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

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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 CLASSIFICATION¹

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	SITE
biogeoclimatic zone	site association
biogeoclimatic subzone	site series
biogeoclimatic variant	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).

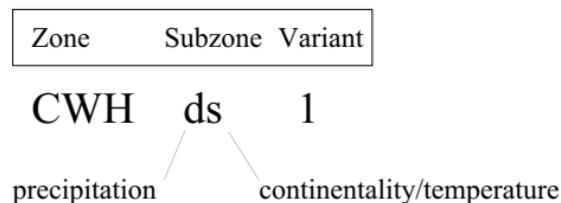
2.2.1 Naming biogeoclimatic units

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.

²Tree species symbols defined in Table 22.

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

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



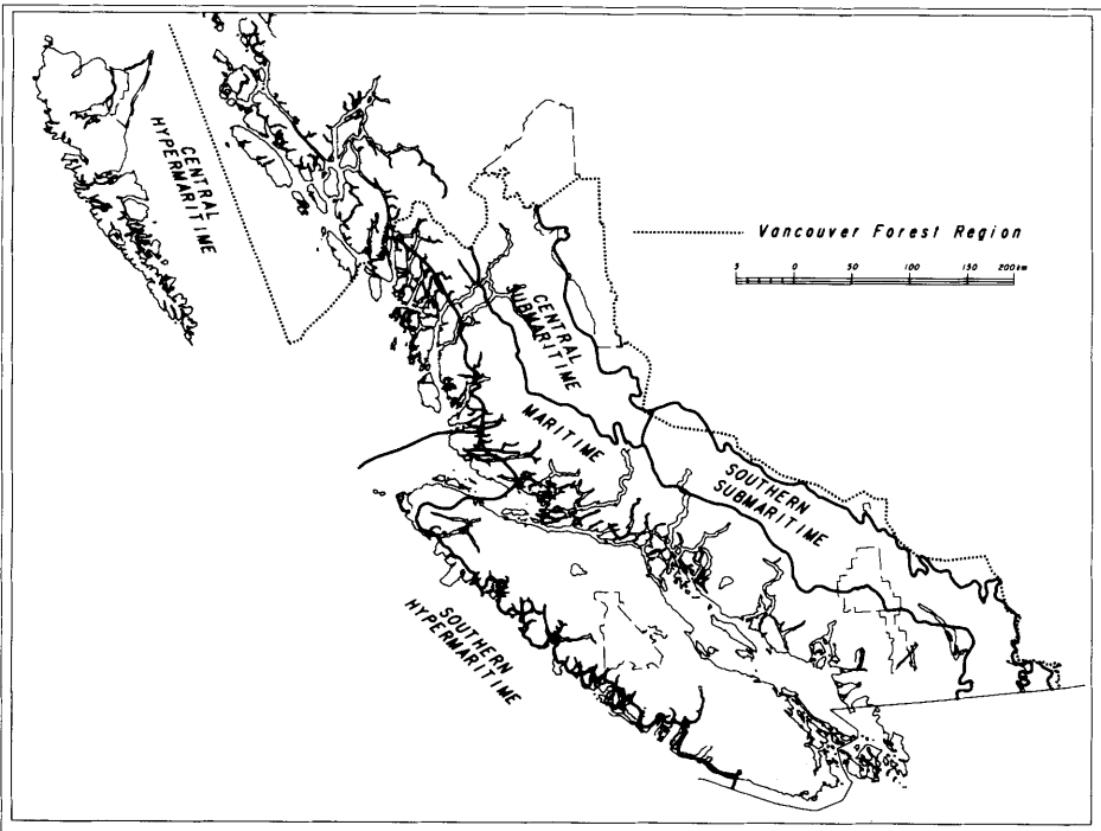


FIGURE 3. The distribution of general climatic types used in naming biogeoclimatic units.

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.

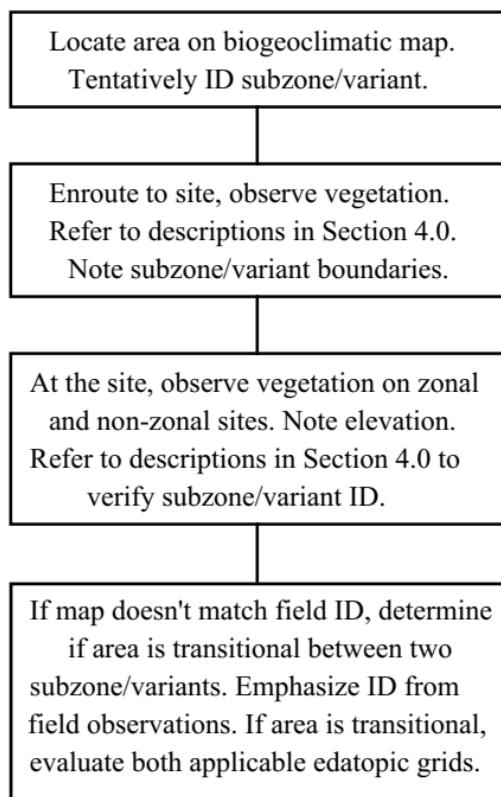


FIGURE 4. Flowchart for identifying biogeoclimatic units.

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.

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

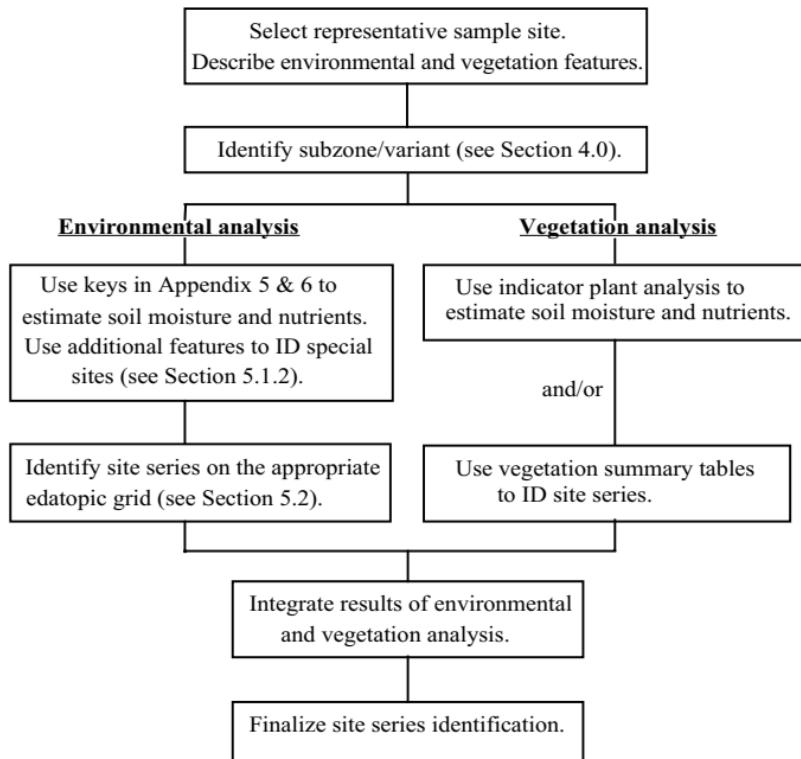


FIGURE 5. Flowchart for describing and identifying site series.

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 assessment 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).

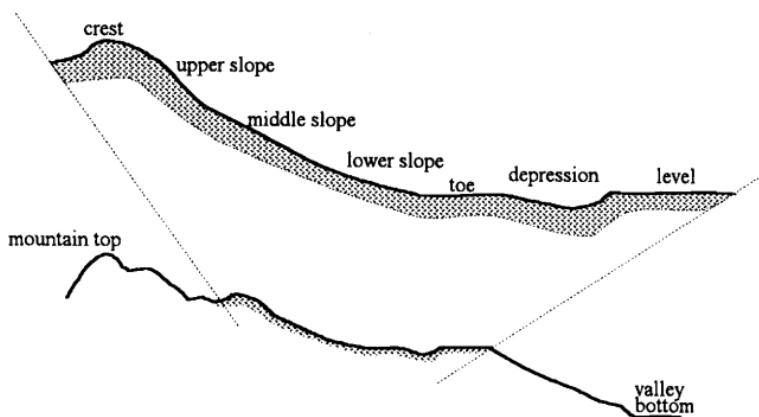


FIGURE 6. The slope segment and classes of slope position.

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

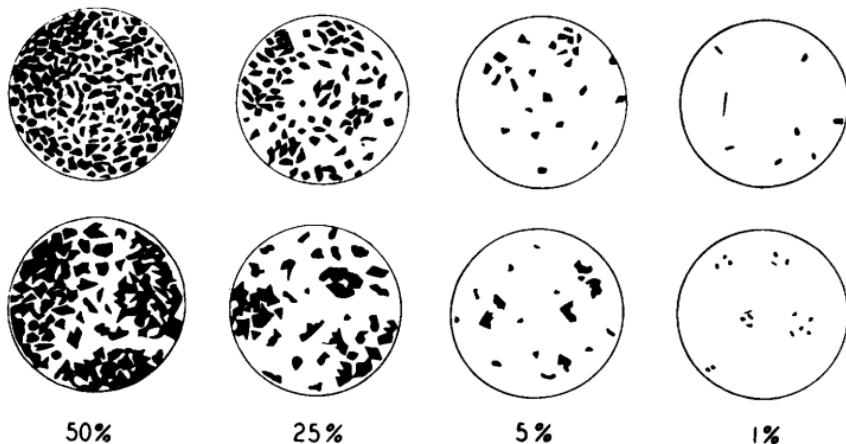
Collect vegetation data on the location chosen for site assessment. List all species present on the main rooting substrate and estimate the cover.

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 #
<i>Pseudotsuga menziesii</i>	5	88	--	--
<i>Gaultheria shallon</i>	1	3	--	1
<i>Vaccinium parvifolium</i>	2	15	--	1
<i>Stachys cooleyae</i>	1	3	5	3
<i>Achlys triphylla</i>	3	38	--	3
<i>Tiarella trifoliata</i>	1	3	4	3
<i>Tiarella lacinata</i>	3	38	4	3
<i>Athyrium filix-femina</i>	1	3	5	3
<i>Galium triflorum</i>	2	15	4	3
<i>Mycelis muralis</i>	1	3	4	3
<i>Trillium ovatum</i>	1	3	4	3
<i>Polystichum munitum</i>	5	88	--	3
<i>Pteridium aquilinum</i>	1	3	--	--
<i>Leucolepis menziesii</i>	1	3	5	3
<i>Rhytidiodelphus triquetrus</i>	2	15	--	2
<i>Plagiomnium insigne</i>	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	I	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

MHm2/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.

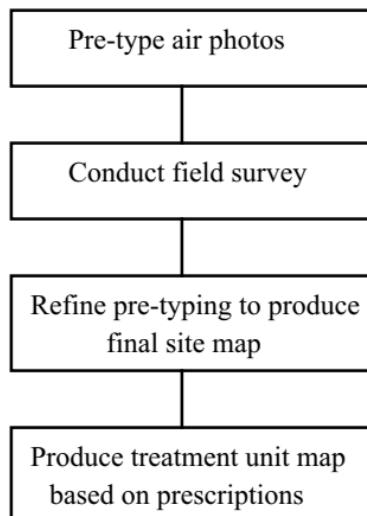


FIGURE 8. Basic steps in site mapping for PHSPs.

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 REGION⁴

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	<i>Southern</i> Dry Submaritime Variant	48
CWHds2	<i>Central</i> Dry Submaritime Variant	49
CWHmm1	<i>Submontane</i> Moist Maritime Variant	50
CWHmm2	<i>Montane</i> Moist Maritime Variant	51
CWHms1	<i>Southern</i> Moist Submaritime Variant	52
CWHms2	<i>Central</i> Moist Submaritime Variant	53
CWHvh1	<i>Southern</i> Very Wet Hypermaritime Variant	55
CWHvh2	<i>Central</i> Very Wet Hypermaritime Variant	56
CWHvm1	<i>Submontane</i> Very Wet Maritime Variant	57
CWHvm2	<i>Montane</i> Very Wet Maritime Variant	59
CWHwh1	<i>Submontane</i> Wet Hypermaritime Variant	60
CWHwh2	<i>Montane</i> Wet Hypermaritime Variant	61
CWHws2	<i>Montane</i> 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	<i>Windward</i> Moist Maritime Variant	67
MHmm2	<i>Leeward</i> Moist Maritime Variant	68
MHwh	Wet Hypermaritime Subzone	70

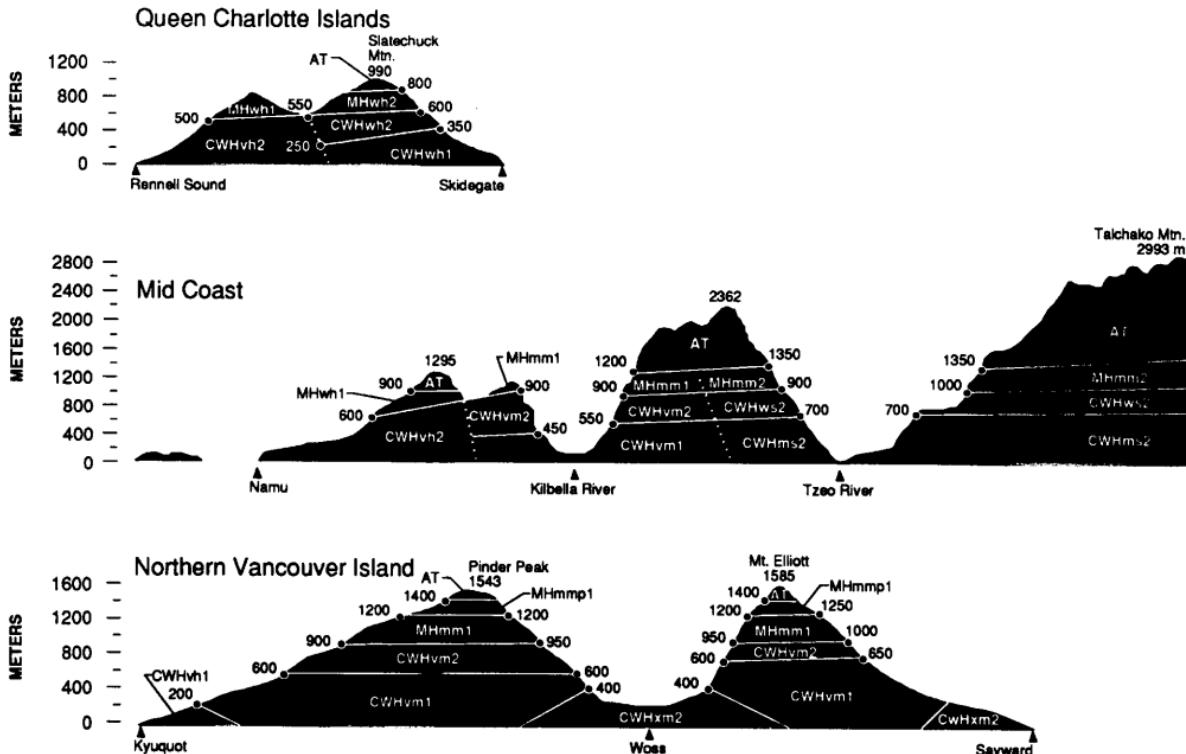


FIGURE 9. Elevational profiles of biogeoclimatic units for the Queen Charlotte Islands, mid-coast, and northern Vancouver Island.

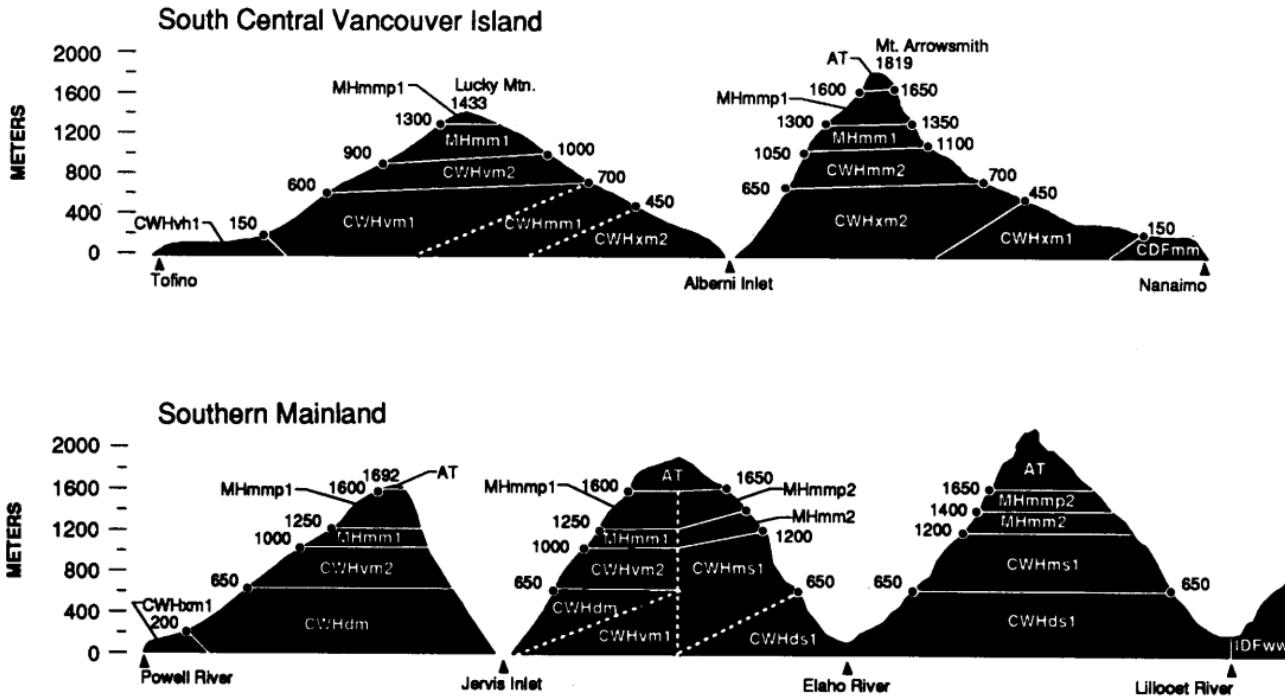


FIGURE 10. Elevational profiles of biogeoclimatic units for south central Vancouver Island and the southern mainland.

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

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

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

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

TABLE 16. Vegetation table for zonal sites of submaritime CWH variants
and the IDF_{WW}

Biogeoclimatic Unit		CWHds1	CWHds2	CWHms1	CWHms2	CWHws2	IDF _{WW}
TREE LAYER	<i>Thuja plicata</i>	■		■			
	<i>Tsuga heterophylla</i>	■	■	■			
	<i>Abies amabilis</i>			■			
	<i>Pseudotsuga menziesii</i>	■	■		■	■	
	<i>Betula papyrifera</i>						
	<i>Picea sitchensis</i>						
	<i>Pinus contorta</i>						
SHRUB LAYER	<i>Tsuga mertensiana</i>						
	<i>Vaccinium membranaceum</i>	■					
	<i>Menziesia ferruginea</i>			■			
	<i>Vaccinium parvifolium</i>	■					
	<i>Vaccinium alaskaense</i>				■		
	<i>Vaccinium ovalifolium</i>			■	■		
	<i>Chimaphila umbellata</i>		■				
	<i>Paxistima myrsinoides</i>	■	■				
	<i>Acer glabrum</i>						
	<i>Acer circinatum</i>		■				
	<i>Mahonia nervosa</i>						
	<i>Rosa gymnocarpa</i>						
	<i>Lonicera ciliosa</i>						
	<i>Amelanchier alnifolia</i>						
	<i>Spiraea betulifolia</i>						
	<i>Symphoricarpos albus</i>						
HERB LAYER	<i>Corylus cornuta</i>						
	<i>Holodiscus discolor</i>						
	<i>Mahonia aquifolium</i>						
	<i>Rosa acicularis</i>						
	<i>Gaultheria shallon</i>						
	<i>Clintonia uniflora</i>	■					
	<i>Cornus canadensis</i>		■				
	<i>Goodyera oblongifolia</i>			■			
	<i>Orthilia secunda</i>			■			
	<i>Rubus pedatus</i>			■			
	<i>Streptopus roseus</i>			■			
	<i>Streptopus streptopoides</i>						
	<i>Linnaea borealis</i>	■					
	<i>Pyrola asarifolia</i>						
	<i>Trientalis latifolia</i>						

TABLE 16. (Continued)

	Biogeoclimatic Unit	cWHds1	CWHds2	CWHms1	CWHms2	CWHws2	IDFww
HERB LAYER	<i>Polystichum munitum</i>	-	-	-	-	-	-
	<i>Disporum hookeri</i>	-	-	-	-	-	-
	<i>Calamagrostis rubescens</i>	-	-	-	-	-	-
	<i>Festuca</i> spp.	-	-	-	-	-	-
	<i>Disporum trachycarpum</i>	-	-	-	-	-	-
MOSS LAYER	<i>Mycelis muralis</i>	-	-	-	-	-	-
	<i>Hylocomium splendens</i>	■	■	■	■	■	■
	<i>Pleurozium schreberi</i>	■	■	■	■	■	■
	<i>Rhytidopsis robusta</i>	■	■	■	■	■	■
	<i>Rhytidadelphus loreus</i>	■	-	-	-	-	-
	<i>Dicranum fuscescens</i>	■	-	-	-	-	-
	<i>Rhytidadelphus triquetrus</i>	■	■	-	-	-	-
	<i>Kindbergia oregana</i>	-	■	-	-	-	-
	<i>Dicranum pallidisetum</i>	-	-	-	-	-	-
	sword fern						
	Hooker's fairybells						
	pinegrass						
	fescue						
	rough-fruited fairybells						
	wall-lettuce						
	step moss						
	red-stemmed feathermoss						
	pipecleaner moss						
	lanky moss						
	curly heron's-bill moss						
	electrified cat's tail moss						
	Oregon beaked moss						
	pale-stalked broom moss						

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 2565 to 2954	863
Mean annual precipitation (mm)	range ref. stn.	— 2793	1341 2565 694-707	— 1995
May to September precipitation (mm)	range ref. stn.	— 838	707 288	398
Total mean annual snowfall (cm)	range ref. stn.	— 1816	816 to 820 816	— 1041
Mean annual temperature (°C)	range ref. stn.	— -2	1.8 to 3.8 1.8 4.6 to 5.0	— 4.6 1.8
Mean temperature of the coldest month (°C)	range ref. stn.	— -8.5	-7.3 to -7.9 -7.9 -2.2 to -2.3	— -2.3 -9.1
Extreme minimum temperature (°C)	range ref. stn.	— -33.5	-35.6 to -42.8 -42.8 -18.5	— -18.5 -35.6
Mean temperature of the warmest month (°C)	range ref. stn.	— 6.9	12.1 to 14.5 12.1 13.1 to 13.2	— 13.2 11.3
Extreme maximum temperature (°C)	range ref. stn.	— 22	31.7 to 33.9 31.7 29.0 to 33.3	— 29.0 31.7
Growing degree-days > 5 (°C)	range ref. stn.	— 214	919 to 933 933 125 to 126	— 629
Frost-free period (days)	range 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 maritime 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 ref. stn. 2009 to 3943 3 120	1532 to 4218 3 186	1555 to 4387 2682	2760 to 2850 2850	1152 to 1535 1535
May to September precipitation (mm)	range ref. stn. 455 to 806 617	421 to 961 869	364 to 1162 611	550 to 681 550	286 to 423 416
Total mean annual snowfall (cm)	range ref. stn. 25 to 272 45	51 to 195 144	20 to 548 195	552 to 605 552	61 to 163 88
Mean annual temperature (°C)	range ref. stn. 5.4 to 9.4 9.1	6.7 to 8.5 7.7	7.0 to 10.1 8.3	-	7.1 to 7.9 7.5
Mean temperature of the coldest month (°C)	range ref. stn. 0.5 to 4.7 4.5	-0.2 to 3.9 1.9	-4.5 to 3.7 0.5	-	0.3 to 2.0 0.4
Extreme minimum temperature (°C)	range ref. stn. -7.5 to -17.2 -13.9	-11.1 to -24.4 -16.7	-8.9 to -22.8 -19.4	-	-13.3 to -25.0 -17.2
Mean temperature of the warmest month (°C)	range ref. stn. 11.5 to 15.3 14.1	13.1 to 15.1 13.7	13.8 to 18.8 16.3	-	13.5 to 14.8 14.8
Extreme maximum temperature (°C)	range ref. stn. 22.8 to 37.8 28.9	23.4 to 33.3 29.4	27.8 to 41.1 34.4	-	26.7 to 32.2 30
Growing degree-days > 5 (°C)	range ref. stn. 818 to 1722 1607	1148 to 1485 1319	1313 to 2011 1633	-	1206 to 1385 1347
Frost-free period (days)	range ref. stn. 163 to 265 229	156 to 272 160	165 to 252 199	-	160 to 206 163

^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 ref. stn. 636 to 1263 873	1367 to 2412 1860	1100 to 2721 1570
May to September precipitation (mm)	range ref. stn. 105 to 272 142	280 to 525 397	160 to 565 243
Total mean annual snowfall (cm)	range ref. stn. 17 to 92 50	45 to 177 88	26 to 234 171
Mean annual temperature (°C)	range ref. stn. 8.8 to 10.5 9.5	8.7 to 10.3 10.0	7.8 to 10.7 8.7
Mean temperature of the coldest month (°C)	range ref. stn. 1.6 to 5.0 3.1	0.5 to 3.4 2.4	-0.5 to 3.9 0.9
Extreme minimum temperature (°C)	range ref. stn. -7.8 to -21.7 -15.6	-10.6 to -25.0 -17.8	-13.5 to -25.6 -20.6
Mean temperature of the warmest month (°C)	range ref. stn. 15.1 to 18.0 10.3	16.6 to 18.5 17.6	14.2 to 18.7 16.9
Extreme maximum temperature (°C)	range ref. stn. 27.8 to 40.6 36.1	31.7 to 40.0 33.3	29.4 to 43.9 43.9
Growing degree-days > 5 (°C)	range ref. stn. 1728 to 2163 1863	1829 to 2165 2088	1498 to 2330 1723
Frost-free period (days)	range ref. stn. 155 to 304 201	171 to 270 222	137 to 244 153

^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 IDF_{ww}

Biogeoclimatic unit	CWHdsl	CWHds2	CWHmsl	IDF _{ww}
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 ref. stn. 990 to 2054 1187	1614 to 2109	1415 to 1420 1415	1198
May to September precipitation (mm)	range ref. stn. 197 to 350 224	357 to 491	265 to 276 265	176
Total mean annual snowfall (cm)	range ref. stn. 193 to 478 310	139 to 190	609 to 657 657	188
Mean annual temperature (°C)	range ref. stn. 6.4 to 9.7 7.2	7.5 to 7.7	-	-
Mean temperature of the coldest month (°C)	range ref. stn. -0.4 to -6.6 -5.6	-1.8 to -2.8	5.7	9.2
Extreme minimum temperature (°C)	range ref. stn. -24.4 to -40.0 -30.0	-22.2 to -28.9	-4.4	-2.6
Mean temperature of the warmest month (°C)	range ref. stn. 15.3 to 18.7 18.7	16.1 to 16.5	-	-
Extreme maximum temperature (°C)	range ref. stn. 36.7 to 40.0 39.4	33.9 to 37.8	-30.6	-27.8
Growing degree-days > 5 (°C)	range ref. stn. 1732 to 2130 1817	1591 to 1626	15.3	20.4
Frost-free period (days)	range ref. stn. 128 to 225 150	161 to 198	36.1	40.6
			1279	2194
			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 *Rhytidadelphus 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 *Rhytidadelphus 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*, *Rhytidadelphus 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 *Rhytidadelphus 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*, *Rhytidopsis robusta*, *Pleurozium schreberi*, and some *Rhytidadelphus 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 *Rhytidadelphus 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*, *Rhytidadelphus triquetrus*, and minor amounts of *Rhytidopsis 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, *Rhytidadelphus loreus*, and *Rhytidopsis 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 *Rhytidopsis 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. *Rhytidopsis robusta*, *Rhytidadelphus 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 *Rhytidopsis 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*, *Rhytidopsis 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 *Rhytidadelphus 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*, *Rhytidopsis 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 *Rhytidiodelphus 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 *Rhytidadelphus 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 *Rhytidadelphus 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 *Rhytidopsis 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 *Rhytidopsis robusta*

CWHvm2 - occurs above; it has:

- some Yc and Hm (more abundant on wetter sites and at higher elevations)
- more *Rhytidopsis 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 *Rhytidopsis 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*, *Rhytidadelphus loreus*, and *Rhytidopsis robusta*.

DISTINGUISHING ADJACENT UNITS FROM THE CWHvm2 (using zonal sites)

CWHvm1- occurs below; it has:

- no Yc or Hm
- less *Rhytidopsis 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
- copperbrush 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*, *Rhytidadelphus 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*, *Rhytidadelphus 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 azalea, bunchberry, five-leaved bramble, and a well-developed moss layer dominated by

Hylocomium splendens, *Rhytidadelphus loreus*, *Rhytidopsis 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 *Rhytidadelphus 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 *Rhytidopsis 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 *Rhytidadelphus 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 *Rhytidadelphus 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 *Rhytidopsis robusta*
- more Yc, *Rhytidadelphus 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, *Rhytidopsis 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 (MHmm2).

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 *Rhytidadelphus 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 splendens* and *Rhytidadelphus 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 *Rhytidadelphus 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 *Rhytidadelphus 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 Subzone⁵

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, *Rhytidadelphus 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 *Rhytidopsis robusta*
- less Yc, *Rhytidadelphus 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.

5.0 SITE SERIES OF THE VANCOUVER FOREST REGION

This section presents all site series currently recognized in the Vancouver Forest Region. Site series are organized into **general sites** and **special sites**, and are presented according to biogeoclimatic subzone or variant. For each biogeoclimatic unit, the site series are portrayed on an edatopic grid (modified grids for special sites), which is accompanied by a vegetation summary table of selected species thought to best characterize the site series. The vegetation tables are derived from sample plot data used to develop the classification. Site series based on limited data (fewer than four plots) are footnoted. The information presented here can be used for identifying site series by following the environmental and vegetation analysis described in Section 3.0. A list of the edatopic grids is shown in Table 21.

5.1 Site Classification

5.1.1 General sites

Site series are displayed on two-dimensional edatopic grids that show the relationship to soil moisture and nutrient regime classes. A blank space on a grid indicates that that site series has not been sampled and recognized for that combination of SMR and SNR. The divisions between site series usually fall on boundaries between SMR and SNR classes, but occasionally a boundary between two site series occurs in the middle of a class (e.g., grid no. 9, site series 01 and 11). This indicates some overlap between the site series in relation to that class (e.g., on Grid No. 9 site series 01 ranges from 4-5 SMR, and site series 11 ranges from 5-6).

It is important to recognize that the classification system cannot cover all possible sites that occur in the landscape. Users are bound to encounter sites that do not appear to "fit" well on the edatopic grid. For these sites, describe the vegetation and environmental features, including climate, soil moisture, and soil nutrients. An understanding of these factors, silvics of tree species, and the ecological effects of management practices is necessary for developing prescriptions.

5.1.2 Special sites

Special sites are shown on modified "grids" that reflect the unique environmental features of the site. For example, floodplain sites are characterized by *bench heights*, strongly fluctuating water table sites are characterized by *summer and winter water regimes*, and shoreline/ocean spray sites are characterized by *coastal landforms and moisture regime*.

FLOODPLAIN SITES

Floodplain sites border streams and rivers, and are formed from sediments deposited during flooding events. These sites are still under the influence of periodic flooding, that distinguishes them from inactive fluvial deposits that are no longer flooded because of downcutting of the river. They are flat benches varying in width from narrow strips along streams to broad floodplains along major rivers. Three types of floodplain sites are recognized, based on the relative bench height:

High bench sites

- The highest and most infrequently flooded (>5 year return interval) portion of a floodplain. Growing season flooding is of short duration.
- Soils are sorted silts, sandy loams, or sands, usually coarser at depth. A surface capping of finer sediments is often present. Forest floor is present with developing horizons, but generally only a few centimetres thick.
- Mature stands dominated by conifers that are sometimes restricted to elevated microsites (look for Cw or Ss stumps in logged areas). Successional stands are dominated by red alder, cottonwood, or bigleaf maple.

Medium bench sites

- The intermediate height, frequently flooded (at least every 5 years, often annually) portion of a floodplain. Duration of growing season flooding significantly longer than on high bench sites.
- Soils are mainly sorted silts and sands, with coarser gravels at depth. Forest floor is thin and poorly developed, often comprised of just litter. Evidence of recent mineral and organic deposits present.

- Mature stands are dominated by deciduous species. Conifers are absent or restricted to elevated microsites.

Low bench sites

- The lowest height, annually flooded portion of a floodplain. Flooding is of long duration during the growing season.
- Soils can be coarse gravels and sands adjacent to high-energy streams, or deep saturated loams and silts adjacent to low-energy streams. Forest floors are absent or comprised of fresh litter.
- Stands are dominated by cottonwood and alder, and typically include willows.

SITES WITH STRONGLY FLUCTUATING WATER TABLE

The soil moisture regime at these sites varies significantly over the year because of a strongly fluctuating water table. Soils are saturated during the winter months due to a combination of flat topography, dense, poorly drained soil layers, and fine textures. During the growing season, the water table drops, leaving an aerated rooting zone of varying depth.

Some of their characteristics are:

- Occur on flat, fine-textured marine deposits (e.g., on east Vancouver Island).
- Soils have an obvious gleyed layer.
- Microtopography is often strongly mounded; the depth of aerated soil can vary over a relatively short distance.
- After logging, these sites are dominated by red alder with small amounts of cottonwood, bigleaf maple, trembling aspen, and sporadic conifer regeneration.

