A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region

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A Field Guide to Site Identification and Interpretation for the Vancouver Forest Region

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This field guide is based on the correlated classification of coastal ecosystems, made possible by the Provincial Correlation Program coordinated by Del Meidinger (Ministry of Forests) and produced by the Coastal Correlation Working Group (Karel Klinka, Jim Pojar, Allen Banner, Del Meidinger, Fred Nuszdorfer, Bob Green, and Alex Inselberg).

DEDICATION

This guide is dedicated to the memory of Dr. Vladimir J. Krajina whose work and teaching resulted in the development and application of the biogeoclimatic ecosystem classification system in British Columbia. Our knowledge of forest ecosystems and their interrelationships evolved from the genius of this great scientist.

"*Yours is the Earth and everything that's in it."*

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1.0 INTRODUCTION

1.1 Objectives and Scope

This guide presents site identification and interpretation information for forest ecosystems of the Vancouver Forest Region (FIGURE 1). Site identification is based on the biogeoclimatic ecosystem classification (BEC), initially developed by Dr. V.J. Krajina and subsequently revised by the B.C. Ministry of Forests. The objectives of this classification are:

- to provide a framework for organizing ecological information and management experience about ecosystems;
- to promote a better understanding of forest ecosystems and their interrelationships;
- to provide resource managers with a common "language" to describe forest sites;
- to improve the user's ability to prescribe and monitor site-specific treatments.

FIGURE 1. Location of the Vancouver Forest Region.

This guide replaces *Site Diagnosis, Tree Species Selection, and Slashburning Guidelines for the Vancouver Forest Region* (Green *et al.* 1984 and Klinka *et al.* 1984). This revised version results from the recently completed provincial correlation of the BEC system. A synopsis of the revised coastal site classification on which the guide is based is provided in Banner *et al.* (1990). Correlations between classification units used in this guide and in the 1984 guide are provided in Appendix 8.

The guide has two principal goals:

- to assist users in describing and identifying forest sites.
- to provide management interpretations to assist users in preparing stand-level forest management prescriptions.

1.2 Other Sources of Information

This guide is to be used in conjunction with the revised biogeoclimatic map for the Vancouver Forest Region (Nuszdorfer *et al.* 1992). More complete descriptions of the BEC system can be found in *Biogeoclimatic ecosystem classification in British Columbia* (Pojar *et al.* 1987), *Use of the Biogeoclimatic ecosystem classification in British Columbia* (MacKinnon *et al*. 1992), and *Ecosystems of British Columbia* (Meidinger and Pojar 1991). For a more detailed discussion of ecosystem description, refer to *Describing ecosystems in the field. 2nd edition* (Luttmerding *et al.* 1990). A comprehensive description of indicator plants is found in *Plants of the Pacific Coast* (MacKinnon and Pojar 1994) and *Indicator plants of coastal British Columbia* (Klinka *et al*. 1989).

1.3 Guide Content and Limitations

The guide consists of six main sections. Following the Introduction, Section 2 provides an overview of the BEC system. Section 3 outlines procedures for assessing sites (e.g. "site diagnosis"). Included is a description of how to describe and analyze environmental and vegetation features of an ecosystem, how to identify site series, and how to map sites for management purposes. Section 4 describes the biogeoclimatic units in the Region, emphasizing their distinguishing features. Section 5

provides a synopsis of all site units recognized in the Region, presented with edatopic grids and vegetation summary tables. Management interpretations are provided in Section 6. This includes information on silviculture (tree species selection, slashburning, site productivity, and potential competing vegetation), harvesting (site sensitivity to ground-based equipment), wildlife, and forest health. Finally, several appendices contain more detailed information on indicator plant analysis and site description.

The principal limitation of the guide is its inability to encompass all the complexity and diversity existing in the Region. The recognized site units cover relatively common forest ecosystems sampled through the major distribution of biogeoclimatic units. Users are bound to encounter sites that do not appear to "fit" the classification. This is where an understanding of basic site factors (e.g., climate, soil moisture, soil nutrients), silvics of tree species, and the effects of various management practices is essential for decision-making. It is important to recognize that the intent of the guide is to **provide information to help users develop management prescriptions**.

1.4 Training

It is assumed that users of this guide have completed the training programs offered by the Regional Forest Sciences Section so that the basic concepts and methods of site assessment have been introduced. For information about these courses, please contact the Forest Sciences Officer.

2.0 THE BIOGEOCLIMATIC ECOSYSTEM CLASSIFICATION[1]

Biogeoclimatic Ecosystem Classification (BEC) is a system that groups similar segments of the landscape (ecosystems) into categories of a hierarchical classification system. An ecosystem is the product of a complex interaction of vegetation, animals, microorganisms, and the physical environment. For purposes of BEC, an ecosystem is defined as a particular plant community and its associated topography, soil, and climate. While boundaries between ecosystems in the landscape can be abrupt, they more often tend to be gradual.

Climate is the most important factor influencing the development of forest ecosystems. The Douglas-fir forests around Nanaimo reflect a much warmer, drier climate than the moist redcedar-hemlock forests on the west coast or the snowy mountain hemlock forests at high elevations. Within each of these climatic areas, ecosystems vary because of differences in topography and soil. Rocky ridges are relatively drier than lower slopes and valley bottoms.

Vegetation is important when developing the ecological classification because it is readily visible, and it reflects the environment, biology, and history of a site. However, vegetation changes over time following disturbance - a process called succession. It is the more stable vegetation from later successional stages ("late seral" or "near climax") that the classification is developed from and that are most useful for identifying ecosystems, although BEC can also be applied to earlier successional stages.

2.1 The Classification System

The BEC system is a hierarchical classification that combines three major classifications: climatic, vegetation, and site. While the vegetation classification is important in developing the system, it is the **climatic** and **site** classifications that are most relevant to field application (Figure 2).

[1] Modified from Meidinger and Pojar (1991) and Lloyd *et al.* (1990).

CLIMATIC
biogeoclimatic zone
biogeoclimatic subzone
biogeoclimatic variant

SITE
site association
site series
site type

FIGURE 2. The hierarchical structure of the climatic and site classifications of the BEC system (modified from Pojar *et al*. 1987).

2.2 Climatic Classification

Geographic areas influenced by similar regional climates are classified into **biogeoclimatic units** in the climatic component of the BEC system. Since climate differences are expressed in vegetation, stable "late-seral" or "near-climax" plant communities found on **zonal sites** are used to classify biogeoclimatic units. Zonal sites are intermediate in soil moisture and nutrient regime within a given area and are felt to best reflect the influence of regional climate.

Zonal sites generally have the following features:

- mid-slope position in mountainous terrain, gentle upper slope position in subdued terrain.
- moderately deep to deep soil with loamy texture and unrestricted drainage.
- intermediate soil moisture and soil nutrient regimes.
- location not subject to atypical local climate such as frost pockets.

Other "non-zonal" sites in an area can be wetter, drier, richer, or poorer than zonal sites and do not provide as clear a reflection of the regional climate.

Several categories are recognized within the climatic classification (zone, subzone, variant). Biogeoclimatic **subzones** represent the basic and most commonly used category. Subzones have characteristic plant communities occurring on zonal sites, such as the Very Wet Maritime Coastal Western Hemlock subzone characterized by

the zonal *HwBa - Blueberry*[2] community. Subzones are grouped into biogeoclimatic **zones** - more generalized units representing much more extensive areas. They are characterized by shade-tolerant "climax" tree species on zonal sites such as the Coastal Western Hemlock zone characterized by *western hemlock* on zonal sites. Subzones can contain some climatic variation, and thus may be subdivided into biogeoclimatic **variants**. Variants are generally recognized for areas that are slightly drier, wetter, snowier, warmer, or colder than other areas within a subzone. For example, the Very Wet Maritime Coastal Western Hemlock subzone is divided into two variants - the *Montane* (snowier, cooler, higher elevation) and *Submontane* (lower elevation, warmer, less snow).

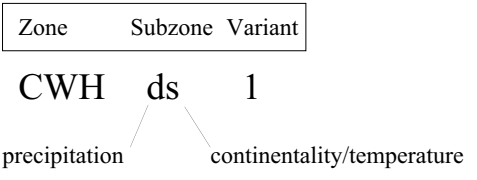
2.2.1 Naming biogeoclimatic units

Biogeoclimatic zones are named for one or more of the dominant climax tree species growing on zonal sites and, in some cases, with a geographic or climatic modifier. A two- to four-letter code corresponds to the name. For example, CWH represents the Coastal Western Hemlock zone. Subzone codes are derived from relative precipitation or continentality/temperature, reflecting their climate. The first letter indicates precipitation; the second letter indicates continentality or temperature. For example, CWHds represents the Dry Submaritime CWH subzone. Variants are named with geographic labels reflecting their general distribution within a subzone. For example, CWHds1 represents the southern variant of the CWHds. See Table 1 for subzone codes and Figure 3 for distribution of general climatic types.

[2]Tree species symbols defined in Table 22.

TABLE 1. Codes used in subzone names occurring in the Vancouver Forest Region

Precipitation	**Code**	**Continentality/ temperature**	**Code**
very dry	**x**	hypermaritime	**h**
dry	**d**	maritime	**m**
moist	**m**	submaritime	**s**
wet	**w**	warm	**w**
very wet	**v**		



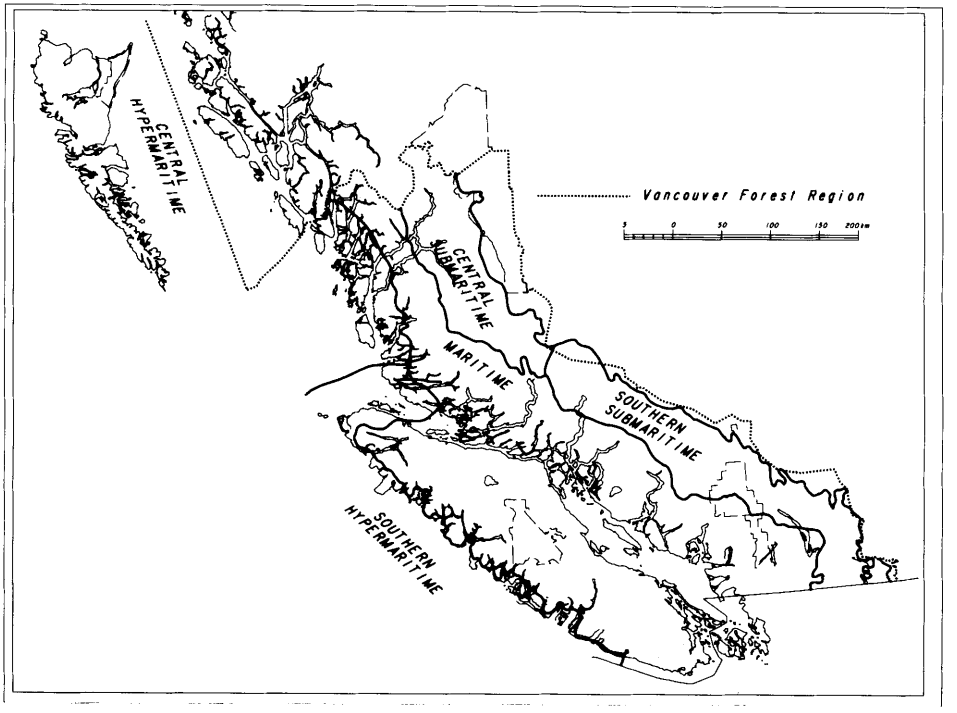


FIGURE 3. The distribution of general climatic types used in naming biogeoclimatic units.

2.3 Site Classification

Within each biogeoclimatic subzone or variant a recurring pattern of sites reflects variation in soil and physiographic properties. These sites are classified based on their potential to produce similar plant communities at late successional stages. Sites with similar vegetation potential also have similar environmental properties, particularly soil moisture and soil nutrient regimes. Site classification units can be identified using these characteristic environmental properties, as well as characteristic stable (e.g., later successional stage) plant communities. It is important to recognize that a particular site classification unit (e.g., *FdHw - Salal*) can support a variety of plant communities depending on successional stage, but should ultimately result in one kind of near-climax or climax plant community.

Three categories are recognized within the site classification (site association, site series, site type), with **site series** representing the most commonly used category for field use. Site series encompass sites capable of producing similar late seral or climax plant communities within a biogeoclimatic subzone or variant. Site series are approximately equivalent to "site units" (edatopic subdivisions) used in the previous version of the field guide (Green *et al.* 1984). A site series is specific to a subzone or variant; however, the stable, late seral or climax plant community encompassed by the site series may occur in more than one biogeoclimatic unit. **Site associations** represent sites capable of producing similar late seral or climax vegetation over a range of climates. For example, the *FdHw - Salal* site association spans the CWHmm, CWHdm, and CWHxm subzones. **Site types** are the most detailed category, representing site series subdivided according to specific soil properties such as texture or depth. The application of site types is generally restricted to detailed studies or management plans.

2.3.1 Naming site classification units

Site associations are named using one or two tree species, followed by one or two understorey species derived from the near-climax plant community on which they are based. **While the species used in the name often reflect the appearance of these communities, they may include less common species to ensure a unique name within the provincial classification.**

Site series use the same name as the site association, preceded by the appropriate biogeoclimatic subzone or variant symbol. For example, *CWHxm/FdHw - Salal* represents a common site series in the CWHxm subzone. Site series are numbered with a two-digit code, which indicates its position on the edatopic grid. Within a subzone or variant, **the zonal site series is always numbered 01**. Remaining site series are numbered sequentially from the driest to the wettest, and from nutrient poorest to richest for units with similar moisture regime. Site types use site series names followed by the soil modifier. For example, *CWHxm/FdHw - Salal/Shallow* represents sites with soils less than 30 cm deep.

3.0 PROCEDURES FOR SITE ASSESSMENT

3.1 Introduction

Site assessment (also known as "site diagnosis") involves describing forest ecosystems in the field and identifying them according to the BEC system. It is fundamental to ecosystem-specific forest management and is required on all sites planned for harvest, according to the current regulations. **Site description** consists of gathering information about the area in question. This includes referring to biogeoclimatic maps, observing tree composition in stands in the general area and enroute to the area, and collecting data on physiographic, soil, and vegetation features. **Site identification** involves synthesizing this information using tools provided in this guide, then identifying the appropriate biogeoclimatic units and site series. The information gathered is also used for developing various management prescriptions, applying interpretations provided in this guide and elsewhere. Accurate site identification and reliable management prescriptions rely on accurate site assessment.

