



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

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Southern Vancouverian Dry Foothill Forest & Woodland

Macrogroup M886

Forêts et terres boisées sèches du piémont du sud de la région floristique de Vancouver

Cool Temperate Forest & Woodland

D192 Vancouverian Forest & Woodland

M886 Southern Vancouverian Dry Foothill Forest & Woodland

M024 Vancouverian Coastal Rainforest

M025 Vancouverian Subalpine – High Montane Forest



Concept

M886 describes the low elevation Pacific coastal forests of the rain shadow influenced maritime climate in western North America. The Canadian expression includes forests and woodlands of the southern British Columbia (BC) coast that occur in the lee of the Olympic and Vancouver Island mountain ranges. Canopies are typically evergreen coniferous, although evergreen broad-leaved and cold-deciduous broad-leaved species are often present in the tree stratum. Coast Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) is the characteristic tree species, however other diagnostic trees include Pacific arbutus (*Arbutus menziesii*) and Garry oak (*Quercus garryana* var. *garryana*). Western red cedar (*Thuja plicata*) and grand fir (*Abies grandis*) often co-occur with Douglas-fir on circum-mesic sites. Shore pine (*Pinus contorta* var. *contorta*) occurs occasionally on dry sites, where it can dominate some stands. The understory of conifer stands is typically dominated by evergreen broad-leaved shrubs, conifer regeneration and a well-developed moss layer. Common shrubs include ocean-spray (*Holodiscus discolor*), Cascade barberry (*Berberis nervosa*) and salal (*Gaultheria shallon*). The main moss species are Oregon beaked moss (*Kindbergia oregana*) and stairstep moss (*Hylocomium splendens*). Garry oak forests and woodlands have a rich understory dominated by camas (*Camassia* spp.) and other flowering herbs in the spring, and a variety of grasses later in the growing season. Historically, stand-replacing fire was the main natural disturbance factor but since European settlement, human-influenced disturbances predominate. Most forests were harvested many years ago and much of the range converted to agriculture, settlement and urban infrastructure; invasive non-native plant species exert a strong influence on understory composition and structure in much of the range.

In Canada, M886 forests occur between sea level and approximately 700 mASL in a cool Mediterranean climate, with moderately warm dry summers and mild wet winters. Mean annual precipitation varies between approximately 650 and 1250 mm, the majority falling as rain in winter months; snow is uncommon and ephemeral. Mean annual temperature is approximately 8° to 10° C; soils do not freeze in winter. Growing degree days above 5° C (GDD) vary between approximately 1700 and 2200 across the Canadian range. All parts of the Canadian range experienced Pleistocene glaciation; soils are mostly Brunisols developed in glacial surficial materials. Mor and moder humus forms predominate.



Patchy forest cover dominated by coast Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) on shallow rocky terrain on Texada Island, British Columbia.

Source: W. MacKenzie, British Columbia Forest Service



Stand canopy dominated by coast Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) and Pacific arbutus (*Arbutus menziesii*), with an open understory dominated by salal (*Gaultheria shallon*) and Cascade barberry (*Berberis nervosa*).

Source: BC Ministry of Environment



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Vegetation

Physiognomy and Structure

M886 includes upland forests as well as woodlands. Generally, forests have closed, multi-layered canopies characterized by tall (often >30 m) long-lived, evergreen coniferous tree species. Stand structure becomes more open on drier sites and natural woodlands can occur. Dry site forests and woodlands often include sclerophyllous evergreen and/or cold-deciduous broad-leaved species (“hardwoods”) in the tree stratum. Stand composition is usually of multiple conifer species, but conifer – hardwood mixes and pure hardwood compositions can occur. Vertical stand structure is typically multi-storied, but can be single-storied after stand-replacing disturbance. Understory structure varies from dense to sparse, and is usually dominated by cold-deciduous and evergreen broad-leaved shrubs, perennial herbs and conifer regeneration. The moss layer is typically well developed under conifer canopies. Stands have the potential to be hundreds of years old, but few old forests remain on the landscape. Riparian and wetland forests and woodlands within the range of M886 are described by M035 [Vancouverian Flooded & Swamp Forest].

Floristics

Pseudotsuga menziesii [see Comments] is the characteristic tree species for M886. *Thuja plicata* and *Abies grandis* are the most common canopy associates on circum-mesic sites. *Acer macrophyllum* occurs occasionally. On dry sites, *Arbutus menziesii* is the most common tree associate, usually forming a subcanopy. *Quercus garryana* (see Comments) can occur as either a minor stand component or a canopy dominant on dry sites. *Pinus contorta* var. *contorta* occurs occasionally on dry sites, where it can dominate some stands (its occurrence on very wet sites is described in M035 [Vancouverian Flooded & Swamp Forest]). *Tsuga heterophylla* occurs infrequently.