The depth to gleying in the soil, and thus the degree of wetness during the winter and summer months determine the three sites recognized in the CWHxm and CWHdm subzones:

Cw - Salmonberry (summer fresh / winter very moist)

- gleying > 35 cm deep
- salmonberry and swordfern abundant; red-osier dogwood, black twinberry, and slough sedge rare.

Cw - Black twinberry (summer moist / winter wet)

- gleying 20-35 cm deep
- red-osier dogwood, black twinberry present but not abundant; slough sedge dominated depressions present but not extensive; Pacific crab apple rare.

Cw - Slough sedge (summer very moist / winter very wet)

- gleying < 20 cm deep
- slough sedge dominated depressions extensive; red-osier dogwood and Pacific crab apple abundant; vanilla-leaf and bracken fern rare.

SHORELINE AND OCEAN SPRAY SITES

These sites are strongly influenced by blowing ocean spray because of their proximity to the ocean in areas of high winds. They are recognized on the outer coast of Vancouver Island, the mainland, and the Queen Charlotte Islands (CWHvh, CWHwh subzones). Sitka spruce dominates these sites because of its tolerance of salt spray.

Recognized shoreline and ocean spray sites include:

Rocky headland - rock outcrops with shallow, discontinuous soil, exposed to the sea and affected by ocean spray.

Old beachplain - sites bordering the ocean, formed of sediments deposited by wave action, which are usually sorted and consist of sand or gravel.

Marine terrace and scarp - flat terraces and associated steep erosional scarps adjacent to the sea, formed by ancient wave action during deglaciation.

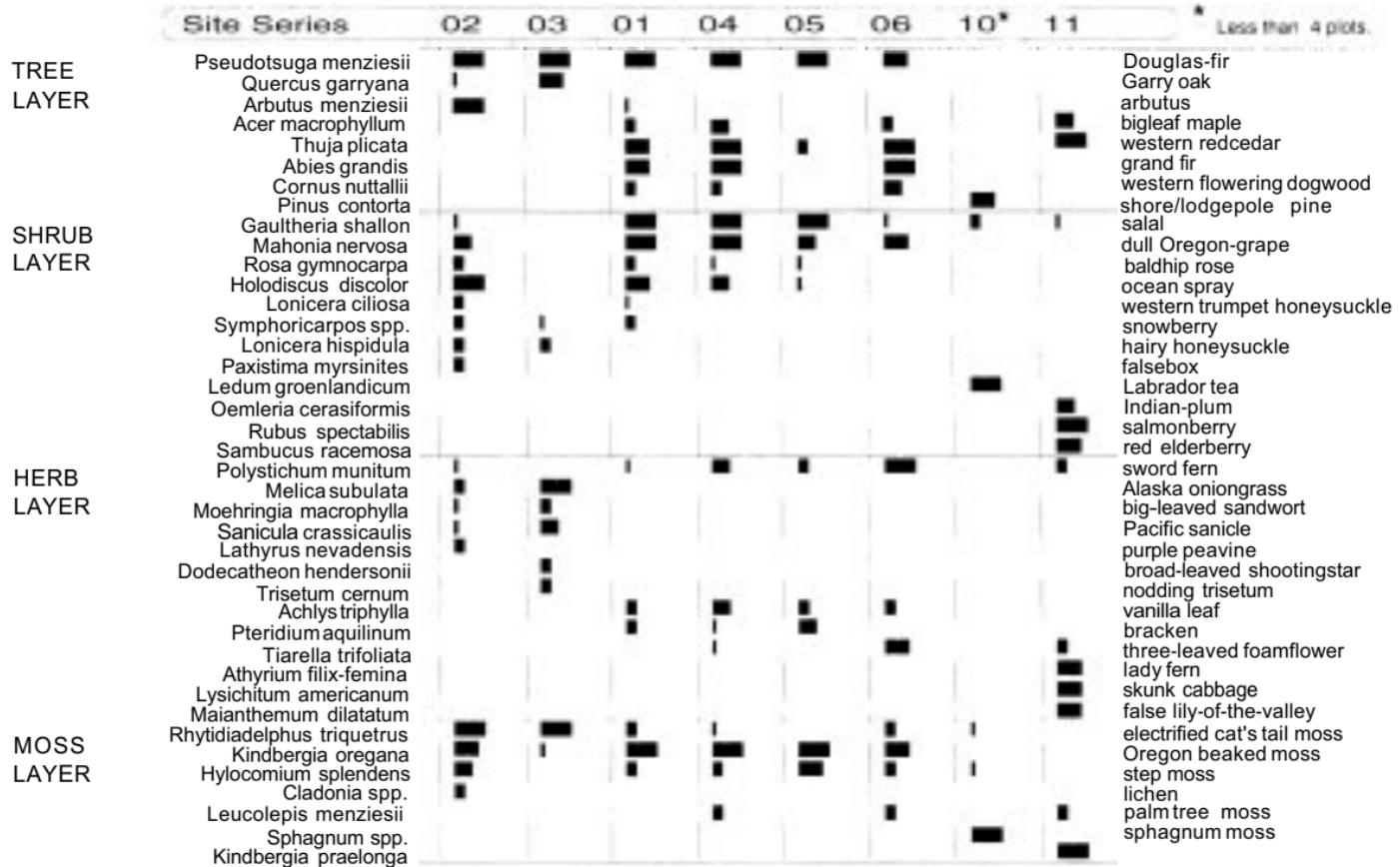
Fluctuating brackish water - estuaries and tidal sloughs where brackish water influences vegetation composition.

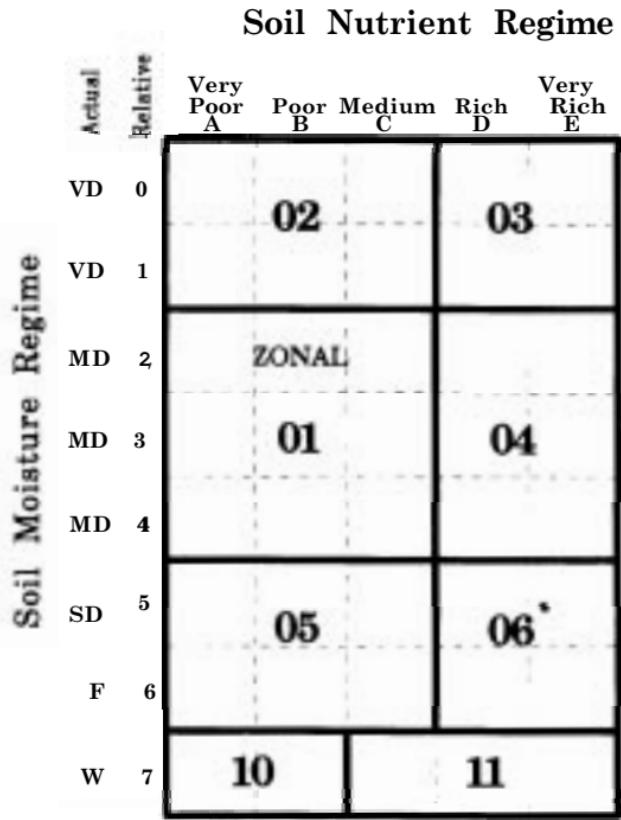
5.2 Site Classification Grids and Vegetation Summary Tables

TABLE 21. Index of site classification grids

Grid no.	Site category	Biogeoclimatic unit
1	General	CDFmm
2	General	CWHdm
3	General	CWHds1
4	General	CWHds2
5	General	CWHmm1
6	General	CWHmm2
7	General	CWHms1
8	General	CWHms2
9	General	CWHvh1
10	General	CWHvh2
11	General	CWHvm1
12	General	CWHvm2
13	General	CWHwh1
14	General	CWHwh2
15	General	CWHws2
16	General	CWHxm
17	General	ESSFmw
18	General	IDFww
19	General	MHmm1
20	General	MHmm2
21	General	MHwh
22	Special - Floodplains	CDFmm
23	Special - Floodplains	CWHdm,CWHds1,CWHxm
24	Special - Floodplains	CWHds2
25	Special - Floodplains	CWHmm1
26	Special - Floodplains	CWHms1,CWHms2
27	Special - Floodplains	CWHwh1
28	Special - Floodplains	CWHvh1,CWHvh2
29	Special - Floodplains	CWHvm1
30	Special - Floodplains	CWHws2
31	Special - Fluctuat water table	CDFmm
32	Special - Fluctuat. water table	CWHdm, CWHxm
33	Special - Shoreline/ocean spray	CWHwh,CWHvh

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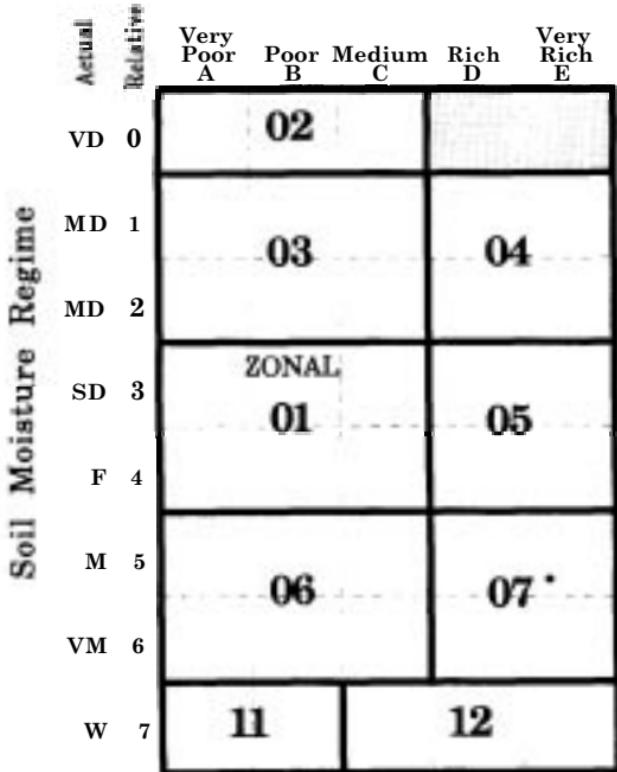
* See grid # 22 for site series 07 - 09.

Site Series

- | Grid No. 1 | Site Series |
|------------------------|------------------------|
| CDFmm | Moist Maritime Subzone |
| 01 Fd - Salal | CDF |
| 02 FdPl - Arbutus | |
| 03 Fd - Oniongrass | |
| 04 FdBg - Oregon grape | |
| 05 CwFd - Kindbergia | |
| 06 CwBg - Foamflower | |
| 10 Pl - Sphagnum | |
| 11 Cw - Skunk cabbage | |

	Site Series	02	03	04*	05	01	06	07	11	12	Less than 4 plots
TREE LAYER	<i>Thuja plicata</i>	.									western redcedar
	<i>Tsuga heterophylla</i>		■	■	■	■	■	■			western hemlock
	<i>Pseudotsuga menziesii</i>	■	■	■	■	■	■	■			Douglas-fir
	<i>Pinus contorta</i>	■									shore/lodgepole pine
	<i>Acer macrophyllum</i>			■							bigleaf maple
	<i>Alnus rubra</i>										red alder
SHRUB LAYER	<i>Gaultheria shallon</i>	■	■			■		■	■		salal
	<i>Vaccinium parvifolium</i>		■	■		■	■	■			red huckleberry
	<i>Holodiscus discolor</i>	■									ocean-spray
	<i>Arctostaphylos columbiana</i>										hairy manzanita
	<i>Pseudotsuga menziesii</i>		■								Douglas-fir
	<i>Mahonia nervosa</i>										dull Oregon-grape
	<i>Acer circinatum</i>			■	■						vine maple
	<i>Rubus spectabilis</i>										salmonberry
	<i>Vaccinium alaskaense</i>										Alaskan blueberry
	<i>Olopanax horridus</i>										devil's club
	<i>Ledum groenlandicum</i>										Labrador tea
	<i>Pteridium aquilinum</i>		■								bracken
	<i>Festuca occidentalis</i>			■							western fescue
	<i>Polystichum munitum</i>				■						sword fern
	<i>Dryopteris expansa</i>					■					spiny wood fern
	<i>Tiarella trifoliata</i>										three-leaved foamflower
	<i>Athyrium filix-femina</i>										lady fern
	<i>Blechnum spicant</i>										deer fern
	<i>Cornus canadensis</i>										bunchberry
	<i>Lysichiton americanum</i>										skunk cabbage
	<i>Maianthemum dilatatum</i>										false lily-of-the-valley
	<i>Hylocomium splendens</i>		■	■	■	■	■	■			step moss
	<i>Kindbergia oregana</i>			■	■	■	■	■			Oregon beaked moss
	<i>Pleurozium schreberi</i>										red-stemmed feather moss
	<i>Rhacomitrium canescens</i>		■								grey frayed-cap moss
	<i>Cladina spp.</i>										lichen
	<i>Rhytidiodelphus triquetus</i>										electrified cat's-tail moss
	<i>Plagiothecium undulatum</i>			■	■	■	■	■			flat moss
	<i>Rytidiadelphus loreus</i>										lanky moss
	<i>Plagiomnium insigne</i>										coastal leafy moss
	<i>Leucolepis menziesii</i>										palm tree moss
	<i>Kindbergia praelonga</i>										sphagnum moss
	<i>Sphagnum spp.</i>										alligator-skin liverwort
	<i>Conocephalum conicum</i>										

Soil Nutrient Regime



* See grid # 23 for site series 08-10.

Site Series

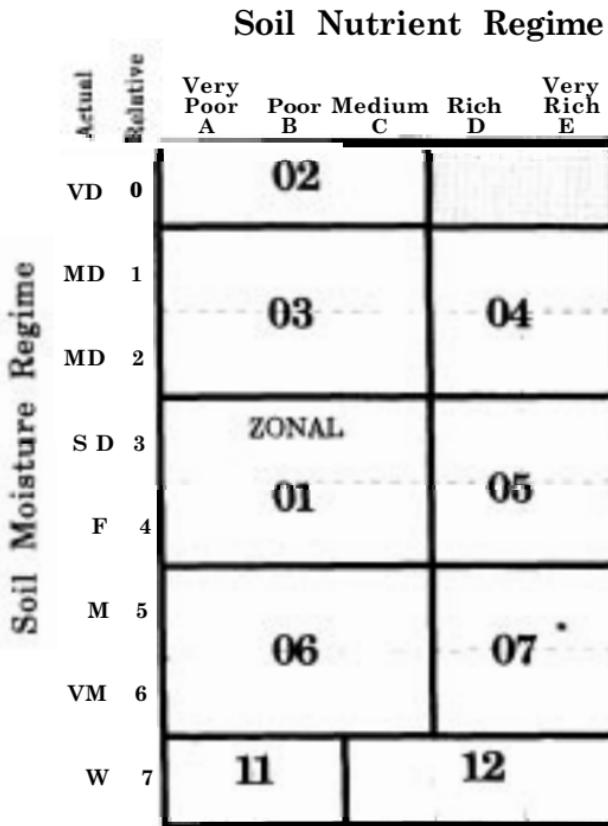
- | Site | Series |
|------|----------------------|
| 01 | Hw - Flat moss |
| 02 | FdPl - Cladina |
| 03 | FdHw - Salal |
| 04 | Fd - Sword fern |
| 05 | Cw - Sword fern |
| 06 | HwCw - Deer fern |
| 07 | Cw - Foamflower |
| 11 | Pl - Sphagnum |
| 12 | CwSs - Skunk cabbage |

Grid No. 2

CWHdm	Dry Maritime CWH Subzone

	Site Series	02	03	04	01	05	06*	07	11*	12*	
TREE LAYER	<i>Thuja plicata</i>	■			■	■	■	■			
	<i>Pseudotsuga menziesii</i>	■	■		■	■	■	■			
	<i>Tsuga heterophylla</i>	■	■								
	<i>Pinus contorta</i>	■									
	<i>Acer macrophyllum</i>					■					
	<i>Chimaphila umbellata</i>	■									
SHRUB LAYER	<i>Paxistima myrsinifolia</i>	■									
	<i>Acer glabrum</i>		■	■	■						
	<i>Symporicarpos albus</i>		■								
	<i>Arctostaphylos uva-ursi</i>	■									
	<i>Mahonia aquifolium</i>			■							
	<i>Holodiscus discolor</i>		■	■							
	<i>Mahonia nervosa</i>				■						
	<i>Gaultheria shallon</i>										
	<i>Acer circinatum</i>					■					
	<i>Oplopanax horridus</i>										
	<i>Sambucus racemosa</i>										
	<i>Rubus spectabilis</i>										
	<i>Ledum groenlandicum</i>										
	<i>Vaccinium oxycoccos</i>										
HERB LAYER	<i>Clintonia uniflora</i>										
	<i>Polystichum munitum</i>					■					
	<i>Disporum hookeri</i>				■						
	<i>Cornus canadensis</i>										
	<i>Tiarella unifoliata</i>										
	<i>Asarum caudatum</i>										
	<i>Gymnocarpium dryopteris</i>										
	<i>Athyrium filix-femina</i>										
	<i>Carex spp.</i>										
	<i>Circaeaa alpina</i>										
	<i>Lysichiton americanum</i>										
	<i>Hylocomium splendens</i>										
MOSS LAYER	<i>Rhytidadelphus triquetrus</i>	■									
	<i>Rhytidopsis robusta</i>		■								
	<i>Pleurozium schreberi</i>		■								
	<i>Peltigera aphthosa</i>		■								
	<i>Cladonia spp.</i>										
	<i>Rhytidadelphus loreus</i>				■						
	<i>Plagiomnium insigne</i>					■					
	<i>Sphagnum spp.</i>						■				

* Less than 4 plots.



* See grid # 23 for site series 08-10

Site Series

- 01 HwFd - Cat's-tail moss
- 02 FdPl - Kinnikinnick
- 03 FdHw - Falsebox
- 04 Fd - Fairybells
- 05 Cw - Solomon's-seal
- 06 Hw - Queen's cup
- 07 Cw - Devil's club
- 11 Pl - Sphagnum
- 12 CwSs - Skunk cabbage

Grid No. 3

CWHdsl	Southern Dry Submaritime
CWH Variant	

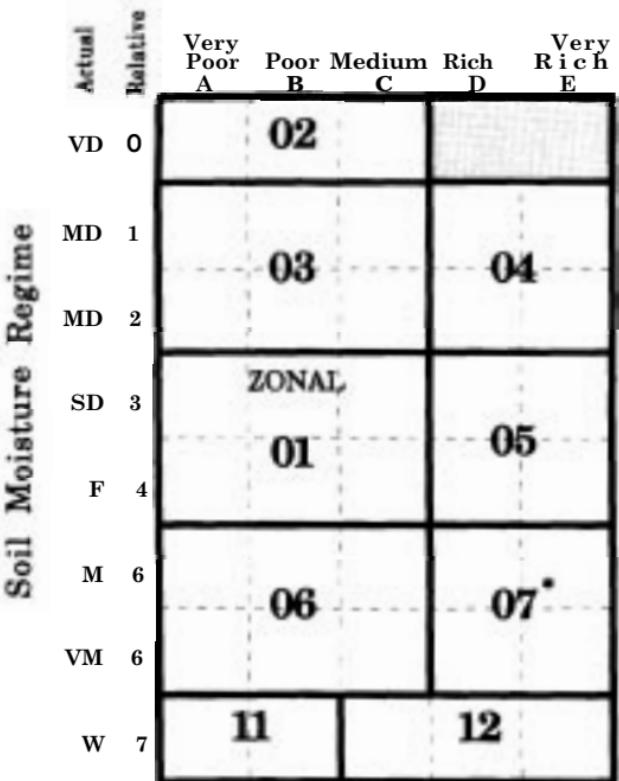
	Site Series		02	03	04	01	05	06*	07	11*	12*	
TREE LAYER			<i>Thuja plicata</i>									* Less than 4 plots.
			<i>Pseudotsuga menziesii</i>	■	■		■	■	■			western redcedar
			<i>Tsuga heterophylla</i>	■	■							Douglas-fir
			<i>Betula papyrifera</i>			■						western hemlock
			<i>Pinus contorta</i>				■					paper birch
			<i>Picea sitchensis</i>									shore/lodgepole pine
			<i>Acer glabrum</i>									Sitka spruce
SHRUB LAYER			<i>Chimaphila umbellata</i>	■	■							Douglas maple
			<i>Paxistima myrsinoides</i>				■					prince's pine
			<i>Vaccinium membranaceum</i>	■	■							falsebox
			<i>Arctostaphylos uva-ursi</i>	■								black huckleberry
			<i>Mahonia aquifolium</i>			■						kinnikinnick
			<i>Rubus parviflorus</i>				■					tall Oregon-grape
			<i>Oplopanax horridus</i>									thimbleberry
			<i>Cornus stolonifera</i>									devil's club
			<i>Ledum groenlandicum</i>									red-osier dogwood
			<i>Vaccinium oxycoccus</i>									Labrador tea
			<i>Viburnum edule</i>									bog cranberry
			<i>Lonicera involucrata</i>									highbush-cranberry
			<i>Disporum hookeri</i>									black twinberry
			<i>Trientalis latifolia</i>									Hooker's fairybells
			<i>Clintonia uniflora</i>									broad-leaved starflower
			<i>Tiarella unifoliata</i>									queen's cup
			<i>Cornus canadensis</i>									one-leaved foamflower
			<i>Streptopus roseus</i>									bunchberry
			<i>Dryopteris expansa</i>									rosy twistedstalk
			<i>Gymnocarpium dryopteris</i>									spiny wood fern
			<i>Tiarella trifoliata</i>									oak fern
			<i>Athyrium filix-femina</i>									three-leaved foamflower
			<i>Lysichiton americanum</i>									lady fern
			<i>Hylocomium splendens</i>									skunkcabbage
			<i>Rhytidiodelphus triquetrus</i>	■	■	■	■	■	■			step moss
			<i>Rhytidopsis robusta</i>									electrified cat's-tail moss
			<i>Pleurozium schreberi</i>									pipecleaner moss
			<i>Kindbergia oregana</i>									red-stemmed feathermoss
			<i>Peltigera aphthosa</i>									Oregon beaked moss
			<i>Cladonia spp.</i>	■								freckled lichen
			<i>Rhytidiodelphus loreus</i>									lichen
			<i>Plagiomnium insigne</i>									lanky moss
			<i>Sphagnum spp.</i>									coastal leafy moss
												sphagnum moss

Grid No. 4

CWHds2	Central Dry Submaritime CWH Variant
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Site Series

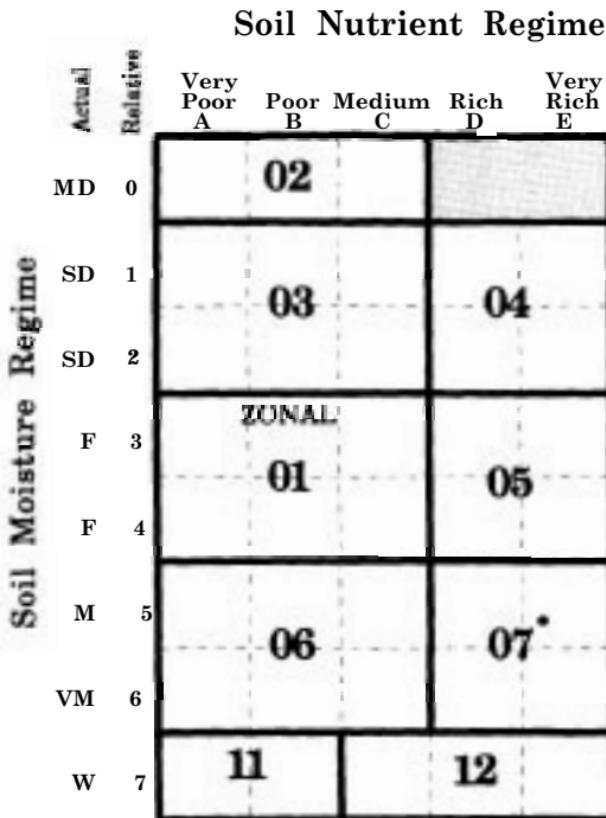
- 01** HwFd - Cat's-tail moss
- 02** FdPl - Kinnikinnick
- 03** FdHw - Falsebox
- 04** Fd - Fairybells
- 05** Cw - Solomon's-seal
- 06** Hw - Queen's cup
- 07** Cw - Devil's club
- 11** Pl - Sphagnum
- 12** CwSs - Skunk cabbage



* See grid # 23 for site series 08-10.

Site Series

	02	03	04	01	05	06*	07	11*	12
TREE LAYER	Tsuga heterophylla								
	Thuja plicata	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Pseudotsuga menziesii	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Pinus contorta	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Abies amabilis	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
SHRUB LAYER	Vaccinium parvifolium	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Vaccinium alaskaense	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Gaultheria shallon	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Vaccinium membranaceum	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Mahonia nervosa	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
HERB LAYER	Vaccinium ovalifolium	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Menziesia ferruginea	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Rubus spectabilis	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Olopanax horridus	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Cornus canadensis	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
MOSS LAYER	Achlys triphylla	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Tiarella trifoliata	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Polystichum munitum	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Rubus pedatus	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Streptopus streptopoides	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
* Less than 4 plots.									
western hemlock western redcedar Douglas-fir shore/lodgepole pine amabilis fir red huckleberry Alaskan blueberry salal black huckleberry dull Oregon-grape oval-leaved blueberry false azalea salmonberry devil's club bunchberry vanilla-leaf three-leaved foamflower sword fern five-leaved bramble small twistedstalk deer fern lady fern oak fern star-flowered false Sol.'s-seal fern-leaved goldthread maidenhair fern Indian hellebore skunk cabbage sedge step moss lanky moss pipecleaner moss lichen red-stemmed feathermoss Oregon beaked moss flat moss coastal leafy moss palm tree moss sphagnum moss shiny liverwort									



* See grid # 25 for site series 08 - 10.

Site Series

- 01** HwBa - Pipecleaner moss
- 02** FdHw - Salal
- 03** HwCw - Salal
- 04** CwHw - Sword fern
- 05** BaCw - Foamflower
- 06** HwBa - Deer fern
- 07** BaCw - Salmonberry
- 11** Pl - Sphagnum
- 12** CwSs - Skunk cabbage

CWMmin	CWMH	Submontane Variant	Moist Maritime
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Grid No. 5

	Site Series	02	03	04	01	05*	06*	07	08	09*	10*	
TREE LAYER	<i>Tsuga heterophylla</i>											western hemlock
	<i>Abies amabilis</i>											amabilis fir
	<i>Thuja plicata</i>											western redcedar
	<i>Tsuga mertensiana</i>	-										mountain hemlock
	<i>Chamaecyparis nootkatensis</i>											yellow-cedar
	<i>Pseudotsuga menziesii</i>	-										Douglas-fir
SHRUB LAYER	<i>Pinus contorta</i>											shore/lodgepole pine
	<i>Vaccinium alaskaense</i>											Alaskan blueberry
	<i>Vaccinium parvifolium</i>											red huckleberry
	<i>Vaccinium ovalifolium</i>											oval-leaved blueberry
	<i>Vaccinium membranaceum</i>											black huckleberry
	<i>Gaultheria shallon</i>											sala
	<i>Mahonia nervosa</i>											dull Oregon grape
	<i>Oplopanax horridus</i>											devil's club
	<i>Rubus spectabilis</i>											salmonberry
HERB LAYER	<i>Rubus pedatus</i>											five-leaved bramble
	<i>Tiarella trifoliata</i>											three-leaved foamflower
	<i>Achlys triphylla</i>											vanilla-leaf
	<i>Streptopus streptopoides</i>											small twistedstalk
	<i>Polystichum munitum</i>											sword fern
	<i>Cornus canadensis</i>											bunchberry
	<i>Blechnum spicant</i>											deer fern
	<i>Streptopus roseus</i>											rosy twistedstalk
	<i>Coptis asplenifolia</i>											fern-leaved goldthread
	<i>Athyrium filix-femina</i>											ladyfern
	<i>Gymnocarpium dryopteris</i>											oak fern
	<i>Veratrum viride</i>											Indian hellebore
	<i>Viola glabella</i>											stream violet
	<i>Lysichiton americanum</i>											skunk cabbage
	<i>Carex spp.</i>											sedge
MOSS LAYER	<i>Fauria crista-galli</i>											deer-cabbage
	<i>Rhytidiodelphus loreus</i>											lanky moss
	<i>Rhytidopsis robusta</i>											pipecleaner moss
	<i>Hylocomium splendens</i>											step moss
	<i>Pleurozium schreberi</i>											red-stemmed feathermoss
	<i>Cladina spp.</i>											lichens
	<i>Plagiomnium insigne</i>											coastal leafy moss
	<i>Rhizomnium nudum</i>											leafy moss
	<i>Sphagnum gigrensohnii</i>											common green sphagnum
	<i>Kindbergia praelonga</i>											

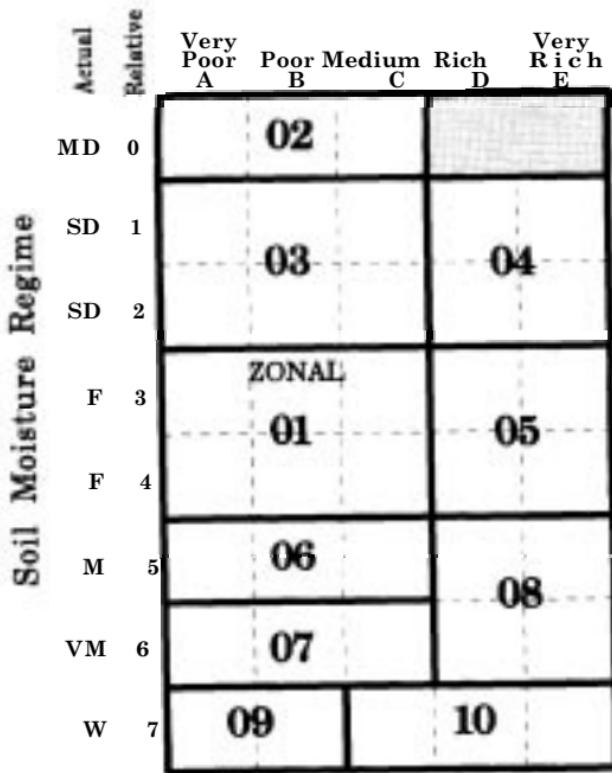
* Less than 4 plots.

Grid No. 6

CW H M m 2	Montane C W H Variant	Moist Maritime
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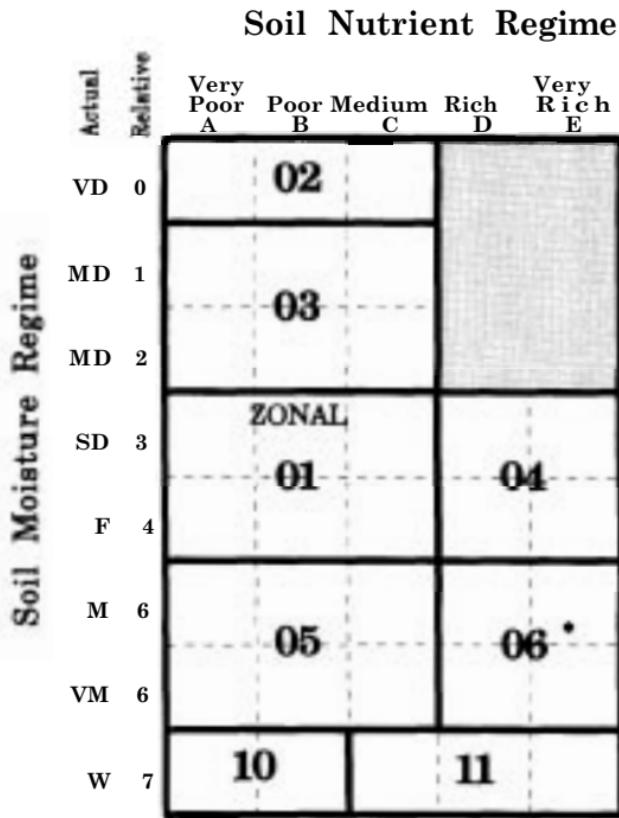
Site Series

- 01 HwBa - Pipecleaner moss
 02 FdHw - Salal
 03 HwCw - Salal
 04 CwHw - Sword fern
 05 BaCw - Foamflower
 06 HwBa - Deer fern
 07 CwYc - Goldthread
 08 BaCw - Salmonberry
 09 Pl - Sphagnum
 10 CwSs - Skunk cabbage



	Site Series	02	03	01	04	05	06	10*	11	
TREE LAYER	<i>Tsuga heterophylla</i>	■								western hemlock
	<i>Pseudotsuga menziesii</i>	■	■■	■■	■■	■	■■		■■	Douglas-fir
	<i>Abies amabilis</i>		■	■■	■■	■			■■	amabilis fir
	<i>Thuja plicata</i>		■	■■	■■	■			■■	western redcedar
	<i>Pinus contorta</i>	■								shore/lodgepole pine
	<i>Abies lasiocarpa</i>									subalpine fir
	<i>Picea sitchensis</i>									Sitka spruce
SHRUB LAYER	<i>Menziesia ferruginea</i>	■■■								false azalea
	<i>Vaccinium membranaceum</i>		■							black huckleberry
	<i>Vaccinium alaskaense</i>		■■	■■						Alaskan blueberry
	<i>Paxistima myrsinoides</i>			■■						falsebox
	<i>Chimaphila umbellata</i>		■■							prince's pine
	<i>Arctostaphylos uva-ursi</i>		■■							kinnikinnick
	<i>Mahonia nervosa</i>		■■							dull Oregon-grape
	<i>Vaccinium ovalifolium</i>		■■			■■				oval-leaved blueberry
	<i>Acer circinatum</i>			■■						vine maple
	<i>Rubus parviflorus</i>				■■					thimbleberry
	<i>Olopanax horridus</i>					■■				devil's club
	<i>Rubus spectabilis</i>						■■			salmonberry
	<i>Ledum groenlandicum</i>							■■■		Labrador tea
	<i>Vaccinium oxycoccos</i>									bog cranberry
	<i>Cornus canadensis</i>									bunchberry
	<i>Clintonia uniflora</i>									queen's cup
	<i>Orthilia secunda</i>									one-sided wintergreen
	<i>Smilacina stellata</i>									star-flowered false Sol.'s-seal
	<i>Rubus pedatus</i>									five-leaved bramble
	<i>Tiarella unifoliata</i>									one-leaved foamflower
	<i>Gymnocarpium dryopteris</i>									oak fern
	<i>Streptopus roseus</i>									rosy twistedstalk
	<i>Athyrium filix-femina</i>									lady fern
	<i>Eriophorum chamissonis</i>									Chamisso's cotton-grass
	<i>Lysichiton americanum</i>									skunk cabbage
	<i>Equisetum arvense</i>									common horsetail
	<i>Pleurozium schreberi</i>									red-stemmed feathermoss
	<i>Hylocomium splendens</i>									step moss
	<i>Rhytidopsis robusta</i>									pipecleaner moss
	<i>Rhytidiodelphus loreus</i>									lanky moss
	<i>Cladonia</i> spp.									lichens
	<i>Plagiomnium insigne</i>									coastal leafy moss
	<i>Sphagnum</i> spp.									sphagnum moss

* Less than 6 plots.