Take the time to describe an area as thoroughly as possible, until you are confident in your assessment!

3.2 Identifying Biogeoclimatic Units

Biogeoclimatic units are identified using the maps available for the Vancouver Forest Region (contact the Regional Research Ecologist for copies) as well as vegetation features, elevational ranges, and other information presented in this guide. The maps provide an initial identification of the biogeoclimatic unit for a particular area, and may be all that is necessary if the area falls well within a map polygon. Field verification is recommended, however, and is required in areas near biogeoclimatic unit boundaries or in complex, mountainous terrain. Identification in the field focuses on vegetation characteristics of late-seral or near-climax plant communities on zonal sites. Of particular importance are shade-tolerant tree species. Vegetation on "non-zonal" sites (e.g., wetter or drier than zonal) may also be useful in identifying some biogeoclimatic units. Use the vegetation summary tables for zonal sites, together with the biogeoclimatic subzone/variant descriptions (see

Section 4.0) to assist in field identification. As tree species are important in differentiating biogeoclimatic units, it is useful to observe changes in tree species composition while driving into the work area. These changes often indicate the approximate location of a subzone or variant boundary. Figure 4 summarizes the major steps for identifying biogeoclimatic units.

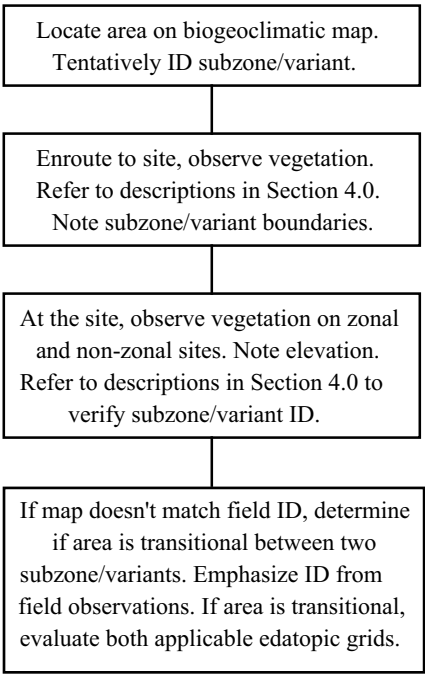


FIGURE 4. Flowchart for identifying biogeoclimatic units.

3.3 Identifying Site Series

3.3.1 Approach

Site series presented in this guide are grouped into "**general sites**" and "**special sites**". General sites include the typical sequence of site series covering dry/nutrient-poor to wet/nutrient-rich soils. The sequence reflects increasing availability of water and nutrients within a biogeoclimatic unit. Special sites are a new feature of the revised classification, and include site series with atypical soil moisture and nutrient processes or site series that reflect unique environmental properties. These include "floodplain sites," "sites with strongly fluctuating water table," and "shoreline and ocean spray sites." The approach to identifying general sites requires determining the basic elements of site quality: **climate** (inferred from biogeoclimatic units), **soil moisture regime** (SMR), and **soil nutrient regime** (SNR). Identification of special sites requires the same information, plus additional information on selected site features.

Environmental analysis uses several important soil and physiographic properties, together with simple keys, to estimate soil moisture and nutrient regime. The appropriate site series is tentatively identified for a given site by determining its position on an **edatopic grid**[3] according to its SMR and SNR. **Vegetation analysis** is also done to verify site identification where possible. Indicator plant analysis is used to infer SMR and SNR as support for the environmental analysis. Vegetation tables summarize floristic characteristics of site series, and are used to assist in site series identification. A comprehensive description of site identification follows, with detailed supplemental information provided in the Appendices. Figure 5 summarizes the major steps for describing and identifying site series.

[3]An edatopic grid is a two-dimensional display of site series according to soil moisture and nutrient regime classes (see Section 5.0).

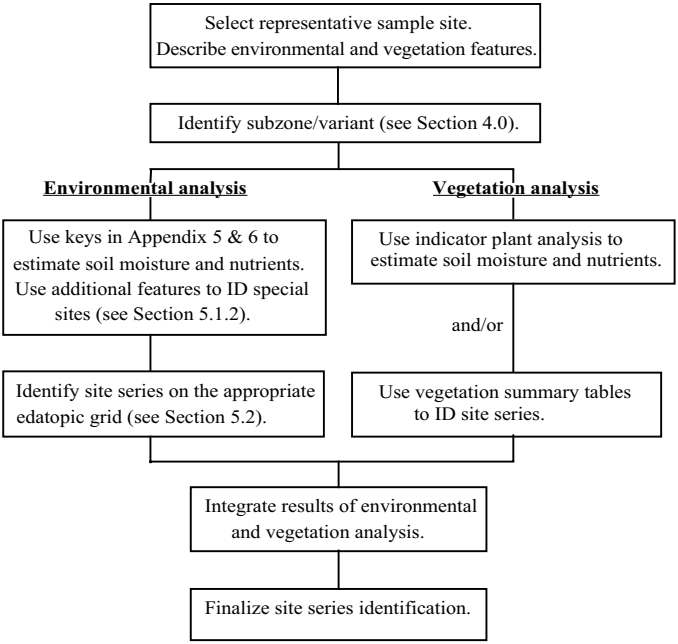


FIGURE 5. Flowchart for describing and identifying site series.

3.3.2 Soil moisture regime

Soil moisture regime (SMR) refers to the average annual amount of soil water available to plants. **Relative** SMR uses eight classes to rank the relatively driest soil (0) to the relatively wettest soil (7) within a particular biogeoclimatic subzone or variant. It can be inferred from selected physiographic and soil features (see Appendix 5). However, relative SMR classes (particularly 0 - 5) do not reflect the actual amount of available water as this is a function of climate. **Actual** SMR is therefore used to describe a more quantitative moisture regime based on annual water balance and water table depth (Klinka *et al.* 1989). Seven classes are recognized (Table 2) with *dry* classes representing growing season water deficits, the *fresh* class representing regimes with neither deficits nor surpluses during the growing season, and *moist to wet* classes indicating growing season water surpluses, often with shallow water tables. Actual SMR can be indirectly inferred using indicator plants, or

from a combination of biogeoclimatic subzone or variant and relative SMR, as shown on the edatopic grids.

TABLE 2. Actual soil moisture regime classes

Code	Class
VD	very dry
MD	moderately dry
SD	slightly dry
F	fresh
M	moist
VM	very moist
W	wet

3.3.3 Soil nutrient regime

Soil nutrient regime (SNR) refers to the amount of essential soil nutrients, particularly nitrogen, that are available to plants (Klinka *et al*. 1989). Five classes are recognized, ranging from *very poor* with low amounts of available N and other nutrients and slow turnover of organic matter; to *very rich* with relatively large amounts of available N and other nutrients, and rapid turnover of organic matter (Table 3). Soil nutrient regime can be inferred using indicator plants or from selected soil properties (see Appendix 6).

TABLE 3. Soil nutrient regime classes

Code	Class
A	very poor
B	poor
C	medium
D	rich
E	very rich

3.3.4 Sample location

Site assessment involves identifying and characterizing the important sites that comprise a given management unit (e.g., proposed cutblock). This requires examining environmental and vegetation features at a number of locations in the field. Sample locations should be in relatively homogenous areas of about 20 x 20 m size that are representative of the site in question. Recently disturbed or atypical areas should be avoided. For environmental analysis, a soil pit must be excavated. This should extend through the root zone and ideally into the lower soil layers. A depth of at least 60 cm is recommended. Road cuts may be used provided they represent the site in question (not too far away) and the weathered surface is cut back to expose fresh soil. For vegetation analysis, a comprehensive list of species and an estimate of their cover is required. The information gathered for a site assessment can be recorded on a field form like the example shown in Appendix 9. A record of site assesssment is useful in subsequent discussions regarding the area or its management and is required for PHSPs.

3.3.5 Environmental analysis

Environmental analysis focuses on selected soil and physiographic properties that are used to identify site series (Table 4). These properties are discussed below in terms of why they are important and how they are described in the field. Most of the properties are used to estimate SMR and SNR, while some are applicable to biogeoclimatic unit and special-site identification.

TABLE 4. Environmental properties used in site assessment

Physiographic properties	**Soil properties**	
elevation	texture	organic matter
slope position	coarse fragments	surface substrate
slope	humus form	landform
aspect	soil depth	flooding
microtopography	water table	bedrock geology
	gleying	porosity/aeration
	A horizon	

PHYSIOGRAPHIC PROPERTIES

Elevation: affects climate, and is therefore used in biogeoclimatic unit identification. Measure with altimeter or estimate from topographic maps.

Slope position: affects soil water movement on a slope. Upper slopes *shed* water and are drier; lower slopes *receive* additional water and dissolved nutrients and are wetter and richer; while middle slopes are in balance. Evaluate for the slope segment that directly affects water movement on the site (e.g., the slope between prominent topographic irregularities, Figure 6).

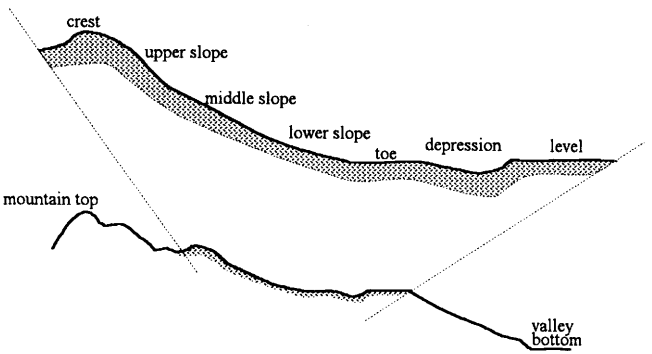


FIGURE 6. The slope segment and classes of slope position.

Slope: affects insolation, hence temperature and moisture, when combined with aspect. Slope also influences soil drainage, particularly in hypermaritime climates. Measure with a clinometer.

Aspect: affects insolation, hence temperature and moisture, when combined with slope (particularly important in dry climates). Measure the direction a slope faces with a compass.

Microtopography: affects soil moisture and aeration on a microsite scale. Useful for regeneration prescriptions on wet or dry sites. Describe using the following classes:

- *Smooth*: few or no mounds
- *Moderately mounded*: mounds are 30 - 100 cm tall and 3 - 7 m apart
- *Strongly mounded*: mounds are 30 - 100 cm tall and 1 - 3 m apart
- *Extremely mounded*: mounds are > 1 m tall

SOIL PROPERTIES

Soil texture: affects soil water-holding capacity, soil nutrient-holding capacity, soil drainage, soil porosity and aeration, and soil bearing strength. Estimate the average texture in the rooting zone by hand-texturing samples using the key in Appendix 4. As texture applies to soil material < 2 mm diameter, try to remove as many coarse fragments from the sample as possible. Make a note if texture changes significantly within the soil profile (e.g., sand over clay, loam over coarse sand, etc.).

Coarse fragment content: affects soil water-holding capacity, soil nutrient-holding capacity, soil drainage, soil porosity and aeration, and soil bearing strength. Coarse fragments are "rocks" > 2 mm in size. Estimate visually as the proportion (in %) of the total volume of soil material. Precise values are not required; critical values are 35% and 70% - the divisions between skeletal and fragmental soils, respectively.

Humus form: affects soil nutrient regime, as well as soil temperature, soil moisture, and soil aeration. Humus form is an important factor in tree species selection, and in site sensitivity for management practices that may degrade soil. Three main humus forms are recognized - *Mor*, *Moder*, and *Mull* (Green *et al.* 1993). Mors are the least biologically active, with relatively slow rates of decomposition and nutrient cycling. They are associated with nutrient-poor to -medium SNRs. Mulls are the

most biologically active humus forms, with very rapid rates of decomposition and nutrient cycling. Moders are intermediate in biological activity, although they are closer to Mulls than Mors. Both Moders and Mulls are associated with nutrient-rich to -very rich SNRs. The term "forest floor" refers to the organic horizon (L,F,H) portion of humus forms. Measure the average thickness of the forest floor and record the average humus form type (see Appendix 2).

Soil depth: affects water and nutrient storage capacity, and tree rooting strength. Measure from the ground surface to bedrock or strongly cemented or compacted material (e.g., "hardpan").

Water table: affects soil moisture and nutrient supply, soil aeration and temperature, soil bearing strength, and windthrow resistance. It represents the surface of free groundwater in the soil, including *perched* water tables occurring above impermeable soil layers. Moving seepage water generally enhances site productivity, while permanent stagnant water tables lower productivity. Measure from the ground surface to the surface of visible water in the soil profile.

Gleying: an indicator of temporary or fluctuating water tables. Gleying is an expression of periodic anaerobic conditions in the soil, and indicates the influence of a water table, even if water is absent at the time of sampling. Gleying is recognized by dull bluish to grey soil matrix colours, usually with reddish coloured mottles. Measure from the ground surface to the surface of the gleyed horizon.

A horizon: helps indicate soil nutrient regime. A horizons are surface mineral horizons, and are not present in all soils. **Ae** horizons indicate strong leaching of organic matter and nutrients from upper mineral soil and are associated with nutrient poor to -medium soils. **Ah** horizons indicate an accumulation of humus in the surface mineral soil, and are generally associated with nutrient-rich soils. Ae horizons are light greyish coloured (lighter than underlying soil) while Ah horizons are dark brown coloured (darker than underlying soil). Note the presence of Ae and Ah horizons and measure the average thickness.

Organic matter content: affects water and nutrient-holding capacity, nutrient reserves, soil structure, and soil porosity. Organic matter, when mixed in mineral soil, imparts a dark brown to black colour. Describe the general colour of the rooting zone mineral soil using three categories: dark, medium, and light. Dark soil has a "chocolate brown" or black

colour (Munsell colour value < 4 when moist), while light soil is very pale coloured (Munsell colour value > 6 when moist). Most soils are medium coloured.

Surface substrate: the two features of interest, bedrock and decaying wood, are indirectly related to soil moisture and nutrient regime and are important in tree species selection and assessment of site sensitivity. Estimate the proportion (in %) of the total ground surface occupied by exposed bedrock or decayed wood.

Landform: used primarily in site classification of special sites and to a limited extent in soil moisture and nutrient assessment. Describe the predominant type of landform (see Section 5.1.2).

Flooding: affects soil moisture and nutrient regime, and soil aeration. The effect depends on the depth, timing, and duration of flooding. Used in classification of "floodplain" sites. Flooding incidence is estimated by noting the proximity of the site to a stream, height above the stream, evidence of flooding such as recent silt or sand deposits on the ground surface or obvious layering of deposits in the soil profile, thin humus forms, and local knowledge of flooding events (see Section 5.1.2).