P. menziesii is a long-lived early seral species that establishes on open sites following disturbance that exposes mineral soil seedbeds, wherever there is an adequate seed supply. In the prevailing climate of M886, it can also replace itself in most established stands. In contemporary M886 forests, many stands of *P. menziesii* have regenerated after forest harvesting but some post-wildfire stands exist, especially in parks. With its thick bark, *P. menziesii* is somewhat resistant to moderate-intensity surface fires and older individuals can persist in stands for long periods, often hundreds of years, maintaining seed sources in the post-fire stands.

Thuja plicata and *Abies grandis* are wide-ranging late seral species that can re-colonize sites following stand-replacing disturbance, invade existing early or mid-seral stands by seeding in from surrounding areas, and also maintain themselves within stands where they are already established. Seeds of *T. plicata* are able to germinate and survive on seedbeds of mineral soil, litter, moss, thick humus and dead wood as long as substrate moisture is sufficient; seedling establishment for *A. grandis* is best on mineral soil seedbeds. Both species are shade tolerant, so seedlings persist under closed canopies for many years.

Alnus rubra and *Acer macrophyllum* are early seral cold-deciduous broad-leaved species that often form even-aged stands following stand-replacing disturbance. *Populus tremuloides* occurs infrequently in early seral forest patches. *Cornus nuttallii* occasionally occurs as a subcanopy tree in *Pseudotsuga menziesii* forests.

Arbutus menziesii is an evergreen broad-leaved species that establishes on dry sites. In its Canadian range it has low shade tolerance and is usually found near openings and along coastal shorelines. It produces abundant berries with seeds that can remain viable in the forest floor for years; however, after disturbance it primarily propagates by sprouting.

Most of the main understory species are widely distributed throughout the Canadian range of M886. On circum-mesic sites, *Holodiscus discolor*, *Berberis nervosa* and *Gaultheria shallon* are the most common understory species along with the mosses *Kindbergia oregana*, *Hylocomium splendens* and *Rhytidiadelphus triquetrus*. *Symphoricarpos albus* can be abundant on some sites. *Rosa gymnocarpa*, *Rubus ursinus*, *Lonicera ciliosa* and *L. hispidula* are often present with low cover. Compared to other coastal forests, ferns are of relatively low importance: *Polystichum munitum* and *Pteridium aquilinum* are often present on mesic sites and *Polypodium* spp. (*P. amorphum*, *P. glycyrrhiza*) occur on dry sites, especially on and around rock outcrops.

In Canada, *Quercus garryana* woodlands occur only within the range of M886. These woodlands have a diverse understory that changes in dominance over the growing season. A characteristic of these stands is a showy display of early spring flowers, including *Erythronium oregonum*, *Triteleia hyacinthina*, *Camassia* spp. (*C. leichtlinii*, *C. quamash*), *Delphinium menziesii*, *Fritillaria affinis*, *Olsynium douglasii*, *Primula hendersonii*, *Plectritis congesta* and *Ranunculus occidentalis*. Other characteristic forbs include *Allium acuminatum*, *Cerastium arvense*, *Claytonia perfoliata*, *Collinsia parviflora*, *Galium aparine*, *Lithophragma parviflorum*, *Lomatium utriculatum*, *Nemophila parviflora*, *Sanicula crassicaulis* and *Toxicoscordion venenosum*. Graminoid cover increases as the growing season progresses, including the native species *Bromus sitchensis* var. *carinatus*, *Elymus glaucus*, *Carex inops* and *Luzula multiflora*. These ecosystems now occupy <5% of their historic area because of settlement and agricultural development.



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Vegetation (cont'd)

Dynamics

Environmental site characteristics, plant species autecology, seed/propagule availability, and disturbance history (i.e., type, severity and frequency) influence secondary succession trends within the forests of M886. Historically, natural disturbances included wildfires, windthrow, pathogens and insect infestations. Since European settlement, forest harvesting, agricultural conversion and settlement clearance, roadbuilding, urban development, and industrial and recreational activities have become the primary disturbance factors. Stand-replacing fire now plays a relatively minor role in the dynamics of Canadian M886 forests and woodlands.