* See grid # 126 for site series 07 - 09.

Site Series

- 01** HwBa - Step moss
- 02** FdPl - Kinnikinnick
- 03** FdHw - Falsebox
- 04** BaCw - Oak fern
- 05** HwBa - Queen's cup
- 06** BaCw - Devil's club
- 10** Pl - Sphagnum
- 11** CwSs - Skunk cabbage

Grid No.	CWHms1	Southern CWH Variant	Moist Submaritime
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Grid No. 7

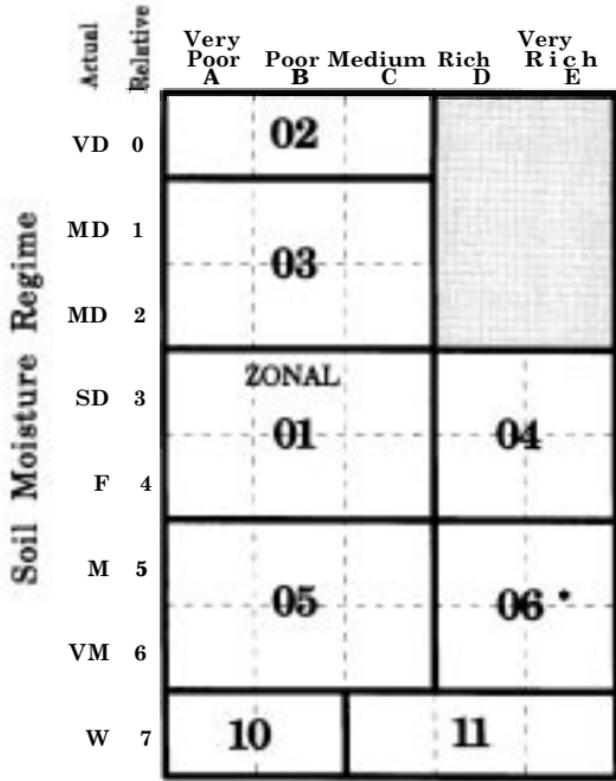
	Site Series	02	03	01	04	05	06	10*	11	
TREE LAYER	<i>Tsuga heterophylla</i>	■								western hemlock
	<i>Abies amabilis</i>		■							amabilis fir
	<i>Thuja plicata</i>			■						western redcedar
	<i>Pseudotsuga menziesii</i>	■	■							Douglas-fir
	<i>Pinus contorta</i>			■						shore/lodgepole pine
	<i>Picea engelmannii</i>				■					Engelmann spruce
	<i>Picea sitchensis</i>					■				Sitka spruce
	<i>Abies lasiocarpa</i>						■			subalpine fir
	<i>Menziesia ferruginea</i>	■								false azalea
SHRUB LAYER	<i>Vaccinium alaskaense</i>		■							Alaskan blueberry
	<i>Vaccinium membranaceum</i>	■	■							black huckleberry
	<i>Paxistima myrsinifolia</i>			■						falsebox
	<i>Chimaphila umbellata</i>	■								prince's pine
	<i>Arctostaphylos uva-ursi</i>	■								kinnikinnick
	<i>Vaccinium ovalifolium</i>				■					oval-leaved blueberry
	<i>Rubus spectabilis</i>					■				salmonberry
	<i>Olopanax horridus</i>						■			devil's club
	<i>Ledum groenlandicum</i>							■		Labrador tea
	<i>Vaccinium oxycoccos</i>									bog cranberry
	<i>Cornus canadensis</i>									bunchberry
	<i>Clintonia uniflora</i>			■						queen's cup
	<i>Orthilia secunda</i>			■						one-sided wintergreen
	<i>Rubus pedatus</i>				■					five-leaved bramble
	<i>Streptopus roseus</i>					■				rosy twistedstalk
	<i>Dryopteris expansa</i>						■			spiny wood fern
	<i>Tiarella trifoliata</i>									three-leaved foamflower
	<i>Gymnocarpium dryopteris</i>									oak fern
	<i>Athyrium filix-femina</i>									lady fern
	<i>Tiarella unifoliata</i>									one-leaved foamflower
	<i>Carex spp.</i>									sedge
	<i>Lysichiton americanus</i>									skunk cabbage
	<i>Equisetum arvense</i>									common horsetail
	<i>Hylocomium splendens</i>	■								step moss
	<i>Rhytidopsis robusta</i>		■							pipecleaner moss
	<i>Pleurozium schreberi</i>			■						red-stemmed feathermoss
	<i>Rhytidiodelphus loreus</i>				■					lanky moss
	<i>Cladonia spp.</i>									lichen
	<i>Plagiomnium insigne</i>									coastal leafy moss
	<i>Rhizomnium glabrescens</i>									large leafy moss
	<i>Sphagnum spp.</i>									sphagnum moss

Grid No. 8

CWHms2	Central Moist Submaritime CWH Variant
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Site Series

- 01** HwBa - Step moss
- 02** FdPl - Kinnikinnick
- 03** FdHw - Falsebox
- 04** BaCw - Oak fern
- 05** HwBa - Queen's cup
- 06** BaCw - Devil's club
- 10** Pl - Sphagnum
- 11** CwSs - Skunk cabbage



* See grid # 26 for site series 07 - 09

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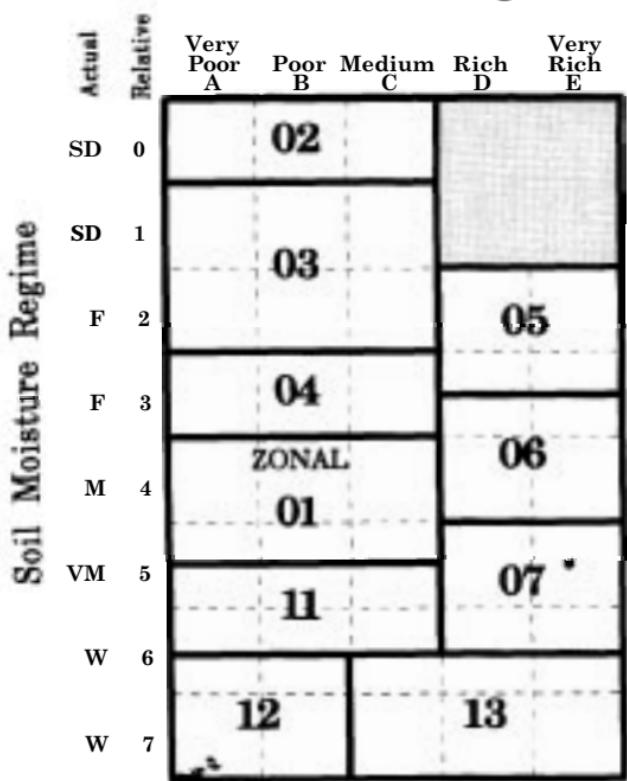
	Site Series	02	03	04	05	01	06	07	11	12	13	
TREE LAYER	<i>Thuja plicata</i>	■										western redcedar
	<i>Tsuga heterophylla</i>	■	■	■	■	■	■					western hemlock
	<i>Chamaecyparis nootkatensis</i>	■										yellow-cedar
	<i>Pinus contorta</i>	■										shore/lodgepole pine
	<i>Picea sitchensis</i>			■								Sitka spruce
	<i>Abies amabilis</i>				■	■	■					amabilis fir
SHRUB LAYER	<i>Gaultheria shallon</i>	■	■	■	■	■	■	■	■	■	■	salal
	<i>Vaccinium parvifolium</i>	■	■	■	■	■	■	■	■	■	■	red huckleberry
	<i>Menziesia ferruginea</i>											false azalea
	<i>Vaccinium alaskaense</i>											Alaskan blueberry
	<i>Vaccinium ovalifolium</i>											oval-leaved blueberry
	<i>Vaccinium ovatum</i>											evergreen huckleberry
	<i>Juniperus communis</i>	■										common juniper
	<i>Rubus spectabilis</i>							■	■	■	■	salmonberry
	<i>Ledum groenlandicum</i>		■	■	■	■	■	■	■	■	■	Labrador tea
	<i>Blechnum spicant</i>											deer fern
HERB LAYER	<i>Maianthemum dilatatum</i>		■	■	■	■	■	■	■	■	■	false lily-of-the-valley
	<i>Cornus canadensis</i>		■	■	■	■	■	■	■	■	■	bunchberry
	<i>Empetrum nigrum</i>		■	■	■	■	■	■	■	■	■	crowberry
	<i>Polystichum munitum</i>					■						sword fern
	<i>Tiarella trifoliata</i>											three-leaved foamflower
	<i>Athyrium filix-femina</i>											lady fern
	<i>Dryopteris expansa</i>											spiny wood fern
	<i>Gymnocarpium dryopteris</i>											oak fern
	<i>Stachys cooleyae</i>											Cooley's hedge-nettle
	<i>Coptis aspleniifolia</i>											fern-leaved goldthread
	<i>Calamagrostis nutkaensis</i>	■										Pacific reedgrass
	<i>Lysichiton americanum</i>											skunk cabbage
	<i>Carex spp.</i>											sedge
	<i>Hylocomium splendens</i>		■	■	■	■	■	■	■	■	■	step moss
	<i>Rhytidadelphus loreus</i>		■	■	■	■	■	■	■	■	■	lanky moss
	<i>Kindbergia oregana</i>			■	■	■	■	■	■	■	■	Oregon beaked moss
	<i>Cladina spp.</i>		■									lichens
MOSS LAYER	<i>Racomitrium lanuginosum</i>											hoary rock moss
	<i>Rhizomnium glabrescens</i>											large leafy moss
	<i>Sphagnum girgensohnii</i>											common green sphagnum
	<i>Pellia neesiana</i>											shiny liverwort
	<i>Leucolepis menziesii</i>											palm tree moss
	<i>Plagiomnium insigne</i>											coastal leafy moss
	<i>Sphagnum spp.</i>									■	■	sphagnum moss

Grid No. 9

CWTHvH	Southern Hypermaritime Very Wet CWH Variante
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Site Series

- 01** CwHw - Salal
- 02** PlYc - Rhacomitrium
- 03** CwYc - Salal
- 04** HwSs - Lanky moss
(steep slopes)
- 05** CwSs - Sword fern
(steep slopes)
- 06** CwSs - Foamflower
- 07** CwSs - Devil's club
- 11** CwYc - Goldthread
- 12** PlYc - Sphagnum
- 13** CwSs - Skunk cabbage

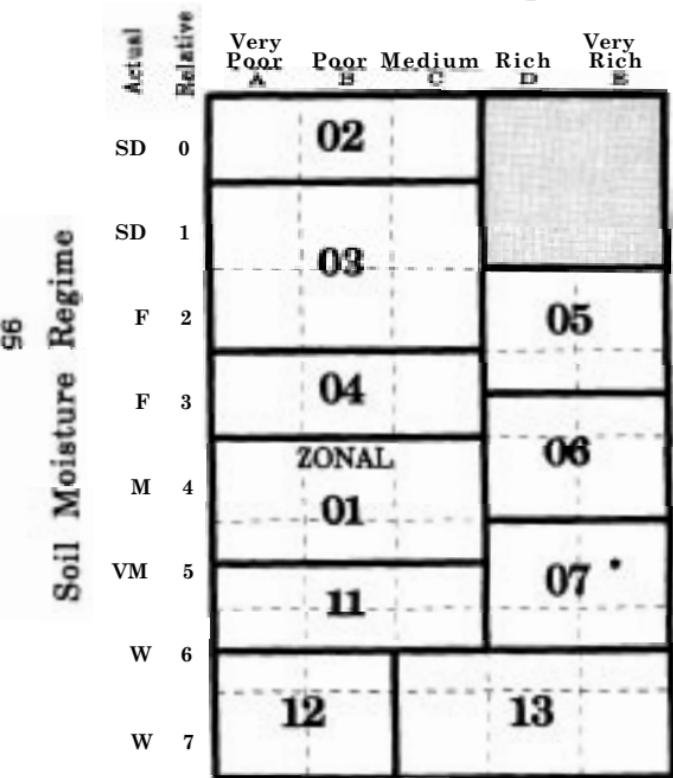


	Site Series	02	03	04	05	01	06	07	11	12	13	
TREE LAYER	<i>Thuja plicata</i> <i>Tsuga heterophylla</i> <i>Chamaecyparis nootkatensis</i> <i>Pinus contorta</i> <i>Picea sitchensis</i> <i>Abies amabilis</i>	-	-	-	-	-	-	-	-	-	-	western redcedar western hemlock yellow-cedar shore/lodgepole pine Sitka spruce amabilis fir salal
SHRUB LAYER	<i>Gaultheria shallon</i> <i>Vaccinium parvifolium</i> <i>Menziesia ferruginea</i> <i>Vaccinium alaskaense</i> <i>Juniperus communis</i> <i>Vaccinium ovalifolium</i> <i>Rubus spectabilis</i> <i>Olopanax horridus</i> <i>Ledum groenlandicum</i> <i>Kalmia microphylla</i> <i>Blechnum spicant</i> <i>Maianthemum dilatatum</i> <i>Cornus canadensis</i> <i>Calamagrostis nutkaensis</i> <i>Empetrum nigrum</i> <i>Dryopteris expansa</i> <i>Polystichum munitum</i> <i>Tiarella trifoliata</i> <i>Athyrium filix-femina</i> <i>Gymnocarpium dryopteris</i> <i>Coptis asplenifolia</i> <i>Lysichiton americanum</i> <i>Fauria crista-galli</i> <i>Carex spp.</i>	-	-	-	-	-	-	-	-	-	-	red huckleberry false azalea Alaskan blueberry common juniper oval-leaved blueberry salmonberry devil's club Labrador tea western bog-laurel deer fern false lily-of-the-valley bunchberry Pacific reedgrass crowberry spiny wood fern sward fern three-leaved foamflower lady fern oak fern fern-leaved goldthread skunk cabbage deer-cabbage sedge
HERB LAYER	<i>Hylocomium splendens</i> <i>Rhytidiodelphus loreus</i> <i>Kindbergia oregana</i> <i>Cladina spp.</i> <i>Racomitrium lanuginosum</i> <i>Rhizomnium glabrescens</i> <i>Sphagnum gigrensohnii</i> <i>Pellia neesiana</i> <i>Leucolepis menziesii</i> <i>Sphagnum spp.</i>	-	-	-	-	-	-	-	-	-	-	step moss lanky moss Oregon beaked moss lichen hoary rock moss large leafy moss common green sphagnum shiny liverwort palm tree moss sphagnum moss
MOSS LAYER												

Grid No. 10

CWHvhd	Central Very Wet Hypermaritime CWH Variant
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- Site Series
- 01 CwHw - Salal
 - 02 PIYc - Racomitrium
 - 03 CwYc - Salal
 - 04 HwSs - Lanky moss
(steep slopes)
 - 05 CwSs - Sword fern
(steep slopes)
 - 06 CwSs - Foamflower
 - 07 CwSs - Devil's club
 - 11 CwYc - Goldthread
 - 12 PIYc - Sphagnum
 - 13 CwSs - Skunk cabbage

Soil Nutrient Regime

* See grid # 28 for site series 08-10.

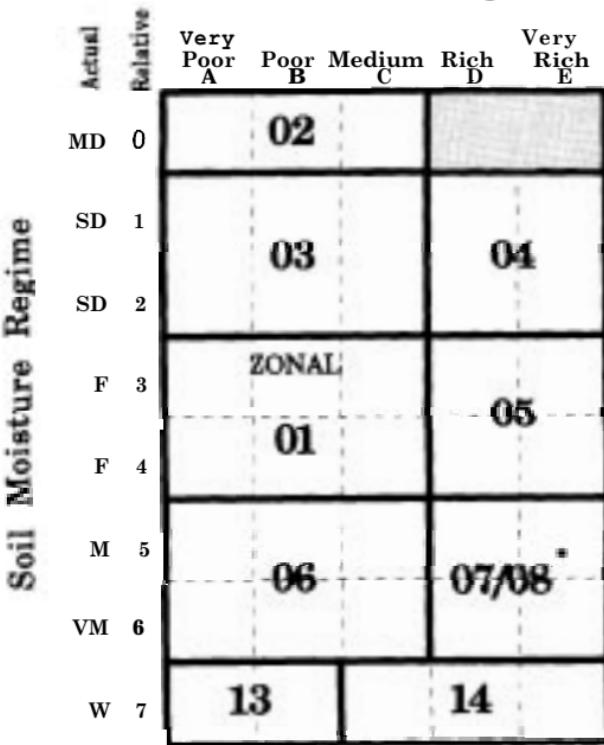
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	Site Series		02	03	04	01 ^a	05	06 ^a	07	08	13	14	
TREE LAYER			<i>Thuja plicata</i>										western redcedar
SHRUB LAYER			<i>Tsuga heterophylla</i>										western hemlock
			<i>Pseudotsuga menziesii^b</i>										Douglas-fir
			<i>Pinus contorta</i>										shore pine
			<i>Abies amabilis</i>										amabilis fir
			<i>Picea sitchensis^c</i>										Sitka spruce
			<i>Alnus rubra</i>										red alder
			<i>Vaccinium parvifolium</i>										red huckleberry
			<i>Vaccinium alaskaense</i>										Alaskan blueberry
			<i>Menziesia ferruginea</i>										false azalea
			<i>Gaultheria shallon</i>										salal
			<i>Vaccinium ovalifolium</i>										oval-leaved blueberry
			<i>Olopanax horridus</i>										devil's club
			<i>Rubus spectabilis</i>										salmonberry
			<i>Kalmia microphylla</i>										western bog-laurel
			<i>Ledum groenlandicum</i>										Labrador tea
HERB LAYER			<i>Blechnum spicant</i>										deer fern
			<i>Cornus canadensis</i>										bunchberry
			<i>Polystichum munitum</i>										sword fern
			<i>Dryopteris expansa</i>										spiny wood fern
			<i>Clintonia uniflora</i>										queen's cup
			<i>Gymnocarpium dryopteris</i>										oak fern
			<i>Rubus pedatus</i>										five-leaved bramble
			<i>Tiarella trifoliata</i>										three-leaved foamflower
			<i>Maianthemum dilatatum</i>										false lily-of-the-valley
			<i>Athyrium filix-femina</i>										lady fern
			<i>Coptis aspleniifolia</i>										fern-leaved goldthread
			<i>Lysichiton americanum</i>										skunk cabbage
			<i>Carex spp.</i>										sedge
MOSS LAYER			<i>Hylocomium splendens</i>										step moss
			<i>Kindbergia oregana</i>										Oregon beaked moss
			<i>Rhytidiodelphus loreus</i>										lanky moss
			<i>Plagiothecium undulatum</i>										flat moss
			<i>Pleurozium schreberi</i>										red-stemmed feathermoss
			<i>Cladina spp.</i>										lichen
			<i>Racomitrium lanuginosum</i>										hoary rock moss
			<i>Sphagnum girgensohnii</i>										common green sphagnum
			<i>Rhizomnium glabrescens</i>										large leafy moss
			<i>Pellia neesiana</i>										shiny liverwort
			<i>Sphagnum spp.</i>										sphagnum moss

^a"Salal phase" dominated by Cw, Hw, salal, Alaskan blueberry and red huckleberry.^b More abundant in southern portion.^c More abundant in northern portion.

Grid No. 11

CWHLvml	Submontane Maritime CWH Variant	Very Wet
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* See grid # 29 for site series 09 - 11; Site series 08 in northern portion of variant; 12 rare in region.

Site Series

**

01 HwBa - Blueberry

02 HwPl - Cladina

03 HwCw - Salal

04 CwHw - Swordfern

05 BaCw - Foamflower

**

06 HwBa - Deer fern

07 BaCw - Salmonberry

08 BaSs - Devil's club

13 P1 - Sphagnum

14 CwSs - Skunk cabbage

**

A nutrient-very poor to poor "salal phase" of site series 01 and 06 occurs in subdued terrain on the west coast and north end of Vancouver Island. It is denoted with an "s" modifier to the site series number (e.g. 01s).

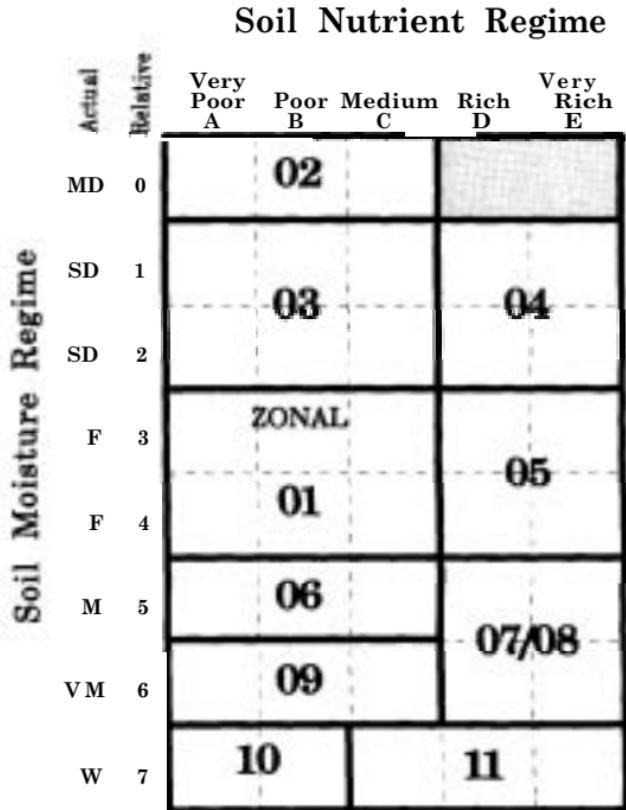
	Site Series	02	03	04	01	05	06	07	08	09	10	11
TREE LAYER	<i>Thuja plicata</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Tsuga heterophylla</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Chamaecyparis nootkatensis</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Abies amabilis</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Pseudotsuga menziesii</i> ^a	-	-	-	-	-	-	-	-	-	-	-
	<i>Tsuga mertensiana</i>	-	-	-	-	-	-	-	-	-	-	-
SHRUB LAYER	<i>Pinus contorta</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Vaccinium alaskaense</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Vaccinium parvifolium</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Vaccinium ovalifolium</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Gaultheria shallon</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Menziesia ferruginea</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Cassiope mertensiana</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Cladodanthus pyroliflorus</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Vaccinium caespitosum</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Mahonia nervosa</i>	-	-	-	-	-	-	-	-	-	-	-
HERB LAYER	<i>Rubus spectabilis</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Oplopanax horridus</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Cornus canadensis</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Achlys triphylla</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Polystichum munitum</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Blechnum spicant</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Rubus pedatus</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Empetrum nigrum</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Tiarella trifoliata</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Dryopteris expansa</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Coptis aspleniifolia</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Athyrium filix-femina</i>	-	-	-	-	-	-	-	-	-	-	-
MOSS LAYER	<i>Fauria crista-galli</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Lysichiton americanum</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Veratrum viride</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Hylocomium splendens</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Rhytidiodelphus loreus</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Rhytidopsis robusta</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Pleurozium schreberi</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Cladina spp.</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Plagiothecium undulatum</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Rhizomnium glabrescens</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Scapania bolanderi</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>Sphagnum girgensohnii</i>	-	-	-	-	-	-	-	-	-	-	-

^a More abundant in southern portion.

Grid No. 12

CW Hvm2	Montane Maritime CWH Variant	Very Wet
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- | Site | Series |
|------|----------------------|
| 01 | HwBa - Blueberry |
| 02 | HwPl - Cladina |
| 03 | HwCw - Salal |
| 04 | CwHw - Sword fern |
| 05 | BaCw - Foamflower |
| 06 | HwBa - Deer fern |
| 07 | BaCw - Salmonberry |
| 08 | BaSs - Devil's club |
| 09 | CwYc - Goldthread |
| 10 | Pl - Sphagnum |
| 11 | CwSs - Skunk cabbage |

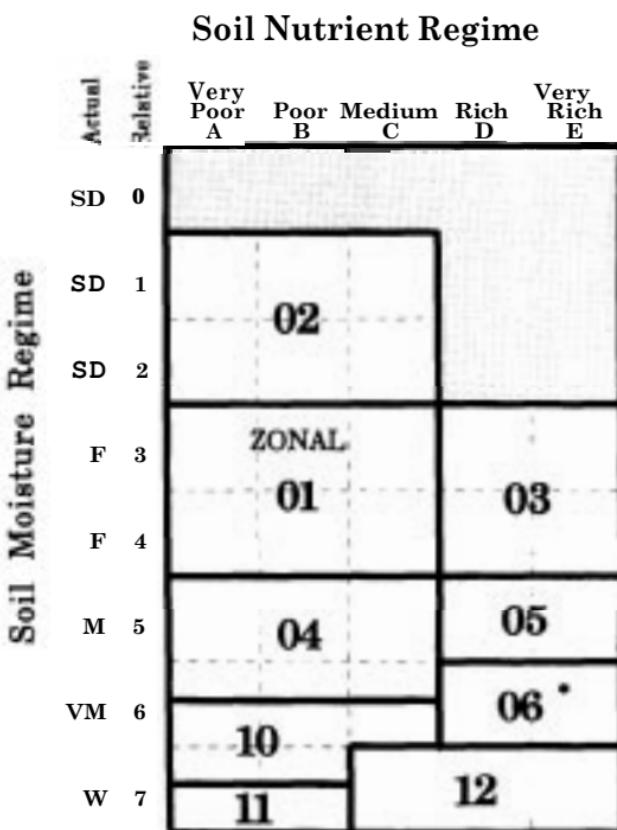


	Site Series		02	01 ^a	03	04 ^b	05	06	10	11	12	
TREE LAYER	Picea sitchensis		■	■	■	■	■	■	■	■	■	Sitka spruce
	Tsuga heterophylla		■	■	■	■	■	■	■	■	■	western hemlock
	Thuja plicata				■							western redcedar
	Chamaecyparis nootkatensis					■						yellow-cedar
	Tsuga mertensiana											mountain hemlock
SHRUB LAYER	Pinus contorta											shore/lodgepole pine
	Vaccinium parvifolium		■	■	■	■	■	■	■	■	■	red huckleberry
	Menziesia ferruginea											false azalea
	Vaccinium alaskaense											Alaskan blueberry
	Gaultheria shallon		■									salal
	Vaccinium ovalifolium											oval-leaved blueberry
	Kalmia microphylla											western bog-laurel
	Ledum groenlandicum											Labrador tea
HERB LAYER	Myrica gale											sweet gale
	Blechnum spicant											deer fern
	Polystichum munitum				■							sword fern
	Cornus canadensis											bunchberry
	Gymnocarpium dryopteris											oak fern
	Tiarella trifoliata											three-leaved foamflower
	Streptopus roseus											rosy twistedstalk
	Coptis asplenifolia											fern-leaved goldthread
	Empetrum nigrum											crowberry
	Carex spp.											sedge
MOSS LAYER	Veratrum viride											Indian hellebore
	Lysichiton americanum											skunk cabbage
	Fauria crista-galli											deer-cabbage
	Trichophorum caespitosum		■	■	■	■	■	■	■	■	■	tufted clubrush
	Hylocomium splendens											step moss
	Rhytidadelphus loreus											lanky moss
	Rhizomnium glabrescens											large leafy moss
	Kindbergia oregana											Oregon beaked moss
	Plagiothecium undulatum											flat moss
	Scapania bolanderi											shiny liverwort
	Pellia neesiana											stiff-leaved haircap moss
	Polytrichum alpinum											palm tree moss
	Conocephalum conicum											common green sphagnum
	Leucolepis menziesii											sphagnum moss
	Sphagnum gigrensohnii											red-stemmed feathermoss
	Sphagnum spp.											
	Pleurozium schreberi											

^a "Salal phase" dominated by Cw, Hw, salal and mosses.^b Salal lacking under dense second-growth stands.

Grid No. 13

CWHL	CVWH Variant	Submontane	Wet	Hypermaritime
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**Site Series**

**

- 01 HwSs - Lanky moss
- 02 CwSs - Salal
- 03 CwSs - Sword fern
- 04 CwHw - Salal
- 05 CwSs - Foamflower
- 06 CwSs - Conocephalum
- 10 CwYc - Goldthread
- 11 PlYc - Sphagnum
- 12 CwSs - Skunk cabbage

**

An nutrient-very poor to poor "salal phase" of site series 01 occurs in subdued terrain on the Queen Charlotte Lowlands and the eastern Skidegate Plateau. It is denoted with an "s" modifier to the site series number (e.g. 01s).

