and Dwarf-shrubs			
red huckleberry	Vaccinium parvifolium	86	3
dwarf Oregongrape	Mahonia nervosa	54	4
trailing blackberry	Rubus ursinus var. macropetalus	68	3
red elderberry	Sambucus racemosa var. racemosa	60	2
salmonberry	Rubus spectabilis var. spectabilis	48	4
salal	Gaultheria shallon	46	2
vine maple	Acer circinatum	41	20
beaked hazelnut	Corylus cornuta var. californica	29	3
Graminoids			
Columbia brome	Bromus vulgaris	21	2
Dewey's sedge	Carex deweyana var. deweyana	21	2
Forbs and Ferns			
sword fern	Polystichum munitum	100	54
spreading woodfern	Dryopteris expansa	78	3
sweet-scented bedstraw	Galium triflorum	71	2
western starflower	Trientalis borealis ssp. latifolia	59	1
lady-fern	Athyrium filix-femina ssp. cyclosorum	54	2
threeleaf foamflower	Tiarella trifoliata var. trifoliata	54	5
western trillium	Trillium ovatum ssp. ovatum	51	1
bracken fern	Pteridium aquilinum var. pubescens	38	3
deerfern	Blechnum spicant	24	2
inside-out flower	Vancouveria hexandra	22	7

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].



Plot locations of TSHE-PSME/POMU-DREX in the Puget Trough

western hemlock - Douglas-fir / sword fern - spreading woodfern

DISTURBANCE/SUCCESSION: Fire is the primary natural disturbance. Old-growth stands show evidence of past low- to moderate-severity fire (underburns). Hemlock and/or redcedar increase over time in absence of disturbance, Douglas-fir decreases. Young stands may have little hemlock or redcedar. Red alder may regenerate abundantly after disturbance if a seed source is present and mineral soil is exposed. This can result in conversion of this association to ALRU/POMU. Alder will typically die out after 80-100 years. Salmonberry and forbs increase in abundance after ground surface disturbance.

VEGETATION: Canopy dominated by western hemlock, Douglas-fir, and/or western redcedar. Western hemlock is almost always present. Bigleaf maple usually forms a prominent lower canopy layer, and red alder less frequently so in natural-origin stands. Grand fir is occasionally prominent. Sword fern almost always dominates the understory, and is taller than average in this association. Vine maple forms a prominent to dominant tall shrub layer on about half the plots. Red huckleberry, dwarf Oregongrape, trailing blackberry, red elderberry, salmonberry, sweet-scented bedstraw, western starflower, spreading woodfern, threeleaf foamflower, and lady-fern are frequent in smaller amounts. Inside-out flower is prominent on about ¼ of plots, especially from Lewis County south.

CLASSIFICATION NOTES: Described by Chappell (1997) as TSHE/POMU-ATFI and by Chappell (2001) as PSME-TSHE/POMU-DREX. NatureServe (2005) taxonomy is in need of revision: names there include TSHE/POMU-TITR or PSME-TSHE/POMU. The future NatureServe name will be TSHE-(PSME-THPL)/POMU-ATFI, a much more widespread type that inclues TSHE/POMU-TITR of Mount Baker-Snoqualmie (Henderson et al. 1992) and Olympic (Henderson et al. 1989) national forests and TSHE/ATFI of Gifford Pinchot National Forest (Topik et al. 1986).

MANAGEMENT NOTES: Red alder can regenerate abundantly after logging of this association. These sites are very productive for tree growth. Non-native English ivy (*Hedera helix*) does well on these sites and if present can quickly overwhelm the native understory. Herb Robert (*Geranium robertianum*) is another threatening invasive.

BIODIVERSITY NOTES: State threatened western wahoo (*Euonymus occidentalis*) and state sensitive tall bugbane (*Cimicifuga elata*) occur in this plant association.