Presettlement fire cycles were typically intermediate (100-270 years) with stand-replacing fires occurring every 200 years (on average). Fires were generally small, ranging from 1 to 500 ha. *Pseudotsuga menziesii* dominates in post-fire stands, although other tree species (especially *Arbutus menziesii*, *Alnus rubra*, *Thuja plicata* or *Abies grandis*) may regenerate immediately or invade early seral stands depending upon available seed sources and post-fire conditions. Following fire, regenerating stands are often even-aged although presence of long-lived *P. menziesii* survivors in fire-originated stands can create a multi-aged structure.

Frequent burning by First Nations for cultivation of camas (*Camassia* spp.) bulbs is considered to have been a significant factor in the historic distribution of *Quercus garryana* woodlands and associated meadows. These were low intensity surface fires designed to keep the woodlands open. With European settlement and subsequent fire suppression, conifers (especially *P. menziesii*) and shrubs are now invading formerly open *Q. garryana* woodlands.

Remaining patches of M886 forest/woodland occur in a rural/urban landscape near human settlements and typically contain trail networks for recreational access. Stands are subject to invasion by non-native species, including *Cytisus scoparius*, *Hedera helix*, *Ilex aquifolium*, *Daphne laureola* and *Rubus armeniacus* that compete with native species and often significantly alter understory composition. Non-native grasses have invaded *Quercus garryana* woodlands, including *Aira praecox*, *Anthoxanthum odoratum*, *Bromus diandrus*, *B. hordeaceus*, *B. sterilis*, *Cynosurus echinatus*, *Dactylis glomerata*, *Poa pratensis* and *Vulpia bromoides*.

A variety of diseases and insects are endemic to these forests. Typically, mortality is limited to individual or small groups of trees within stands, but occasional broad-scale infestations are capable of creating changes in tree species dominance at both the stand and landscape levels. Rust-red stringy rot (*Echinodontium tinctorium*), laminated root rot (*Phellinus weirii*) and armillaria root disease (*Armillaria ostoyae*) are widespread in forests of M886, causing mortality of young trees and increasing the susceptibility of older trees to windthrow and insect attack. The interaction between root- and stem-rot pathogens and windthrow results in gap formation in most mature stands.

Periodic insect outbreaks are a natural part of the ecology of these forests. *Pseudotsuga menziesii* populations are attacked by western spruce budworm (*Choristoneura occidentalis*) and Douglas-fir beetle (*Dendroctonus pseudotsugae*). Balsam woolly adelgid (*Adelges piceae*) is a serious invasive pest of *Abies grandis*. Winter moth (*Operophtera brumata*) is an invasive defoliator of *Quercus garryana*.



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Environment

Climate

In Canada, M886 forests develop at low elevations of coastal southern British Columbia (BC) in the lee of the Olympic Mountains and the Vancouver Island Ranges. Rain shadow effects on mild moist Pacific air masses create relatively drier conditions within the generally maritime temperate climate of coastal BC, resulting in a cool Mediterranean climate with moderately warm dry summers and mild wet winters.

Mean annual precipitation mostly varies between 650 and 1250 mm, but M886 forests and woodlands can develop on edaphically very dry sites in nearby wetter climates. The majority of total precipitation falls in autumn and winter months as rain; snow is only a minor proportion. The rain shadow effect from the Olympic Mountains and the Vancouver Island Ranges decreases annual precipitation significantly compared to that received by surrounding M024 [Vancouverian Coastal Rainforest] forests. Mean annual temperature is approximately 8° to 10° C, the lower values in wetter climatic areas. Growing degree days above 5° C (GDD) vary between approximately 1700 and 2200 GDD throughout the Canadian range. Frozen soils do not occur in winter, which is important for the survival of many of the coastal plant species.

Physiography, Geology, Topography and Soils

M886 occurs in the westernmost Cordillera of North America. In Canada, it occupies the Georgia Depression, a lowland area lying between the Vancouver Island Ranges and the Pacific Ranges of the Coast Mountains. M886 forests and woodlands primarily occur between sea level and about 150 mASL, but can occur up to 650-700 mASL on very dry rocky sites.

The geology of the Georgia Depression is mostly folded and faulted volcanic and sedimentary rocks. The area has been glaciated numerous times and the most prevalent parent material is glacial till, although marine clay is also common due to post-glacial isostatic rebound. An extensive area of fluvial outwash occurs on the lower Fraser River valley, although it is now mostly agricultural land. Due to the mountainous terrain, often with bedrock exposures, colluvium is also common. Parent material textures vary considerably, although the tills are mostly medium-textured with moderate to high coarse fragment content. Although geologically young, the soils are generally well developed. The predominant soil forming processes are podzolization and mor humus formation. Soils are mostly Brunisols, but in areas of higher precipitation Podzols can occur. Humus forms are mors and moders, the latter occurring under deciduous broad-leaved forest canopies.