	Site Series	01	02	03	04	05	06	
TREE LAYER	<i>Picea sitchensis</i>	■						Sitka spruce
	<i>Tsuga heterophylla</i>	■	■	■	■	■	■	western hemlock
SHRUB LAYER	<i>Chamaecyparis nootkatensis</i>							yellow-cedar
	<i>Thuja plicata</i>	■	■	■				western redcedar
HERB LAYER	<i>Tsuga mertensiana</i>							mountain hemlock
	<i>Vaccinium alaskaense</i>	■						Alaskan blueberry
MOSS LAYER	<i>Vaccinium ovalifolium</i>		■	■				oval-leaved blueberry
	<i>Vaccinium parvifolium</i>			■	■	■		red huckleberry
HERB LAYER	<i>Menziesia ferruginea</i>							false azalea
	<i>Gaultheria shallon</i>							salal
HERB LAYER	<i>Malus fusca</i>		■					Pacific crab apple
	<i>Blechnum spicant</i>			■				deer fern
HERB LAYER	<i>Coptis asplenifolia</i>							fern-leaved goldthread
	<i>Listera cordata</i>	■						heart-leaved twayblade
HERB LAYER	<i>Cornus canadensis</i>							bunchberry
	<i>Huperzia haleakalae</i>							Haleakalae fir clubmoss
HERB LAYER	<i>Streptopus roseus</i>							rosy twistedstalk
	<i>Tiarella trifoliata</i>							three-leaved foamflower
HERB LAYER	<i>Lycopodium clavatum</i>							running clubmoss
	<i>Rubus pedatus</i>							five-leaved bramble
HERB LAYER	<i>Gymnocarpium dryopteris</i>							oak fern
	<i>Carex spp.</i>							sedge
HERB LAYER	<i>Veratrum viride</i>							Indian hellebore
	<i>Maianthemum dilatatum</i>							false lily-of-the-valley
HERB LAYER	<i>Lysichiton americanum</i>							skunk-cabbage
	<i>Hylocomium splendens</i>							step moss
HERB LAYER	<i>Rhytidiodelphus loreus</i>							lanky moss
	<i>Rhizomnium glabrescens</i>							large leafy moss
HERB LAYER	<i>Scapania bolanderi</i>							scapania
	<i>Pellia neesiana</i>							shiny liverwort
HERB LAYER	<i>Kindbergia oregana</i>							Oregon beaked moss
	<i>Plagiothecium undulatum</i>							flat moss
HERB LAYER	<i>Polytrichum alpinum</i>							stiff-leaved haircap moss
	<i>Sphagnum gigrensohnii</i>							common green sphagnum
HERB LAYER	<i>Conocephalum conicum</i>							alligator-skin liverwort
	<i>Leucolepis menziesii</i>							palm tree moss
HERB LAYER	<i>Sphagnum spp.</i>							sphagnum moss
	<i>Rhytidopsis robusta</i>							pipecleaner moss

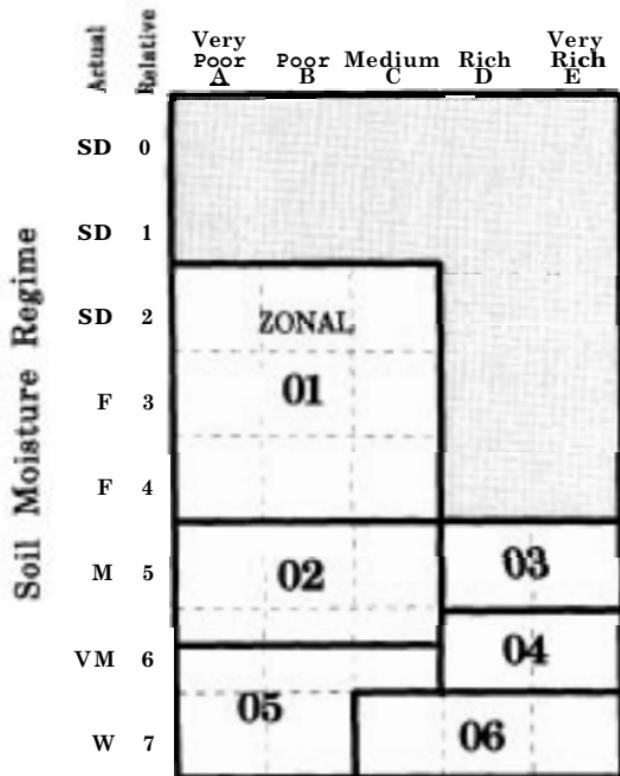
Grid No. 14

CWHwh2	Montane Wet Hypermaritime CWH Variant
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Site _____ Series _____

- 01** HwSs - Lanky moss
- 02** CwHw - Salal *
- 03** CwSs - Foamflower
- 04** CwSs - Conocephalum
- 05** CwYc - Goldthread
- 06** CwSs - Skunk cabbage

* This site series occurs
at lower elevations



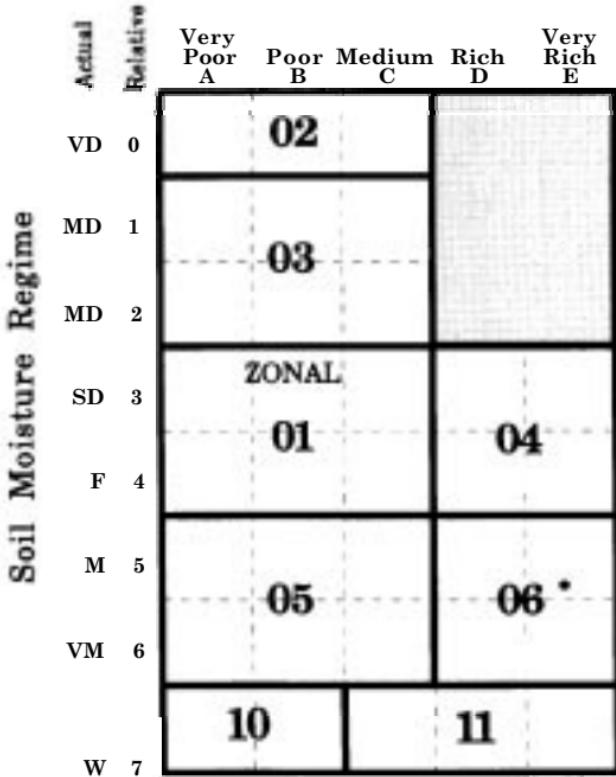
	Site Series	02	03	01	04	05*	06	10	11	
TREE LAYER										Less than 4 plots.
	<i>Abies amabilis</i>	■								<i>amabilis</i> fir
	<i>Tsuga heterophylla</i>	■	■	■	■	■	■	■	■	western hemlock
	<i>Thuja plicata</i>	■								western redcedar
	<i>Tsuga mertensiana</i>	■								mountain hemlock
	<i>Betula papyrifera</i>									paper birch
	<i>Picea sitchensis</i>									Sitka spruce
	<i>Abies lasiocarpa</i>	■								subalpine fir
	<i>Chamaecyparis nootkatensis</i>									yellow-cedar
SHRUB LAYER										<i>Vaccinium alaskaense</i>
										Alaskan blueberry
	<i>Vaccinium ovalifolium</i>	■	■	■	■	■	■	■	■	oval-leaved blueberry
	<i>Menziesia ferruginea</i>	■								false azalea
	<i>Oplopanax horridus</i>	■	■	■	■	■	■	■	■	devil's club
	<i>Rubus spectabilis</i>									salmonberry
	<i>Gaultheria shallon</i>									salal
	<i>Cornus stolonifera</i>									red-osier dogwood
	<i>Cornus canadensis</i>									bunchberry
	<i>Rubus pedatus</i>	■	■	■	■	■	■	■	■	five-leaved bramble
	<i>Orthilia secunda</i>									one-sided wintergreen
	<i>Clintonia uniflora</i>									queen's cup
	<i>Tiarella trifoliata</i>									three-leaved foamflower
	<i>Dryopteris expansa</i>									spiny wood fern
	<i>Streptopus roseus</i>									rosy twistedstalk
	<i>Gymnocarpium dryopteris</i>									oakfern
	<i>Athyrium filix-femina</i>									lady fern
	<i>Tiarella unifoliata</i>									one-leaved foamflower
	<i>Viola glabella</i>									stream violet
	<i>Blechnum spicant</i>									deer fern
	<i>Veratrum viride</i>									Indian hellebore
	<i>Coptis asplenifolia</i>									fern-leaved goldthread
	<i>Fauria crista-galli</i>									deer-cabbage
	<i>Lysichiton americanum</i>									skunk cabbage
	<i>Hylocomiumsplendens</i>									step moss
	<i>Rhytidiodelphus loreus</i>									lanky moss
	<i>Rhytidiodiopsis robusta</i>									pipecleaner moss
	<i>Pleurozium schreberi</i>									red-stemmed feathermoss
	<i>Ptilium crista-castrensis</i>									knott's plume moss
	<i>Rhizomnium glabrescens</i>									large leafy moss
	<i>Rhizomnium nudum</i>									leafy moss
	<i>Sphagnum girgensohnii</i>									common green sphagnum
	<i>Sphagnum spp.</i>									sphagnum moss

Grid No. 15

CW	WH	ms	2	Montane Wet Submaritime
CW	WH	Varietal		

Site Series

- 01 HwBa - Bramble
 02 Pl - Kinnikinnick
 03 HwPl - Feathermoss
 04 BaCw - Oak fern
 05 HwBa - Queen's cup
 06 BaCw - Devil's club
 10 Pl - Sphagnum
 11 CwSs - Skunk cabbage



* See grid #30 for site series 07 - 09

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	Site Series	02	03	04	05	01	06*	07	11*	12	
TREE LAYER	<i>Pseudotsuga menziesii</i>	■									
	<i>Tsuga heterophylla</i>		■	■	■						
	<i>Thuja plicata</i>					■					
	<i>Pinus contorta</i>	■									
	<i>Arbutus menziesii</i>					■					
	<i>Abies grandis</i>										
	<i>Alnus rubra</i>										
	<i>Acer macrophyllum</i>					■					
SHRUB LAYER	<i>Gaultheria shallon</i>										
	<i>Mahonia nervosa</i>										
	<i>Vaccinium parvifolium</i>										
	<i>Pseudotsuga menziesii</i>										
	<i>Rosa gymnocarpa</i>										
	<i>Holodiscus discolor</i>										
	<i>Menziesia ferruginea</i>										
	<i>Rubus spectabilis</i>										
	<i>Oplopanax horridus</i>										
	<i>Ledum groenlandicum</i>										
HERB LAYER	<i>Achlys triphylla</i>										
	<i>Polystichum munitum</i>										
	<i>Lactuca muralis</i>										
	<i>Linnaea borealis</i>										
	<i>Hypochaeris radicata</i>										
	<i>Pteridium aquilinum</i>										
	<i>Galium triflorum</i>										
	<i>Tiarella trifoliata</i>										
	<i>Blechnum spicant</i>										
	<i>Athyrium filix-femina</i>										
	<i>Gymnocarpium dryopteris</i>										
	<i>Lysichiton americanum</i>										
	<i>Hylocomium splendens</i>										
	<i>Kindbergia oregana</i>										
	<i>Rhytidiodelphus loreus</i>										
MOSS LAYER	<i>Rhytidiodelphus triquetrus</i>										
	<i>Pleurozium schreberi</i>										
	<i>Polytrichum juniperinum</i>										
	<i>Cladina spp.</i>										
	<i>Leucolepis menziesii</i>										
	<i>Plagiomnium insigne</i>										
	<i>Sphagnum spp.</i>										

* Less than 4 plots.

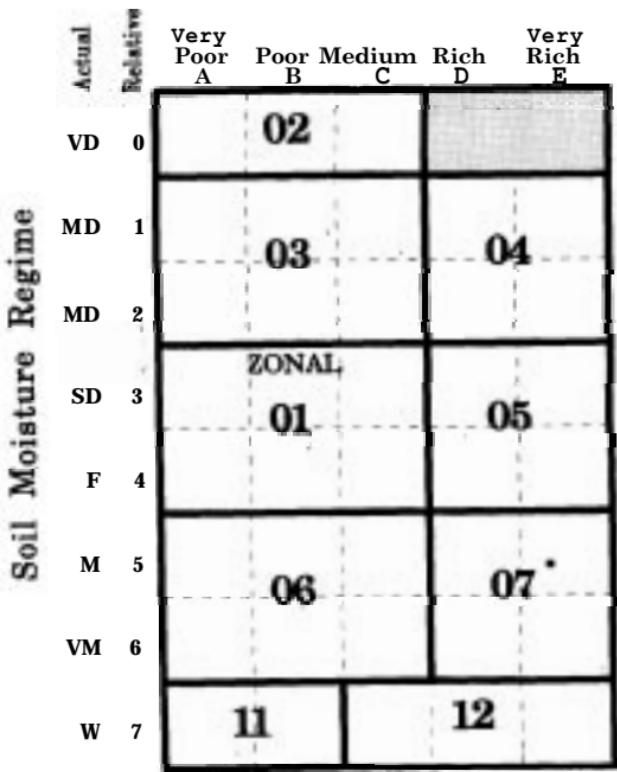
Douglas-fir
western hemlock
western redcedar
shore/lodgepole pine
arbutus
grand fir
red alder
bigleaf maple
salal
dull Oregon-grape
red huckleberry
Douglas-fir
baldhip rose
ocean-spray
false azalea
salmonberry
devil's club
Labrador tea
vanilla-leaf
swordfern
wall-lettuce
twinflower
hairy cat's ear
bracken
sweet-scented bedstraw
three-leaved foamflower
deer fern
lady fern
oak fern
skunk cabbage
step moss
Oregon beaked moss
lanky moss
electrified cat's-tail moss
red-stemmed feathermoss
juniper haircap moss
lichen
palm tree moss
coastal leafy moss
sphagnummoss

Grid No. 16

CWHxm	Very Dry Maritime Subzone

Site Series

- 01 HwFd - Kindbergia
 02 FdPl - Cladina
 03 FdHw - Salal
 04 Fd - Sword fern
 05 Cw - Sword fern
 06 HwCw - Deer fern
 07 Cw - Foamflower
 11 Pl - Sphagnum
 12 CwSs - Skunk cabbage



* See grid # 23 for site series 08 - 10.

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TREE LAYER

- Pseudotsuga menziesii
- Pinus contorta
- Abies lasiocarpa
- Picea engelmannii
- Abies amabilis
- Thuja plicata
- Tsuga mertensiana

SHRUB LAYER

- Juniperus communis
- Amelanchier alnifolia
- Spiraea betulifolia
- Paxistima myrsinifolia
- Vaccinium membranaceum
- Rhododendron albiflorum
- Menziesia ferruginea
- Ribes lacustre
- Vaccinium ovalifolium
- Arctostaphylos uva-ursi
- Calamagrostis rubescens
- Aster conspicuus
- Chimaphila umbellata
- Orthilia secunda
- Rubus pedatus
- Valeriana sitchensis
- Tiarella unifoliata
- Streptopus roseus
- Clintonia uniflora
- Cornus canadensis
- Thalictrum occidentale
- Arnica latifolia
- Athyrium filix-femina
- Gymnocarpium dryopteris
- Streptopus amplexifolius
- Equisetum spp.
- Leptarrhena pyrolifolia
- Polytrichum juniperinum
- Cladonia spp.
- Rhamacomitrium spp.
- Pleurozium schreberi
- Barbilophozia lycopodioides
- Rhytidopsis robusta

HERB LAYER

MOSS LAYER

Douglas-fir
lodgepole pine
subalpine fir
Engelmann spruce
amabilis fir
western redcedar
mountain hemlock
common juniper
saskatoon
birch-leaved spirea
falsebox
black huckleberry
white-flowered rhododendron
false azalea
black gooseberry
oval-leaved blueberry
kinnikinnick
pinegrass
showy aster
prince's pine
one-sided wintergreen
five-leaved bramble
Sitka valerian
one-leaved foamflower
rosy twistedstalk
queen's cup
bunchberry
western meadowrue
mountain amica
lady fern
oak fern
clasping twistedstalk
horsetail
leatherleaf saxifrage
juniper haircap moss
lichen
rock moss
red-stemmed feathermoss
common leafy liverwort
pipecleaner moss

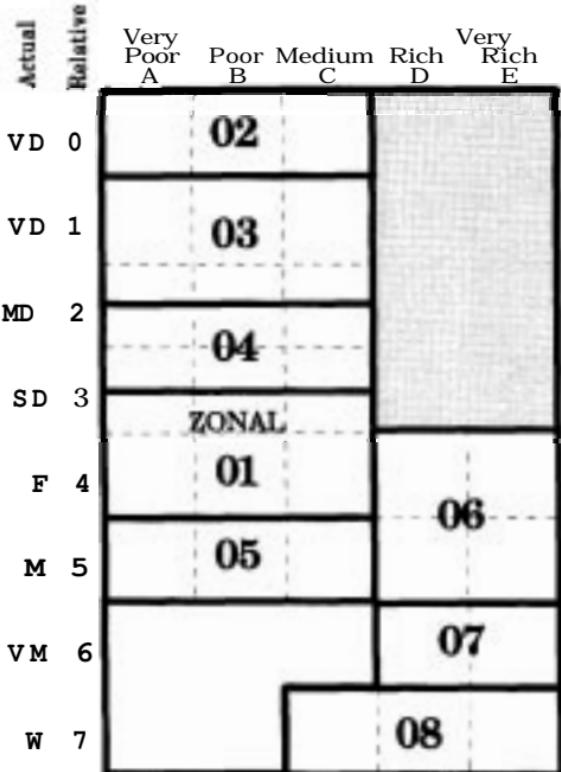
Grid No. 17

ESFfmw	Mist.	Warm
HSSP		Subzone

Site Series

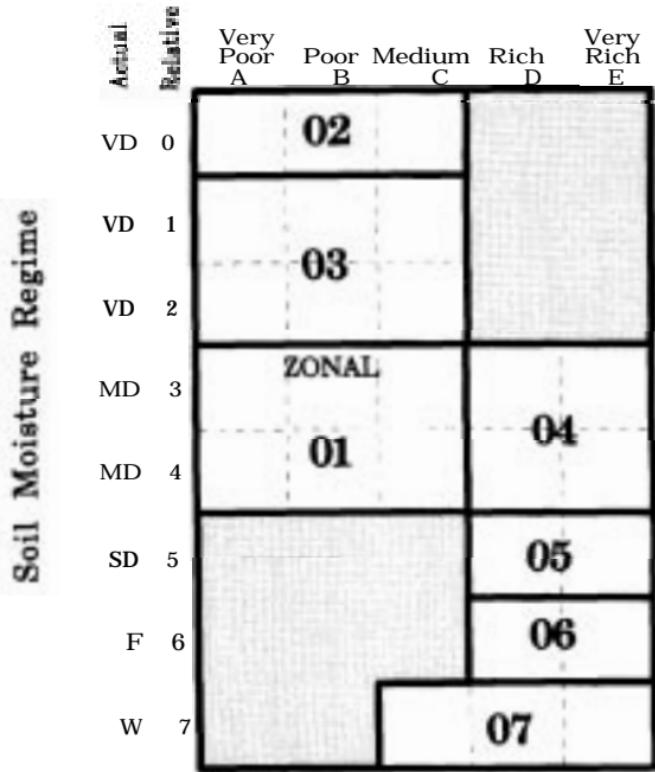
- 01 BlBa - Rhododendron
- 02 BlPl - Juniper-Rhacomitrium
- 03 Fd - Falsebox-Pinegrass
- 04 Bl - Huckleberry-Falsebox
- 05 BlBa - Azalea-Pipecleaner moss
- 06 Bl - Gooseberry-Valerian
- 07 BlBa - Oak fern-Lady fern
- 08 Bl - Gooseberry-Horsetail

Soil Moisture Regime



	Site Series	02*	03	01	04	05	06	07*	
TREE LAYER	<i>Pseudotsuga menziesii</i>	■	■	■	-	■	■	■	Douglas-fir
	<i>Pinus contorta</i>	■	■	-	-	■	■	-	lodgepole pine
	<i>Thuja plicata</i>	-	-	■	-	-	-	-	western redcedar
	<i>Tsuga heterophylla</i>	-	■	-	-	-	-	-	western hemlock
	<i>Betula papyrifera</i>	-	-	-	-	-	-	-	paperbirch
	<i>Picea engelmannii</i>	-	-	-	-	-	-	-	Engelmann spruce
SHRUB LAYER	<i>Amelanchier alnifolia</i>	■	■	■	-	-	-	-	saskatoon
	<i>Mahonia aquifolium</i>	■	■	■	-	-	-	-	tall Oregon-grape
	<i>Chimaphila umbellata</i>	■	■	■	-	-	-	-	prince's pine
	<i>Holodiscus discolor</i>	■	■	■	-	-	-	-	ocean-spray
	<i>Paxistima myrsinifolia</i>	■	■	■	-	-	-	-	falsebox
	<i>Spiraea betulifolia</i>	■	■	■	-	-	-	-	birch-leaved spirea
	<i>Rosa acicularis</i>	■	■	-	-	-	-	-	prickly rose
	<i>Arctostaphylos uva-ursi</i>	■	■	■	-	-	-	-	kinnikinnick
	<i>Rosa gymnocarpa</i>	■	■	■	-	-	-	-	baldhip rose
	<i>Lonicera ciliosa</i>	■	■	■	-	-	-	-	western trumpet honeysuckle
	<i>Acer circinatum</i>	■	■	■	-	-	-	-	vine maple
	<i>Corylus cornuta</i>	■	■	■	-	-	-	-	beaked hazelnut
	<i>Mahonia nervosa</i>	■	■	■	-	-	-	-	dull Oregon-grape
	<i>Acer glabrum</i>	■	■	■	-	-	-	-	Douglas maple
	<i>Rubus parviflorus</i>	■	■	■	-	-	-	-	thimbleberry
	<i>Cornus stolonifera</i>	■	■	■	-	-	-	-	red-osier dogwood
	<i>Oplopanax horridus</i>	■	■	■	-	-	-	-	devil's club
	<i>Viburnum edule</i>	■	■	■	-	-	-	-	highbush-cranberry
	<i>Trientalis latifolia</i>	■	■	■	-	-	-	-	broad-leaved starflower
HERB LAYER	<i>Calamagrostis rubescens</i>	■	■	■	-	-	-	-	pinegrass
	<i>Festuca occidentalis</i>	■	■	■	-	-	-	-	western fescue
	<i>Disporum hookeri</i>	■	■	■	-	-	-	-	Hooker's fairybells
	<i>Achlys triphylla</i>	■	■	■	-	-	-	-	vanilla-leaf
	<i>Athyrium filix-femina</i>	■	■	■	-	-	-	-	lady fern
	<i>Circaeaa alpina</i>	■	■	■	-	-	-	-	enchanter's nightshade
	<i>Tiarella unifoliata</i>	■	■	■	-	-	-	-	one-leaved foamflower
	<i>Equisetum arvense</i>	■	■	■	-	-	-	-	common horsetail
MOSS LAYER	<i>Lysichiton americanum</i>	■	■	■	-	-	-	-	skunk cabbage
	<i>Hylocomium splendens</i>	■	■	■	-	-	-	-	step moss
	<i>Rhytidadelphus triquetus</i>	■	■	■	-	-	-	-	electrified cat's-tail moss
	<i>Pleurozium schreberi</i>	■	■	■	-	-	-	-	red-stemmed feathermoss
	<i>Cladonia spp.</i>	■	■	■	-	-	-	-	lichen
	<i>Peltigera aphthosa</i>	■	■	■	-	-	-	-	freckled lichen
	<i>Plagiomnium insigne</i>	■	■	■	-	-	-	-	coastal leafy moss

Soil Nutrient Regime



Site Series

- | | |
|---------------------|------------------|
| Grid No. | 18 |
| Site Classification | DDFWWW |
| | DDCP Wet Subzone |
- 01 FdCw - Hazelnut
 - 02 FdPl - Peltigera
 - 03 Fd - Falsebox-Feathermoss
 - 04 Fd - Douglas maple-Fairybells
 - 05 CwFd - Vine maple
 - 06 Cw - Devil's club-Ladyfern
 - 07 CwSwx - Skunk cabbage

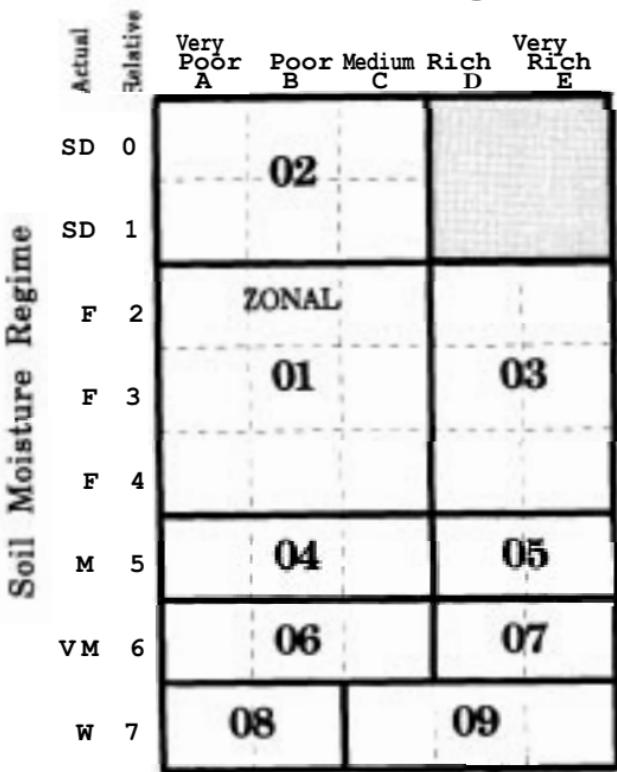
	Site Series	02	01	03	04	05	06*	07*	08*	09	
TREE LAYER	<i>Tsuga mertensiana</i>	■									mountain hemlock
	<i>Abies amabilis</i>	■									amabilis fir
SHRUB LAYER	<i>Chamaecyparis nootkatensis</i>	■									yellow-cedar
	<i>Tsuga heterophylla</i>										western hemlock
HERB LAYER	<i>Vaccinium ovalifolium</i>	■									oval-leaved blueberry
	<i>Vaccinium alaskense</i>										Alaskan blueberry
MOSS LAYER	<i>Menziesia ferruginea</i>										false azalea
	<i>Cladodanthus pyroliflorus</i>	■									copperbush
	<i>Vaccinium membranaceum</i>	■									black huckleberry
	<i>Rhododendron albiflorum</i>	■									white-flowered rhododendron
	<i>Vaccinium deliciosum</i>	■									blue-leaved huckleberry
	<i>Rubus spectabilis</i>										salmonberry
	<i>Oplopanax horridus</i>										devil's club
	<i>Alnus viridis</i>										green alder
	<i>Rubus pedatus</i>	■									five-leaved bramble
	<i>Phillyedoce empetrifoliformis</i>	■									pink mountain-heather
	<i>Cassiope mertensiana</i>										white mountain-heather
	<i>Blechnum spicant</i>										deer fern
	<i>Streptopus roseus</i>										rosy twistedstalk
	<i>Streptopus streptopoides</i>										small twistedstalk
	<i>Streptopus amplexifolius</i>										clasping twistedstalk
	<i>Athyrium filix-femina</i>										lady fern
	<i>Gymnocarpium dryopteris</i>										oak fern
	<i>Tiarella unifoliata</i>										one-leaved foamflower
	<i>Tiarella trifoliata</i>										three-leaved foamflower
	<i>Veratrum viride</i>										Indian hellebore
	<i>Fauria crista-galli</i>										deer-cabbage
	<i>Coptis asplenifolia</i>										fern-leaved goldthread
	<i>Caltha leptosepala</i>										white marsh-marigold
	<i>Lysichiton americanum</i>										skunk cabbage
	<i>Valeriana sitchensis</i>										Sitka valerian
	<i>Carex spp.</i>										sedge
	<i>Rhytidiodelphus loreus</i>	■									lanky moss
	<i>Rhytidiodopsis robusta</i>		■								pipecleaner moss
	<i>Dicranum fuscescens</i>			■							curly heron's-bill moss
	<i>Barbilophozia florkei</i>				■						mountain leafy liverwort
	<i>Cladonia spp.</i>	■									lichens
	<i>Dicranum scoparium</i>										broom moss
	<i>Rhizomnium nudum</i>										leafy moss
	<i>Sphagnum spp.</i>										sphagnum moss
											Less than 4 plots.

Grid No. 19

MHmml	Windward Moist Maritime MH Variant
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Site Series

- 01 HmBa - Blueberry
 02 HmBa - Mountain-heather
 03 BaHm - Oak fern
 04 HmBa - Bramble
 05 BaHm - Twistedstalk
 06 HmYc - Deer-cabbage
 07 YcHm - Hellebore
 08 HmYc - Sphagnum
 09 YcHm - Skunk cabbage



	Site Series	02	01	03	04	05	06*	07	08*	09
TREE LAYER	<i>Tsuga mertensiana</i>	■	■	■	■	■	■	■	■	■
	<i>Abies amabilis</i>	■	■	■	■	■	■	■	■	■
SHRUB LAYER	<i>Chamaecyparis nootkatensis</i>	■	■	■	■	■	■	■	■	■
	<i>Tsuga heterophylla</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Abies lasiocarpa</i>	■	■	■	■	■	■	■	■	■
	<i>Menziesia ferruginea</i>	■	■	■	■	■	■	■	■	■
MOSS LAYER	<i>Vaccinium alaskaense</i>	■	■	■	■	■	■	■	■	■
	<i>Vaccinium ovalifolium</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Vaccinium membranaceum</i>	■	■	■	■	■	■	■	■	■
	<i>Rhododendron albiflorum</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Cladodramnus pyroliflorus</i>	■	■	■	■	■	■	■	■	■
	<i>Vaccinium deliciosum</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Olopanax horridus</i>	■	■	■	■	■	■	■	■	■
	<i>Rubus pedatus</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Phyllodoce empetriflora</i>	■	■	■	■	■	■	■	■	■
	<i>Streptopus roseus</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Cassiope mertensiana</i>	■	■	■	■	■	■	■	■	■
	<i>Veratrum viride</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Gymnocarpium dryopteris</i>	■	■	■	■	■	■	■	■	■
	<i>Tiarella unifoliata</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Athyrium filix-femina</i>	■	■	■	■	■	■	■	■	■
	<i>Valeriana sitchensis</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Leptarrhena pyrolifolia</i>	■	■	■	■	■	■	■	■	■
	<i>Blechnum spicant</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Fauriacrista-galli</i>	■	■	■	■	■	■	■	■	■
	<i>Coptis asplenifolia</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Calamagrostis nutkaensis</i>	■	■	■	■	■	■	■	■	■
	<i>Caltha leptosepala</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Carex spp.</i>	■	■	■	■	■	■	■	■	■
	<i>Lysichiton americanum</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Rhytidiodipsos robusta</i>	■	■	■	■	■	■	■	■	■
	<i>Rhytidiodelphus loereus</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Pleurozium schreberi</i>	■	■	■	■	■	■	■	■	■
	<i>Dicranum scoparium</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Barbilophozia floerkei</i>	■	■	■	■	■	■	■	■	■
	<i>Hylocomium splendens</i>	■	■	■	■	■	■	■	■	■
HERB LAYER	<i>Dicranum fuscescens</i>	■	■	■	■	■	■	■	■	■
	<i>Rhizomnium nudum</i>	■	■	■	■	■	■	■	■	■
MOSS LAYER	<i>Sphagnum gigrense</i>	■	■	■	■	■	■	■	■	■
	<i>Sphagnum spp.</i>	■	■	■	■	■	■	■	■	■

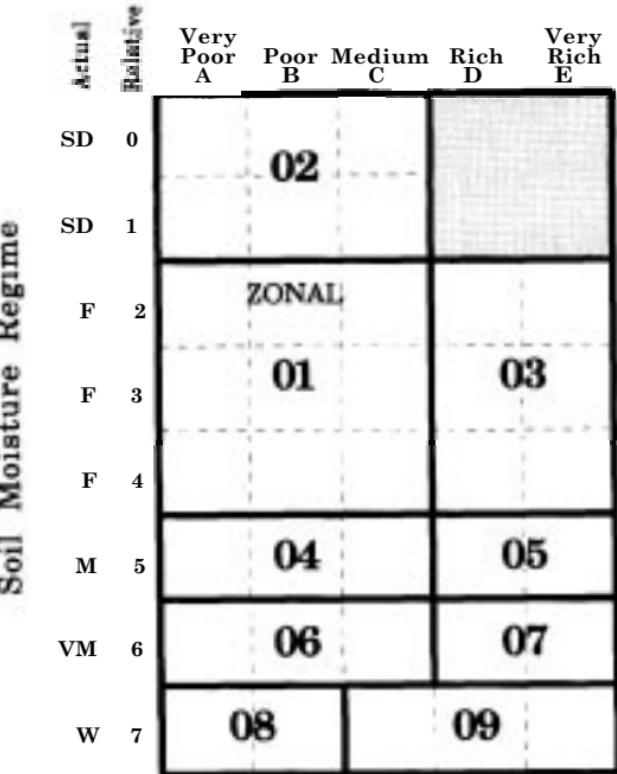
* Less than 4 plots.