Shrub-dominated upland vegetation in the Puget Trough has not been adequately quantitatively sampled because most known examples are related to timber harvest activities. There appear to be extremely few small natural-origin upland shrub-dominated stands of vegetation in the Puget Trough ecoregion. Dry shrub-dominated vegetation, or "shrub barrens" maintained by a particular fire frequency, may have been widespread in the ecoregion prior to Western settlement and the disruption of historic fire regimes (Floberg et al. 2004).

Small, apparently natural-origin fragments of a native shrubland vegetation type have been observed in urbanized western Pierce County (South Tacoma and vicinity). These stands of vegetation are dominated by the tall shrub beaked hazelnut (*Corylus cornuta* var. *californica*). Common to abundant associates include salal (*Gaultheria shallon*) (often forming a dense lower shrub layer), common snowberry (*Symphoricarpos albus*), Douglas-fir (*Pseudotsuga menziesii*), and Pacific madrone (*Arbutus menziesii*), the latter two as widely scattered trees. This vegetation type appears to have been maintained by periodic fires in the vicinity of prairies. It may have been a common feature of the pre-Western settlement South Puget Sound landscape. Interestingly, hazelnut-dominated shrublands with scattered oak and Douglas-fir have been documented as historically occupying huge acreages in the Willamette Valley of Oregon. They were transitional between prairies/savannas and forests and probably had intermediate fire frequencies (Christy et al. 1999, Floberg et al. 2004).

A few older Christmas tree plantations in central Mason County host a unique vegetation type characterized by dominance or co-dominance by kinnikinnick (*Arctostaphylos uva-ursi*) and/or beargrass (*Xerophyllum tenax*). Existing vegetation in these areas is typically open woodland co-dominated by lodgepole pine (*Pinus contorta* var. *contorta*) and Douglas-fir. Openings between the tree crowns support the unique shrub-forb composition. While beargrass is, technically speaking, a forb, in some respects it functions similarly to a shrub in terms of its stature, its evergreen habit, and its contribution to soil forming processes. Salal is abundant in this vegetation type, mostly under tree crowns. Poverty danthonia (*Danthonia spicata*), hairy manzanita (*Arctostaphylos columbiana*), dwarf huckleberry (*Vaccinium caespitosum*), spreading snowberry (*Symphoricarpos hesperius*), and several

SHRUBLANDS AND RELATED VEGETATION

forbs characteristic of prairies are common. Historic records indicate that these areas were probably beargrass savannas with scattered Douglas-fir trees and may have been quite extensive in central and western Mason County prior to Western settlement, maintained by periodic burning by aboriginal people (Peter and Shebitz *in press*). This vegetation type occurs on very gravelly glacial outwash plains.

Vegetation in clearcuts on the Kitsap Peninsula and northeast Olympic Peninsula are often dominated by salal, Pacific rhododendron (*Rhododendron macrophyllum*), evergreen huckleberry (*Vaccinium ovatum*), and/or snow-brush ceanothus (*Ceanothus velutinus*). These areas suggest the possibility of pre-Western settlement shrub-dominated vegetation with similar composition that could have been maintained by periodic fires.

The *Arctostaphylos columbiana* (hairy manzanita) association (Chappell 2006) occurs rarely in western Whatcom County and perhaps elsewhere in the ecoregion. These shrublands associated with herbaceous balds are less dependent on historic fires than the aforementioned shrub vegetation types. This vegetation type occurs on shallow soils in the context of mostly herbaceous-dominated balds and is more frequent in the adjacent more mountainous ecoregions.