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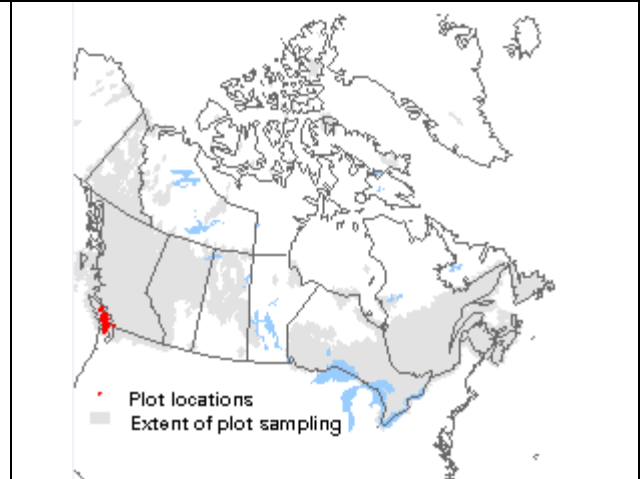
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Distribution and Geographic Range

In Canada, M886 includes low elevation forests of southeastern Vancouver Island and adjacent islands in the Strait of Georgia, as well as the southwestern portion of the British Columbia mainland coast. The Canadian range lies in the northern portion of the global range of forests of Mediterranean climates in western North America, extending south to northern Baja California, Mexico.



Related Concepts

M886 includes forests and woodlands of mesic and drier sites that have been described in British Columbia provincial publications for the Coastal Douglas-Fir biogeoclimatic zone. M886 also includes some forests and woodlands of very dry sites in the adjacent Coastal Western Hemlock biogeoclimatic zone.

USNVC M886 [Southern Vancouverian Dry Foothill Forest & Woodland] includes similar forests and woodlands, primarily occurring in Washington and Oregon (currently, the USNVC Macrogroup description is not available). This CNVC factsheet describes the Canadian expression of this vegetation, which includes conditions treated (at least in part) in USNVC Groups G800 [Southern Vancouverian Dry Douglas-fir - Madrone Woodland Group] and G206 [Cascadian Oregon White Oak - Conifer Forest & Woodland Group]. Some elements of G205 [Vancouverian Dry Coastal Beach Pine Forest & Woodland Group] may occur in M886 (currently placed in M024 [Vancouverian Coastal Rainforest]).

Riparian and wetland forests and woodlands within the range of M886 are described by M035 [Vancouverian Flooded & Swamp Forest].

Comments

M886 describes low elevation forests and woodlands on mesic and dry sites in the cool Mediterranean climate of the central Pacific coast of North America. Stands lack *Tsuga heterophylla* and are dominated by *Pseudotsuga menziesii*, often with *Quercus garryana* and/or *Arbutus menziesii*. Forests on moister sites in this drier climatic region and at low elevations in wetter climatic regions adjacent to M886, that contain *Tsuga heterophylla* and grade into temperate maritime “rainforests” of the Pacific coast of North America, are included in M024 [Vancouverian Coastal Rainforest].

All M886 forest and woodland Associations in British Columbia (BC) are considered to be at a high risk of becoming extinct, both globally and provincially, and are included on the BC Red List of Threatened Ecological Communities. Many red-listed plant species occur within these ecosystems.

Pseudotsuga menziesii here refers to variety *menziesii* (coast Douglas-fir).

Quercus garryana here refers to variety *garryana* (Garry oak).



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Source Information

Number of Source Plots for M886: 735 (BECMaster ecosystem plot database [VPro13/MSAccess 2010 format]).

Information Sources (data):

Biogeoclimatic Ecosystem Classification Program of British Columbia. 2015. BECMaster ecosystem plot database [VPro13/MSAccess 2010 format]. W.H. MacKenzie, (ed.) B.C. Min. For., Lands, and Nat. Res. Ops., Smithers, BC. Available: www.for.gov.bc.ca/hre/becweb/resources/information-requests (accessed: November 2017). (735 plots)

Concept Authors: D. Meidinger, W. MacKenzie, K. Baldwin, USNVC

Description Authors: D. Meidinger and K. Baldwin

Date of Concept: April, 2015

Date of Description: March, 2018

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The information contained in this factsheet is based on data and expert knowledge that is current to the date of description. As new information becomes available, the factsheet will be updated.