Bedrock geology: affects soil mineralogy and thus nutrient regime through the release of bases (e.g., calcium, magnesium, potassium) during weathering. It also influences soil texture. Parent materials formed from dark-coloured, fine-grained, and calcareous bedrock tend to have nutrient-richer soils with relatively high base content and finer textures. Shale, slate, basalt, limestone, and dark (basic) schists are examples. Parent materials formed from light-coloured, coarse-grained bedrock yield nutrient-poorer soils with low base content and coarser textures. Quartzite, sandstone, and granite are examples. Note the general bedrock type in the area from exposed rock outcrops, using the key in Appendix 3 for identification.

Porosity/aeration: affects gas exchange, which is very important for root development and function, and soil biological activity. It is important in soil sensitivity to compaction. Porosity refers to the proportion of soil made up of open spaces or pores. It is evaluated by noting the presence of obvious pores, and by the structure and density of the soil. Light, fluffy soils with good structure have high porosity while heavy, dense soils with poor structure have lower porosity. Pores can hold air or water. Aeration refers to the proportion of pores occupied by air. It can be

indirectly estimated from soil colour: reddish soil indicates oxygen movement and thus good aeration; dull olive or blue colours indicate poor aeration; mottles indicate seasonally poor aeration.

3.3.6 Synthesis of environmental information

Each property described above influences soil moisture and nutrient regime in a certain way. For example, coarse-textured soil is generally drier than fine-textured soil; lower slope positions are generally moister than mid-slopes; etc. However, it is the *integrated* effect of these properties that ultimately determines a site's moisture and nutrient supply. Various factors often compensate for each other, so that a factor that tends to decrease moisture or nutrient availability may be compensated by another that increases moisture or nutrients (e.g., coarse-textured soil in a lower slope position). The keys in Appendices 5 and 6 have been developed to estimate SMR and SNR using a combination of these environmental properties. They attempt to incorporate many of the common compensating interactions among properties. The keys were developed to approximately follow the thinking of trained ecologists and pedologists when they evaluate forest sites. They were tested on 223 plots and found to be within 1 class of the "specialist's" estimate 98 % of the time.

Once SMR and SNR have been estimated, refer to Section 5.0 to tentatively identify the site series:

1. select the edatopic grid for the appropriate subzone/variant.
2. locate the area where the estimated SMR and SNR intersect to identify the site series.

3.3.7 Vegetation analysis

Vegetation analysis should be considered an integral part of site assessment. Forest vegetation is one of the best integrators of site conditions. That is, the composition and vigour of the vegetation reflects the biotic and abiotic influences that contribute to the site growth potential.

We use two approaches for using vegetation in site assessment: 1) *indicator plant analysis* to identify soil moisture and soil nutrient regimes, and, subsequently, site series, and 2) *vegetation summary tables* to directly identify site series. Vegetation summary tables are most

reliable in older stands with well-developed understoreys (e.g., late-seral to climax) as these are the types of stands they were derived from. Indicator plant analysis can be used over a wider range of successional stages, providing species are reasonably diverse. Rowe (1956) suggested an adequate sample for indicator plant analysis should contain at least 12 species. Some early successional stages dominated by pioneer species with wide ecological amplitude are also less suited to indicator plant analysis.

There are some situations when vegetation is generally unreliable for site assessment, for example, when understorey vegetation is poorly developed under a dense forest canopy, and on some recently disturbed areas. In these cases, more or all emphasis should be placed on environmental analysis.

DATA COLLECTION

Collect vegetation data on the location chosen for site assessment. List all species present on the main rooting substrate and estimate the cover. **Cover** refers to the proportion of a plot covered by a vertical projection of crown/foliage onto the ground. Cover may be recorded as a percent estimate (Figure 7), or by using the six-class cover scale shown in Table 5. Accuracy in vegetation analysis depends on the detail of the vegetation description. The more complete the species list and the more precise the cover estimates, the more accurate the analysis will be.

Species identification is often the biggest hurdle for field staff. Recommended references are Klinka *et al.* (1989), MacKinnon, Pojar, and Coupé (1992), and MacKinnon and Pojar (1994). Staff are encouraged to establish and maintain a herbarium with representative species for their working area. Contact the Forest Sciences Section for information on establishing herbariums. Throughout this guide, common plant names follow Meidinger (1988); scientific names follow Douglas *et al*. (1989, 1990, 1991, and 1993) for vascular plants, Ireland *et al*. (1987) for mosses, Stotler and Crandall-Stotler (1977) for liverworts, and Noble *et al*. (1987) for lichens.

TABLE 5. Cover scale

Code	Class interval (%)	Class midpoint (%)
+	< 1	0.5
1	1 - 5	3
2	5 - 25	15
3	25 - 50	38
4	50 - 75	63
5	> 75	88

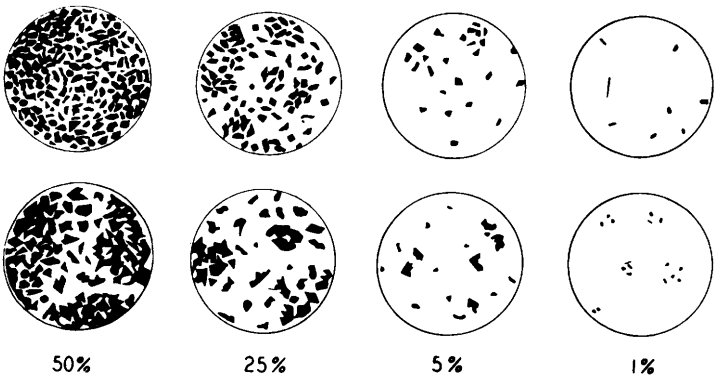


FIGURE 7. Comparison charts for estimation of foliage cover (from Luttmerding *et al.* 1990).

INDICATOR PLANT ANALYSIS

Indicator plant analysis (from Klinka *et al*. 1989) is based on the premise that plant species can have characteristic amplitudes in relation to site properties; in this case soil moisture and nutrient regimes. This information can be used to judge site quality according to the occurrence

of these indicator species. Species with similar ecological amplitudes are combined into *indicator species groups (ISGs)*. Six soil moisture ISGs and three soil nutrient ISGs are recognized (Tables 6 and 7). Appendix 1 lists a total of 393 species useful for indicating soil moisture and nutrient regimes, together with their respective ISG numbers. If no ISG number is given for a species in this list, that species has no indicator value for that property (moisture or nutrients).

TABLE 6. Indicator species groups of soil moisture

ISG No.	Range of actual SMR
1	excessively dry to very dry
2	very dry to moderately dry
3	moderately dry to fresh
4	fresh to very moist
5	very moist to wet
6	wet to very wet

TABLE 7. Indicator species groups of soil nutrients

ISG No.	Range of SNR
1	very poor to poor
2	medium
3	rich to very rich

Indicator species analysis involves preparing a "spectrum" or frequency profile of ISGs for a site. This is then compared with standard profiles for soil moisture and nutrient regime classes to determine the closest "fit." The frequency profile is prepared using the following steps:

1. List the understorey species present.
2. Record the percent cover estimate (or the cover class).
3. Using Appendix 1, record the moisture and nutrient ISG number for each species.
4. Repeat the following for soil moisture, then soil nutrients:
   - sum the cover values (or midpoint values) for all species in **each** ISG.
   - sum the cover values for all ISGs.

- calculate the frequency of each ISG represented on the site. An ISG frequency equals its cover divided by the total cover of all ISGs, multiplied by 100.

Compare the resulting frequency profiles to "standard" frequency profiles (Tables 8 and 9) to determine which moisture and nutrient regime class the site most closely represents. Indicator plant analysis does not always give precise results, and in these cases, emphasis should be placed on environmental analysis. An example of indicator plant analysis follows. Once soil moisture and nutrient regime has been estimated, refer to Section 5 to tentatively identify the site series.

EXAMPLE OF INDICATOR PLANT ANALYSIS (CWHXM SITE)

Vegetation list

Species	Cover class	Midpoint % cover	Moist. ISG #	Nut. ISG #
Pseudotsuga menziesii	5	88	--	--
Gaultheria shallon	1	3	--	1
Vaccinium parvifolium	2	15	--	1
Stachys cooleyae	1	3	5	3
Achlys triphylla	3	38	--	3
Tiarella trifoliata	1	3	4	3
Tiarella laciniata	3	38	4	3
Athyrium filix-femina	1	3	5	3
Galium triflorum	2	15	4	3
Mycelis muralis	1	3	4	3
Trillium ovatum	1	3	4	3
Polystichum munitum	5	88	--	3
Pteridium aquilinum	1	3	--	--
Leucolepis menziesii	1	3	5	3
Rhytidiadelphus triquetrus	2	15	--	2
Plagiomnium insigne	3	38	5	3

Frequency profiles

Moisture

	ISG 1	ISG 2	ISG 3	ISG 4	ISG 5	ISG 6	Total
Summed cover	0	0	0	62	47	0	109
Frequency (%)	0	0	0	57	43	0	100%

Nutrients

	ISG 1	ISG 2	ISG 3	Total
Summed cover	18	15	235	268
Frequency (%)	7	6	87	100%

A comparison to the standard frequency profiles indicates the closest fit is a *very moist* soil moisture regime and *rich to very rich* soil nutrient regime.

TABLE 8. Standard ISG frequency profile for actual soil moisture regime

Actual SMR	Frequency (%)					
	ISG 1	ISG 2	ISG 3	ISG 4	ISG 5	ISG 6
Very dry	**21**	**36**	**42**	**1**		
Moderately dry		**6**	**88**	**5**	**1**	
Slightly dry and fresh		**1**	**46**	**51**	**2**	
Moist		**1**	**12**	**62**	**26**	
Very moist			**5**	**52**	**42**	**2**
Wet			**2**	**36**	**29**	**33**

TABLE 9. Standard ISG frequency profile for soil nutrient regime

SNR	Frequency (%) of ISG # 3
Very poor	< 6
Poor	6 - 18
Medium	19 - 42
Rich and very rich	> 42

VEGETATION SUMMARY TABLES

Another approach to vegetation analysis is the use of *vegetation summary tables.* These tables compare the vegetation composition of site series within biogeoclimatic subzones or variants (see Section 5). Species are listed by structural layer (trees to mosses), and within layers, along a moisture gradient. Site series are arranged from driest to wettest. The species *prominence* value shown in the table is a combined measure of cover and frequency of a species' occurrence in a site series (Table 10). This information was derived from sample plot data used to develop the classification.

TABLE 10. Prominence classes used in vegetation tables

Prominence class	Symbol	Description
1	▮	low frequency and/or low cover (<1%)
2	■	low frequency and/or low cover (1-7%)
3	■	medium - high frequency; 8-15% cover
4	■	medium - high frequency; 16-25% cover
5	■	high frequency; >25% cover

The vegetation tables provide a general guide to the understorey species that best characterize site series. The tables apply to late seral or climax stands with relatively well-developed and stable understoreys. The actual occurrence of a plant species on a site depends on several factors including successional stage, and the type of disturbance that initiated succession.

Some plants may be unique to a particular site series, usually those occurring at the environmental extremes (e.g., the driest and wettest site series). Most site series do not have exclusive plants, and it is usually the relative abundance as well as the presence/absence of a group of plants that distinguish one site series from another.

3.3.8 Integrating environmental and vegetation analysis

In many situations, site identification derived from both environmental and vegetation analysis will coincide. However, this is not always the case. Where vegetation analysis gives a wide-ranging or unreliable result because of unsuitable floristic conditions, place greater emphasis on environmental analysis. If vegetation analysis gives a strong and distinct result that differs significantly from environmental analysis, look more closely at the environmental analysis to attempt to explain the discrepancy. For example, a flat, coarse-textured site that initially appears relatively dry based on environmental properties may have plants indicating a moist soil moisture regime. A closer examination of the soil (deeper soil pit) may reveal a fine-textured layer creating a temporary perched water table. If neither vegetation analysis nor environmental analysis provide a reasonably accurate identification, check if the area is in a climatic transition. If it is, check site series in the grid for the adjacent biogeoclimatic unit. Try to identify the site series having the closest fit - describe and, if possible, explain anomalies if they occur. For example, a site may most closely fit the

MHmm2/HmBa - Blueberry site series, however, the atypically common presence of **Se** indicates that the area is transitional to the ESSFmw.

3.4 Site Mapping

A map of sites is a useful planning tool. It provides a permanent record of ecosystems, and serves as a framework for developing and implementing management prescriptions. It also provides a basis for long-term monitoring of management prescriptions so that information gained can be applied elsewhere. In view of this, a site map of proposed cutblocks is a legal requirement for pre-harvest silviculture prescriptions (PHSPs).

The objective of site mapping is to identify and characterize the important ecosystems comprising a proposed management block, and to show their distribution on a map. From this, a "treatment unit" map outlining site-specific prescriptions can be produced. Figure 8 summarizes some major steps in site mapping.

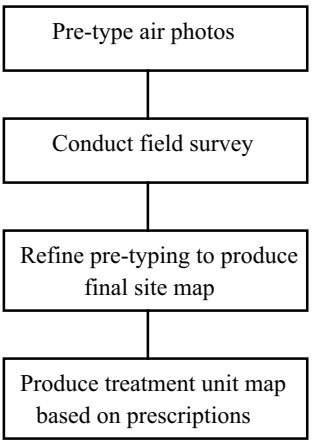


FIGURE 8. Basic steps in site mapping for PHSPs.

3.4.1 Pre-type air photos

Considerable information about the nature and distribution of ecosystems can be obtained from air photos. Photo scales of 1:10 000, 1:15 840, and 1:20 000 are suitable, although the largest scale is preferable, particularly for small blocks. Initially, stratify the area into approximate ecosystem units showing boundaries and general types (e.g., dry upper slopes, steep colluvial slopes, moisture-receiving draws, gully/ridge complex, etc.). Note the following features visible on photos:

Topography*:* Obvious topographic changes are often associated with site changes. These include changes in slope and aspect, slope shape (draws, ridges, knolls, depressions), and slope position (e.g., upper vs. lower).

Stand features*:* Obvious changes in species composition can be a useful indicator of site changes. For example, older deciduous stands are usually associated with moist, rich sites; lodgepole pine stands indicate dry or very wet, nutrient-poor sites; redcedar-dominated stands may reflect moist, nutrient-poor sites in hypermaritime climates or moist, nutrient-rich sites in drier maritime climates. Changes in stand stocking (e.g., uniform vs. irregular stocking), or variation in tree vigour (sometimes visible through stand height or foliage colour) may also reflect site differences.