Grid No. 20

MH	Hmm2	Leward	Moist	Maritime
		MH Variant		

Site Series

- 01 HmBa - Blueberry
 02 HmBa - Mountain-heather
 03 BaHm - Oak fern
 04 HmBa - Bramble
 05 BaHm - Twistedstalk
 06 HmYc - Deer-cabbage
 07 YcHm - Hellebore
 08 HmYc - Sphagnum
 09 YcHm - Skunk cabbage



	Site Series		02*	01	03	04	05	06*	07	08*	09	
TREE LAYER	<i>Chamaecyparis nootkatensis</i>		■	■	■	■	■	■	■	■	■	Less than 4 plots
SHRUB LAYER	<i>Tsuga mertensiana</i>		■	■								mountain hemlock
HERB LAYER	<i>Tsuga heterophylla</i>		■									western hemlock
MOSS LAYER	<i>Thuja plicata</i>		■									western redcedar
	<i>Abies amabilis</i>		■									amabilis fir
	<i>Picea sitchensis</i>											Sitka spruce
	<i>Pinus contorta</i>											lodgepole pine
SHRUB LAYER	<i>Vaccinium alaskaense</i>		■									Alaskan blueberry
HERB LAYER	<i>Vaccinium ovalifolium</i>		■									oval-leaved blueberry
MOSS LAYER	<i>Cassiope stellariana</i>		■									Alaskan mountain-heather
	<i>Alnus viridis</i>											green alder
SHRUB LAYER	<i>Menziesia ferruginea</i>											false azalea
HERB LAYER	<i>Coptis aspleniifolia</i>		■									fern-leaved goldthread
MOSS LAYER	<i>Cornus canadensis</i>											bunchberry
	<i>Rubus pedatus</i>											five-leaved bramble
SHRUB LAYER	<i>Veratrum eschscholtzii</i>											Indian hellebore
HERB LAYER	<i>Phyllocladus empetrifolius</i>		■									pink mountain-heather
MOSS LAYER	<i>Cassiope mertensiana</i>											white mountain-heather
	<i>Luetkea pectinata</i>											partridgefoot
SHRUB LAYER	<i>Streptopus roseus</i>											rosy twistedstalk
HERB LAYER	<i>Calamagrostis nutkaensis</i>											Pacific reedgrass
MOSS LAYER	<i>Lycopodium clavatum</i>											running clubmoss
	<i>Caltha leptosepala</i>											white marsh-marigold
SHRUB LAYER	<i>Fauria crista-galli</i>											deer-cabbage
HERB LAYER	<i>Gymnocarpium dryopteris</i>											oak fern
MOSS LAYER	<i>Lysichiton americanum</i>											skunk cabbage
	<i>Athyrium filix-femina</i>											lady fern
SHRUB LAYER	<i>Valeriana sitchensis</i>											Sitka valerian
HERB LAYER	<i>Rhytidiodelphus loreus</i>											lanky moss
MOSS LAYER	<i>Dicranum scoparium</i>											broom moss
	<i>Peltigera aphthosa</i>											freckled lichen
SHRUB LAYER	<i>Pleurozium schreberi</i>											red-stemmed feathermoss
HERB LAYER	<i>Scapania bolanderi</i>											scapania
MOSS LAYER	<i>Hylocomium splendens</i>											step moss
	<i>Pellia neesiana</i>											shiny liverwort
SHRUB LAYER	<i>Sphagnum girgensohnii</i>											common green sphagnum
HERB LAYER	<i>Rhytidopsis robusta</i>											pipecleaner moss
MOSS LAYER	<i>Rhizomnium nudum</i>											leafy moss
	<i>Sphagnum spp.</i>											sphagnum moss

Grid No. 21

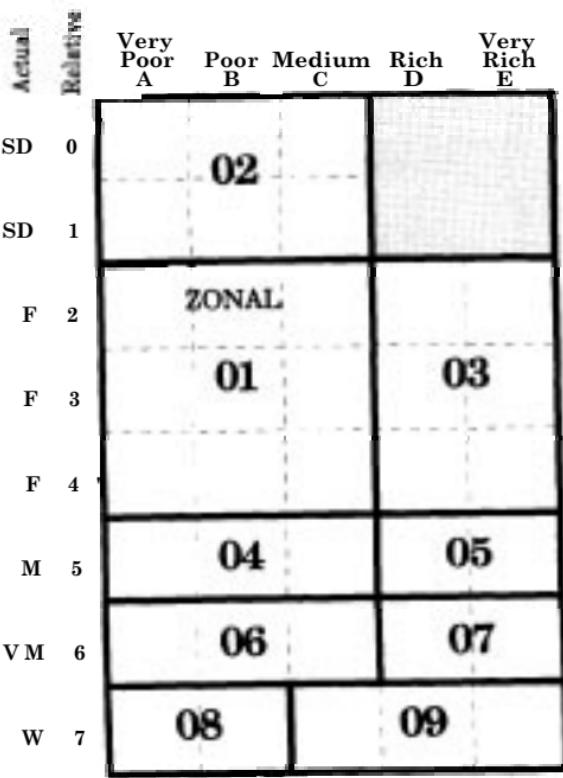
MHwh	Wet MH Subzone

Site Series

- 01** HmSs - Blueberry
02 HmYc - Mountain-heather
03 SsHm - Reedgrass
04 HmYc - Goldthread
05 YcHm - Twistedstalk
06 HmYc - Deer-cabbage
07 YcHm - Hellebore
08 HmYc - Sphagnum
09 YcHm - Skunk cabbage

Soil Moisture Regime

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	Site Series			CDFmm			CWHdm, ds1, xm			CWHds2			* Less than 4 plots.
	07	08	09*	06	09	10	08*	09	10*	08*	09	10*	* Less than 4 plots.
TREE LAYER	<i>Alnus rubra</i>	■	■	■	■	■	■	■	■	■	■	■	red alder
	<i>Populus trichocarpa</i>	■											black cottonwood
	<i>Thuja plicata</i>	■	■										western redcedar
	<i>Acer macrophyllum</i>	■	■										bigleaf maple
	<i>Tsuga heterophylla</i>	■											western hemlock
	<i>Pseudotsuga menziesii</i>	■											Douglas-fir
	<i>Picea sitchensis</i>	■											Sitka spruce
	<i>Abies grandis</i>	■											grand fir
	<i>Rubus spectabilis</i>	■											salmonberry
	<i>Sambucus racemosa</i>	■											red elderberry
SHRUB LAYER	<i>Olopanax horridus</i>	■											devil's club
	<i>Ribes bracteosum</i>	■											stink currant
	<i>Lonicera utahensis</i>	■											Utah honeysuckle
	<i>Symporicarpos albus</i>	■											common snowberry
	<i>Lonicera involucrata</i>	■											black twinberry
	<i>Oemleria cerasiformis</i>	■											Indian-plum
	<i>Cornus stolonifera</i>	■											red-osier dogwood
	<i>Salix spp.</i>	■											willow
	<i>Smilacina stellata</i>	■											star-flowered false solomon's-seal
	<i>Elymus glaucus</i>	■											blue wildrye
HERB LAYER	<i>Maianthemum dilatatum</i>	■											false lily-of-the-valley
	<i>Polystichum munitum</i>	■	■										sword fern
	<i>Tolmiea menziesii</i>	■											piggy-back plant
	<i>Osmorhiza chilensis</i>	■											mountain sweet-cicely
	<i>Athyrium filix-femina</i>	■											lady fern
	<i>Achlys triphylla</i>	■											vanilla-leaf
	<i>Tiarella trifoliata</i>	■											three-leaved foamflower
	<i>Dryopteris expansa</i>	■											spiny wood fern
	<i>Disporum hookeri</i>	■											Hooker's fairybells
	<i>Tiarella unifoliata</i>	■											one-leaved foamflower
MOSS LAYER	<i>Pyrola asarifolia</i>	■											pink wintergreen
	<i>Equisetum hyemale</i>	■											scouring-rush
	<i>Equisetum arvense</i>	■											common horsetail
	<i>Kindbergia praelonga</i>	■											palm tree moss
	<i>Leucolepis menziesii</i>	■											coastal leafy moss
	<i>Plagiomnium insigne</i>	■											electrified cat's-tail moss
	<i>Rhytidadelphus triquetrus</i>	■											

FLOODPLAINS**Grids No: 22-24****Grid No. 22****CDFmm**

High Bench

07 Cw - Snowberry

Medium Bench

08 Act - Red-osier dogwood

Low Bench

09 Act - Willow

Medium to very rich soil nutrient regime

Grid No. 23**CWHdm, CWHds1, CWHxm**

High Bench

08 Ss - Salmonberry

Medium Bench

09 Act - Red-osier dogwood

Low Bench

10 Act - Willow

Medium to very rich soil nutrient regime

Grid No. 24**CWHds2**

High Bench

08 Ss - Salmonberry

Medium Bench

09 Act - Red-osier dogwood

Low Bench

10 Act - Willow

Medium to very rich soil nutrient regime

Site Series		CWHmm1			CWHms			CWHwh1			
		08	09	10*	07	08	09	08*	09	10*	
TREE LAYER	<i>Picea sitchensis</i>	■	■		■	■		■	■		
	<i>Thuja plicata</i>	■	■		■	■		■	■		
	<i>Tsuga heterophylla</i>	■			■	■		■	■		
	<i>Alnus rubra</i>	■			■	■		■	■		
	<i>Abies amabilis</i>				■	■		■	■		
SHRUB LAYER	<i>Populus trichocarpa</i>	■			■	■		■	■		
	<i>Rubus spectabilis</i>	■	■		■	■		■	■		
	<i>Vaccinium parvifolium</i>	■			■	■		■	■		
	<i>Vaccinium alaskaense</i>	■			■	■		■	■		
	<i>Viburnum edule</i>				■	■		■	■		
	<i>Rubus parviflorus</i>				■	■		■	■		
	<i>Olopanax horridus</i>	■			■	■		■	■		
	<i>Cornus stolonifera</i>				■	■		■	■		
	<i>Ribes bracteosum</i>	■			■	■		■	■		
	<i>Sambucus racemosa</i>				■	■		■	■		
HERB LAYER	<i>Lonicera involucrata</i>	■			■	■		■	■		
	<i>Salix</i> spp.				■	■		■	■		
	<i>Athyrium filix-femina</i>	■	■		■	■		■	■		
	<i>Stachys cooleyae</i>				■	■		■	■		
	<i>Dryopteris expansa</i>				■	■		■	■		
	<i>Gymnocarpium dryopteris</i>	■	■		■	■		■	■		
	<i>Maianthemum dilatatum</i>	■	■		■	■		■	■		
	<i>Trautvetteria carolinensis</i>	■	■		■	■		■	■		
	<i>Polystichum munitum</i>	■	■		■	■		■	■		
	<i>Tiarella trifoliata</i>	■	■		■	■		■	■		
MOSS LAYER	<i>Galium triflorum</i>	■	■		■	■		■	■		
	<i>Blechnum spicant</i>	■	■		■	■		■	■		
	<i>Circaeal alpina</i>				■	■		■	■		
	<i>Melica subulata</i>				■	■		■	■		
	<i>Trisetum cernuum</i>				■	■		■	■		
	<i>Elymus</i> spp.				■	■		■	■		
	<i>Equisetum hyemale</i>				■	■		■	■		
	<i>Rhytidiodelphus loreus</i>	■	■		■	■		■	■		
	<i>Kindbergia oregana</i>				■	■		■	■		
	<i>Hylocomium splendens</i>	■	■		■	■		■	■		
<i>Rhizomnium glabrescens</i>				■	■		■	■			
<i>Leucolepis menziesii</i>	■	■		■	■		■	■			
<i>Plagiomnium insigne</i>				■	■		■	■			
<i>Kindbergia praelonga</i>	■	■		■	■		■	■			
<i>Concocephalum conicum</i>				■	■		■	■			
											* less than 4 plots.

FLOODPLAINS

Grids No: 25 - 27

Grid No. 25

CWHmm1

High Bench

08	Ss - Salmonberry
----	------------------

Medium Bench

09	Act - Red-osier dogwood
----	-------------------------

Low Bench

10	Act - Willow
----	--------------

Medium to very rich soil nutrient regime

Grid No. 26

CWHms1, CWHms2

High Bench

07	Ss - Salmonberry
----	------------------

Medium Bench

08	Act - Red-osier dogwood
----	-------------------------

Low Bench

09	Act - Willow
----	--------------

Medium to very rich soil nutrient regime

Grid No. 27

CWHwh1

High Bench

07	Ss - Lily-of-the-valley
----	-------------------------

Medium Bench

08	Ss - Trisetum
----	---------------

Low Bench

09	Dr - Lily-of-the-valley
----	-------------------------

Medium to very rich soil nutrient regime

	Site Series		CWHvh1,CWHvh2			CWHvm1			CWHws2			
	08	09	10	09	10	11	07	08	09			
TREE LAYER	<i>Picea sitchensis</i>	■	■		■		■	■				
	<i>Tsuga heterophylla</i>		■									
	<i>Thuja plicata</i>											
	<i>Abies amabilis</i>											
	<i>Alnus rubra</i>		■				■	■				
SHRUB LAYER	<i>Populus trichocarpa</i>	■										
	<i>Rubus spectabilis</i>		■									
	<i>Vaccinium ovalifolium</i>			■	■							
	<i>Ribes bracteosum</i>											
	<i>Olopanax horridus</i>											
HERB LAYER	<i>Vaccinium alaskaense</i>											
	<i>Sambucus racemosa</i>											
	<i>Cornus stolonifera</i>											
	<i>Salix spp.</i>									■		
	<i>Athyrium filix-femina</i>	■										
MOSS LAYER	<i>Streptopus amplexifolius</i>		■									
	<i>Tiarella trifoliata</i>		■									
	<i>Blechnum spicant</i>		■									
	<i>Maianthemum dilatatum</i>			■								
	<i>Polystichum munatum</i>				■							
	<i>Viola glabella</i>					■						
	<i>Gymnocarpium dryopteris</i>						■					
	<i>Streptopus roseus</i>							■				
	<i>Tiarella unifoliata</i>								■			
	<i>Melica subulata</i>									■		
	<i>Disporum hookeri</i>										■	
	<i>Stachys cooleyae</i>											■
	<i>Trisetum cernuum</i>											
	<i>Circaea alpina</i>											
	<i>Equisetum arvense</i>											
	<i>Clintonia uniflora</i>											
	<i>Pyrola asarifolia</i>											
	<i>Plagiognathus insigne</i>											
	<i>Rhytidiodelphus loreus</i>											
	<i>Hylocomium splendens</i>											
	<i>Rhizomnium glabrescens</i>											
	<i>Kindbergia praelonga</i>											
	<i>Rhacomitrium spp.</i>											
	<i>Cladonia spp.</i>											

Less than 4 plots.

FLOODPLAINS**Grids No: 28- 30****Grid No. 28****CWHvh1, CWHvh2**

High Bench	08	Ss - Lily-of-the-valley
Medium Bench	09	Ss - Trisetum
Low Bench	10	Dr - Lily-of-the-valley

Medium to very rich soil nutrient regime

Grid No. 29**CWHvm1**

High Bench	09	Ss - Salmonberry
Medium Bench	10	Ad - Red-osier dogwood
Low Bench	11	Act - Willow

Medium to very rich soil nutrient regime

Grid No. 30**CWHws2**

High Bench	07	Ss - Salmonberry
Medium Bench	08	Act - Red-osier dogwood
Low Bench	09	Ad - Willow

Medium to very rich soil nutrient regime

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	Site Series	CDFmm 12	CDFmm 13	CDFmm 14	CWHdm,CWHxm 13	CWHdm,CWHxm 14	CWHdm,CWHxm 15		
TREE LAYER	<i>Alnus rubra</i> <i>Abies grandis</i> <i>Pseudotsuga menziesii</i> <i>Acer macrophyllum</i> <i>Cornus nuttallii</i> <i>Populus trichocarpa</i> <i>Rubus ursinus</i> <i>Symporicarpos albus</i> <i>Rubus spectabilis</i> <i>Oemleria cerasiformis</i> <i>Rubus parviflorus</i> <i>Gaultheria shallon</i> <i>Holodiscus discolor</i> <i>Mahonia nervosa</i> <i>Sambucus racemosa</i> <i>Cornus stolonifera</i> <i>Lonicera involucrata</i> <i>Malus fusca</i> <i>Physocarpus capitatus</i> <i>Polystichum munitum</i> <i>Tiarella trifoliata</i> <i>Achlys triphylla</i> <i>Lactuca muralis</i> <i>Carex obnupta</i> <i>Oenanthe sarmentosa</i> <i>Maianthemum dilatatum</i> <i>Stachys cooleye</i> <i>Athyrium felix-femina</i> <i>Claytonia sibirica</i> <i>Festuca subulata</i> <i>Pteridium aquilinum</i> <i>Trautvetteria carolinensis</i> <i>Dicentra formosa</i> <i>Galium trifidum</i> <i>Osmorhiza chilensis</i> <i>Lysichiton americanum</i> <i>Kindbergia praelonga</i> <i>Leucolepis menziesii</i> <i>Plagiomnium insigne</i> <i>Kindbergia oregana</i>	■■■■■	■■■■■	■■■	■■■■■	■■■■■	■■■■■	■■■■■	red alder grand fir Douglas-fir bigleaf maple western flowering dogwood black cottonwood trailing blackberry common snowberry salmonberry Indian-plum thimbleberry salal ocean-spray dull Oregon-grape red elderberry red-osier dogwood black twinberry Pacific crab apple Pacific ninebark sword fern three-leaved foamflower vanilla-leaf wall-lettuce slough sedge water-parsley false lily-of-the-valley Cooley's hedge-nettle lady fern Siberian miner's-lettuce bearded fescue bracken false bugbane bleeding heart small bedstraw mountain sweet-cicely skunk cabbage
SHRUB LAYER									
HERB LAYER									
MOSS LAYER								palm tree moss coastal leafy moss Oregon beaked moss	

**SITES WITH STRONGLY
FLUCTUATING WATER TABLES**
Grids No: 31 - 32

Grid No. 31

Relative SMR	Winter SMR	CDFmm	Summer SMR
5f	VM	12 Cw - Vanilla-leaf	SD
6f	W	13 Cw - Indian-plum	F
7f	VW	14 Cw - Slough sedge	M

Medium to very rich soil nutrient regime

Grid No. 32

Relative SMR	Winter SMR	CWHdm, CWHxm	Summer SMR
5f	VM	13 Cw - Salmonberry	F
6f	W	14 Cw - Black twinberry	M
7f	VW	15 Cw - Slough sedge	VM

Medium to very rich soil nutrient regime

Site Series	CWHwh					CWHyh				Less than 4 plots.
	13	14	15*	16	17	14	15	16	17	
TREE LAYER	Picea sitchensis Thuja plicata Tsuga heterophylla Alnus rubra Gaultheria shallon Rubus spectabilis Vaccinium parvifolium Menziesia ferruginea Malus fusca Lonicera involucrata Vaccinium ovatum Salix hookeriana Blechnum spicant	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	Sitka spruce western redcedar western hemlock red alder salal salmonberry red huckleberry false azalea Pacific crab apple black twinberry evergreen huckleberry Hooker's willow deer fern false lily-of-the-valley sword fern bracken
SHRUB LAYER	Vaccinium parvifolium Menziesia ferruginea Malus fusca Lonicera involucrata Vaccinium ovatum Salix hookeriana Blechnum spicant Maianthemum dilatatum Polystichum munitum Pteridium aquilinum	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	Pacific crab apple black twinberry evergreen huckleberry Hooker's willow deer fern false lily-of-the-valley sword fern bracken
HERB LAYER	Calamagrostis nutkaensis Carex obnupta Lysichiton americanum Kindbergia oregana Plagiothecium undulatum Hylocomium splendens Rhytidiodelphus loreus Rhizomnium glabrescens Kindbergia praelonga Rhizomnium punctatum Peltigera polydactyla Isothecium myosuroides Dicranum fuscescens Pleurozium schreberi Fontinalis neomexicana	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	Pacific reedgrass slough sedge skunk cabbage Oregon beaked moss flat moss step moss lanky moss large leafy moss
MOSS LAYER	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	curly heron's-bill moss red-stemmed feathermoss

SHORELINE/OCEANSPRAY SITES**Grid No. 33****CWHwh, CWHvh****Soil Moisture Regime**

SD	^a 13/14 ^b	Ss - Salal	Rocky headland
F	14/15	Ss-Kindbergia	Old Beachplain

Very poor to medium soil nutrient regime

SD-F	15/16	Ss - Reedgrass	Rocky headland
M	16/17	Ss - Sword fern	Marine terrace/scarp
W	17/18	Ss - Slough sedge	Fluctuating brackish water

Rich to very rich soil nutrient regime

^a Site series numbers for CWHwh.^b Site series numbers for CWHvh.

6.0 MANAGEMENT INTERPRETATIONS

6.1 Tree Species Selection

6.1.1 Edatopic grids

Recommended tree species for all recognized site series are displayed on edatopic grids. The grids are grouped by **general sites** (which includes the typical sequence of dry, nutrient-poor to wet, nutrient-rich sites) and **special sites** (which includes sites that reflect unique environmental properties - "floodplain sites," "sites with strongly fluctuating water table," and "shoreline and ocean spray sites"). An index of all tree species selection grids is shown in Table 24.

Within each site series box, the first line of tree species symbols (see Table 22 for explanation of symbols), shown in larger, boldface font, are the **general recommended species** (Figure 11). These apply under average conditions for a site series, without specific restrictions related to site, climate, or pest hazard. Unbracketed symbols represent "primary" species, which are the major recommended species to manage for. Symbols with square brackets represent "secondary" species, which have lower preference than primary species. Secondary species should be used more conservatively and should not dominate over primary species in a stand. This is particularly true for Hw on fresh to moist, nutrient-rich sites. Secondary species, however, are not limited to a minor stand component only. Symbols in round brackets are "tertiary" species, which are managed as a minor stand component (< 20-30%) or in limited areas.

The second line shown in smaller, lightface font are the **alternative recommended species**. These have specific restrictions to their application and may be used as alternatives to, or in addition to, the general recommended species under certain conditions described in the accompanying comments. These are generally considered secondary species because of their restrictions; however, they may form primary species where indicated in the comments.

On the special-site grids, general recommended species are shown in large, boldface font, and alternative species appear in small, lightface font. Coniferous options are shown on the left side and deciduous options are shown on the right.

TABLE 22. Tree species codes

Symbol	Common Name	Scientific name
Act	black cottonwood	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>
Ba	amabilis fir	<i>Abies amabilis</i>
Bg	grand fir	<i>Abies grandis</i>
Bl	subalpine fir	<i>Abies lasiocarpa</i>
Bp	noble fir	<i>Abies procera</i>
Cw	western redcedar	<i>Thuja plicata</i>
Dr	red alder	<i>Alnus rubra</i>
Fd	Douglas-fir	<i>Pseudotsuga menziesii</i>
Hm	mountain hemlock	<i>Tsuga mertensiana</i>
Hw	western hemlock	<i>Tsuga heterophylla</i>
Lw	western larch	<i>Larix occidentalis</i>
Pl	lodgepole pine	<i>Pinus contorta</i>
Pw	western white pine	<i>Pinus monticola</i>
Py	ponderosa pine	<i>Pinus ponderosa</i>
Se	Engelmann spruce	<i>Picea engelmannii</i>
Ss	Sitka spruce	<i>Picea sitchensis</i>
Sxs	hybrid spruce	<i>Picea sitchensis x engelmannii</i>
Yc	yellow-cedar	<i>Chamaecyparis nootkatensis</i>

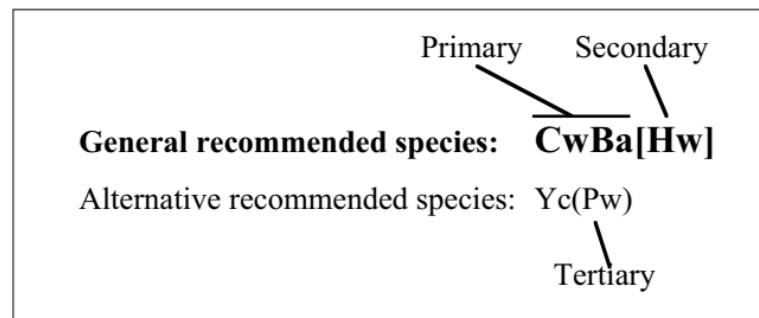


FIGURE 11. Explanation of symbols used for tree species selection on edatopic grids.

6.1.2. Accompanying comments

Comments on the recommended tree species appear on the facing page for each edatopic grid. **General comments** describe features or conditions broadly related to the biogeoclimatic unit. **Specific comments** describe conditions when alternative recommended species are suitable and other site series-specific information. Species introduced beyond their normal range, such as western larch, noble fir, and Engelmann spruce, are discussed in the comments but not shown on the grids because they should be used conservatively. Specific comments are referenced by site series number. Information presented on the grids is incomplete without the accompanying comments.

It is critical that you always check the comments when you review recommended tree species!

6.1.3. Suggested stand composition

The tree species recommendations represent suggested stand composition to manage towards in maturing stands. Mixed-species stands are recommended for most sites. Compared to single-species stands, mixed stands of compatible species can:

- enhance stand yield through more complete use of the available growing site and improved soil nutrition.
- improve stand reliability by reducing disease and insect hazards and enhancing windfirmness.
- improve wood quality by encouraging natural branch pruning.
- enhance floristic and structural diversity and provide habitat for a greater variety of animals.

The particular mixture used depends on the site, stand objectives, and compatibility of the species options. For example, yield may be improved in a mixture of less shade-tolerant Douglas-fir with more shade-tolerant grand fir, or by including a component of redcedar or red alder with Douglas-fir on a nutrient-poor site. Windfirmness is enhanced in a mixed western hemlock - redcedar stand because redcedar has a more extensive root system. Root disease impact can be reduced by mixing a resistant species with a more susceptible species. Diversity of

bird populations can be increased by including a deciduous component in the stand.

On the grids, two or more recommended species are listed for most site series. Two species represent the suggested composition of mature stands to manage towards. If more than two species are recommended, at least two of these are suggested for a stand's composition. You should include the first species listed, plus one of the others. See Table 23 for a list of suggested combinations of species. These combinations are based on compatibility in shade tolerance, nutritional requirements, and compositions observed in natural mature stands.

TABLE 23. Some recommended combinations of tree species for mixed-species stands (combinations are repeated with species in reverse order)

BaCw	CwBa	FdPw	SeBa
BaHm	CwBg	HmBa	SeBg
BaHw	CwFd	HmYc	SeBl
BaSe	CwHw	HwBa	SeCw
BaSs	CwPl	HwCw	SeHw
BaYc	CwPy	HwSe	SeYc
BgCw	CwSe	HwSs	SsBa
BgFd	CwSs	PIBl	SsCw
BgSe	FdBg	PICw	SsHw
BIFd	FdBl	PwFd	YcBa
BIPI	FdCw	PyCw	YcHm
BlSe			YcSe

The following examples describe some stand composition options for selected site series:

CWHvm1/HwBa - Blueberry (#01)

Hw Ba Cw (with minor Ss in northern portion)

Hw Ba (with minor Ss in northern portion)

Hw Cw (on nutrient-poor salal sites)

Fd Cw (on rapidly drained S-aspects in southern portion)

CWHxm/HwFd - Kindbergia (#01)

Fd (Cw) (with minor Pw if blister rust controlled)

Hw (Cw) (in the wetter portion)

Fd (HwCw) (with minor Pw if blister rust controlled)

Hw (FdCw) (in the wetter portion)

CWHms1/HwBa - Step moss (#01)

Fd (Cw)

Se (Cw) (in upper elevations in eastern portion)

Hw Ba (Cw) (in higher elevations and fresh N-aspects)

(Bp) (as a minor in the above on nutrient-medium sites)

6.1.4. Application

The tree species selection guidelines provide species **recommendations**, which are used with other information to develop pre-harvest silviculture **prescriptions**. The recommended species presented in the guidelines **do not, in themselves, represent prescriptions**.

To determine a tree species prescription:

- 1.** Identify the site.
- 2.** Review the tree species options in the grids and review the associated comments. If the site is in a transitional area, check recommendations for neighbouring site series or biogeoclimatic units.
- 3.** Review management objectives regarding timber production goals and other resource values.
- 4.** Check local performance of the tree species options. Focus on factors that may negatively affect establishment, productivity, and reliability, such as disease, insects, nutritional limitations, snow, and frost.
- 5.** Estimate the potential (species, density, vigour) of advance and post-logging natural regeneration.
- 6.** Evaluate the feasibility of establishing and maintaining the species options given existing constraints.

7. Determine the preferred/acceptable tree species composition and the appropriate reproduction method.

6.1.5 Background information

Additional information on tree species selection can be found in the following references. In particular, readers should review the section on silvical characteristics of major tree species in Klinka *et al.* (1990).

Krajina, V.J., K. Klinka, and J. Worrall. 1982. Ecological characteristics of trees and shrubs of British Columbia. University of British Columbia Press, Vancouver, B.C.

Klinka, K. and M.C. Feller. 1984. Principles used in selecting tree species for regeneration of forest sites in southwestern British Columbia. *For. Chron.* 60: 77-85.

Klinka, K., M.C. Feller, R.N. Green, D.V. Meidinger, J. Pojar, and J. Worrall. 1990. Ecological principles: applications. *In* D.P. Lavender, *et al.* (editors). *Regenerating British Columbia's forests*. University of British Columbia Press, Vancouver, B.C.

Silviculture Interpretations Working Group. 1993. Correlated guidelines for tree species selection and stocking standards for the ecosystems of British Columbia. B.C. Min. For. and For. Can., Victoria, B.C.

6.1.6 Recommended tree species grids

TABLE 24. Index of recommended tree species grids

Grid no.	Site category	Biogeoclimatic unit
1	General	CDFmm
2	General	CWHdm
3	General	CWHds1
4	General	CWHds2
5	General	CWHmm1
6	General	CWHmm2
7	General	CWHms1
8	General	CWHms2
9	General	CWHvh1
10	General	CWHvh2
11	General	CWHvm1
12	General	CWHvm2
13	General	CWHwh1
14	General	CWHwh2
15	General	CWHws2
16	General	CWHxm
17	General	ESSFmw
18	General	IDFww
19	General	MHmm1
20	General	MHmm2
21	General	MHwh
22	Special - Floodplains	CDFmm
23	Special - Floodplains	CWHdm,CWHds1,CWHxm
24	Special - Floodplains	CWHds2
25	Special - Floodplains	CWHmm1
26	Special - Floodplains	CWHms1,CWHms2
27	Special - Floodplains	CWHwh1
28	Special - Floodplains	CWHvh1,CWHvh2
29	Special - Floodplains	CWHvm1
30	Special - Floodplains	CWHws2
31	Special - Fluctuat water table	CDFmm
32	Special - Fluctuat. water table	CWHdm, CWHxm
33	Special - Shoreline/ocean spray	CWHwh,CWHvh

Comments: Grid No. 1 CDFmm

GENERAL COMMENTS:

- high hazard for laminated root rot; moderate hazard for Armillaria root rot
- where recommended on the grid, **Pi** is an alternative to **Fd** on sites affected by laminated root rot

SPECIFIC COMMENTS:

- 01** **Pi** is an alternative to **Fd** on nutrient very poor to poor sites; **Bg** is a suitable minor species on nutrient-medium sites; **Cw** can function as non-crop (nurse) species
- 02** marginal sites for timber production; **Pi** is an alternative to **Fd** on nutrient very poor to poor sites
- 03** marginal sites for timber production; **Pi** is an alternative to **Fd** on the driest sites
- 04** n/a
- 05** n/a
- 06** n/a
- 10** marginal sites for timber production; elevated microsites are preferred
- 11** elevated microsites are preferred

Grid No. 1

CDFmm

Moist Maritime
CDF Subzone

Soil nutrient regime

		Relative				
		A	B	C	D	E
		Very Poor	Poor	Medium	Rich	Very Rich
VD	0	02			03	
VD	1		Fd			Fd
MD	2	01			04	
MD	3		Fd(Cw)		Fd(BgCw)	
MD	4		Pl(BgCw)			
SD	5	05			06	
F	6		Fd(Cw)		FdBgCw	
W	7	10	Pl(Cw)	11**	Cw	

See comments on facing page

* See grid # 22 for site series 07 - 09

** See grid # 31 for site series 12 - 14

Site series

01 Fd - Salal

05 CwFd - Kindbergia

02 FdPl - Arbutus

06 CwBg - Foamflower

03 Fd - Oniongrass

10 Pl - Sphagnum

04 FdBg - Oregon grape

11 Cw - Skunk cabbage

Comments: Grid No. 2 CWHdm

GENERAL COMMENTS:

- where recommended on the grid, **Lw** (on a trial basis) **Cw**, and **Pw** are alternatives to **Fd** on sites affected by laminated root rot
- **Lw** is recommended on a trial basis as a minor species on dry sites
- high hazard for Sitka spruce weevil, white pine blister rust, and laminated root rot; moderate hazard for Armillaria root rot

SPECIFIC COMMENTS:

- 01** **Hw** is an alternative to **Fd** in the wetter portion of the subzone; **Pw** is a suitable minor species
- 02** marginal sites for timber production; **Fd** is an alternative to **Pl**
- 03** **Lw** is a suitable minor species; **Cw** can function as a non-crop (nurse) species
- 04** **Lw** or **Pw** are suitable minor species
- 05** **Pw** is a suitable minor species
- 06** **Fd** is a suitable minor species except on very moist / nutrient very poor to poor sites
- 07** **Act** or **Dr** are alternative management options except on soils with strong gleying in the upper 30 cm; **Fd** should be restricted to elevated microsites on strongly gleyed soils
- 11** marginal sites for timber production; elevated microsites are preferred
- 12** **Pw** and **Ss** are suitable minor species; elevated microsites are preferred

Grid No. 2**CWHdm**Dry Maritime
CWH Subzone**Soil nutrient regime**

Soil moisture regime	Actual Relative	Very Poor A	Poor B	Medium C	Rich D	Very Rich E
		02 VD 0	PI Fd			
	MD 1	03		Fd(Cw)	04	Fd(Cw)
	MD 2					(Pw)
	SD 3	01		Fd(Cw)	05	FdCw
	F 4			Hw(Pw)		(Pw)
	M 5	06		HwCw	07 *	FdBgCw
	VM 6			(Fd)		AetDr
	W 7	11	PI(Cw)	12**	Cw(Hw) (PwSs)	

See comments on facing page

* See grid # 28 for site series 08 - 10

** See grid # 32 for site series 13 - 15

Site series

01 Hw - Flat moss**02** FdPl - Cladina**03** FdHw - Salal**04** Fd - Swordfern**05** Cw - Swordfern**06** HwCw - Deer fern**07** Cw - Foamflower**11** PI - Sphagnum**12** CwSs - Skunk cabbage

Comments: Grid No. 3 CWHds1

GENERAL COMMENTS:

- **Hw** is, in general, a less desirable species
- **Bp, Lw** and **Py** are recommended on a trial basis in the eastern portion of the variant
- **Bg** should only be applied south of 50°N latitude
- high hazard for white pine blister rust; moderate hazard for laminated root rot and Armillaria root rot

SPECIFIC COMMENTS:

- 01 **Lw** and **Pw** are suitable minor species
- 02 marginal sites for timber production; **Fd** is an alternative to **Pl**
- 03 **Pl** and **Py** are alternatives to **Fd** on nutrient very poor and medium sites, respectively; **Cw** can function as a non-crop (nurse) species
- 04 **Lw, Py**, and **Pw** are suitable minor species
- 05 **Se** is an alternative to **Fd** in the upper, eastern portion of the variant; **Bp** or **Pw** are alternatives to **Cw** in the upper portion of the variant
- 06 **Fd** is an alternative to **Hw** except on very moist / nutrient very poor to poor sites
- 07 **Bp** is an alternative to **Bg** in the upper portion of the variant; **Fd** should be restricted to elevated microsites on strongly gleyed soils
- 11 marginal sites for timber production; elevated microsites are preferred
- 12 elevated microsites are preferred

Grid No. 3

CWHdslSouthern Dry Submaritime
CWH Variant

Soil nutrient regime

		Soil moisture regime				
		Actual Relative				
		Very Poor A	Poor B	Medium C	Rich D	Very Rich E
VD	0	02	Pl Fd			
MD	1	03		Fd(Cw)	04	Fd(Cw)
MD	2			Pl		(Pw)
SD	3	01		Fd(Cw)	05	Fd(Cw)
F	4			(Pw)		Se(Pw)
M	5	06			07 *	
VM	6		Hw(Cw)			FdBgCw
W	7	11	Pl(Cw)	12		Cw

See comments on facing page

* See grid # 23 for site series 08 - 10

Site series

- 01** HwFd - Cat's-tail moss
02 FdPl - Kinnikinnick
03 FdHw - Falsebox
04 Fd - Fairybells
05 Cw - Solomon's-seal

- 06** Hw - Queen's cup
07 Cw - Devil's club
11 Pl - Sphagnum
12 CwSs - Skunk cabbage

Comments: Grid No. 4 CWHds2

GENERAL COMMENTS:

- **Se** may be more suitable than **Ss** in the eastern, upper portion of the variant
- high hazard for Sitka spruce weevil; moderate hazard for Armillaria root rot

SPECIFIC COMMENTS:

- 01** **Hw** is an alternative to **Fd** in the wetter portion of the variant
- 02** marginal sites for timber production
- 03** **Pl** is an alternative to **Fd**; **Cw** can function as a non-crop (nurse) species
- 04** **Pl** is an alternative to **Fd**
- 05** **Ss** is a suitable minor species except in the eastern, upper portion of the variant where **Se** is more suitable
- 06** **Fd** is an alternative to **Hw** except on very moist / nutrient very poor to poor sites
- 07** **Ss** is an alternative to **Fd**; **Fd** should be restricted to elevated microsites on strongly gleyed soils
- 11** marginal sites for timber production; elevated microsites are preferred
- 12** elevated microsites are preferred

Grid No. 4**CWHds2**Central Dry Submaritime
CWH Variant**Soil nutrient regime**

		Actual Relative				
		Very Poor A	Poor B	Medium C	Rich D	Very Rich E
Soil moisture regime	VD	02	Pl			
	M D	03			04	Fd(Cw)
	M D	02		Pl		Pl
	S D	01			05	Fd(Cw)
	F		Hw			(SsSe)
	M	06			07*	HwCw
	VM		Fd			Ss
	W	11	Pl(Cw)	12		Cw(Ss)

See comments on facing page

* See grid # 24 for site series 08 - 10

Site series**01** HwFd - Cat's-tail moss**02** FdPl - Kinnikinnick**03** FdHw - Falsebox**04** Fd - Fairybells**06** Cw - Solomon's-seal**06** Hw - Queen's cup**07** Cw - Devil's club**11** Pl - Sphagnum**12** CwSs - Skunk cabbage

Comments: Grid No. 5 CWHmm1

GENERAL COMMENTS:

- **Lw** is recommended on a trial basis as a minor species on dry sites
- high hazard for white pine blister rust

SPECIFIC COMMENTS:

- 01** **Hw** is an alternative to **Fd** on northerly aspects
- 02** marginal sites for timber production; **Fd** is an alternative to **PI**
- 03** **Lw** is a suitable minor species
- 04** **Pw** and **Lw** are suitable minor species
- 05** **Pw** is a suitable minor species
- 06** n/a
- 07** **Fd** should be restricted to elevated microsites on strongly gleyed soils
- 11** marginal sites for timber production; elevated microsites are preferred
- 12** elevated microsites are preferred

Grid No. 5

CWHmm1Submontane Moist Maritime
CWH Variant

Soil nutrient regime

Soil moisture regime	Actual Relative	Very Poor A	Poor B	Medium C	Rich D	Very Rich E
		02	Pl Fd			
MD 0		03	Fd(Cw)		04	Fd(Cw) (Pw)
SD 1		01	Fd(Cw)		05	FdCw(Hw)
SD 2			Hw			(Pw)
F 3		06	HwCw(Ba)		07 *	FdCw(Ba)
F 4						
M 5		11	Pl(Cw)	12		Cw(SsHw)
VM 6						
W 7						

See comments on facing page

* See grid # 25 for site series 08 - 10

Site series

01 HwBa - Pipecleaner moss

06 HwBa - Deer fern

02 FdHw - Salal

07 BaCw - Salmonberry

03 HwCw - Salal

11 Pl - Sphagnum

04 CwHw - Swordfern

12 CwSs - Skunk cabbage

06 BaCw - Foamflower

Comments: Grid No. 6 CWHmm2

GENERAL COMMENTS:

- **Se, Bp** and **Lw** are recommended on a trial basis
- **Yc** is an alternative to, or may be used with **Cw** throughout the variant, and should replace it at upper elevational limits
- **Cw** is an alternative to **Ba** on nutrient-very poor to medium sites or on steep slopes
- high hazard for white pine blister rust

SPECIFIC COMMENTS:

- 01 **Fd** is an alternative to **Hw** on steep, southerly aspects or where local climate is warmer/drier than normal; **Ba** is more suitable on northerly aspects; **Se** is a suitable minor species, particularly on southerly aspects; **Yc** is an alternative to **Cw**
- 02 marginal sites for timber production; **Fd** is an alternative to **Pl**
- 03 **Se** is an alternative to **Fd**; **Lw** is a suitable minor species; **Yc** is an alternative to **Cw**
- 04 **Se** is an alternative to **Fd**; **Pw** or **Lw** are suitable minor species; **Yc** is an alternative to **Cw**
- 05 **Fd** is an alternative to **Ba** on steep southerly aspects; **Bp** is an alternative to **Ba**; **Yc** is an alternative to **Cw**; **Se** or **Pw** are suitable minor species
- 06 **Yc** is an alternative to **Cw**
- 07 n/a
- 08 **Hw** is suitable on sites with thick forest floors (>20cm) or abundant decayed wood, but should not form the leading species; **Yc** is an alternative to **Cw**; **Fd** is a suitable minor species on steep southerly aspects
- 09 marginal sites for timber production; elevated microsites are preferred
- 10 **Pw** is a suitable minor species; elevated microsites are preferred

Grid No. 6

CWHmm2	Montane Moist Maritime CWH Variant
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Soil nutrient regime

		Actual Rainfall/vw				
		Very Poor A	Poor B	Medium C	Rich D	Very Rich E
	MD 0	02	Pl Fd			
	SD 1	03	Fd(Cw)		04	Fd(Cw)
	SD 2		(Yc)			(PwYc)
	F 3	01	Hw[BaCw]		05	CwBa[Hw]
	F 4		FdYc			FdYc(Pw)
	M 5	06 HwCw[Ba] Ye			08	CwBa
	VM 6	07 Cw(Yc)				HwYc(Fd)
	W 7	09 Pl(Yc)	10	Cw(HwYc) (Pw)		

See comments on facing page

Site series

- | | |
|-----------------------------------|--------------------------------|
| 01 HwBa - Pipecleaner moss | 06 HwBa - Deer fern |
| 02 FdHw - Salal | 07 CwYc - Goldthread |
| 03 HwCw - Salal | 08 BaCw - Salmonberry |
| 04 CwHw - Swordfern | 09 Pl - Sphagnum |
| 05 BaCw - Foamflower | 10 CwSs - Skunk cabbage |

Comments: Grid No. 7 CWHms1

GENERAL COMMENTS:

- upper elevational ranges of the CWHms1 express "montane" effects of higher snowfall, cooler temperatures, and shorter growing seasons. Stands are dominated by **Hw**, **Ba** and **Cw** with a minor occurrence of **Fd** restricted to drier sites and southerly aspects. Here, tree species recommended on the grid should be modified to reflect a greater role of **Hw** and **Ba** on slightly dry to very moist sites
- **Hw** and **Yc** are less desirable species in the eastern portion of the variant; **Lw** is recommended on a trial basis as a minor species in the eastern portion of the variant
- **Bg** may be used in the western portion of the variant, south of 50° N latitude; **Bp** is recommended as a minor species on nutrient-medium to rich sites, south of 50°N latitude
- high hazard for white pine blister rust; moderate hazard for Armillaria root rot

SPECIFIC COMMENTS:

- 01 **Se** is an alternative to **Fd** in the upper, eastern portion; **Hw** and **Ba** are alternatives to **Fd** on fresh, northerly aspects and at higher elevations; **Bp** is a suitable minor species on nutrient-medium sites
- 02 marginal sites for timber production; **Fd** is an alternative to **Pl**
- 03 **Se** is an alternative to **Fd** in the upper, eastern portion of the variant; **Lw** is a suitable minor species
- 04 **Se** is an alternative to **Fd** in the upper, eastern portion; **Ba** and [**Hw**] are alternatives to **Fd** at higher elevations and fresh, northerly aspects; **Yc** is an alternative to **Cw** at upper elevations in the western portion of the variant; **Bp**, **Pw** and **Lw** are suitable minor species
- 05 **Ba** is suitable at higher elevations and northerly aspects; **Yc** is an alternative to **Cw** at upper elevations in the western portion
- 06 **Se** and **Ba** are alternatives to **Fd** at higher elevations; **Bg** is an alternative to **Cw** at lower elevation in the western portion of the variant; **Bp** is a suitable minor species; **Yc** is an alternative to **Cw** at upper elevations in the western portion
- 10 marginal sites for timber production; elevated microsites are preferred
- 11 **Yc** is an alternative to **Cw** at higher elevations in the western portion of the variant; **Pw** is a suitable minor species

Grid No. 7

CWHmslSouthern Moist Submaritime
CWH Variant**Soil nutrient regime**

		Actual Relative				
		Very Poor A	Poor B	Medium C	Rich D	Very Rich E
Soil moisture regime	VD	02	Pl Fd			
	MD	03		Fd		
	MD	02		Se		
	SD	01			04	
	F		Fd(Cw)			FdCw
	M		HwBaSe		BaHwSeYc	
	VM	05			06*	
	W		HwCw			FdCw
			BaYc			SeBaBgYc
		10	Pl(Cw)	11		Cw(Se) Yc(Pw)

See comments on facing page

* See grid # 26 for site series 07 - 09

Site series**01** HwBa - Step moss**05** HwBa - Queen's cup**02** FdPl - Kinnikinnick**06** BaCw - Devil's club**03** FdHw - Falsebox**10** Pl - Sphagnum**04** BaCw - Oak fern**11** CwSs - Skunk cabbage

Comments: Grid No. 8 CWHms2

GENERAL COMMENTS:

- **Se** is an alternative to **Ss** in the eastern and upper limits of the variant
- high hazard for Sitka spruce weevil, except north of Dean Channel; moderate hazard for Armillaria root rot

SPECIFIC COMMENTS:

- 01** **Hw** is an alternative to **Fd** on fresh sites, particularly on northerly aspects
- 02** marginal sites for timber production; **Fd** is an alternative to **Pl**
- 03** **Pl** is an alternative to **Fd**; **Cw** can function as a non-crop (nurse) species
- 04** **Ba** and **Hw** are alternatives to **Fd** at higher elevations and on fresh, northerly aspects; **Ss** is a suitable minor species in the western portion of the variant; **Se** is a suitable minor species at upper elevations in the eastern portion of the variant
- 05** **Ba** is suitable at higher elevations and on northerly aspects
- 06** **Ba** is an alternative to **Fd** at higher elevations and on northerly aspects; **Ss** is a suitable minor species in the western portion of the variant; **Se** is a suitable minor species on upper elevation in the eastern portion of the variant
- 10** marginal sites for timber production; elevated microsites are preferred
- 11** elevated microsites are preferred

Grid No. 8**CWHms2**Central Moist Submaritime
CWH Variant**Soil nutrient regime**

		Actual Relative	Very Poor A	Poor B	Medium C	Rich D	Very Rich E
			02	Pl			
	VD	0		Fd			
	MD	1	03				
	MD	2		Fd(Cw)			
	SD	3	01			04	
	F	4		Fd(Cw)			
	M	5	05	Hw		06*	
	VM	6		HwCw			FdCw
	W	7	10	Pl(Cw)	11		Cw(HwSs)

See comments on facing page

* See grid # 26 for site series 07 - 09

Site series**01** HwBa - Step moss**05** HwBa - Queen's cup**02** FdPl - Kinnikinnick**06** BaCw - Devil's club**03** FdHw - Falsebox**10** Pl - Sphagnum**04** BaCw - Oak fern**11** CwSs - Skunk cabbage

Comments: Grid No. 9 CWHvh1

GENERAL COMMENTS:

- in the portion of the variant, more or less limited to a narrow belt of lowlands along the outer coast of Vancouver Island (approximately 1-5 km wide, and reaching to 150 m in elevation), **Ss** can be used as a major species on fresh to moist and nutrient-medium sites that are under the combined influence of ocean spray and fog
- low to moderate hazard for Sitka spruce weevil
- the application of **Fd** should be restricted to well- to rapidly-drained soils on steep southerly aspects, and based on local evidence of its natural occurrence in the area

SPECIFIC COMMENTS:

- 01 **Pl** is suitable on nutrient-very poor to poor sites; **Ba** and **Ss** are suitable minor species on nutrient-medium sites
- 02 marginal sites for timber production
- 03 n/a
- 04 steep slope sites; **Cw** is an alternative to **Ss** and should form at least a minor stand component
- 05 **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species
- 06 **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species
- 07 **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species
- 11 elevated microsites are preferred
- 12 marginal sites for timber production; elevated microsites are preferred
- 13 elevated microsites are preferred

Grid No. 9

CWHvh1Southern Very Wet
Hypermaritime CWH Variant

Soil nutrient regime

Soil moisture regime	Actual	Relative	Very	Poor	Medium	Rich	Very Rich
			A	B	C	D	E
SD	0	02		Pl[YeCw]			
SD	1	03					
F	2			CwHwPl			
F	3	04	HwBa[Ss]				
			Cw				Hw
M	4	01	CwHw				
			Pl(SsBa)				Hw
VM	5	11	CwYeHw				
VW	6	12		13**			
W	7	PI[CwYc]			Cw(HwSs)		

See comments on facing page

* See grid # 28 for site series 08 - 10

** See grid # 33 for site series 14 - 18

Site series

01 CwHw - Salal

06 CwSs - Foamflower

02 PIYc - Rhacomitrium

07 CwSs - Devil's club

03 CwYc - Salal

11 CwYc - Goldthread

04 HwSs - Lanky moss
(steep slopes)

12 PIYc - Sphagnum

05 CwSs - Swordfern
(steep slopes)

13 CwSs - Skunk cabbage

Comments: Grid No. 10 CWHvh2

GENERAL COMMENTS:

- **Ba** is a suitable primary species on the mainland coast only
- low hazard for Sitka spruce weevil

SPECIFIC COMMENTS:

- 01 **Ba** (mainland coast only) and **Ss** are suitable minor species on nutrient-medium sites; **Pl** is a suitable minor species
- 02 marginal sites for timber production
- 03 n/a
- 04 steep slope sites; **Ba** is suitable on the mainland coast; **Yc** is a suitable minor species
- 05 **Ba** is suitable on the mainland coast; **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species
- 06 **Ba** is suitable on the mainland coast; **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species
- 07 **Ba** is suitable on the mainland coast; **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species
- 11 elevated microsites are preferred
- 12 bog woodlands; marginal sites for timber production
- 13 elevated microsites are preferred; **Hw** is a suitable minor species

Grid No. 10

CWHvh2Central Very Wet
Hypermaritime CWH Variant

Soil nutrient regime

	Soil moisture regime	Actual	Relative				
			Very Poor A	Poor B	Medium C	Rich D	Very Rich E
SD	0	02	Pi[YcCw]				
SD	1	03	CwHwPl				
F	2					05	SsCw(Yc)
F	3	04	HwSs[Cw]		Ba(Yc)		BaHw
M	4	01	CwHw(Yc) (BaSaPl)			06	SsCw(Yc) BaHw
VM	5	11	CwYcHw[Pl]			07*	SsCw(Yc)
VM	6	12	Pl				BaHw
W	7	PlCwYc			13**	CwYc(Ss)	

See comments on facing page

* See grid # 28 for site series 08 - 10

** See grid # 33 for site series 14 - 18

Site series

01 CwHw - Salal**06** CwSs - Foamflower**02** PlYc - Rhacomitrium**07** CwSs - Devil's club**03** CwYc - Salal**11** CwYc - Goldthread**04** HwSs - Lanky moss
(steep slopes)**12** PlYc - Sphagnum**05** CwSs - Swordfern
(steep slopes)**13** CwSs - Skunk cabbage

Comments: Grid No. 11 CWHvm1

GENERAL COMMENTS:

- the application of **Fd** should be restricted to the southern part of the variant (south of Brooks Peninsula and Seymour Inlet) and based on local evidence of its natural occurrence in the area (generally restricted to well to rapidly drained soils on steep southerly aspects)
- high hazard for Sitka spruce weevil, except north of Dean Channel
- **Ss** has wider application in the northern part of the variant

SPECIFIC COMMENTS:

- 01 **Cw** and **Hw** are the primary species on the nutrient very poor to poor salal phase (01s); **Ss** is a suitable minor species on nutrient-medium sites, particularly in the northern portion of the variant; **Fd** is an alternative to **Hw** and **Ba** on well to rapidly drained soils on southerly aspects in the southern portion of the variant
- 02 marginal sites for timber production; **Fd** is an alternative to **PI** in the southern portion of the variant
- 03 **Fd** is an alternative to **Hw** on steep southerly aspects in the southern portion of the variant
- 04 **Fd** is an alternative to **Hw** on steep southerly aspects in the southern portion; **Ss** is a suitable minor species, particularly in the northern portion of the variant
- 05 **Ss** is an alternative to **Hw** where weevil hazard is low; **Fd** is an alternative to **Hw** on well to rapidly drained soils on steep southerly aspects in the southern portion of the variant
- 06 **Cw** and **Hw** are the primary species on the nutrient very poor to poor salal phase (06s); **Ss** is a suitable minor species on nutrient-medium sites, particularly in the northern portion of the variant;
- 07 **Ss** is suitable where weevil hazard is low; **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species; **Act** or **Dr** are alternative management options except on soils with strong gleying in the upper 30 cm
- 13 marginal sites for timber production; elevated microsites are preferred
- 14 elevated microsites are preferred

Grid No. 11

CWHvm1Submontane Very Wet
Maritime CWH Variant

Soil nutrient regime

Soil moisture regime	Actual	Relative	Very	Poor	Poor	Medium	Rich	Very Rich
			Poor	A	B	C	D	E
MD	0		02	Pl[HwCw]				
					Fd			
SD	1		03				04	
				HwCw(Pl)			CwHw(Ba)	
SD	2				Fd			Fd(Ss)
F	3		01				05	
				HwBaCw			CwBa[Hwl]	
F	4				Fd(Ss)			SsFd
M	5		06				07/08*	
				HwBaCw			CwBa	
VM	6				(Ss)			HwSs
								ActDr
W	7		13	Pl(Cw)		14		Cw(SsHw)

See comments on facing page

* See grid # 29 for site series 09 - 11; 08 in northern portion of variant; 12 rare in region

Site series

01 HwBa - Blueberry**02** HwPl - Cladina**03** HwCw - Salal**04** CwHw - Swordfern**05** BaCw - Foamflower**06** HwBa - Deer fern**07** BaCw - Salmonberry**08** BaSs - Devil's club**13** Pl - Sphagnum**14** CwSs - Skunk cabbage

Comments: Grid No. 12 CWHvm2

GENERAL COMMENTS:

- the application of **Fd** and **Pw** should be restricted to the southern portion (south of Brooks Peninsula and Seymour Inlet) and based on local evidence of their natural occurrence in the area (generally restricted to low elevations on well to rapidly drained soils on steep southerly aspects)
- **Ss** has wider application in the northern part of the variant (north of Seymour Inlet). Sitka spruce weevil hazard is moderate in the southern portion and low in the northern portion of the variant
- **Yc** is an alternative to, or may be used with **Cw** throughout the variant, and should replace it at upper elevational limits; **Bp** is recommended on a trial basis as an alternative to **Ba** on nutrient-medium to rich sites, south of 50° N latitude

SPECIFIC COMMENTS:

- 01 **Ss** is a suitable species on nutrient-medium sites, particularly in the northern portion; **Yc** is an alternative to **Cw**
- 02 marginal sites for timber production; **Fd** is an alternative to **Pl** in the southern portion; **Yc** is an alternative to **Cw**
- 03 **Yc** is an alternative to **Cw**; **Fd** is an alternative to **Hw** on steep southerly aspects at lower elevations in the southern portion of the variant; **Pw** is a suitable minor species in the southern portion
- 04 **Yc** is an alternative to **Cw**; **Fd** is an alternative to **Hw** on steep southerly aspects at lower elevations in the southern portion of the variant; **Pw** is a suitable minor species in the southern portion; **Ss** is a suitable minor species, particularly in the northern portion
- 05 **Yc** is an alternative to **Cw**; **Ss** is an alternative to **Ba**, particularly in the northern portion of the variant
- 06 **Yc** is an alternative to **Cw**; **Ss** is a suitable minor species on nut.-medium sites
- 07 **Yc** is an alternative to **Cw**; **Ss** is an alternative to **Ba**, particularly in the northern portion; **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species
- 09 **Hm** is an alternative to **Hw** at upper elevations; **Pl** is a suitable minor species
- 10 marginal sites for timber production; elevated microsites are preferred
- 11 **Ss** is a suitable minor species, particularly in the northern portion; elevated microsites are preferred

Grid No. 12

CWHvm2	Montane Very Wet Maritime CWH Variant
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Soil nutrient regime

Soil moisture regime	Actual	Relative	Very	Poor	Poor	Medium	Rich	Very Rich
			A	B	C	D	E	
MD	0	02	Pl[HwCw] FdYc					
SD	1	03				04		
SD	2		HwCw(Pl)				CwHw[Ba]	
F	3	01			YcFd(Pw)			YcFd(Pw)
F	4			HwBa[Cw]		05		
M	5	06	IIwDaCw Yc(Sa)			07/08 *		
VM	6	09	CwYcHw Hm(Pl)				CwBa	
W	7	10	PlYc	11		CwYc(Hw) (Sa)		

See comments on facing page

* 08 in the northern portion of the variant

Site series

01 HwBa - Blueberry	06 HwBa - Deer fern
02 HwPl - Cladina	07 BaCw - Salmonberry
03 HwCw - Salal	08 BaSs - Devil's club
04 CwHw - Swordfern	09 CwYc - Goldthread
05 BaCw - Foamflower	10 Pl - Sphagnum
	11 CwSs - Skunk cabbage

Comments: Grid No. 13 CWHwh1

GENERAL COMMENTS:

- n/a

SPECIFIC COMMENTS:

- 01 **Cw** and **Hw** are the primary species on the nutrient-very poor to poor salal phase (01s), or sites with thick forest floors and abundant decayed wood
- 02 n/a
- 03 **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species
- 04 **Pl** and **Ss** are suitable minor species on sites lacking salal
- 05 **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species
- 06 **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species; elevated microsites are preferred
- 10 marginal sites for timber production; elevated microsites are preferred
- 11 bog woodland; **Cw** is a suitable minor species
- 12 elevated microsites are preferred

Grid No. 13

CWHwh1Submontane Wet Hypermaritime
CWH Variant

Soil nutrient regime

Soil moisture regime	Actual	Relative	Very	Poor	Medium	Rich	Very
			Poor	A	B	C	E
SD	0						
SD	1	02					
SD	2						
F	3	01				03	
F	4						Hw
M	5	04	CwHw			05	SsCw Hw
			(PlSe)			06*	SsCw Hw
VM	6	10 Cw(HwPlYc)					
W	7	11 Pl(Yc)			12**	Cw(HwPl)	

See comments on facing page

* See grid # 27 for site series 07 - 09

** See grid # 33 for site series 13 - 17

Site series

- 01** HwSs - Lanky moss
02 CwSs - Salal
03 CwSs - Swordfern
04 CwHw - Salal
05 CwSs - Foamflower

- 06** CwSs - Conocephalum
10 CwYc - Goldthread
11 PlYc - Sphagnum
12 CwSs - Skunk cabbage

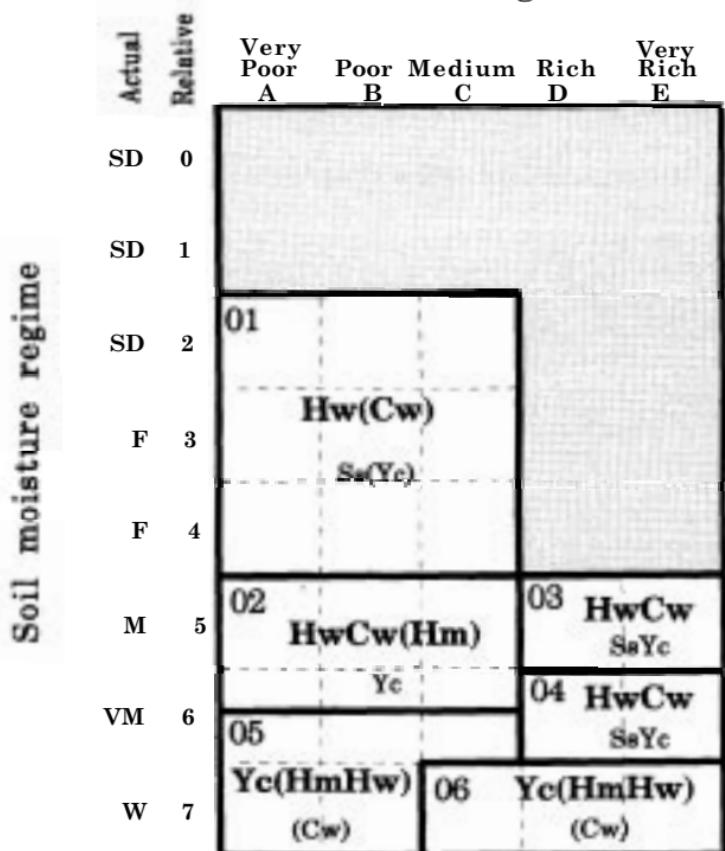
Comments: Grid No. 14 CWHwh2

GENERAL COMMENTS:

- **Yc** is an alternative to, or can be used with **Cw** throughout the variant

SPECIFIC COMMENTS:

- 01** **Ss** is suitable at lower elevations except on sites with thick forest floors (>20 cm) or abundant decayed wood; **Yc** is an alternative to **Cw**
- 02** **Yc** is an alternative to **Cw**
- 03** **Ss** is suitable at lower elevations; **Yc** is an alternative to **Cw**
- 04** **Ss** is suitable on elevated microsites at lower elevations; **Yc** is an alternative to **Cw**
- 05** marginal sites for timber production; **Cw** is a suitable minor species; elevated microsites are preferred
- 06** **Cw** is a suitable minor species; elevated microsites are preferred

Grid No. 14**CWHwh2**Montane Wet Hypermaritime
CWH Variant**Soil nutrient regime**

See comments on facing page

Site series**01** HwSs - Lanky moss**04** CwSs - Conocephalum**02** CwHw - Salal**05** CwYc - Goldthread**03** CwSs - Foamflower**06** CwSs - Skunk cabbage

Comments: Grid No. 15 CWHws2

GENERAL COMMENTS:

- **Bl** is an alternative to **Ba** on sites influenced by cold air outflow from glaciers
- the application of **Fd** should be based on local evidence of its occurrence
- **Yc** is an alternative to **Cw**, particularly in upper ranges of the subzone
- **Hm** can replace **Hw** at higher elevations
- high (lower elevations) to moderate (upper elevations) hazard for **Ss** weevil

SPECIFIC COMMENTS:

- 01 **Sxs** is an alternative to **Hw** on nutrient-medium sites; **Bl** is an alternative to **Ba** on cold air outflow sites; **Pl** is a suitable minor species
- 02 marginal sites for timber production
- 03 **Fd** is an alternative to **Hw** at lower elevations on southerly aspects
- 04 **Bl** is an alternative to **Ba** on cold air outflow sites; **Sxs** is an alternative to **Hw** where weevil hazard is low
- 05 **Bl** is an alternative to **Ba** on cold air outflow sites; **Sxs** is a suitable minor species on nutrient medium sites
- 06 **Bl** is an alternative to **Ba** on cold air outflow sites; **Hw** is suitable on sites with thick forest floors (>20 cm) or abundant decayed wood, but should not form the leading species; **Sxs** is a suitable major species where weevil hazard is low
- 10 marginal sites for timber production; elevated microsites are preferred
- 11 elevated microsites are preferred; **Sxs** is a suitable species where weevil hazard is low

Grid No. 15

CWHws2Montane Wet Submaritime
CWH Variant

Soil nutrient regime

Soil moisture regime	Actual	Relative	Very Poor	Poor	Medium	Rich	Very Rich		
			A	B	C	D	E		
VD	0	02	Pl(CwHw)						
MD	1	03	HwPl[Cw]						
MD	2		Fd						
SD	3	01	HwBa[Cw]			04	CwBa[Hw]		
F	4		BlSxs(Pl)			SxaBl			
M	5	05	HwCwBa			06 *	CwBa		
VM	6		Bl(Sxs)			BlSxsHw			
W	7	10	Pl(Cw)	11	Cw(BaHw)				
					Sxa				

See comments on facing page

* See grid # 30 for site series 07 - 09

Site series

01 HwBa - Bramble**05** HwBa - Queen's cup**02** Pl - Kinnikinnick**06** BaCw - Devil's club**03** HwPl - Feathermoss**10** Pl - Sphagnum**04** BaCw - Oak fern**11** CwSs - Skunk cabbage

Comments: Grid No. 16 CWHxm

GENERAL COMMENTS:

- where recommended on the grid, **Lw** (on a trial basis), **Cw** and **Pw** are alternatives to **Fd** on sites affected by laminated root rot
- **Lw** is recommended on a trial basis as a minor species on dry sites
- high hazard for Sitka spruce weevil, white pine blister rust, and laminated root rot; moderate hazard for Armillaria root rot

SPECIFIC COMMENTS:

- 01 **Hw** is an alternative to **Fd** in the wetter portion of the subzone; **Pw** is a suitable minor species
- 02 marginal sites for timber production; **Fd** is an alternative to **Pl**
- 03 **Pl** is an alternative to **Fd** on nutrient very poor to poor sites; **Lw** is a suitable minor species; **Cw** can function as a non-crop (nurse) species
- 04 **Lw** or **Pw** are suitable minor species
- 05 **Pw** is a suitable minor species
- 06 **Fd** is an alternative to **Hw** in the eastern variant (CWHxm1); otherwise it is a suitable minor species, except on very moist / nutrient very poor to poor sites
- 07 **Act** or **Dr** are alternative management options except on soils with strong gleying in the upper 30 cm; **Fd** should be restricted to elevated microsites on strongly gleyed soils
- 11 marginal sites for timber production; elevated microsites are preferred
- 12 **Pw** and **Ss** are suitable minor species; elevated microsites are preferred

Grid No. 16

CWHxm

Very Dry Maritime
CWH Subzone

Soil nutrient regime

		Soil moisture regime				
		Relative Nutrient Availability				
		Very Poor A	Poor B	Medium C	Rich D	Very Rich E
VD	0	02	Pl Fd			
MD	1	03			04	Fd(Cw)
MD	2		Fd(Cw)			(Pw)
SD	3	01			05	FdCw(Bg)
F	4		Hw(Pw)			(Pw)
M	5	06			07	*
VM	6		HwCw			FdBgCw
W	7	11	Pl(Cw)	12**	Cw(Hw) (PwSe)	

See comments on facing page

* See grid # 23 for site series 08 - 10

** See grid # 32 for site series 13 - 15

Site series

01 HwFd - Kindbergia**02** FdPl - Cladina**03** FdHw - Salal**04** Fd - Swordfern**05** Cw - Swordfern**06** HwCw - Deer fern**07** Cw - Foamflower**11** Pl - Sphagnum**12** CwSs - Skunk cabbage

Comments: Grid No. 17 ESSFmw

GENERAL COMMENTS:

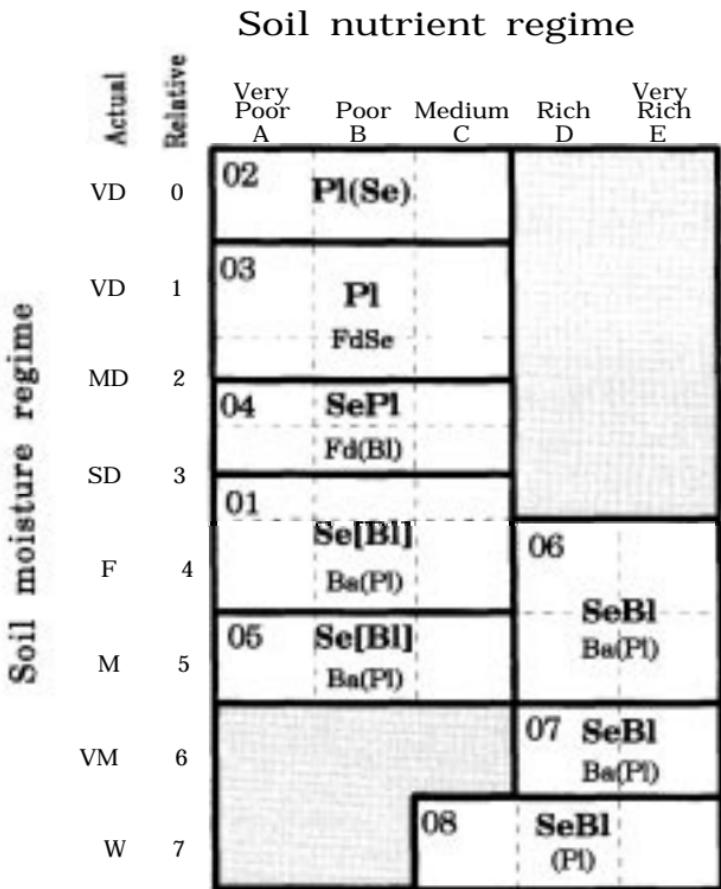
- **Ba** is an alternative to **Bl** in the western portion of the subzone
- moderate hazard for Armillaria root rot

SPECIFIC COMMENTS:

- 01 **Ba** is an alternative to **Bl** in the western portion of the subzone; **Pl** is an alternative to **Bl** on coarse-textured, slightly dry sites
- 02 marginal sites for timber production
- 03 **Fd** is an alternative to **Pl** on south-facing slopes at lower elevations; **Se** is an alternative to **Pl** except on coarse-textured soils
- 04 **Fd** is an alternative to **Pl** on south-facing slopes at lower elevations; **Bl** is a suitable minor species except on coarse-textured soils
- 05 **Ba** is an alternative to **Bl** in the western portion of the subzone; **Pl** is a suitable minor species
- 06 **Ba** is an alternative to **Bl** in the western portion of the subzone; **Pl** is a suitable minor species
- 07 **Ba** is an alternative to **Bl** in the western portion of the subzone; **Pl** is a suitable minor species
- 08 **Pl** is a suitable minor species; elevated microsites are preferred