The *Arctostaphylos uva-ursi-Fragaria virginiana-(Festuca roemeri)* association (kinnikinnick-broadpetal strawberry-Roemer's fescue) described by Chappell (2006) occurs sometimes within the context of shallow-soiled balds or gravelly prairies (FERO-SERI association) within the Puget Trough. It is dominated or co-dominated by dwarf-shrubs.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

Herbaceous vegetation dominated by native species that does not fit the types described elsewhere in this classification is known to exist within the ecoregion. Such stands of vegetation include unique local assemblages or stands that are poorly represented in our data for the Puget Trough. Much of the forb-dominated vegetation in the ecoregion (forbs much higher in cover than graminiods) occurs at a very small spatial scale within the context of balds or, less commonly, prairies. It is likely that such forb-dominated vegetation would have been more common in pre-Western settlement prairies due to the effects of aboriginal burning and digging.

These small-scale forb patches were initially not a focus of our sampling and have only become so in the last few years with the expansion of our sampling of herbaceous bald vegetation into adjacent montane ecoregions. For this reason, our samples from the Puget Trough are limited in number. Because these forb-dominated types are generally more common in the adjacent ecoregions, it is important that any classification of associations consider data from both areas. An association classification based on balds vegetation from western Washington has recently been completed: if you find yourself in balds habitat (shallow soils) and are unable to determine a good fit from the associations contained in this document, consult Chappell (2006).

Herbaceous Balds Vegetation (see Chappell 2006)

Plant associations that have been identified within the Puget Trough, but are not described in this document, include the following list of associations described in Chappell (2006):

ACLE *Achnatherum lemmonii*, Lemmon's needlegrass

ARUV-FRVI-(FERO) *Arctostaphylos uva-ursi-Fragaria virginiana-(Festuca roemeri)*, Kinnikinnick-broadpetal strawberry-(Roemer's fescue)

CAIN-ERLA *Carex inops-Eriophyllum lanatum*, Long-stolon sedge-woolly sunflower

CAQU-TRHY *Camassia quamash-Triteleia hyacinthina*, Common camas-hyacinth triteleia

MIGU-TRHY *Mimulus guttatus-Triteleia hyacinthina*, Yellow monkey-flower-hyacinth triteleia

PLCO *Plectritis congesta*, Showy plectritis

TRHY *Triteleia hyacinthina*, hyacinth triteleia

UNCLASSIFIED HERBACEOUS VEGETATION

Other vegetation types are possible within balds in the Puget Trough. For example, there is a small area dominated by Hood's sedge (*Carex hoodii*) near the top of Mount Constitution on Orcas Island. This vegetation type has not been seen elsewhere in western Washington.

Mesic to Wet Prairies

Seasonally wet prairies are another ecological system that is not covered by this classification because they are wetlands and because we have no data. Seasonally wet prairies are now very rare and known mostly from Lewis and Clark counties. One wet prairie plant association known to occur in Clark County, Washington, is *Deschampsia caespitosa – Danthonia californica* (tufted hairgrass – California danthonia) (Christy 2004, NatureServe 2005). The *Camassia quamash* (common camas) wet prairie association (Christy 2004) is another type that has been seen (in relatively degraded condition) in central Lewis County. Wet prairie areas dominated by dense sedge (*Carex densa*) have also been observed (F. Caplow pers. comm.) in the southern Puget Trough. A seasonally wet swale within an upland prairie (see Easterly et al. 2005) in Thurston County has several species in common with Willamette Valley wet prairies. The vegetation composition of this swale is very patchy and diverse.

Mesic prairies, less dry sites than our FERO-SERI association but not seasonally flooded or saturated, were undoubtedly once an important component of pre-Western settlement prairie landscapes in the ecoregion. They are now extremely rare and mostly degraded. Several of the remnant sites supporting the endangered golden paintbrush (Castilleja levisecta) are mesic prairie fragments (Chappell and Caplow 2004). Degraded mesic prairie fragments in Island County support lush herbaceous vegetation characterized by high abundance of foothill sedge (*Carex tumulicola*), red fescue (*Festuca rubra*) of unknown origin (nativity uncertain), Pacific sanicle (*Sanicula crassicaulis*), and non-native Kentucky bluegrass (*Poa pratensis*) (Chappell and Caplow 2004).

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. [http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

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