Rock outcrops: These are clearly visible on air photos and indicate drier sites with shallow soil.

3.4.2 Field survey

This is required to fine-tune photo typing, to describe and characterize sites, and to finalize the map unit boundaries. Before going into the field, plan an efficient traverse route using the typed air photos, forest cover map, or topographic map. The route can be informal, aiming to sample the main typed units, and paying close attention to units you are least certain about. Try to cover as much of the site variation as possible. In the field, do site assessments at representative locations, until the important types are well characterized. Note the location of site boundaries and check them on the air photo (or working base map if suitable photos not available). Carefully locate the traverse route and

inspection points on the map, using control points such as the cruise plot grid, flagged roadlines, and block boundaries.

3.4.3 Final site map

Information obtained from the photo typing and field survey should be transferred to the final base map. The map should show all important site polygons and a legend to describe them. The legend should include the site series, plus other environmental features that may influence management prescriptions (slope, soil depth, site sensitivity, etc.). Map units may be "simple" (representing one site series), or "complex" (representing more than one site series). Complex units are used when several distinctly different sites occur but are too intricately distributed to map separately (gully/ridge, deep soil with rock outcrops, wet depressions with well-drained soil, etc.). Complex units can be noted with a label that indicates the approximate proportions of the components. For example, *A / B* indicates approximately equal proportions, and *A // B* indicates that the first unit is dominant over the second.

Mapping should not be excessively detailed. Focus on the dominant types, and include minor types only if they differ substantially in management requirements. Map polygons should not be smaller than 1 x 1 cm, except for small units that are distinctly different, that can be 0.5 x 0.5 cm in size. The areas represented by these minimum polygon sizes are shown in Table 11.

TABLE 11. Area represented by minimum polygon sizes

Scale	Polygon size	
	1.0 x 1.0 cm	0.5 x 0.5 cm
1:5 000	0.25 ha	0.06 ha
1:10 000	1.0 ha	0.25 ha
1:15 840	2.5 ha	0.63 ha
1:20 000	4.0 ha	1.0 ha

3.4.4 Treatment unit map

A treatment unit map represents the final product of site mapping. It shows *treatment units* that indicate management requirements for the area. The original site map may contain different sites that require or are

suited to similar treatments. These can be grouped together to form a treatment unit.

Assess site sensitivities and management prescriptions for the unit(s) present on the site map, and group those that are similar in tree species selection, sensitivity to disturbance, competing vegetation potential, harvesting system, and wildlife values. A treatment unit represents ecosystems that can be managed through the uniform application of harvest systems and silvicultural treatments. The legend should include the sites comprising each map unit (with approximate proportions), the area of each map unit, and the prescriptions for each unit. Complex map units consisting of distinctly different sites must be dealt with carefully. Prescriptions such as tree species allocation can be applied specifically to each component site where practical. For example, *Fd on ridges and Cw in gullies* can be prescribed for a complex gully/ridge unit. Prescriptions that cannot be applied so specifically must recognize the most limiting site component. For example, slashburning would be inappropriate for a complex unit comprised of 60% low sensitivity site and 40% very high sensitivity site.

4.0 BIOGEOCLIMATIC UNITS OF THE VANCOUVER FOREST REGION[4]

This section provides a summary of key features of the biogeoclimatic units included in this guide. As the focus of the guide is forest ecosystems, the non-forested Alpine Tundra (AT) zone and the sparsely forested parkland subzones of the Mountain Hemlock (MH) and Engelmann Spruce - Subalpine fir (ESSF) zones are not covered. A general description of these units can be found in Meidinger and Pojar (1991). Also, units with very limited occurrence along the eastern boundary of the Vancouver Forest Region are not covered in this guide. Refer to the appropriate regional field guide for a complete description.

For each biogeoclimatic unit, a brief description of the distribution, climate, and vegetation is provided, together with characteristics distinguishing it from adjacent units. Comparative tables summarizing zonal vegetation (Tables 13 - 16) and climatic properties (Tables 17 - 20) are also included. For these tables, biogeoclimatic units are grouped according to broad similarities to facilitate comparison. These groupings include: 1) subalpine units; 2) wet and very wet hypermaritime and very wet maritime units; 3) summer-dry maritime units; and 4) submaritime units (excluding subalpine). Finally, elevational profiles for several representative transects of the Vancouver Forest Region display the general vertical distribution of biogeoclimatic units (Figures 9 and 10). Elevation limits shown in these figures and included in the descriptions, are approximate and may vary by at least 100 m. For example, drier units may be higher on south aspects, moister units may come down lower on north aspects, subalpine units are higher in submaritime or subcontinental areas and lower in hypermaritime areas, etc. A complete list of the biogeoclimatic units included in this guide is shown in Table 12. Variant names are italicized for clarity. Correlation between old and new names is shown in Appendix 8.

[4] Prepared by R.N. Green and F.C. Nuszdorfer, Research Ecologist, Ministry of Forests, Vancouver Forest Region.

TABLE 12. Names and symbols of forested biogeoclimatic units described in this guide

Symbol	Biogeoclimatic unit name	Page #
CDF	**Coastal Douglas-fir Zone**	
CDFmm	Moist Maritime Subzone	46
CWH	**Coastal Western Hemlock Zone**	
CWHdm	Dry Maritime Subzone	47
CWHds1	*Southern* Dry Submaritime Variant	48
CWHds2	*Central* Dry Submaritime Variant	49
CWHmm1	*Submontane* Moist Maritime Variant	50
CWHmm2	*Montane* Moist Maritime Variant	51
CWHms1	*Southern* Moist Submaritime Variant	52
CWHms2	*Central* Moist Submaritime Variant	53
CWHvh1	*Southern* Very Wet Hypermaritime Variant	55
CWHvh2	*Central* Very Wet Hypermaritime Variant	56
CWHvm1	*Submontane* Very Wet Maritime Variant	57
CWHvm2	*Montane* Very Wet Maritime Variant	59
CWHwh1	*Submontane* Wet Hypermaritime Variant	60
CWHwh2	*Montane* Wet Hypermaritime Variant	61
CWHws2	*Montane* Wet Submaritime Variant	62
CWHxm	Very Dry Maritime Subzone	63
ESSF	**Engelmann Spruce - Subalpine fir Zone**	
ESSFmw	Moist Warm Subzone	65
IDF	**Interior Douglas-fir Zone**	
IDFww	Wet Warm Subzone	66
MH	**Mountain Hemlock Zone**	
MHmm1	*Windward* Moist Maritime Variant	67
MHmm2	*Leeward* Moist Maritime Variant	68
MHwh	Wet Hypermaritime Subzone	70

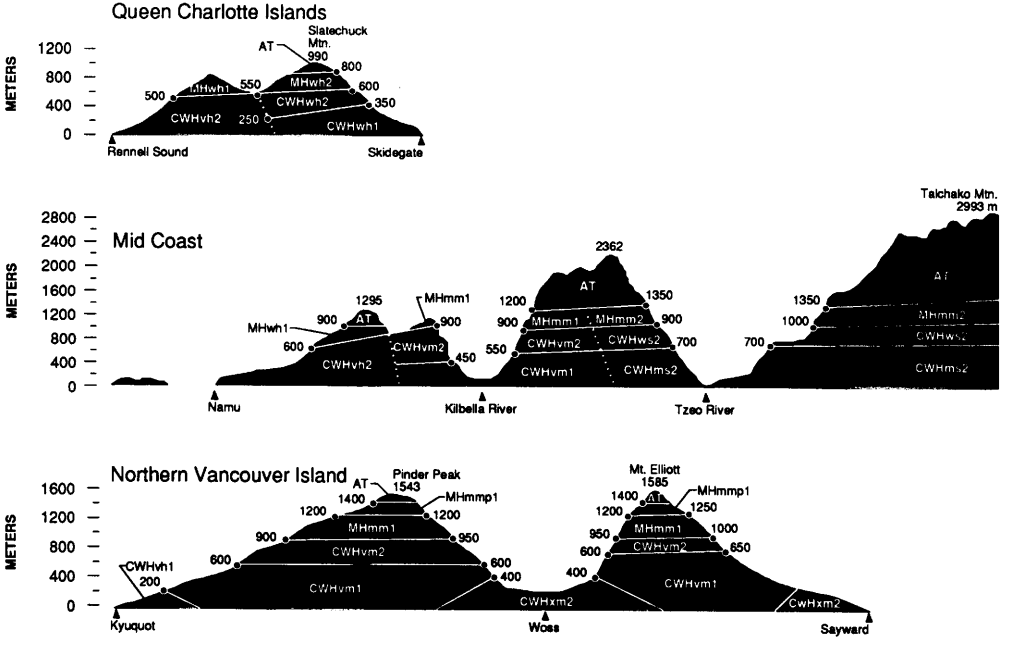


FIGURE 9. Elevational profiles of biogeocimatic units for the Queen Charlotte Islands, mid-coast, and northern Vancouver Island.

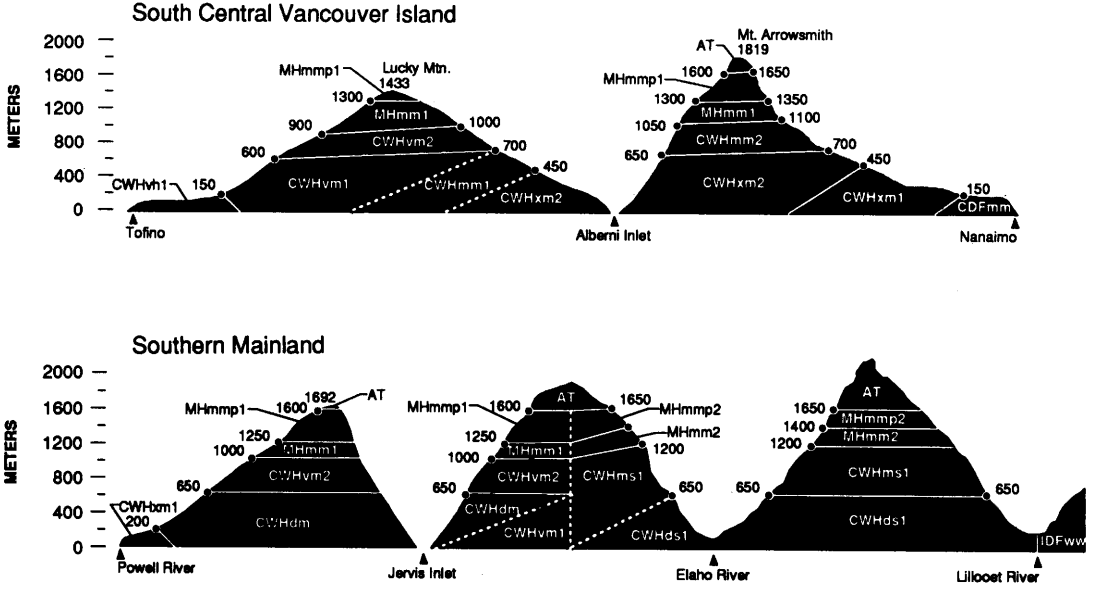


FIGURE 10. Elevational profiles of biogeoclimatic units for south central Vancouver Island and the southern mainland.

TABLE 13. Vegetation table for zonal sites of subalpine biogeoclimatic units (see Table 10 for explanation of prominence bars).

	Biogeoclimatic Unit	ESSFmw	MHmm1	MHmm2	MHwh	
TREE LAYER	Tsuga heterophylla					western hemlock
	Tsuga mertensiana					mountain hemlock
	Chamaecyparis nootkatensis					yellow-cedar
	Picea sitchensis					Sitka spruce
	Abies amabilis					amabilis fir
	Abies lasiocarpa					subalpine fir
	Picea engelmannii					Engelmann spruce
	Pinus contorta					lodgepole pine
SHRUB LAYER	Vaccinium ovalifolium					oval-leaved blueberry
	Menziesia ferruginea					false azalea
	Vaccinium alaskaense					Alaskan blueberry
	Vaccinium parvifolium					red huckleberry
	Rhododendron albiflorum					white-flowered rhododendron
	Vaccinium membranaceum					black huckleberry
	Cladothamnus pyroliflorus					copperbush
	Sorbus sitchensis					Sitka mountain ash
	Ribes lacustre					black gooseberry
	Vaccinium scoparium					grouseberry
HERB LAYER	Rubus pedatus					five-leaved bramble
	Listera cordata					heart-leaved twayblade
	Coptis aspleniifolia					fern-leaved goldthread
	Blechnum spicant					deer fern
	Phyllodoce empetriformis					pink mountain-heather
	Orthilia secunda					one-sided wintergreen
	Clintonia uniflora					queen's cup
	Tiarella unifoliata					one-leaved foamflower
	Valeriana sitchensis					Sitka valerian
	Arnica latifolia					mountain arnica
MOSS LAYER	Dicranum fuscescens					curly heron's-bill moss
	Rhytidiopsis robusta					pipecleaner moss
	Dicranum sp.					heron's bill moss
	Rhytidiadelphus loreus					lanky moss
	Hylocomium splendens					step moss
	Scapania bolanderi					scapania
	Sphagnum girgensohnii					common green sphagnum
	Pleurozium schreberi					red-stemmed feathermoss
	Pellia neesiana					

TABLE 14. Vegetation table for zonal sites of wet and very wet hypermaritime and very wet maritime CWH variants