Grid No. 17

ESSFmw	Moist ESSF	Warm Subzone
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See comments on facing page

Site series

01 BlBa - Rhododendron	05 BlBa - Azalea-Pipecleaner moss
02 BlPl - Juniper-Rhacomitrium	06 Bl - Gooseberry-Valerian
03 Fd - Falsebox-Pinegrass	07 BlBa - Oak fern-Lady fern
04 Bl - Huckleberry-Falsebox	08 Bl - Gooseberry-Horsetail

Comments: Grid No. 18 IDFww

GENERAL COMMENTS:

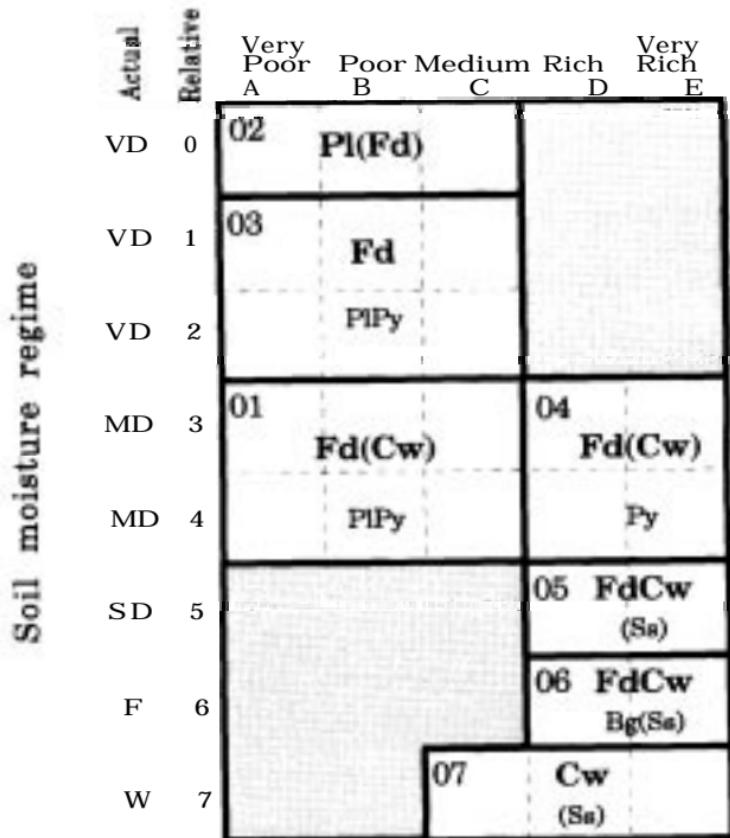
- **Lw** is recommended on a trial basis as a minor species south of 50° N latitude
- **Bg** is suitable only south of 50° N latitude
- high hazard for Sitka spruce weevil; moderate hazard for laminated root rot and Armillaria root rot

SPECIFIC COMMENTS:

- 01 **Pl** is an alternative to **Fd**; **Py** is an alternative to **Fd** on nutrient medium sites in the southern portion of the subzone (south of 51° N latitude); **Lw** is a suitable minor species south of 50° N latitude; **Cw** can function as a non-crop (nurse) species
- 02 marginal sites for timber production
- 03 **Pl** is an alternative to **Fd**; **Py** is an alternative to **Fd** on nutrient medium sites in the southern portion of the subzone
- 04 **Py** is an alternative to **Fd** in the southern portion of the subzone; **Lw** is a suitable minor species south of 50° N latitude
- 05 **Ss** is a suitable minor species in the northern portion of the subzone
- 06 **Bg** is suitable in the southern portion of the subzone; **Ss** is a suitable minor species in the northern portion of the subzone
- 07 **Ss** is a suitable minor species in the northern portion of the subzone

Grid No. 18

IDFww	Wet IDF	Warm Subzone
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Soil nutrient regime

See comments on facing page

Site series

-
- | | |
|--------------------------------------|------------------------------------|
| 01 FdCw - Hazelnut | 05 CwFd - Vine maple |
| 02 FdPl - Peltigera | 06 Cw - Devil's club-
Lady fern |
| 03 Fd - Falsebox-
Feathermoss | 07 CwSs - Skunk cabbage |
| 04 Fd - Douglas maple-
Fairybells | |

Comments: Grid No. 19 MHmm1

GENERAL COMMENTS:

- **Se** is recommended as an alternative species on the leeward slopes of the Vancouver Island Ranges
- **Bp** is recommended as a minor species on nutrient-medium to rich sites for the lower elevational and southern portion of the variant (south of 50° N latitude) on the Pacific Ranges and the leeward slopes of the Vancouver Island Ranges

SPECIFIC COMMENTS:

- 01** **Se** is a suitable minor species; **Bp** is a suitable minor species on nutrient-medium sites
- 02** marginal sites for timber production; **Se** is an alternative to **Hm**
- 03** **Se** and **Bp** are suitable minor species
- 04** n/a
- 05** n/a
- 06** elevated microsites are preferred
- 07** elevated microsites are preferred
- 08** marginal sites for timber production; elevated microsites are preferred
- 09** marginal sites for timber production; elevated microsites are preferred

Grid No. 19

MHmm1Windward Moist Maritime
MH Variant

Soil nutrient regime

		Relative Actual				
		Very Poor A	Poor B	Medium C	Rich D	Very Rich E
		SD 0	02			
		SD 1		HmYc[Ba]		
		F 2	01			
		F 3		HmBaYc		HmBaYc
		F 4				
		M 5	04	HmBaYc		05 BaYc[Hm]
		VM 6	06	HmYc(Ba)		07 BaYe[Hm]
		W 7	08	HmYc	09	Ye[Hm]

See comments on facing page

Site series

- | | |
|----------------------------|-------------------------|
| 01 HmBa - Blueberry | 06 HmYc - Deer-cabbage |
| 02 HmBa - Mountain-heather | 07 YcHm - Hellebore |
| 03 BaHm - Oak fern | 08 HmYc - Sphagnum |
| 04 HmBa - Bramble | 09 YcHm - Skunk cabbage |
| 05 BaHm - Twistedstalk | |

Comments: Grid No. 20 MHmm2

GENERAL COMMENTS:

- **Hm** and **Yc** are less desirable species in the eastern portion of the variant
- **Se** is particularly suitable in the eastern portion of the variant
- **Bp** is recommended as a minor species on nutrient-medium to rich sites in the lower elevational and southern portion of the variant (south of 50° N latitude)

SPECIFIC COMMENTS:

- 01** **Yc** is suitable in the western portion of the variant; **Bp** is a suitable minor species on nutrient-medium sites
- 02** marginal sites for timber production; **Yc** is suitable in the western portion of the variant
- 03** **Bp** is a suitable minor species; **Yc** is suitable in the western portion of the variant
- 04** **Yc** is suitable in the western portion of the variant
- 05** **Bp** is a suitable minor species; **Yc** is suitable in the western portion of the variant
- 06** **Yc** is suitable in the western portion of the variant; elevated microsites are preferred
- 07** **Yc** is suitable in the western portion of the variant; elevated microsites are preferred
- 08** marginal sites for timber production; **Yc** is suitable in the western portion of the variant; elevated microsites are preferred
- 09** marginal sites for timber production; elevated microsites are preferred; **Yc** is suitable in the western portion of the variant

Grid No. 20

MHmm2Leeward Moist Maritime
MH Variant

Soil nutrient regime

		Soil moisture regime				
		Relative Nutrient Regime				
		Very Poor	Poor	Medium	Rich	Very Rich
		A	B	C	D	E
SD	0	02				
SD	1		Yc			
F	2	01			03	
F	3		HmBa[Se]		HmBaSe	
F	4		Yc			Yc
M	5	04	HmBa		05 BaSe[Hm]	
			Yc			Yc
VM	6	06	Hm(Ba)		07 BaSe[Hm]	
			Yc			Yc
W	7	08	Hm	09	Hm(Se)	
			Yc			Yc

See comments on facing page

Site series

- | | |
|----------------------------|-------------------------|
| 01 HmBa - Blueberry | 06 HmYc - Deer-cabbage |
| 02 HmBa - Mountain-heather | 07 YcHm - Hellebore |
| 03 BaHm - Oak fern | 08 HmYc - Sphagnum |
| 04 HmBa - Bramble | 09 YcHm - Skunk cabbage |
| 05 BaHm - Twistedstalk | |

Comments: MHwh Grid No. 21

GENERAL COMMENTS:

- **Cw** is an alternative to, or can be used with, **Yc** at lower elevations
- **Ba** is a suitable primary species on the mainland coast only

SPECIFIC COMMENTS:

- 01 **Ss** and **Hw** are suitable at lower elevations; **Ba** is suitable on the mainland coast only; **Cw** is an alternative to **Yc** at lower elevations
- 02 **Cw** is an alternative to **Yc** at lower elevations
- 03 **Ss** is suitable at lower elevations; **Cw** is an alternative to **Yc** at lower elevations
- 04 **Ba** is suitable on the mainland coast only; **Cw** is an alternative to **Yc** at lower elevations; **Hw** is suitable at lower elevations
- 05 **Ba** is suitable on the mainland coast only; **Ss** is suitable at lower elevations; **Cw** is an alternative to **Yc** at lower elevations
- 06 **Ba** is suitable on the mainland coast only; **Cw** is an alternative to **Yc** at lower elevations; elevated microsites preferred
- 07 **Ba** is suitable on the mainland coast only; **Ss** is suitable at lower elevations; **Cw** is an alternative to **Yc** at lower elevations; elevated microsites preferred
- 08 marginal sites for timber production; **Cw** is an alternative to **Yc** at lower elevations; elevated microsites are preferred
- 09 **Ss** is a suitable minor species at lower elevations; **Cw** is an alternative to **Yc** at lower elevations; elevated microsites are preferred

Grid No. 21

MHwh	Wet MH	Hypermaritime Subzone
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Soil nutrient regime

Soil moisture regime		Actual Relative	Very Poor A	Poor B	Medium C	Rich D	Very Rich E
			SD 0	SD 1	SD 2	SD 3	SD 4
		02	HmYc	Cw			
		01				03	
			HmYc			HmYc	
			SsBaHwCw			SsCw	
		04	HmYc BaHwCw		05	Yc[Hm] BaSsCw	
		06	HmYc (Ba)Cw		07	Yc[Hm] BaSsCw	
		08	HmYc Cw	09	Yc(Hm) Cw(Ss)		
		W 7					

See comments on facing page

Site series

01 HmSs - Blueberry	06 HmYc - Deer-cabbage
02 HmYc - Mountain-heather	07 YcHm - Hellebore
03 SsHm - Reedgrass	08 HmYc - Sphagnum
04 HmYc - Goldthread	09 YcHm - Skunk cabbage
05 YcHm - Twistedstalk	

Comments: Floodplain sites Grids No. 22 and 23

GENERAL COMMENTS:

Floodplain sites have high fisheries, wildlife, water, and aesthetic values - refer to the appropriate guidelines for riparian ecosystem management.

- high bench sites are suited to the following options:
 1. conifer management
 2. hardwood management
 3. mixed hardwood / conifer management
- medium bench sites are best suited to hardwood management because of the high frequency of flooding, severe competition from deciduous trees and shrubs, and the restriction of conifers to elevated microsites. It may be possible to manage for conifers if elevated microsites occupy a sufficiently large portion of the area.
- low bench sites should generally not be disturbed

SPECIFIC COMMENTS:

Grids No.22-23: high hazard for Ss weevil; **Bg** should only be applied south of 50° N latitude in the CWHds1; hardwood management not recommended on high bench sites with very coarse textured soils (>70% coarse fragment content)

FLOODPLAINS

Grid No. 22 - 23

Grid No. 22

CDFmm

High Bench

07

FdBgCw

Act

Medium Bench

08

BgCw

Act or Dr

Low Bench

09

Act

Medium to very rich soil nutrient regime
See comments on facing page

Grid No. 23

CWHdm, CWHds1, CWHxm

High Bench

08

BgCw

Act or Dr

Medium Bench

09

BgCw

Act or [Dr]

Low Bench

10

Act

Medium to very rich soil nutrient regime
See comments on facing page

Site series

CDFmm

07 Cw - Snowberry

08 Act - Red-osier dogwood

09 Act - Willow

CWHxm, CWHdm, CWHds1

08 Ss - Salmonberry

09 Act - Red-osier dogwood

10 Act - Willow

Comments: Floodplain sites Grids No. 24 and 25

GENERAL COMMENTS:

Floodplain sites have high fisheries, wildlife, water, and aesthetic values - refer to the appropriate guidelines for riparian ecosystem management.

- high bench sites are suited to the following options:
 1. conifer management
 2. hardwood management
 3. mixed hardwood / conifer management
- medium bench sites are best suited to hardwood management because of the high frequency of flooding, severe competition from deciduous trees and shrubs, and the restriction of conifers to elevated microsites. It may be possible to manage for conifers if elevated microsites occupy a sufficiently large portion of the area.
- low bench sites are marginally productive

SPECIFIC COMMENTS:

Grids No.24-25: high hazard for Ss weevil; hardwood management not recommended on high bench sites with very coarse textured soils (>70% coarse fragment content)

FLOODPLAINS

Grid No. 24 - 25

Grid No. 24**CWHds2**

High Bench

08

Cw(Ss)

Act or Dr

Medium Bench

09

Cw(Ss)

Actor [Dr]

Low Bench

10

Act

Medium to very rich soil nutrient regime

See comments on facing page

Grid No. 26**CWHmm1**

High Bench

08

CwBa

Act or Dr

Medium Bench

09

CwBa

Actor [Dr]

Low Bench

10

Act

Medium to very rich soil nutrient regime

See comments on facing page

Site series

CWHds2, CWHmm1**08** Ss - Salmonberry**09** Act - Red-osier dogwood**10** Act - Willow

Comments: Floodplain sites Grids No. 26 and 27

Floodplain sites have high fisheries, wildlife, water, and aesthetic values - refer to the appropriate guidelines for riparian ecosystem management.

GENERAL COMMENTS:

- high bench sites are suited to the following options:
 1. conifer management
 2. hardwood management
 3. mixed hardwood / conifer management
- medium bench sites are best suited to hardwood management because of the high frequency of flooding, severe competition from deciduous trees and shrubs, and restriction of conifers to elevated microsites. It may be possible to manage for conifers if elevated microsites occupy a sufficiently large portion of the area.
- low bench sites are marginally productive

SPECIFIC COMMENTS:

Grid No.26: high hazard for Ss weevil; **Se** is generally more suitable in the eastern portion of the variant; **Ss** can replace **Se** in the western portion of the CWHms2; hardwood management not recommended on high bench sites with very coarse textured soils (>70% coarse fragment content)

Grid No.27: hardwood management not recommended on high bench sites with very coarse textured soils (>70% coarse fragment content)

FLOODPLAINS

Grid No. 26 - 27

Grid No. 26

CWHms1, CWHms2

High Bench

07	CwBa(Se)	Act or Dr
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Medium Bench

08	CwBa	Act or [Dr]
----	------	-------------

Low Bench

09	Act
----	-----

Medium to very rich soil nutrient regime
See comments on facing page

Grid No. 27

CWHwh1

High Bench

07	SsCw(Hw)	Dr
----	----------	----

Medium Bench

08	SsCw	Dr
----	------	----

Low Bench

09	Dr
----	----

Medium to very rich soil nutrient regime
See comments on facing page

Site series

CWHms1, CWHms2

07 Ss - Salmonberry

08 Act - Red-osier dogwood

09 Act - Willow

CWHwh1

07 Ss - Lily-of-the-valley

08 Ss - Trisetum

09 Dr - Lily-of-the-valley

Comments: Floodplain sites Grids No. 28 and 29

GENERAL COMMENTS:

Floodplain sites have high fisheries, wildlife, water, and aesthetic values - refer to the appropriate guidelines for riparian ecosystem management.

- high bench sites are suited to the following options:
 1. conifer management
 2. hardwood management
 3. mixed hardwood / conifer management
- medium bench sites are best suited to hardwood management, because of the high frequency of flooding, severe competition from deciduous trees and shrubs, and restriction of conifers to elevated microsites. It may be possible to manage for conifers if elevated microsites occupy a sufficiently large portion of the area.
- low bench sites are marginally productive

SPECIFIC COMMENTS:

Grid No.28: **Hw** is a suitable minor species on high and medium bench sites; **Ba** is not suitable in the Queen Charlotte Island portion of the CWHvh2; low (CWHvh2) or low to moderate (CWHvh1) hazard for **Ss** weevil; hardwood management not recommended on high bench sites with very coarse textured soils (> 70% coarse fragment content)

Grid No.29: **Hw** is a suitable minor species on high bench sites; **Act** is not suitable near the outer coast; high hazard for **Ss** weevil, except north of Dean Channel; hardwood management not recommended on high bench sites with very coarse textured soils (>70% coarse fragment content)

FLOODPLAINS

Grid No. 28 - 29

Grid No. 28

CWHvh1, CWHvh2

High Bench

08**SsCw[Ba]****Dr**

Medium Bench

09**SsCwBa****Dr**

Low Bench

10**Dr**

Medium to very rich soil nutrient regime

See comments on facing page

Grid No. 29

CWHvm1

High Bench

09**CwBa(Ss)****Act or Dr**

Medium Bench

10**CwBa(Ss)****Act or [Dr]**

Low Bench

11**Act**

Medium to very rich soil nutrient regime

See comments on facing page

Site series

CWHvh1, CWHvh2

08 Ss - Lily-of-the-valley**09** Ss - Trisetum**10** Dr - Lily-of-the-valley

CWHvm1

09 Ss - Salmonberry**10** Act - Red-osier dogwood**11** Act - Willow

Comments: Floodplain sites Grid No. 30

GENERAL COMMENTS:

Floodplain sites have high fisheries, wildlife, water, and aesthetic values - refer to the appropriate guidelines for riparian ecosystem management.

- high bench sites are suited to the following options:
 1. conifer management
 2. hardwood management
 3. mixed hardwood / conifer management
- medium bench sites are best suited to hardwood management, because of the high frequency of flooding, severe competition from deciduous trees and shrubs, and restriction of conifers to elevated microsites. It may be possible to manage for conifers if elevated microsites occupy a sufficiently large portion of the area.
- low bench sites are marginally productive

SPECIFIC COMMENTS:

Grid No.30: BI is an alternative to **Ba** on sites influenced by cold air outflow from glaciers; high (lower elevation) to moderate (upper elevation) hazard for Ss weevil; hardwood management not recommended on high bench sites with very coarse textured soils (>70% coarse fragment content); **Hw** is a suitable minor species on high bench sites

FLOODPLAINS

Grid No. 30

Grid No. 30

CWHws2

High Bench

07	CwBa[Sxs]	Act or Dr
----	-----------	-----------

Medium Bench

08	CwBaSxs*	Act or [Dr]
----	----------	-------------

Low Bench

09	Act
----	-----

Medium to very rich soil nutrient regime
See comments on facing page

Site series

CWHws2

07 Ss - Salmonberry

08 Act - Red-osier dogwood

09 Act - Willow

Comments: Sites with strongly fluctuating watertables Grids No. 31 and 32

GENERAL COMMENTS:

- these sites are suited to the following options:
 1. conifer management
 2. hardwood management
 3. mixed hardwood / conifer management
- because of high winter watertables, conifers should be established on elevated microsites as much as possible. This is particularly important for **Fd**
- **Act** productivity exceeds **Dr** on sites with moist or very moist summer soil moisture regime

SPECIFIC COMMENTS:

Grid No. 31: **Fd** should be restricted to elevated microsites in site series 13

Grid No. 32: **Fd** should be restricted to elevated microsites in site series 13

**SITES WITH STRONGLY
FLUCTUATING WATER TABLES**
Grid No. 31 - 32

				Grid No. 31	
Relative SMR	Winter SMR	CDFmm			Summer SMR
5f	VM	12 FdBgCw	Act		SD
6f	W	13 BgCw[Fd]	Act or Dr		F
7f	Vw	14 Cw[Bg]	Act or [Dr]		M

Medium to very rich soil nutrient regime

See comments on facing page

				Grid No. 32	
Relative SMR	Winter SMR	CWHdm, CWHxm			Summer SMR
5f	VM	13 BgCw[Fdl]	Act or Dr		F
6f	W	14 BgCw	Act or [Dr]		M
7f	VW	15 Cw	Act or (Dr)		VM

Medium to very rich soil nutrient regime

See comments on facing page

Site series

CDFmm

- 12** Cw - Vanilla-leaf
- 13** Cw - Indian-plum
- 14** Cw - Slough sedge

CWHdm, CWHxm

- 13** Cw - Salmonberry
- 14** Cw - Black twinberry
- 15** Cw - Slough sedge

Comments: Shoreline/oceanspray sites Grid No. 33

GENERAL COMMENTS:

- these sites are strongly influenced by blowing ocean spray because of their proximity to coastlines. **Ss** is the recommended major species on all sites because of its ability to tolerate high levels of salt introduced by ocean spray
- these sites are restricted in occurrence, being confined to a narrow fringe of forested coastline running along the outer coast of Vancouver Island, the central mainland, and the Queen Charlotte Islands

SHORELINE / OCEAN SPRAY SITES

Grid No. 33

CWHwh, CWHvh

Soil Moisture Regime

SD	^a 13/14 ^b	Ss(CwHwPl)	Rocky headland
F	14/15	Ss(CwHw)	Old Beachplain

Very poor to medium soil nutrient regime

SD-F	15/16	Ss(CwHwPl)	Rocky headland
M	16/17	Ss[CwHw]	Marine terrace/scarp
W	17/18	Ss	Fluctuating brackish water

Rich to very rich soil nutrient regime

a - site series number for CWHwh

b - site series number for CWHvh

Site series

CWHwh CWHvh

13	14	Ss - Salal
14	15	Ss - Kindbergia
16	16	Ss - Reedgrass
16	17	Ss - Swordfern
17	18	Ss - Slough sedge

6.2 Slashburning

6.2.1 Introduction

Making a decision about prescribing slashburning for a particular site is very complex. Many factors need careful consideration. Slashburning can be an effective management tool when used under the right conditions, but it can also have very detrimental effects if used incorrectly. One of the most important considerations is the potential impact of slashburning on forest productivity. Maintaining site productivity is the foundation of ecologically sound slashburning prescriptions (Beese 1992).

Slashburning removes organic matter from a site, resulting in a loss of nutrients. Nitrogen loss is the most important because: 1) organic matter contains most of the site N capital, 2) N is the most common limiting nutrient in coastal forests, and 3) natural N additions (through biological fixation and precipitation) are slow. *The amount of N lost through burning is proportional to the amount of forest floor consumed by fire* (Little and Ohmann 1988). Slashburning may expose mineral soil, which may lead to surface erosion and further nutrient loss and other resource impacts (e.g., reduced water quality). Removal of organic matter through fire may also decrease the water-holding capacity of some soils. The potential impact on productivity depends on factors that are specific to a site. Soil with limited nutrient capital distributed mainly in the forest floor is most sensitive to nutrient loss; a dry site with limited water-holding capacity is most sensitive to increased moisture loss; an inherently erodible soil is sensitive to mineral soil exposure.

A five-class rating system (Table 25) is used to estimate the sensitivity of a particular site to slashburning. These classes are identified in the field using a key (Appendix 7).

TABLE 25. Site sensitivity classes

Code	Class
VH	very high sensitivity
H	high sensitivity
M	medium sensitivity
L	low sensitivity
VL	very low sensitivity

6.2.2 Site Sensitivity to slashburning

VERY HIGH SENSITIVITY

Characteristics:

- Very shallow organic or mineral soils (< 25 cm) on rock outcrops and adjacent slopes, and/or
- Fragmental or very skeletal soils (> 80% coarse fragment content in surface layer).

Potential impact of fire: Fire will likely result in severe soil degradation and reduced regeneration potential. Fire will consume much of the forest floor, which accounts for the bulk of the soil water-holding capacity and nutrient reserve. Removal of the forest floor exposes the underlying bedrock or coarse fragments, or exposes mineral soil to erosion. Potential growing site will be lost and regeneration hampered.

Comment: Slashburning should be avoided on these sites.

HIGH SENSITIVITY

Characteristics:

- Very dry to fresh, nutrient-very poor to -poor sites that have forest floors less than 20 cm thick and well-developed Ae horizons, coarse particle size, and/or shallow soils (< 50 cm deep).
- Very steep slopes (> 80%) subject to potential surface erosion.

Potential impact of fire: Removal of the forest floor and protective vegetative cover will likely have a high impact on the soil. Critical soil nutrient capital will be lost, moisture-holding capacity of upper soil layers will decrease, and surface erosion may be accelerated. The effect on site productivity will likely occur early in the rotation.

Comment: Organic matter must be conserved on these sites.

Generally, slashburning should be avoided; however if it is prescribed, it is critical that fire severity is low, with the bulk of the forest floor being preserved.

MEDIUM SENSITIVITY

Characteristics:

- Dry to moist, nutrient-poor to -medium sites that have forest floors less than 20 cm thick, soils with high organic matter content and well-developed Ae horizons, or soils with low organic matter content with weak or absent Ae horizons, > 50 cm depth, and/or particle size not coarse.
- Steep (50-80%) slopes, or moderately steep (33-50%) slopes with silty soils subject to potential surface erosion.

Potential impact of fire: Removal of the forest floor and protective vegetative cover will likely have a moderate impact on the soil. The effect will be similar to High sensitivity sites but the impact will be less pronounced. Site productivity will likely be affected in the long term.

Comment: Organic matter should be preserved on these sites. Slashburning prescriptions should aim for low severity, with the bulk of the forest floor being preserved.

LOW SENSITIVITY

Characteristics: Fresh to wet, nutrient-medium to -very rich sites that have gentle to moderate slopes (< 50%); moderately deep to deep soils, and; soils affected by seepage, high water tables, or flooding; or Mull or Moder (with Ah) forest floors and coarse soil particle size, or moist and thick forest floors (> 20 cm); or thin forest floors and high soil organic matter content.

Potential impact of fire: Under the prevailing conditions, fire tends to remove a small fraction of the forest floor. This loss, in relation to the total forest floor depth and/or to the quantity of organic matter in the soil, will likely have a low impact on site productivity.

Comment: Slashburning can be an effective tool for site preparation and short-term vegetation control on these sites. However, high-severity fires that consume a significant portion of the forest floor should be avoided.

VERY LOW SENSITIVITY

Characteristics: Fresh to moist, nutrient-medium to -very rich sites that have moderately deep to deep soil, thin Moder or Mull forest floors with well-developed Ah horizons; soil particle size that is not coarse, gentle slopes, and soil affected by seepage, high water tables, or flooding.

Potential impact of fire: The bulk of the site nutrient capital and soil water-holding capacity is contained in the mineral soil. Removal of the forest floor will likely have an insignificant impact on site productivity.

Comment: Slashburning can be an effective tool for site preparation and short-term vegetation control on these sites.

6.2.3 Application

Site sensitivity is an important criterion when making ecologically sound slashburning decisions. Some additional considerations include the following:

- Ensure that the slashburning decision is consistent with regeneration plans, particularly the preferred species and method of regeneration. For example, high-elevation sites classed as "low sensitivity" are not suitable for slashburning because regeneration plans call for natural and advance regeneration of Hm, Yc, and Ba.
- Specify slashburning objectives that are consistent with the site's sensitivity to fire. For example, conservation of the forest floor is critical on sensitive sites.
- Develop a slashburn prescription designed to meet the stated objectives. Make sure the prescription and objectives are achievable given the site and fuel conditions, expected weather, etc.
- Plan and execute the slashburn carefully using accurate, on-site information.
- In general, if slashburning is deemed to be a suitable option, the prescription should be designed to achieve the lowest impact fire that still meets silvicultural objectives (Beese 1992).

Slashburning decisions must be made on a *site-specific basis*; therefore, site sensitivity must be assessed for all the important units recognized in a proposed block. Complex blocks containing a mix of high sensitivity and low sensitivity sites are problematic because slashburning cannot be applied in a localized fashion. Options that may be used to avoid damaging the more sensitive block components include: deleting the sensitive areas from the block, harvesting in a way that reduces slash loads and thus the need for slashburning, and using mechanical site preparation to create plantable spots.

6.2.4 Background information

B.C. Ministry of Forests. 1985. A guide to prescribed broadcast burning in the Vancouver Forest Region. B.C. Min. For., Vancouver, B.C.

Hawkes, B.C., M.C. Feller, and D. Meehan. 1990. Site preparation: fire. *In Regenerating British Columbia's forests*. D.P. Lavender *et al.* (editors). University of British Columbia Press, Vancouver, B.C.

Lindbergh, S. 1990. Effects of prescribed fire on site productivity: a literature review. B.C. Min. For., Land Manage. Rep. No. 66, Victoria, B.C.

6.3 Site Productivity

Site index classes are used to rank relative productivity of site series (Figure 12). Four classes (roman numerals **I** to **IV**) are displayed on the site productivity and competing vegetation grids in this section. The information was derived from 930 plots representing stands suitable for site index estimation (<120 years, even-aged, undamaged). The classes are derived from "average" site index values calculated for site associations using general recommended tree species. Classes are described using "box plots" showing the distribution of site index data for major coniferous tree species (Ba, Cw, Fd, Hw, Ss) in each class.

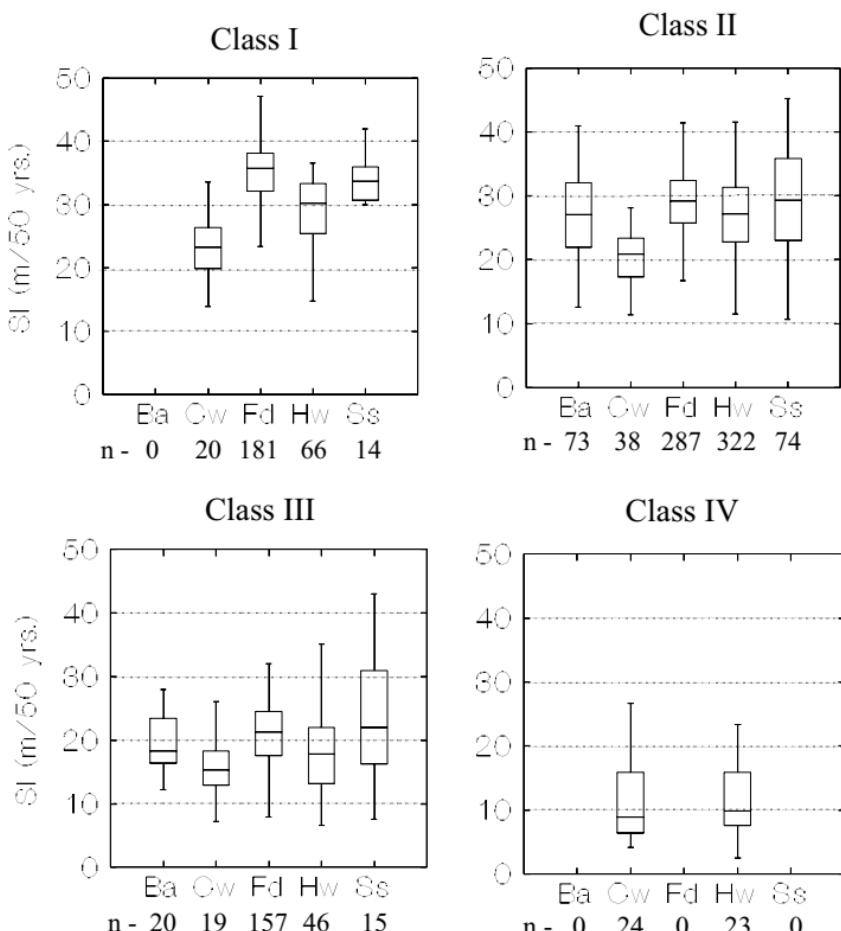


FIGURE 12. Site index (SI) classes and the distribution of species-specific SI data (SI from Mitchell and Polsson 1988).

A box plot (Figure 13) provides a graphical summary of the distribution of observations, indicating the median (middle value), the central 50% of the data, and the range of values (maximum and minimum).

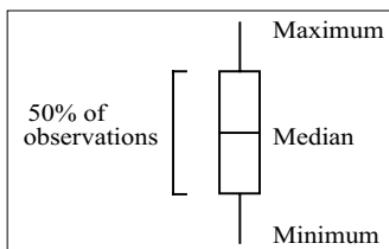


FIGURE 13. Graphical conventions used in box plots.

The information presented in this section gives a general indication of the productivity potential of a site series. It is important to recognize the variability encompassed by the site index classes. Rather than focusing just on the median, you should consider that each class represents a range in site index for a species. The range shown in the "box" represents 50% of observations and is a reasonable indication of the central tendency of the available data. Expect to be in the upper range of the data if you are in a "better quality" example of a site series (e.g., a particularly rich, well-aerated version of CWHxm/07). Expect to be in the lower range for poorer quality examples of a site series (e.g., a coarser textured, drier version of CWHxm/01). It is also important to consider the site series when evaluating species-specific site index information for a class. For example, information for Fd in class III is irrelevant on CwSs - Skunk cabbage sites in the CWHdm (site series # 12) where Fd is unsuitable. For special sites, **cottonwood** productivity potential is portrayed using the site index classes shown in Table 26 (from McLennan 1991).

TABLE 26. Cottonwood site index classes for special sites

SI class	SI range (m/15 yrs)
I	> 22
II	18 - 22
III	12 - 17
IV	< 12

6.4 Competing Vegetation Potential

The **competing vegetation potential** indicates the potential of a site to produce post-logging vegetation communities that may affect crop tree establishment and growth. A two-part rating is shown for each site series on the site productivity and competing vegetation grids in this section. The first part of the rating system (e.g., VH/3) is the severity rating, while the second part (e.g., VH/3) indicates the competing vegetation complex.