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Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

Southern Vancouverian Dry Foothill Forest & Woodland

Macrogroup M886

Forêts et terres boisées sèches du piémont du sud de la région floristique de Vancouver

Comparison of Vegetation Characteristics for Vancouverian Forest Macrogroups

Lifeform	Species Name	n=735	n=6322	n=418	Species Common Name
		M886 Dry Vancouverian	M024 Rainforest	M025 Subalpine	
Tree	<i>Quercus garryana</i> var. <i>garryana</i>	*****			Garry oak
	<i>Acer macrophyllum</i>	***			big-leaved maple
	<i>Abies grandis</i>	****			grand fir
	<i>Arbutus menziesii</i>	■■■■■			Pacific arbutus
	<i>Thuja plicata</i>	■■■■■	■■■■■		western red cedar
	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	■■■■■	■■■■■		coast Douglas-fir
	<i>Picea sitchensis</i>		****		Sitka spruce
	<i>Tsuga heterophylla</i>		■■■■■	■■■■■	western hemlock
	<i>Abies amabilis</i>		■■■■■	■■■■■	Pacific silver fir
	<i>Tsuga mertensiana</i>			■■■■■	mountain hemlock
	<i>Callitropsis nootkatensis</i>			■■■■■	yellow-cypress
Shrub	<i>Symphoricarpos albus</i>	***			thin-leaved snowberry
	<i>Lonicera hispidula</i> + <i>L. ciliosa</i>	***			pink & orange honeysuckles
	<i>Rosa gymnocarpa</i>	■■			dwarf woodland rose
	<i>Holodiscus discolor</i>	■■■■■			oceanspray
	<i>Berberis nervosa</i>	■■■■■			Cascade barberry
	<i>Gaultheria shallon</i>	■■■■■	■■■■■		salal
	<i>Vaccinium parvifolium</i>	**	■■■	**	red huckleberry
	<i>Rubus spectabilis</i>		■■■		salmonberry
	<i>Vaccinium ovalifolium</i>		■■■■■	■■■■■	oval-leaved blueberry
	<i>Menziesia ferruginea</i>		■■■	■■■	false azalea
	<i>Vaccinium membranaceum</i>			■■■■■	mountain huckleberry
	<i>Sorbus sitchensis</i>			■■	Sitka mountain-ash
	<i>Elliottia pyroliflora</i>			***	copperbush
Herb/ Dwarf Shrub	<i>Pteridium aquilinum</i>	***			bracken fern
	<i>Rubus ursinus</i>	■■			Pacific trailing blackberry
	<i>Polystichum munitum</i>	■■	■■■■■		western sword fern
	<i>Dryopteris expansa</i>		■■■		spreading wood fern
	<i>Athyrium filix-femina</i>		***		common lady fern
	<i>Tiarella trifoliata</i>		■■■	***	three-leaved foamflower
	<i>Blechnum spicant</i>		■■■	■■	deer fern
	<i>Cornus canadensis</i>		■■■	■■	bunchberry
	<i>Rubus pedatus</i>		***	■■■	five-leaved dwarf bramble
	<i>Streptopus</i> spp.		**	■■■	twistedstalks
	<i>Neottia cordata</i> + <i>N. banksiana</i>		**	*	twayblades
	<i>Veratrum viride</i>			■■	green false hellebore
	<i>Phyllodoce empetrifomis</i>			***	pink mountain heather
	<i>Coptis asplenifolia</i>			**	fern-leaved goldthread
<i>Nephrophyllidium crista-galli</i>			***	deer cabbage	
Moss/Lichen	<i>Rhytidiadelphus triquetrus</i>	****			electrified cat's-tail moss
	<i>Kindbergia oregana</i>	■■■■■	■■■■■		Oregon beaked moss
	<i>Hylocomium splendens</i>	■■■■■	■■■■■	****	stairstep moss
	<i>Buckiella undulata</i>		■■■		flat moss
	<i>Mniaceae</i>		■■■	■■■	leafy mosses
	<i>Rhytidiadelphus loreus</i>		■■■■■	■■■■■	lanky moss
	<i>Rhytidiopsis robusta</i>			■■■■■	pipecleaner moss

Legend

Constancy:	Black bar >= 50%	Cover:	5 bars >= 25%	2 bars >= 1%
	Grey bar >= 30%		4 bars >= 10%	1 bar < 1%
	Asterisk >= 20%		3 bars >= 3%	