	Biogeoclimatic Unit	CWHvm1	CWHvm2	CWHvh1	CWHvh2	CWHwh1	CWHwh2	
TREE LAYER	Thuja plicata							western redcedar
	Tsuga heterophylla							western hemlock
	Chamaecyparis nootkatensis							yellow-cedar
	Abies amabilis							amabilis fir
	Picea sitchensis							Sitka spruce
	Tsuga mertensiana							mountain hemlock
	Pinus contorta							shore/lodgepole pine
	Pseudotsuga menziesii							Douglas-fir
SHRUB LAYER	Menziesia ferruginea							false azalea
	Vaccinium alaskaense							Alaskan blueberry
	Vaccinium ovalifolium							oval-leaved blueberry
	Vaccinium parvifolium							red huckleberry
	Gaultheria shallon							salal
	Vaccinium ovatum							evergreen huckleberry
HERB LAYER	Blechnum spicant							deer fern
	Listera cordata							heart-leaved twayblade
	Maianthemum dilatatum							false lily-of-the-valley
	Cornus canadensis							bunchberry
	Rubus pedatus							five-leaved bramble
	Linnaea borealis							twinflower
	Polystichum munitum							sword fern
	Streptopus roseus							rosy twistedstalk
	Coptis aspleniifolia							fern-leaved goldthread
	Lysichitum americanum							skunk cabbage
	Dryopteris expansa							spiny wood fern
	Clintonia uniflora							queen's cup
MOSS LAYER	Hylocomium splendens							step moss
	Plagiothecium undulatum							flat moss
	Rhizomnium glabrescens							large leafy moss
	Rhytidiadelphus loreus							lanky moss
	Scapania bolanderi							scapania
	Kindbergia oregana							Oregon beaked moss
	Sphagnum girgensohnii							common green sphagnum
	Pellia neesiana							shiny liverwort
	Polytrichum alpinum							stiff-leaved haircap moss
	Rhytidiopsis robusta							pipecleaner moss

TABLE 15. Vegetation table for zonal sites of summer-dry maritime biogeoclimatic units

Layer	Biogeoclimatic Unit	CDFmm	CWHdm	CWHmm1	CWHmm2	CWHxm1	CWHxm2	
TREE LAYER	Pseudotsuga menziesii	█████	█████	████	████	█████	█████	Douglas-fir
	Thuja plicata	████	████	██	███	██	██	western redcedar
	Abies grandis	████						grand fir
	Acer macrophyllurn	██						bigleaf maple
	Cornus nuttallii	██						western flowering dogwood
	Tsuga heterophylla		█████	█████	█████	███	████	western hemlock
	Abies amabilis			████	████			amabilis fir
	Chamaecyparis nootkatensis				██			yellow-cedar
	Tsuga mertensiana				██			mountain hemlock
	Arbutus menziesii	▌						arbutus
SHRUB LAYER	Gaultheria shallon	█████	███	███	██	█████	█████	salal
	Mahonia nervosa	█████	██	██		███	███	dull Oregon-grape
	Vaccinium parvifolium	▌	███	███	██	███	███	red huckleberry
	Rubus ursinus	██	▌			▌		trailing blackberry
	Rosa gymnocarpa	██				▌	▌	baldhip rose
	Holodiscus discolor	████				▌		ocean spray
	Symphoricarpos mollis	██						trailing snowberry
	Lonicera ciliosa	▌						western trumpet honeysuckle
	Symphoricarpos albus	▌						common snowberry
	Chimaphila umbellata			▌	▌	▌		prince's pine
	Vaccinium alaskaense			█████	████			Alaskan blueberry
	Acer circinatum		██					vine maple
	Vaccinium membranaceum				██			black huckleberry
	Vaccinium ovalifolium				▌			oval-leaved blueberry
	Philadelphus lewisii	▌						mock-orange
HERB LAYER	Linnaea borealis	██	▌	██	██	██	██	twinflower
	Polystichum munitum	▌	██			██	██	sword fern
	Pteridium aquilinum	██	██			███	▌	bracken
	Trientalis latifolia	██						broad-leaved starflower
	Achlys triphylla	██		██	██	██	██	vanilla leaf
	Blechnum spicant			▌				deer fern
	Clintonia uniflora			▌				queen's cup
	Cornus canadensis		▌	██				bunchberry
	Rubus pedatus			▌	▌			five-leaved bramble
MOSS LAYER	Hylocomium splendens	██	████	████	███	████	████	step moss
	Kindbergia oregana	█████	████	██		█████	████	Oregon beaked moss
	Rhytidiadelphus triquetrus	██						electrified cat's tail moss
	Plagiothecium undulatum		███	████		▌		flat moss
	Rhytidiadelphus loreus		██	█████	███	▌	██	lanky moss
	Rhytidiopsis robusta			███			▌	pipecleaner moss

TABLE 16. Vegetation table for zonal sites of submaritime CWH variants and the IDFww

	Biogeoclimatic Unit	CWHds1	CWHds2	CWHms1	CWHms2	CWHws2	IDFww	
TREE LAYER	Thuja plicata	■	■	■	■	▪	■	western redcedar
	Tsuga heterophylla	■	■	■	■	■	▪	western hemlock
	Abies amabilis			■	■	■		amabilis fir
	Pseudotsuga menziesii	■	■	■	■		■	Douglas-fir
	Betula papyrifera		▪					paper birch
	Picea sitchensis		▪					Sitka spruce
	Pinus contorta						▪	lodgepole pine
	Tsuga mertensiana					▪		mountain hemlock
SHRUB LAYER	Vaccinium membranaceum	■		■	■		▪	black huckleberry
	Menziesia ferruginea	▪		▪	■	▪		false azalea
	Vaccinium parvifolium	■		■	■	▪		red huckleberry
	Vaccinium alaskaense	▪		■	■	■		Alaskan blueberry
	Vaccinium ovalifolium			■	■	■		oval-leaved blueberry
	Chimaphila umbellata	■	■	▪			■	prince's pine
	Paxistima myrsinites	■		▪			■	falsebox
	Acer glabrum		■				▪	Douglas maple
	Acer circinatum	▪					■	vine maple
	Mahonia nervosa	■		▪			■	dull Oregon-grape
	Rosa gymnocarpa	▪					■	baldhip rose
	Lonicera ciliosa						■	western trumpet honeysuckle
	Amelanchier alnifolia						■	saskatoon
	Spiraea betulifolia						■	birch-leaved spirea
	Symphoricarpos albus						▪	common snowberry
	Corylus cornuta						■	beaked hazelnut
	Holodiscus discolor						▪	ocean spray
	Mahonia aquifolium						■	tall Oregon-grape
	Rosa acicularis						▪	prickly rose
	Gaultheria shallon	▪			▪			salal
HERB LAYER	Clintonia uniflora	■	■	■	■	▪		queen's cup
	Cornus canadensis			■	■	■		bunchberry
	Goodyera oblongifolia	▪	▪					rattlesnake-plantain
	Orthilia secunda	▪	▪	▪	■	▪	▪	one-sided wintergreen
	Rubus pedatus			■	■	■		five-leaved bramble
	Streptopus roseus					▪		rosy twistedstalk
	Streptopus streptopoides					▪		small twistedstalk
	Linnaea borealis	■	▪	■	▪		■	twinflower
	Pyrola asarifolia	▪						pink wintergreen
	Trientalis latifolia	▪					■	broad-leaved starflower

TABLE 16. (Continued)

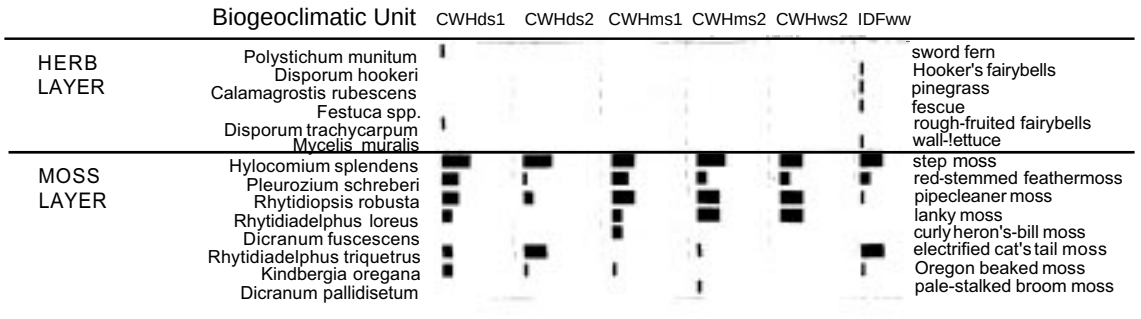


TABLE 17. Climatic data for certain subalpine and alpine biogeoclimatic units

Biogeoclimatic unit		AT	ESSFmw	MHmml	MHmm2
Number of stations		1	1	2	1
Name of reference station		Kemano-Kildala Pass[a]	Allison Pass	Grouse Mt. Resort	Tahtsa Lk. West[b]
Elevation of reference station (m)		1609	1341	1128	863
Mean annual precipitation (mm)	range	–	–	2565 to 2954	–
	ref. stn.	2793	1524	2565	1995
May to September precipitation (mm)	range	–	–	694-707	–
	ref. stn.	838	288	707	398
Total mean annual snowfall (cm)	range	–	–	816 to 820	–
	ref. stn.	1816	1431	816	1041
Mean annual temperature (°C)	range	–	1.8 to 3.8	4.6 to 5.0	–
	ref. stn.	-2	1.8	4.6	1.8
Mean temperature of the coldest month (°C)	range	–	-7.3 to -7.9	-2.2 to -2.3	–
	rof. stn.	-8.5	-7.9	-2.3	-9.1
Extreme minimum temperature (°C)	range	–	-35.6 to -42.8	-18.5 to -26.7	–
	rcf. stn.	-33.5	-42.8	-18.5	-35.6
Mean temperature of the warmest month (°C)	range	–	12.1 to 14.5	13.1 to 13.2	–
	ref. stn.	6.9	12.1	13.2	11.3
Extreme maximum temperature (°C)	range	–	31.7 to 33.9	29.0 to 33.3	–
	ref. stn.	22	31.7	29.0	31.7
Growing degree-days > 5 (°C)	range	–	–	919 to 933	–
	ref. stn.	214	703	933	629
Frost-free period (days)	range	–	–	125 to 126	–
	ref. stn.	70	32	126	56

[a] Only 5-6 years of data, ending 1959; normalized by George Reynolds (1993). Report on file.

[b] Station is not in Vancouver Forest Region: near boundary to CWHws2 and ESSFmk.

– No data.

TABLE 18. Climatic data for wet and very wet hypermaritime and very wet maritime CWH variants

Biogeoclimatic unit		CWHvh1	CWHvh2	CWHym1	CWHvm2	CWHwh1
Number of stations		32	13[a]	32[b]	2	6
Name of reference station		Estevan Point	Ethelda Bay	Haney Loon Lk.	Tunnel Camp	Port Clements
Elevation of reference station (m)		7	8	354	671	16
Mean annual precipitation (mm)	range	2009 to 3943	1532 to 4218	1555 to 4387	2760 to 2850	1152 to 1535
	ref. stn.	3120	3186	2682	2850	1535
May to September precipitation (mm)	range	455 to 806	421 to 961	364 to 1162	550 to 681	286 to 423
	ref. stn.	617	869	611	550	416
Total mean annual snowfall (cm)	range	25 to 272	51 to 195	20 to 548	552 to 605	61 to 163
	ref. stn.	45	144	195	552	88
Mean annual temperature (°C)	range	5.4 to 9.4	6.7 to 8.5	7.0 to 10.1	–	7.1 to 7.9
	ref. stn.	9.1	7.7	8.3	–	7.5
Mean temperature of the coldest month (°C)	range	0.5 to 4.7	-0.2 to 3.9	-4.5 to 3.7	–	0.3 to 2.0
	ref. stn.	4.5	1.9	0.5	–	0.4
Extreme minimum temperature (°C)	range	-7.5 to -17.2	-11.1 to -24.4	-8.9 to -22.8	–	-13.3 to -25.0
	ref. stn.	-13.9	-16.7	-19.4	–	-17.2
Mean temperature of the warmest month (°C)	range	11.5 to 15.3	13.1 to 15.1	13.8 to 18.8	–	13.5 to 14.8
	ref. stn.	14.1	13.7	16.3	–	14.8
Extreme maximum temperature (°C)	range	22.8 to 37.8	23.4 to 33.3	27.8 to 41.1	–	26.7 to 32.2
	ref. stn.	28.9	29.4	34.4	–	30
Growing degree-days >5 (°C)	range	818 to 1722	1148 to 1485	1313 to 2011	–	1206 to 1385
	ref. stn.	1607	1319	1633	–	1347
Frost-free period (days)	range	163 to 265	156 to 272	165 to 252	–	160 to 206
	ref. stn.	229	160	199	–	163

[a] Temperature data based on 10 stations.
[b] Temperature data based on 21 stations.
– No data.

TABLE 19. Climatic data for certain summer-dry maritime biogeoclimatic subzones

Biogeoclimatic unit		CDFmm	CWHdm	CWHxm
Number of stations		52[a]	48[b]	76[c]
Name of reference station		Victoria Airport	N .Vancouver Cloverly	Cumberland
Elevation of reference station (m)		17	79	159
Mean annual precipitation (m)	range	636 to 1263	1367 to 2412	1100 to 2721
	ref. stn.	873	1860	1570
May to September precipitation (m m)	range	105 to 272	280 to 525	160 to 565
	ref: stn.	142	397	243
Total mean annual snowfall (cm)	range	17 to 92	45 to 177	26 to 234
	ref. stn.	50	88	171
Mean annual temperature (°C)	range	8.8 to 10.5	8.7 to 10.3	7.8 to 10.7
	ref. stn.	9.5	10.0	8.7
Mean temperature of the coldest month (°C)	range	1.6 to 5.0	0.5 to 3.4	-05 to 3.9
	ref. stn.	3.1	2.4	0.9
Extreme minimum temperature (°C)	range	-7.8 to -21 .7	-10.6 to -25.0	-13.5 to -25.6
	ref. stn.	- 15.6	-17.8	-20.6
Mean temperature of the warmest month (°C)	range	15.1 to 18.0	16.6 to 18.5	14.2 to 18.7
	ref. stn.	10.3	17.6	16.9
Extreme maximum temperature (°C)	range	27.8 to 40.6	31.7 to 40.0	29.4 to 43.9
	ref. stn.	36.1	33.3	43.9
Growing degree-days > 5 (°C)	range	1728 to 2163	1829 to 2165	1498 to 2330
	ref. stn.	1863	2088	1723
Frost-free period (days)	range	155 to 304	171 to 270	137 to 244
	ref. stn.	201	222	153

[a] Temperature data based on 34 stations.
[b] Temperature data based on 21 stations.
[c] Temperature data based on 51 stations.

TABLE 20. Climatic data for certain submaritime CWH variants and the IDFww

Biogeoclimatic unit		CWHdsl	CWHds2	CWHmsl	IDFww
Number of stations		7[a]	2[b]	2	1[c]
Name of reference station		Pemberton BCFS		Alta Lk.	Hells Gate
Elevation of reference station (m)		218	–	668	122
Mean annual precipitation (mm)	range	990 to 2054	1614 to 2109	1415 to 1420	–
	ref. stn.	1187	–	1415	1198
May to September precipitation (mm)	range	197 to 350	357 to 491	265 to 276	–
	ref. stn.	224	–	265	176
Total mean annual snowfall (cm)	range	193 to 478	139 to 190	609 to 657	–
	ref. stn.	310	–	657	188
Mean annual temperature (°C)	range	6.4 to 9.7	7.5 to 7.7	–	–
	ref. stn.	7.2	–	5.7	9.2
Mean temperature of the coldest month (°C)	range	-0.4 to -6.6	-1.8 to -2.8	–	–
	ref. stn.	-5.6	–	-4.4	-2.6
Extreme minimum temperature (°C)	range	-24.4 to -40.0	-22.2 to -28.9	–	–
	ref. stn.	-30.0	–	-30.6	-27.8
Mean temperature of the warmest month (°C)	range	15.3 to 18.7	16.1 to 16.5	–	–
	ref. stn.	18.7	–	15.3	20.4
Extreme maximum temperature (°C)	range	36.7 to 40.0	33.9 to 37.8	–	–
	ref. stn.	39.4	–	36.1	40.6
Growing degree-days >5 (°C)	range	1732 to 2130	1591 to 1626	–	–
	ref. stn.	1817	–	1279	2194
Frost-free period (days)	range	128 to 225	161 to 198	–	–
	ref. stn.	150	–	116	204

[a] Temperature data based on 5 stations.
[b] Both stations are near CWHms2.
[c] Station is from lower part of subzone.
– No data.

4.1 CDFmm - Moist Maritime Coastal Douglas-fir Subzone

DISTRIBUTION: The CDFmm is restricted to low elevations along southeast Vancouver Island from Bowser to Victoria, the Gulf Islands south of Cortes Island, and a narrow strip along the Sunshine Coast near Halfmoon Bay. Elevational limits range from sea level to approximately 150 m.

CLIMATE (Table 19): The CDFmm lies in the rainshadow of the Vancouver Island and Olympic mountains resulting in warm, dry summers and mild, wet winters. Growing seasons are very long and feature pronounced water deficits on zonal and drier sites. The CDFmm represents the mildest climate in Canada.

VEGETATION (Table 15): Forests on zonal sites are dominated by Fd, as well as Bg and Cw. The understorey is dominated by salal, dull Oregon-grape, ocean-spray, and *Kindbergia oregana*. Less prominent species include baldhip rose, snowberry, western trumpet honeysuckle, vanilla-leaf, and *Rhytidiadelphus triquetrus*. Drier sites are characterized by the presence of Garry oak and arbutus, as well as numerous members of the lily family.

DISTINGUISHING ADJACENT UNITS FROM THE CDFmm (using zonal sites)

CWHxm - occurs adjacent and above; it has:

- common Hw
- rare Bg
- less salal and ocean-spray
- rare dogwood, snowberry, and *Rhytidiadelphus triquetrus*
- rare Garry oak; less arbutus on drier sites
- rare Indian plum on wet/rich sites

NOTES ON CLASSIFICATION: The CDFmm is the only subzone recognized in the CDF zone in British Columbia.

4.2 CWHdm - Dry Maritime Coastal Western Hemlock Subzone

DISTRIBUTION: The CWHdm occurs at low elevations on the mainland and immediately adjacent islands. It extends from Hardwicke Island in the north to the Chilliwack River in the southeast. Along the Sunshine Coast and lower Fraser Valley it occurs above and adjacent to the CWHxm, respectively. Elevational limits range from sea level (or above CWHxm if present) to approximately 650 m (lower in wetter valleys).

CLIMATE (Table 19): The CWHdm has warm, relatively dry summers and moist, mild winters with little snowfall. Growing seasons are long, and feature only minor water deficits on zonal sites.

VEGETATION (Table 15): Forests on zonal sites are dominated by Fd, Cw, and Hw. Major understorey species include salal, red huckleberry, *Hylocomium splendens*, *Kindbergia oregana*, *Rhytidiadelphus loreus*, and *Plagiothecium undulatum.* Less common species include dull Oregon-grape, vine maple, bracken, and swordfern.

DISTINGUISHING ADJACENT UNITS FROM THE CWHdm (using zonal sites)

CWHxm - occurs below, along the Sunshine Coast or adjacent in the Fraser Valley; it has:
- rare vine maple; less *Plagiothecium undulatum*
- some vanilla-leaf; minor ocean-spray and baldhip rose
- minor arbutus on very dry sites

CWHvm1 - occurs above; it has:
- common Ba and Alaskan blueberry

CWHds1 - adjacent in submaritime areas; it has:
- much less salal and red huckleberry
- common falsebox, *Pleurozium schreberi*, and *Rhytidiosis robusta*
- some queen's cup, and *Rhytidiadelphus triquetrus*
- Douglas maple on drier sites

4.3 CWHds1 - Southern Dry Submaritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHds1 occurs at lower elevations in drainages of the upper Fraser River east and north of Chilliwack, and in the eastern portion of the Coast Mountains from upper Harrison Lake to the Homathko River. Elevational limits range from valley bottom to approximately 650 m.

CLIMATE (Table 20): The CWHds1 has a climate transitional between the coast and interior, characterized by warm, dry summers and moist, cool winters with moderate snowfall. Growing seasons feature water deficits on zonal sites. Compared to the CWHdm, the CWHds1 has less precipitation, more pronounced water deficits, cooler temperatures, and more snowfall.

VEGETATION (Table 16): Forests on zonal sites are dominated by Fd, Hw, and, to a lesser extent, Cw. The understorey is characterized by relatively poorly developed shrub and herb layers featuring some falsebox and minor amounts of prince's pine, dull Oregon-grape, and queen's cup, with a well-developed moss layer dominated by *Hylocomium splendens*, *Rhytidiopsis robusta*, *Pleurozium schreberi*, and some *Rhytidiadelphus triquetrus* and *R. loreus*.

DISTINGUISHING ADJACENT UNITS FROM THE CWHds1 (using zonal sites)

CWHdm - occurs to the west; it has:
- common salal, red huckleberry, and *Plagiothecium undulatum*
- rare falsebox, *Pleurozium schreberi*, *Rhytidiosis robusta,* and *Rhytidiadelphus triquetrus*
- rare Douglas maple on drier sites

CWHms1 - occurs above; it has:
- common Ba and Alaskan blueberry

4.4 CWHds2 - Central Dry Submaritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHds2 occurs at low elevations in submaritime and subcontinental areas north of the head of Knight Inlet. Its major occurrences include the lower Klinaklini, Bella Coola, Talchako, and Dean valleys. Elevational limits range from valley bottom to approximately 500 m.

CLIMATE (Table 20): The CWHds2 has a climate transitional between the coast and interior, characterized by warm, dry summers and moist, cool winters with moderate snowfall. Growing seasons feature water deficits on zonal sites.

VEGETATION (Table 16): Forests on zonal sites are dominated by Fd, Hw, Cw, and minor paper birch. The understorey is characterized by relatively poorly developed shrub and herb layers featuring some Douglas maple and minor amounts of queen's cup, with a well-developed moss layer dominated by *Hylocomium splendens*, *Rhytidiadelphus triquetris,* and minor amounts of *Rhytidiopsis robusta* and *Pleurozium schreberi*.

DISTINGUISHING ADJACENT UNITS FROM THE CWHds2 (using zonal sites)

CWHms2 - occurs adjacent and above; it has:
- common Ba and Alaskan blueberry

CWHws2 - occurs adjacent and above; it has:
- common Ba and Alaskan blueberry

IDFww - occurs adjacent to the east; it has
- much less Hw
- more falsebox
- well-developed shrub layer with a mix of species (e.g., tall Oregon-grape, baldhip rose, western trumpet honeysuckle, saskatoon, birch-leaved spirea, beaked hazelnut, etc.)

4.5 CWHmm1 - Submontane Moist Maritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHmm1 is mainly restricted to Vancouver Island where it occurs along the leeward side of the Vancouver Island Ranges above the CWHxm subzone. It also occurs at higher elevations on Quadra, Sonora, and West and East Thurlow islands. It has a discontinuous distribution, often occurring in the upper portions of valleys draining the eastern slopes of the Vancouver Island Ranges. Elevational limits range from approximately 450 to 700 m (above the CWHxm if present), although it extends lower in isolated cases.

CLIMATE: The CWHmm1 has climatic conditions intermediate between the CWHxm and the CWHvm subzones. It has moist, mild winters and cool but relatively dry summers. Historically, dry summers have occasionally resulted in stand-replacing wildfires, which have contributed to the abundance of Fd in this variant. Climatic data are unavailable for the CWHmm1.

VEGETATION (Table 15): Forests on zonal sites are dominated by Hw, Ba, and Fd. Shrub layers commonly include red huckleberry, Alaskan blueberry, and, to a lesser extent, salal and dull Oregon-grape. *Hylocomium splendens*, *Rhytidiadelphus loreus*, and *Rhytidiopsis robusta* dominate the well-developed moss layer. Stands established following fire tend to have a greater component of Fd and its associated understorey vegetation (more salal, dull Oregon-grape, vanilla-leaf, etc.).

DISTINGUISHING ADJACENT UNITS FROM THE CWHmm1 (using zonal sites)

CWHmm2 - occurs above; it has:
- some Yc and Hm (more common on wetter sites), and black huckleberry
- rare dull Oregon-grape or *Kindbergia oregana*

CWHxm - occurs below; it has:
- rare Ba and Alaskan blueberry

CWHvm1 - occurs adjacent to the west; it has:
- less Fd
- rare *Rhytidiopsis robusta,* dull Oregon-grape, and vanilla-leaf

CWHvm2 - occurs adjacent and above to the west; it has:
- rare Fd
- some Yc and Hm (more common on wetter sites)
- rare dull Oregon-grape, vanilla-leaf, and *Kindbergia oregana*

4.6 CWHmm2 - Montane Moist Maritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHmm2 occurs at higher elevations along the leeward side of the Vancouver Island Ranges, below the MH zone. Elevational limits range from approximately 700 to 1100 m.

CLIMATE: Compared with the submontane variant, the CWHmm2 has cooler temperatures, shorter growing seasons, and heavier snowfall, with snowpacks persisting throughout the winter. Like the submontane variant, the CWHmm2 has a growing season water deficit from the rainshadow effect of the Vancouver Island mountains. Climatic data are lacking for this variant.

VEGETATION (Table 15): Forests on zonal sites are dominated by Hw, Ba, Fd, and minor amounts of Yc and Hm (more common at upper elevations and on wetter sites). The understorey features abundant Alaskan blueberry and lesser amounts of salal, oval-leaved blueberry, and black huckleberry. *Rhytidiopsis robusta, Rhytidiadelphus loreus,* and *Hylocomium splendens* dominate the well-developed moss layer. A history of wildfires has contributed to the relatively large stand component of Fd throughout the CWHmm2.

DISTINGUISHING ADJACENT UNITS FROM THE CWHmm2 (using zonal sites)

CWHxm - occurs below; it has:
- rare Ba and Alaskan blueberry

CWHmm1 - occurs below; it has:
- no Yc or Hm; rare black huckleberry
- some dull Oregon-grape and *Kindbergia oregana*

CWHvm1 - occurs adjacent to the west; it has:

- no Yc or Hm; rare black huckleberry, vanilla-leaf, and *Rhytidiosis robusta*
- less Fd

CWHvm2 - occurs adjacent to the west; it has:

- less Fd
- rare black huckleberry and vanilla-leaf

MHmm1 - occurs above; it has:

- over 50% of hemlock cover as Hm
- no Fd or salal

4.7 CWHms1 - Southern Moist Submaritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHms1 occurs at higher elevations in drainages of the upper Fraser River east and north of Chilliwack, and in the eastern portion of the Coast Mountains from upper Harrison Lake to the Homathko River. Elevational limits range from approximately 650 to 1200 m in submaritime areas, and from 900 to 1350 m in subcontinental areas further to the east.

CLIMATE (Table 20): The CWHms1 has a climate transitional between the coast and interior, characterized by moist, cool winters, and cool but relatively dry summers. Historically, dry summers have resulted in stand-replacing wildfires, which have contributed to the abundance of Fd in this variant. Snowfall is relatively heavy, particularly in the upper elevational ranges of the variant.

VEGETATION (Table 16): Forests on zonal sites are dominated by Hw, Fd, Cw, and Ba. Common understorey species include Alaskan blueberry and a well-developed moss layer featuring *Hylocomium splendens*, *Rhytidopsis robusta*, and *Pleurozium schreberi*. Less commonly occurring species include black huckleberry, oval-leaved blueberry, falsebox, bunchberry, queen's cup, five-leaved bramble, and one-sided wintergreen. Higher elevations featuring greater snowfall and cooler temperatures are dominated by Hw, Ba, and Cw, with Fd restricted mainly to drier sites.

DISTINGUISHING ADJACENT UNITS FROM THE CWHms1 (using zonal sites)

CWHds1 - occurs below; it, has:
- rare Ba and Alaskan blueberry

CWHvm1 - occurs adjacent to the west; it has:
- less Fd (mainly on drier sites); more Ba
- rare *Pleurozium schreberi*, *Rhytidiopsis robusta,* black huckleberry, one-sided wintergreen, and falsebox
- minor salal (common on drier sites)
- rare one-leaved foamflower and rosy twistedstalk on rich sites

CWHvm2 - occurs adjacent to the west at higher elevations; it has:
- less Fd (mainly on drier sites); more Ba
- some Yc and Hm
- rare *Pleurozium schreberi,* black huckleberry, one-sided wintergreen, and falsebox
- minor salal (common on drier sites)
- rare one-leaved foamflower and oak fern on rich sites

MHmm2 - occurs above; it has:
- over 50% of hemlock cover as Hm; forests dominated by Hm and Ba
- more black huckleberry; minor white-flowered rhododendron

ESSFmw - occurs above in eastern limits, it has:
- common Bl, Se, black huckleberry, and white-flowered rhododendron

IDFww - occurs below in the eastern limits; it has:
- rare Ba and Hw

4.8 CWHms2 - Central Moist Submaritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHms2 occurs at lower elevations in submaritime and subcontinental areas north of the head of Knight Inlet. Its major occurrences include the lower Kimsquit River, southern Dean Channel, Labouchere Channel, South Bentinck Arm, and the main rivers draining

into the east end of Owikeno Lake. Elevational limits range from sea level to approximately 700 m.

CLIMATE: The CWHms2 has a climate transitional between the coast and interior, characterized by moist, cool winters and cool but relatively dry summers. Historically, dry summers have resulted in stand-replacing wildfires, which have contributed to the abundance of Fd in this variant. Snowfall is relatively heavy, particularly in the upper elevational ranges of the variant. Climate data are unavailable for this variant.

VEGETATION (Table 16): Forests on zonal sites are dominated by Hw, Fd, Cw, and Ba. Common understorey species include Alaskan blueberry, and a well-developed moss layer featuring *Hylocomium splendens*, *Rhytidopsis robusta*, and *Rhytidiadelphus loreus*. Less commonly occurring species include black huckleberry, oval-leaved blueberry, false azalea, bunchberry, queen's cup, five-leaved bramble, one-sided wintergreen, and *Pleurozium schreberi*. Higher elevations featuring greater snowfall and cooler temperatures are dominated by Hw, Ba, and Cw, with Fd restricted mainly to drier sites.

DISTINGUISHING ADJACENT UNITS FROM THE CWHms2 (using zonal sites)

CWHds2 - occurs below in some drainages; it has:
- rare Ba and Alaskan blueberry

CWHws2 - occurs above; it has:
- rare Fd and black huckleberry
- rare falsebox and kinnikinnick on drier sites

CWHvm1 - occurs adjacent to the west; it has:
- less Fd (mainly on drier sites); more Ba
- rare *Pleurozium schreberi*, *Rhytidiopsis robusta,* black huckleberry, one-sided wintergreen, and falsebox
- minor salal (common on drier sites)

4.9 CWHvh1 - Southern Very Wet Hypermaritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHvh1 occurs in hypermaritime areas of the south coast. It is restricted to a narrow coastal fringe on the outer coast of Vancouver Island from near Port Renfrew to Quatsino Sound. It widens north of Quatsino Sound, covering the northern end of Vancouver Island. On the mainland it occupies lower elevations along the outer coast from Wells Passage, west of Broughton Island, to Smith Inlet. The elevational limits range from sea level to approximately 200 m (higher in the north).

CLIMATE (Table 18): The CWHvh1 is cool with very little snowfall. The proximity to the Pacific Ocean moderates temperatures throughout the year. Fog, cloud, and drizzle are common throughout the year. Precipitation varies widely in this unit, with lowest values occurring in the local rainshadow on the northeastern part of Vancouver Island at Bull Harbour. The highest values occur where air masses lift over steep mountains (e.g., 3943 mm at Port Renfrew).

VEGETATION (Table 14): Forests on zonal sites are dominated by Hw, accompanied by Ba, Cw, and minor amounts of Yc (in the northern part). Major understorey species include salal, Alaskan blueberry, red huckleberry, deer fern, *Hylocomium splendens*, and *Rhytidiadelphus loreus*. Evergreen huckleberry is a minor species on zonal sites, but more common on drier sites. It is a good indicator of the CWHvh1. Bog ecosystems occur commonly on subdued terrain.

DISTINGUISHING ADJACENT UNITS FROM THE CWHvh1 (using zonal sites)

CWHvm1 - occurs adjacent, inland throughout range; it has:
- rare evergreen huckleberry and Yc; less salal and deer fern
- some Fd on dry south-facing sites

CWHvh2 - occurs adjacent in the northern limits; it has:
- more Yc, Pl, less Ba
- rare evergreen huckleberry
- minor amounts of fern-leaved goldthread, skunk cabbage, and *Sphagnum girgensohnii*

NOTES ON CLASSIFICATION: Zonal sites are difficult to find in many areas because of extensive subdued, poorly drained terrain.

4.10 CWHvh2 - Central Very Wet Hypermaritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHvh2 occurs along the outer mainland coast from Smith Inlet in the south to the Vancouver Forest Region boundary in the north. On the Queen Charlotte Islands it occurs along the windward side of the Queen Charlotte Ranges, except for south Moresby Island where it covers much of the area, except higher elevations. The elevational limits range from sea level to approximately 500 m.

CLIMATE (Table 18): The CWHvh2 is cool with very little snowfall. The proximity to the Pacific Ocean moderates temperatures. Fog, cloud, and drizzle are common throughout the year. Precipitation varies widely in this unit. It is lowest at the southern tip of the Queen Charlotte Islands and highest where air masses lift over steep mountains (e.g., 4218 mm at Tasu Sound).

VEGETATION (Table 14): Forests on zonal sites are dominated by Cw, Hw, and variable amounts of Yc. Ba (not on Queen Charlotte Islands), Pl, and Ss occur in relatively minor amounts. Major understorey species include salal, Alaskan blueberry, false azalea, deer fern, *Hylocomium splendens*, and *Rhytidiadelphus loreus,* with minor amounts of fern-leaved goldthread, skunk cabbage, and *Sphagnum girgensohnii.* Extensive bog ecosystems occur commonly on subdued terrain. Productive forests are restricted to steeper, better drained slopes and floodplains.

DISTINGUISHING ADJACENT UNITS FROM THE CWHvh2 (using zonal sites)

CWHvh1 - occurs adjacent in the southern limits; it has:

- less Yc, and Pl; more Ba
- rare fern-leaved goldthread, skunk cabbage, and *Sphagnum girgensohnii*
- evergreen huckleberry present

CWHvm1- occurs adjacent inland on mainland; it has:

- rare Yc, Pl, fern-leaved goldthread, skunk cabbage, and *Sphagnum girgensohnii*
- less Cw and salal; more Ba
- some Fd on dry south-facing sites

CWHwh1 - occurs adjacent to the east on the Queen Charlotte Islands; it has:

- rare Yc and Hm
- more Ss
- rare fern-leaved goldthread, skunk cabbage, and *Sphagnum girgensohnii*

MHwh - occurs above; it has:

- over 50% of hemlock cover as Hm; no salal

NOTES ON CLASSIFICATION: Zonal sites are difficult to find in many areas because of extensive subdued, poorly drained terrain.

4.11 CWHvm1 - Submontane Very Wet Maritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHvm1 is the most extensive biogeoclimatic unit in the Vancouver Forest Region. It occurs on the windward slopes of Vancouver Island as far south as Jordan River, and on both sides of Vancouver Island north of Kelsey Bay. Its northern limit on Vancouver Island occurs just north of Port Hardy. On the mainland, the CWHvm1 occurs along the windward slopes of the Coast Mountains, from the Fraser River to the northern boundary of the Vancouver Forest Region. In the south an isolated occurrence is mapped in Garne Creek, 15 km west of Hope; otherwise it only occurs west of Harrison Lake. The elevational limits range from sea level (or above CWHxm or CWHdm if present) to approximately 650 m (600 m on Vancouver Island).

CLIMATE (Table 18): The CWHvm1 has a wet, humid climate with cool summers and mild winters featuring relatively little snow. Growing seasons are long. Although precipitation is high, it can vary considerably, from lower values in the local rainshadow of northeastern Vancouver Island (Port Hardy, Port Alice, Coal Harbour, and Alice Lake

areas), to the highest values where air masses lift over steep mountains (e.g., Ocean Falls).

VEGETATION (Table 14): Forests on zonal sites are dominated by Hw, Ba, and lesser amounts of Cw. The understorey generally features a well-developed shrub layer dominated by red huckleberry and Alaskan blueberry, and a well-developed moss layer dominated by *Hylocomium splendens* and *Rhytidiadelphus loreus*. Herbs are sparse and include minor amounts of deer fern, five-leaved bramble, bunchberry, and queen's cup. Subdued terrain on the west coast and northern end of Vancouver Island features very old successional stages dominated by Cw, Hw, and salal.

DISTINGUISHING ADJACENT UNITS FROM THE CWHvm1 (using zonal sites)

CWHxm - occurs adjacent on Vancouver Island; it has:
- rare Ba and Alaskan blueberry

CWHmm1 - occurs adjacent on Vancouver Island; it has:
- common Fd and *Rhytidiopsis robusta*
- some dull Oregon-grape, vanilla-leaf, and *Kindbergia oregana*

CWHmm2 - occurs adjacent and above on Vancouver Island; it has:
- minor Yc, Hm, black huckleberry, and vanilla-leaf
- more Fd
- common *Rhytidiopsis robusta*

CWHvm2 - occurs above; it has:
- some Yc and Hm (more abundant on wetter sites and at higher elevations)
- more *Rhytidiopsis robusta*

CWHdm - occurs below or adjacent on the mainland; it has:
- rare Ba and Alaskan blueberry

CWHms - occurs adjacent on the mainland in submaritime areas; it has:
- common Fd, *Pleurozium schreberi*, and *Rhytidiopsis robusta*
- some black huckleberry and one-sided wintergreen
- rare salal but some falsebox on dry sites
- one-leaved foamflower and rosy twistedstalk on rich sites

CWHvh1 - occurs adjacent to the west on Vancouver Island and the mainland south of Smith Inlet; it has:

- minor Yc and Hm
- more salal, deer fern, and false lily-of-the-valley
- no Fd on drier sites
- minor evergreen huckleberry (more common on drier sites)

CWHvh2 - occurs adjacent to the west on the mainland north of Smith Inlet; it has:

- minor Yc, Pl, fern-leaved goldthread, skunk cabbage, and *Sphagnum girgensohnii*
- more salal, and Cw; less Ba
- no Fd on drier sites

4.12 CWHvm2 - Montane Very Wet Maritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHvm2 occurs at higher elevations, above the CWHvm1. Elevational limits range from approximately 650-1000 m in the south to 450-800 m in the north. It grades into the MH zone above.

CLIMATE (Table 18): The CWHvm2 has a wet, humid climate with cool, short summers and cool winters featuring substantial snowfall. Compared with the submontane variant, the CWHvm2 has cooler temperatures, shorter growing seasons, and heavier snowfall, with snowpacks persisting throughout the winter.

VEGETATION (Table 14): Forests on zonal sites are dominated by Hw, Ba, and, to a lesser extent, Cw, Yc, and Hm. The latter two species become more common with increasing elevation and wetter sites. Major understorey species include Alaskan blueberry, five-leaved bramble, *Hylocomium splendens*, *Rhytidiadelphus loreus*, and *Rhytidiopsis robusta*.

DISTINGUISHING ADJACENT UNITS FROM THE CWHvm2 (using zonal sites)

CWHvm1- occurs below; it has:

- no Yc or Hm
- less *Rhytidiopsis robusta*

CWHmm1 - occurs adjacent on Vancouver Island; it has:
- common Fd
- no Yc or Hm
- some dull Oregon-grape, vanilla-leaf, and *Kindbergia oregana*

CWHmm2 - occurs adjacent on Vancouver Island; it has:
- common Fd
- minor black huckleberry and vanilla-leaf

CWHms - occurs adjacent on the mainland in submaritime areas; it has:
- common Fd and *Pleurozium schreberi*
- rare Yc and Hm
- some black huckleberry and one-sided wintergreen
- rare salal but minor falsebox (more common on drier sites)
- one-leaved foamflower and oak fern on rich sites

MHmm - occurs above; it has:
- over 50% of hemlock cover as Hm
- copperbush common on wetter sites

4.13 CWHwh1 - Submontane Wet Hypermaritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHwh1 is restricted to the Queen Charlotte Islands where it occurs at lower elevations on the leeward side of the Queen Charlotte Ranges. The elevational limits range from sea level to approximately 350 m (250 m approaching the CWHvh2 to the west).

CLIMATE (Table 18): The CWHwh1 has mild, wet winters with little snowfall, and cool moist summers. Occasional warm dry periods during the summer reflect the rainshadow effect of the Queen Charlotte Ranges. The overall temperature regime is mild due to the moderating effect of the Pacific Ocean. Cloud and fog are frequent throughout the year.

VEGETATION (Table 14): Forests on zonal sites are dominated by Hw, Cw, and Ss. Mosses dominate the understorey with *Hylocomium splendens*, *Rhytidiadelphus loreus*, and *Rhizomnium glabrescens* occurring most commonly. The herb and shrub layers are sparse, probably due to heavy deer browsing. Very old successional stages are increasingly dominated by Cw. Subdued terrain on the Queen Charlotte

Lowlands and eastern Skidegate Plateau have extensive bogs and nutrient-very poor to -poor, Cw, Hw, salal-dominated stands.

DISTINGUISHING ADJACENT UNITS FROM THE CWHwh1 (using zonal sites)

CWHvh2 - occurs adjacent to the west; it has:
- common Yc and salal, as well as minor Pl and Hm
- minor amounts of fern-leaved goldthread, skunk cabbage, and *Sphagnum girgensohnii*

CWHwh2 - occurs above; it has:
- common Yc
- minor amounts of Hm (common on wet/poor sites)
- more *Scapania bolanderi,* small twistedstalk, Indian hellebore, and *Dicranum* spp.

4.14 CWHwh2 - Montane Wet Hypermaritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHwh2 is restricted to the Queen Charlotte Islands where it occurs above the CWHwh1 throughout the eastern Skidegate Plateau and eastern Queen Charlotte Ranges. Elevational limits range from approximately 350 to 600 m.

CLIMATE: The CWHwh2 is cooler and wetter than the CWHwh1 below it, and has greater snowfall and a more persistent snowpack. Low cloud and fog likely influence this variant more than the submontane variant. There are no long-term climate data to characterize this unit.

VEGETATION (Table 14): Forests on zonal sites are dominated by Hw, Cw, and Yc, with Ss occurring less commonly. Minor amounts of Hm may occur but vigour is poor. The understorey is dominated by mosses and liverworts, including *Hylocomium splendens*, *Rhytidiadelphus loreus*, and *Scapania bolanderi*. The herb and shrub layers are sparse, probably due to heavy deer browsing.

DISTINGUISHING ADJACENT UNITS FROM THE CWHwh2 (using zonal sites)

CWHwh1 - occurs below; it has:
- rare Yc and Hm
- less *Scapania bolanderi*
- common salal

CWHvh2 - occurs adjacent to the west, it has:
- common salal; more deer fern
- some Pl and *Sphagnum girgensohnii*

MHwh - occurs above; it has:
- over 50% of hemlock cover as Hm
- rare salal

4.15 CWHws2 - Montane Wet Submaritime Coastal Western Hemlock Variant

DISTRIBUTION: The CWHws2 occupies upper valleys and inland drainages in the eastern portion of the central coast, north of Knight Inlet. Its major occurrences include the Kimsquit, Dean, Bella Coola, Klinaklini, and Kingcome rivers, as well as the main rivers draining into the east end of Owikeno Lake and South Bentinck Arm. It generally occurs between the CWHms2 and the MHmm2. The elevational limits of the CWHws2 range from about 700 to 1000 m (lower in the north).

CLIMATE: The CWHws2 has a climate transitional between the coast and interior, characterized by moist, warm summers, and cool to cold winters with relatively heavy amounts of wet snowfall. It is influenced by cold air drainage off large glaciers present at the heads of drainages. Climate data are unavailable for this variant.

VEGETATION (Table 16): Forests on zonal sites are dominated by Hw and Ba, with minor amounts of Cw and Hm (more common on wetter sites). Bl may form a major stand component in upper reaches under the influence of cold air drainage. Major understorey species include Alaskan blueberry, oval-leaved blueberry, false azelea, bunchberry, five-leaved bramble, and a well-developed moss layer dominated by

Hylocomium splendens, *Rhytidiadelphus loreus*, *Rhytidiopsis robusta*, and some *Pleurozium schreberi*.

DISTINGUISHING ADJACENT UNITS FROM THE CWHws2 (using zonal sites)

CWHms2 - occurs below; it has:
- common Fd
- some falsebox and kinnikinnick on drier sites
- minor black huckleberry (common on drier sites)

CWHds2 - occurs below; it has:
- rare Ba and Alaskan blueberry

CWHvm2 - occurs adjacent to the west; it has:
- common Yc; more deer fern
- salal on drier sites
- rare one-sided wintergreen, queen's cup and *Pleurozium schreberi*

MHmm2 - occurs above in submaritime areas; it has:
- over 50% of hemlock cover as Hm

ESSFmw - occurs above in subcontinental areas; it has:
- common Bl, Se, black huckleberry, and white-flowered rhododendron

NOTES ON CLASSIFICATION: The submontane variant of this subzone (CWHws1) does not occur in the Vancouver Forest Region.

4.16 CWHxm - Very Dry Maritime Coastal Western Hemlock Subzone

DISTRIBUTION: The CWHxm occurs at lower elevations along the east side of Vancouver Island (above the CDF where present) as far north as Kelsey Bay, and on the islands around southern Johnstone Strait. It also occurs inland on Vancouver Island along major valleys from Nimpkish Valley in the north to Cowichan Valley in the south. On the mainland it extends up the south side of the Fraser River as far as Chilliwack, and along the Sunshine Coast as far as Desolation Sound. Elevational limits range from sea level (or above the CDFmm where present) to

approximately 700 m. Near the wetter parts of its distribution, the upper limit is lower (e.g., 150 m on Gambier and Bowen islands, and in the Fraser Valley).

CLIMATE (Table 19): The CWHxm has warm, dry summers and moist, mild winters with relatively little snowfall. Growing seasons are long, and feature water deficits on zonal sites.

VEGETATION (Table 15): Forests on zonal sites are dominated by Fd, accompanied by Hw and minor amounts of Cw. Major understorey species include salal, dull Oregon-grape, red huckleberry, *Hylocomium splendens,* and *Kindbergia oregana*. Less common species include vanilla-leaf, sword fern, twinflower, and bracken.

DISTINGUISHING ADJACENT UNITS FROM THE CWHxm (using zonal sites)

CDFmm - occurs adjacent and below, towards the ocean; it has:
- rare Hw
- common Bg and ocean-spray
- Garry oak and more arbutus on drier sites; Indian plum on wet/rich sites
- some dogwood, snowberry, and *Rhytidiadelphus triquetrus*

CWHdm - occurs above along the Sunshine Coast and northern Gulf Islands, or adjacent in the Fraser Valley; it has:
- some vine maple; more *Plagiothecium undulatum*
- rare vanilla-leaf, ocean-spray, and baldhip rose
- no arbutus on drier sites

CWHmm - occurs above along east Vancouver Island; it has:
- common Ba and Alaskan blueberry

CWHvm - occurs adjacent to the west and above on Vancouver Island; it has:
- common Ba and Alaskan blueberry

NOTES ON CLASSIFICATION: The CWHxm is subdivided into two variants, the CWHxm1 (former CDFb) and the CWHxm2 (former CWHa2). These were not differentiated in this guide due to their similarities in properties and management interpretations.

4.17 ESSFmw - Moist Warm Engelmann Spruce - Subalpine Fir Subzone

DISTRIBUTION: The ESSF occurs at high elevations in subcontinental areas along the eastern extremities of the Vancouver Forest Region. Elevational ranges vary from approximately 1300 to 1650 m in the south; and from 1200 to 1550 m in the north.

CLIMATE (Table 17): The ESSFmw has long, cold winters featuring heavy snowfall, and short, cool summers. The continental temperature regime is moderated somewhat by its proximity to the Pacific Ocean. This is the mildest subzone of the ESSF zone. Total snowfall is high, resulting in substantial snowpacks that can persist into June. Soils may freeze when temperatures drop in the fall before a snowpack forms.

VEGETATION (Table 13): Forests on zonal sites are dominated by Bl, Se, and, to a lesser extent, Ba. Pl is common in fire-regenerated early successional stands. Ba and Hm may dominate in the upper reaches of narrow valleys and on steep northerly aspects (refer to MHmm2 in these situations). The understorey is dominated by black huckleberry, white-flowered rhododendron, *Pleurozium schreberi*, and *Rhytidiopsis robusta*. Less common species include one-sided wintergreen, Sitka valerian, and five-leaved bramble. Snow avalanche tracks, dominated by slide alder, commonly bisect the continuous forest in the ESSFmw. Upper elevations grade into discontinuous forests of the parkland subzone (ESSFmwp).

DISTINGUISHING ADJACENT UNITS FROM THE ESSFmw (using zonal sites)

IDFww - occurs below; it has:
- no Bl or Se
- common Fd

CWHms - occurs below and adjacent, it has;
- rare Bl and Se
- common Hw, Ba, Fd, and Cw

CWHws2 - occurs below north of Knight Inlet; it has:
- rare Bl and Se
- common Hw, Ba, Alaskan Blueberry, and *Hylocomium splendens*

MHmm2 - occurs adjacent to the west; it has;

- rare Se
- common Hm and Alaskan blueberry

NOTES ON CLASSIFICATION: Areas of ESSFmw-like vegetation, that may occur on steep southerly aspects in an area that is mostly MHmm2, should be treated as ESSFmw. Similarly, the MH-like vegetation, that may occur in special habitats within the ESSFmw, should be treated as MHmm2.

4.18 IDFww - Wet Warm Interior Douglas-fir Subzone

DISTRIBUTION: The IDFww has limited distribution in the Vancouver Forest Region. It occurs at low elevations in major drainages near the eastern limits of the Region. It is more commonly distributed along southwest-facing slopes. In the southern portion it is present discontinuously from the Lillooet River to the Skagit River. In the northern part of the region it occurs in the Klinaklini and Atnarko river valleys. The elevational limits range from approximately 100 to 1200 m.

CLIMATE (Table 20): The IDFww has a continental climate that is transitional to a maritime climate because of its proximity to the Pacific Ocean. Summers are warm and dry, while winters are cool and relatively moist, with moderate snowfall. Growing season water deficits are very pronounced. This subzone represents the wettest and mildest part of the IDF zone, which is more extensive in the interior of the province.

VEGETATION (Table 16): Forests on zonal sites are dominated by Fd, with minor amounts of low vigour Hw and Cw. The understorey is characterized by a well-developed shrub layer featuring a diverse mixture of species, including falsebox, saskatoon, tall and dull Oregon-grape, prince's pine, birch-leaved spirea, baldhip rose, beaked hazelnut, and western trumpet honeysuckle. The moss layer is dominated by *Hylocomium splendens* and *Rhytidiadelphus triquetrus*. Py occurs on drier, lower-elevation sites at Anderson Lake and in the Fraser Valley north of Boston Bar.

DISTINGUISHING ADJACENT UNITS FROM THE IDFww (using zonal sites)

CWHds - occurs above or adjacent; it has
- much more Hw
- less falsebox
- less diverse and well-developed shrub layer

CWHms - occurs above; it has:
- common Hw and Ba

ESSFmw - occurs above; it has:
- common Bl and Se

4.19 MHmm1 - Windward Moist Maritime Mountain Hemlock Variant

DISTRIBUTION: The MHmm1 occurs at high elevations on Vancouver Island and in maritime areas of the mainland coast. The lower elevational limit is between 800 and 1000 m and the upper limit is between 1100 and 1350 m.

CLIMATE (Table 17): The MHmm1 has long, wet, cold winters and short, cool moist summers. Frozen soils are rare due to the insulating snowpack, but growing season frosts are common. Total snowfall is high, resulting in substantial snowpacks that can persist into July.

VEGETATION (Table 13): Forests on zonal sites are dominated by Ba and Hm, and, to a lesser extent, Yc. Alaskan blueberry, oval-leaved blueberry, and *Rhytidiadopsis robusta* are prominent in the understorey. Vegetation and stand characteristics in the MHmm1 are strongly influenced by local topography, which affects timing and pattern of snowmelt. Upper elevations grade into discontinuous forests of the parkland subzone (MHmmp1).

DISTINGUISHING ADJACENT UNITS FROM THE MHmm1 (using zonal sites)

CWHvm2 - occurs below; it has:
- over 50% of hemlock cover as Hw; forests dominated by Hw, Ba, and, to a lesser extent, Cw and Yc
- more *Hylocomium splendens* and *Rhytidiadelphus loreus*

- some salal on dry sites

CWHmm2 - occurs below on part of Vancouver Island; it has:
- over 50% of hemlock cover as Hw; forests dominated by Hw, Ba, Fd, and Cw
- more *Hylocomium splendens* and *Rhytidiadelphus loreus*
- salal common on dry sites

MHmm2 - occurs adjacent to the east in submaritime areas; it has:
- some Bl, less Yc
- more black huckleberry, white-flowered rhododendron, and *Pleurozium schreberi*

MHwh - occurs adjacent to the west; it has:
- less Ba, black huckleberry, and *Rhytidiopsis robusta*
- more Yc, *Rhytidiadelphus loreus, Hylocomium splendens, Scapania bolanderi*, and *Sphagnum girgensohnii*
- some Ss

4.20 MHmm2 - Leeward Moist Maritime Mountain Hemlock Variant

DISTRIBUTION: The MHmm2 occurs at high elevations in submaritime areas of the coast. The lower elevational limit is between 900 and 1200 m and the upper limit is between 1200 and 1400 m.

CLIMATE (Table 17): The MHmm2 has a climate transitional between the coast and interior, characterized by long, moist, cold winters and short, cool, moist summers. The climate is somewhat colder and drier than the windward variant. Frozen soils are rare due to the insulating snowpack, but growing season frosts are common. Total snowfall is high, resulting in substantial snowpacks that can persist into July.

VEGETATION (Table 13): Forests on zonal sites are dominated by Ba and Hm, with Hw (lower elevations) and Bl occurring less commonly. Alaskan blueberry, black huckleberry, oval-leaved blueberry, five-leaved bramble, *Rhytidiopsis robusta,* and *Pleurozium schreberi* are common in the understorey. White-flowered rhododendron may also be present. Vegetation and stand characteristics are strongly influenced by local topography, which affects timing and pattern of snowmelt. Upper

elevations grade into discontinuous forests of the parkland subzone (MHmmp2).

DISTINGUISHING ADJACENT UNITS FROM THE MHmm2 (using zonal sites)

CWHms1 - occurs below, south of Smith Inlet; it has:
- over 50% of hemlock cover as Hw; forests dominated by Hw, Ba, Fd, and to a lesser, extent Cw
- less black huckleberry; more *Hylocomium splendens* and *Rhytidiadelphus loreus*

CWHms2 - occurs below, north of Smith Inlet; it has:
- over 50% of hemlock cover as Hw; forests dominated by Hw, Ba, Fd, and, to a lesser extent, Cw
- less black huckleberry; more *Hylocomium splenden* and *Rhytidiadelphus loreus*

CWHvm2 - occurs below, at western limits; it has:
- over 50% of hemlock cover as Hw; forests dominated by Hw, Ba, and, to a lesser extent, Cw
- more *Hylocomium splendens* and *Rhytidiadelphus loreus;* some salal on dry sites

CWHws2 - occurs below, north of Knight Inlet; it has:
- over 50% of hemlock cover as Hw; forests dominated by Hw and Ba
- rare white-flowered rhododendron
- more *Hylocomium splendens* and *Rhytidiadelphus loreus*

MHmm1 - occurs adjacent to the west, it has:
- no Bl, more Yc
- less black huckleberry, white-flowered rhododendron, and *Pleurozium schreberi*

ESSFmw - occurs adjacent to the east in subcontinental areas; it has:
- common Bl, Se, black huckleberry, white-flowered rhododendron, and grouseberry

4.21 MHwh - Wet Hypermaritime Mountain Hemlock Subzone[5]

DISTRIBUTION : The MHwh occurs at high elevations on the Queen Charlotte Islands (QCI) and in hypermaritime areas of the coast, north of Smith Inlet. The elevational limits range from approximately 500 to 900 m.

CLIMATE: The MHwh has long, very wet, cold winters and short, cool, moist summers. When a North Pacific high pressure system dominates the coast, this area has marine cloud for at least the early part of most days. Frozen soils are rare due to the insulating snowpack, but growing season frosts are common. Total snowfall is high, resulting in substantial snowpacks that can persist into July.

VEGETATION (Table 13): Forests on zonal sites are dominated by Hm and Yc (Ba on the mainland only), with Alaskan blueberry, *Rhytidiadelphus loreus, Hylocomium splendens*, *Scapania bolanderi*, and *Sphagnum girgensohnii* common in the understorey. Vegetation and stand characteristics in the MHwh are strongly influenced by local topography, which affects timing and pattern of snowmelt. Upper elevations grade into discontinuous forests of the parkland subzone.

DISTINGUISHING ADJACENT UNITS FROM THE MHwh (using zonal sites)

CWHvh2 - occurs below; it has:
- over 50% of hemlock cover as Hw; forests dominated by Cw, Hw, Yc; salal prominent in the understorey

CWHwh2 - occurs below on the QCI; it has:
- over 50% of hemlock cover as Hw; forests dominated by Hw, Yc, and Cw

MHmm1 - occurs inland above the CWHvm2; it has:
- more Ba, black huckleberry, and *Rhytidiopsis robusta*
- less Yc, *Rhytidiadelphus loreus, Hylocomium splendens, Scapania bolanderi*, and *Sphagnum girgensohnii*; no Ss

[5] Two variants - Windward (MHwh1) and Leeward (MHwh2) are recognized for this subzone. They are not differentiated in this guide because of their similarities.

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