Four classes are recognized in the **severity rating**:

- L - low
- M - medium
- H - high
- VH - very high

This rating reflects the general level of post-logging site occupancy and growth by non-crop vegetation, and the potential effect on crop tree performance. High and very high ratings apply where vegetation development significantly decreases growth and survival of crop trees. Medium ratings apply where vegetation affects crop tree growth but does not significantly reduce regeneration survival. In general, the severity rating increases with increasing availability of soil moisture and soil nutrients. High to very high classes characterize fresh to wet, nutrient-rich to -very rich sites. Exceptions include medium classes for salal and *Vaccinium* spp., which tend to dominate on nutrient-poor to -medium sites.

While the severity rating provides a general estimate of vegetation potential, the actual development after harvesting depends on a number of factors such as the amount and type of disturbance, understorey development prior to harvest, and availability of seed and re-sprouting buds.

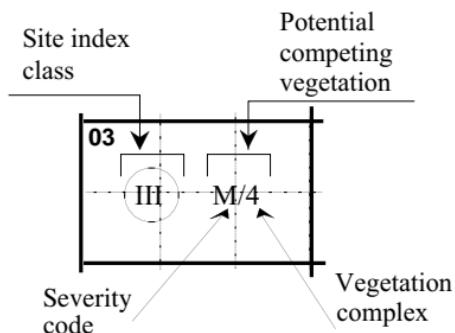
The **vegetation complexes** include 7 of the 22 major vegetation complexes recognized by Newton and Comeau (1990) for harvested sites in B.C. (Table 27). Each complex includes one or more related species that have the potential to affect conifer performance. This portion of the rating is intended to give a general indication of the type of vegetation community that can be expected to develop after harvesting. Variation in species will occur; that is, not all species will occur on all

indicated sites. A more specific estimation of a site series' vegetation potential may be obtained from the vegetation tables (Section 5.0) and from field observations of similar harvested sites. No competing vegetation complex is shown for sites with low severity ratings.

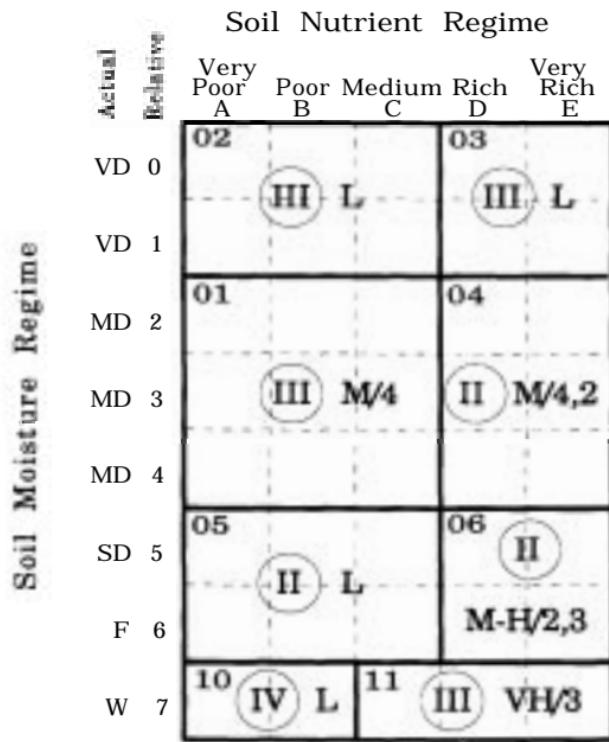
TABLE 27. Vegetation complex codes

No.	Name	Major species	
1	Cottonwood - alder	cottonwood red alder salmonberry red-osier dogwood	devil's club red elderberry thimbleberry
2	Bigleaf maple	bigleaf maple	
3	Red alder - shrub	red alder vine maple thimbleberry salmonberry	red elderberry devil's club currant spp. sword fern
4	Salal	salal	
5	Mixed shrub	thimbleberry red raspberry black twinberry Douglas maple Sitka alder falsebox red elderberry	devil's club false azalea willow spp. red-osier dogwood fireweed lady fern bracken fern
6	Ericaceous shrub	white-flowered rhododendron	false azalea huckleberry blueberry
7	Dry shrub	Saskatoon ceanothus falsebox soopolallie	snowberry ocean-spray Pacific ninebark beaked hazelnut
8	Subalpine herb	Sitka valerian arrow-leaved groundsel	Indian hellebore woodrush fireweed

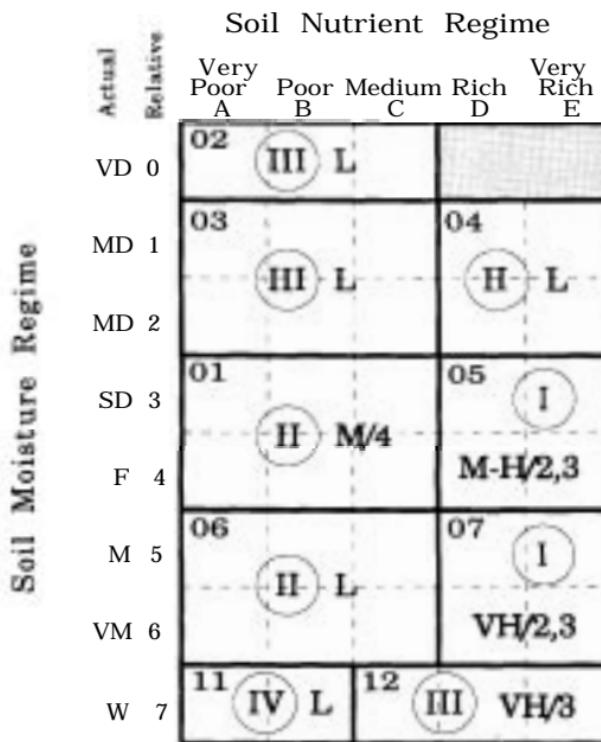
The potential competing vegetation and site productivity information for a site series is presented on the grids in the following format:



Grid No. 1 : CDFmm



Grid No. 2 : CWHdm



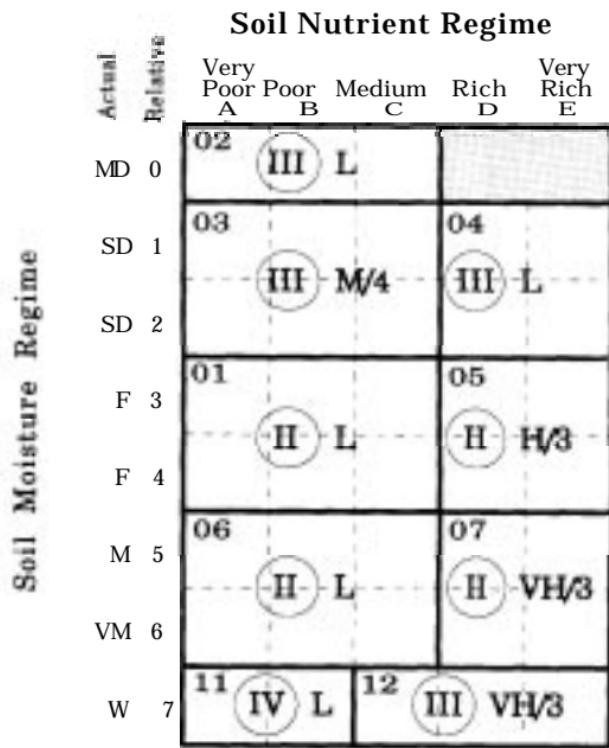
Grid No. 3: CWHds1

		Soil Nutrient Regime				
		Very Poor A	Poor B	Medium C	Rich D	Rich E
Soil Moisture Regime	Actual	02	IV L			
	Relative	03		04		
Soil Moisture Regime	Actual	III L		III M/7		
	Relative	01		05	II	
Soil Moisture Regime	Actual	III L		M-H/3,2		
	Relative	06		07	I	
Soil Moisture Regime	Actual	II L		VH/3,2		
	Relative	11 IV L	12 III VH/3			

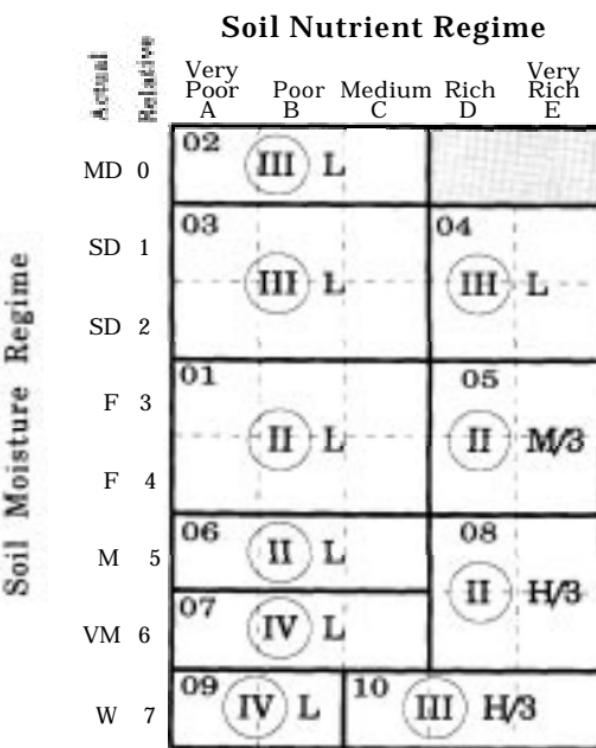
Grid No. 4: CWHds2

		Soil Nutrient Regime				
		Very Poor A	Poor B	Medium C	Rich D	Very Rich E
Soil Moisture Regime	Actual	02	IV L			
	Relative	03		04		
Soil Moisture Regime	Actual	III L		III M/7		
	Relative	01		05		
Soil Moisture Regime	Actual	III L		II M-H/3		
	Relative	06		07		
Soil Moisture Regime	Actual	II L		VH/3		
	Relative	11 IV L	12 III VH/3			

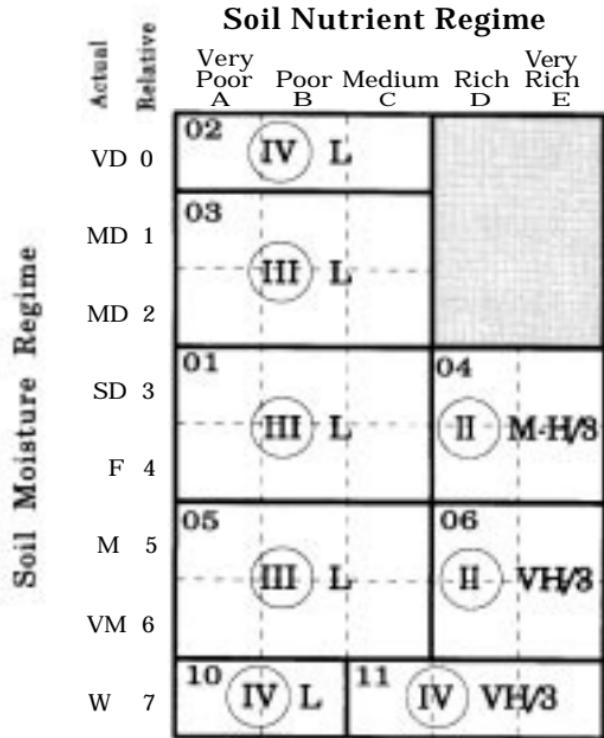
Grid No. 5: CWHmm1



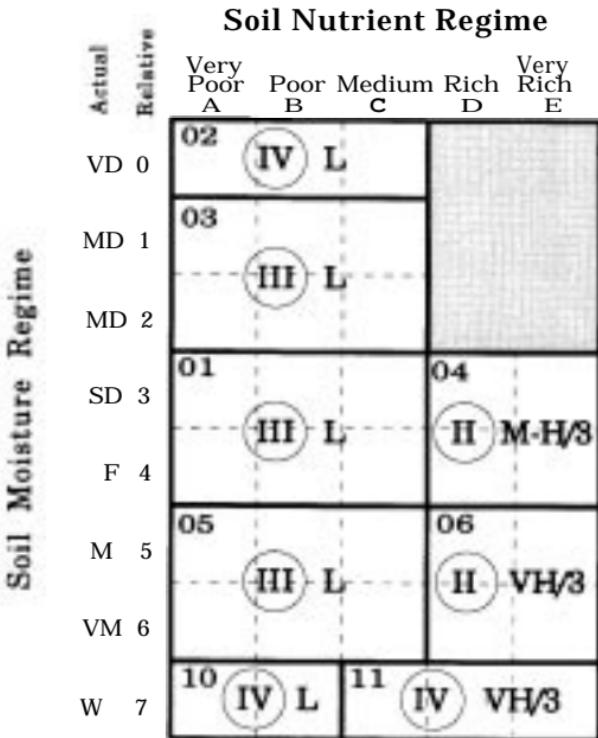
Grid No. 6: CWHmm2



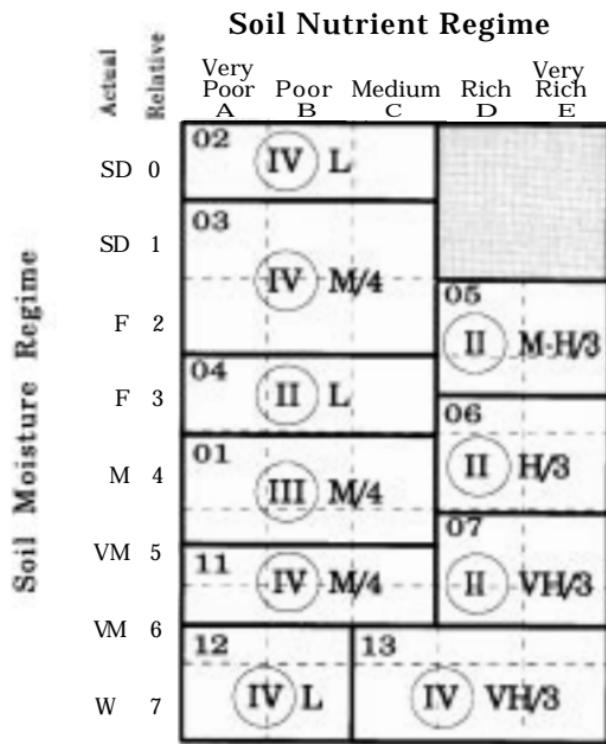
Grid No. 7: CWHms1



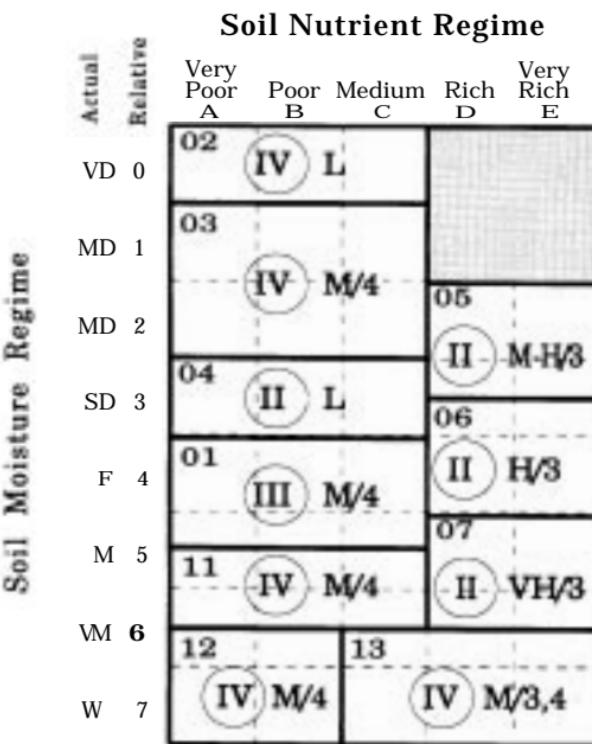
Grid No. 8: CWHms2



Grid No. 9: CWHvh1



Grid No. 10: CWHvh2



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Grid No. 11: CWHvm1

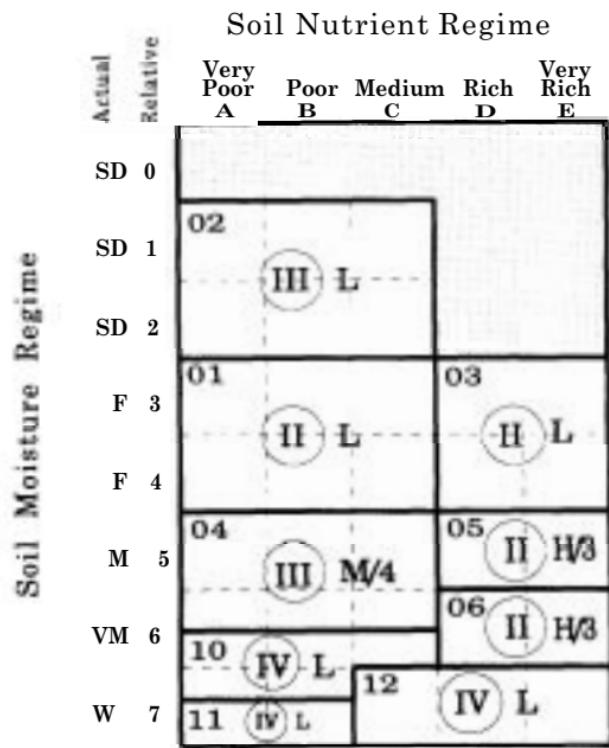
		Soil Nutrient Regime				
		Very Poor A	Poor B	Medium C	Rich D	Very Rich E
Soil Moisture Regime	Actual	02	IV L			
	Relative	SD 1	III M/4	04	II M/3	
Soil Moisture Regime	Actual	SD 2				
	Relative	01		05	H H/3	
Soil Moisture Regime	Actual	F 3	H L*			
	Relative	F 4				
Soil Moisture Regime	Actual	M 5	II L*	06	07	
	Relative	M 6			I VH/3	
Soil Moisture Regime	Actual	VM 6				
	Relative	W 7	12 IV L	13 III VH/3		

* M/4 on salal phase

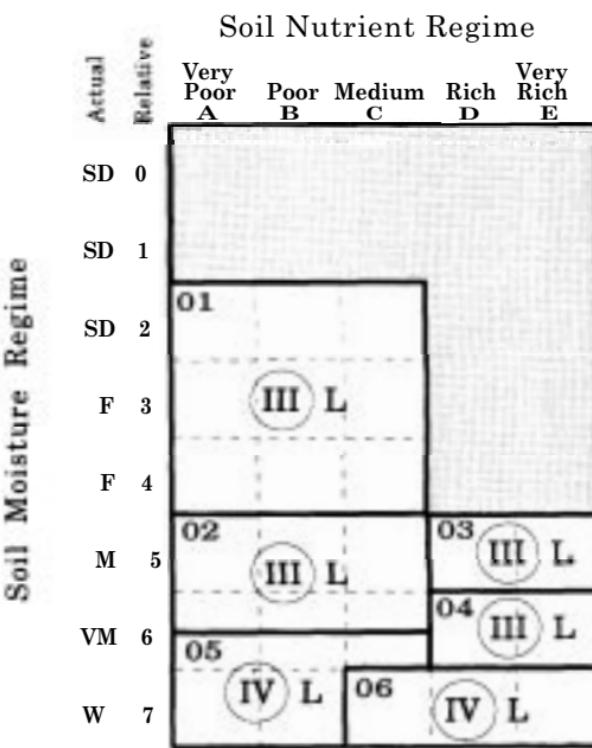
Grid No. 12: CWHvm2

		Soil Nutrient Regime				
		Very Poor A	Poor B	Medium C	Rich D	Very Rich E
Soil Moisture Regime	Actual	02	IV L			
	Relative	SD 1		04		
Soil Moisture Regime	Actual	SD 2	III M/4		III L	
	Relative	01		05		
Soil Moisture Regime	Actual	F 3	H L		II M/3	
	Relative	F 4				
Soil Moisture Regime	Actual	M 5	II L	06	07	
	Relative	M 6			II H/3	
Soil Moisture Regime	Actual	VM 6	IV L	09		
	Relative	W 7		10 IV L	11 III H/3	

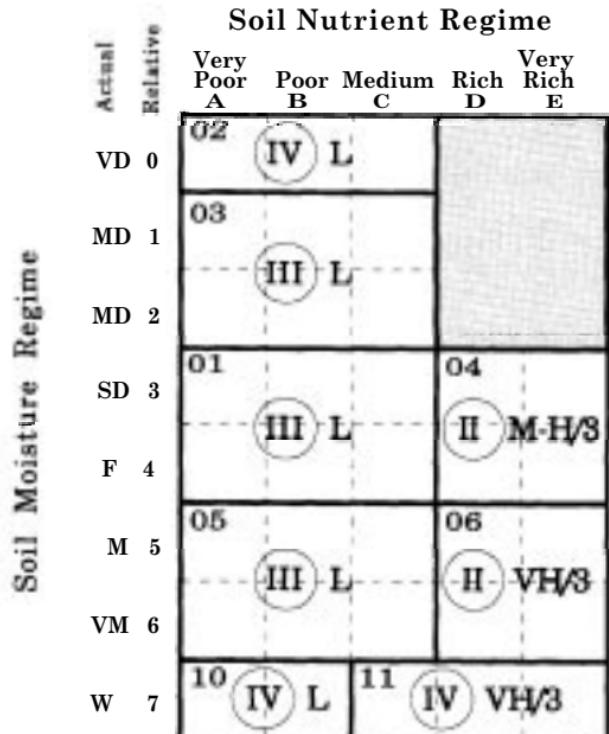
Grid No. 13: CWHwh1



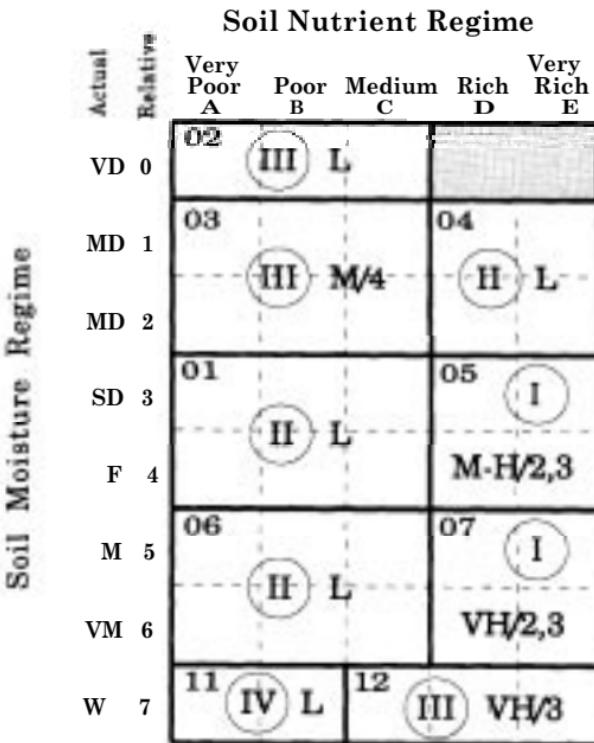
Grid No. 14: CWHwh2



Grid No. 15: CWHws2



Grid No. 16: CWHxm



Soil Moisture Regime

Actual
Relative

	Very Poor A	Poor B	Medium C	Rich D	Very Rich E
SD 0	02 IV L				
SD 1	03 IV L				
F 2	04 IV L				
F 3	01 III M/6		06 III VH/8		
F 4	05 III L				
M 5					
VM 6			07 IV VH/8		
W 7		08 IV VH/3			

Grid No. 17: ESSFmw

Grid No. 18: IDFww

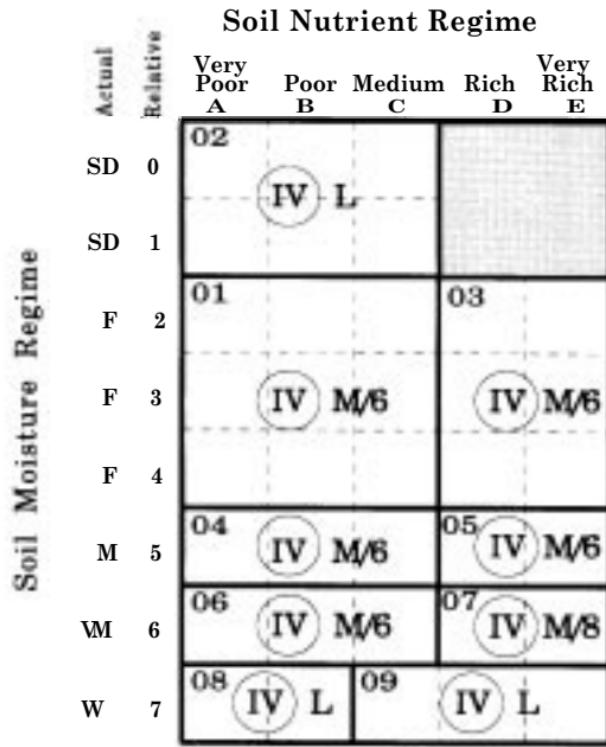
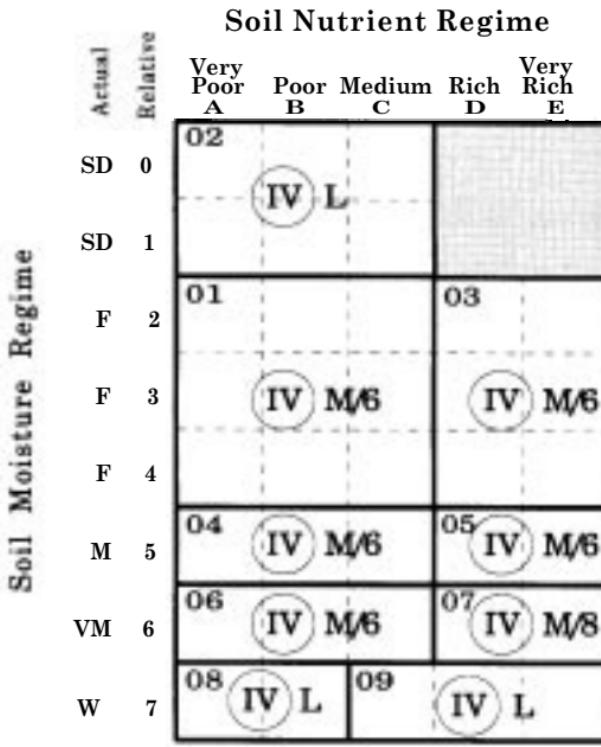
Soil Moisture Regime

Actual
Relative

	Very Poor A	Poor B	Medium C	Rich D	Very Rich E
VD 0	02 IV L				
VD 1	03 III L				
VD 2					
MD 3	01 III M/7		04 III VH/7		
MD 4					
SD 5				05 II H/5	
F 6				06 II H/5	
W 7			07 III H/5		

Soil Nutrient Regime

Very Poor
A Poor
B Medium
C Rich
D Very Rich
E

Grid No. 19: MHmm1**Grid No. 20: MHmm2**

Grid No. 21: MHwh

Soil Nutrient Regime

	Actual Relative	Very Poor A	Poor B	Medium C	Rich D	Very Rich E
Soil Moisture Regime		02				
SD	0		IV-L			
SD	1	01			03	
F	2					
F	3	IV M/6			IV M/6	
F	4					
M	5	IV M/6		05	IV L	
VM	6	IV L		06	IV M/8	
W	7	IV L	08	IV L	09	IV L

FLOODPLAINS

Grid No. 22

CDFmm

High
Bench

07	(II)	I	VH/1
08	-	II	VH/1
09	-	IV	VH/1

Medium
Bench

Low
Bench

SI class for Act in square.

Grid No. 23

CWHdm,CWHds1,CWHxm

High
Bench

08	(I)	I	VH/1
09	-	II	VH/1
10	-	IV	VH/1

Medium
Bench

Low
Bench

Grid No. 24

CWHds2

High
Bench

08	(I)	I	VH/1
09	-	II	VH/1
10	-	IV	VH/1

Medium
Bench

Low
Bench

Grid No. 25

CWHmm1

High
Bench

08	(II)	I	VH/1
09	-	II	VH/1
10	-	IV	VH/1

Medium
Bench

Low
Bench

FLOODPLAINS

Grid No. 26

CWHms1, CWHms2

High
Bench

07	(II)	I	*	VH/1
08	-	II		VH/1
09	-	IV		VH/1

Medium
Bench

Low
Bench

*SI class for Act in square.

Grid No. 27

CWHwh1

High
Bench

07	(I)	-		VH/1
08	-	-		VH/1
09	-	-		VH/1

Medium
Bench

Low
Bench

Grid No. 28

CWHvh1, CWHvh2

High
Bench

08	(I)	-		VH/1
09	-	-		VH/1
10	-	-		VH/1

Medium
Bench

Low
Bench

Grid No. 29

CWHvm1

High
Bench

09	(I)	I		VH/1
10	-	II		VH/1
11	-	IV		VH/1

Medium
Bench

Low
Bench

FLOODPLAINS

Grid No. 30 CWHws2

High Bench

07	(II)	I	*	VH/1
08	-	II		VH/1
09	-	IV		VH/1

Medium Bench

Low Bench

*SI class for Act in square.

SITES WITH STRONGLY FLUCTUATING WATER TABLE

Grid No. 31 CDFmm

Winter SMR	VM	12	(II)	I	*	VH/1	Summer SMR
W	13	-	II			VH/1	
VW	14	-	IV			VH/1	

Medium to very rich soil nutrient regime

* SI class for Act in square.

Grid No. 32

CWHdm, CWHxm

Winter SMR	VM	13	(II)	I	*	VH/1	Summer SMR
W	14	-	II			VH/1	M
VW	15	-	IV			VH/1	VM

Medium to very rich soil nutrient regime

* SI class for Act in square.

SHORELINE / OCEAN SPRAY SITES

Grid No. 33

CWHwh, CWHvh

Soil Moisture Regime	SD	^a ^b 13/14 (IV) M/4	Rocky headland
		14/15 (III) L	

Very poor to medium soil nutrient regime

Soil Moisture Regime	SD-F	15/16 (III) L	Rocky headland
		16/17 (II) VH/3	Marine terrace/scarp
		17/18 (IV) VH/3	Fluctuating brackish water

Rich to very rich soil nutrient regime

^a Site series number for CWHwh.

^b Site series number for CWHvh.

6.5 Ground-based Harvesting

6.5.1 Introduction

Ground-based harvesting systems have the potential to cause significant site degradation if poorly planned and used under the wrong conditions. Soil compaction, displacement of productive surface soils, and surface erosion are some of the potential impacts of ground-based harvesting that can lead to reduced site productivity. Minimizing site degradation depends on carefully matching the harvesting strategy to the site conditions.

Assessing site sensitivity is an important step in determining the suitability of ground-based harvesting systems. The following sections describe a method of estimating this site sensitivity and how to apply the information to harvesting decisions. (Strategies for planning harvesting operations on steep, potentially unstable terrain can be found in Chatwin *et al.* [1991]).

6.5.2 Site sensitivity to ground-based harvesting

The site sensitivity assessment has three components: *slope*, *terrain*, and *compaction*. In each component, a sensitivity rating is indicated, which reflects the potential impact of ground-based harvesting on site productivity. Sensitivity ratings are low - L, moderate - M, and high - H, with a site's sensitivity based on its most limiting feature.

SLOPE

< 30 % - L	> 30 % - H
------------	------------

Slope affects the amount of area affected by bladed skidroads. In general, soil displacement associated with skidroad construction becomes unacceptable on slopes steeper than 30%.

TERRAIN

Smooth, regular terrain	L
Complex, irregular terrain	H

Complex terrain results in much greater soil displacement from skidroad construction because of alignment limitations. Sensitivity increases as terrain becomes more irregular and complex.

COMPACTION⁶

SOIL TEXTURE (0 - 30cm)	HAZARD RATING		
	SMR 0-5	SMR 6-7	Wet season *
Fragmental coarse fragments > 70%	L	M	M
Coarse fragments <70%	Sandy S, LS	L	H
	Loamy SL, L	M	
	Silty Si, SiL	H	
	Clayey CL, SiCL, SiC, C, SC	H	

* wet season from October to May on all sites

Compaction sensitivity is assessed for the dominant soil texture and coarse fragment content in the upper 30 cm of *mineral soil*. If a pronounced textural change occurs within the upper 30 cm (e.g., sandy over silty), then use the more limiting texture, providing it amounts to more than 5 cm of the top 30 cm. All *organic soils* (> 40 cm of wet peaty or mucky material) have high compaction sensitivity.

Compaction sensitivity relates to a soil's ability to support heavy weight without significantly changing its physical properties. Greater soil "strength" is associated with coarse textures, high coarse fragment content, and high initial density. Soil water acts as a lubricant between soil particles and decreases soil strength. Thick fibrous forest floors (> 20 cm) and heavy slash can support considerable weight and thus provide some protection to underlying soil.

⁶ Modified from Lewis *et al.* (1993).

6.5.3 Application

The general suitability of ground-based harvesting systems according to site sensitivity is:

- **High** sensitivity: avoid ground-based systems
- **Medium** sensitivity: lower-impact ground-based systems acceptable (e.g., hoe-forwarding, low ground pressure skidders); designated skidtrails preferred to facilitate rehabilitation
- **Low** sensitivity sites: ground-based systems acceptable

Site sensitivity reflects *potential* harvesting impacts; *actual* impact depends on site conditions during logging, and on the nature and quality of the logging practices (Lewis *et al.* 1991). Even Low sensitivity sites can be significantly affected if harvested improperly (e.g., multiple passes, wet weather, blading away protective organic material and surface mineral horizons).

The following pointers will help minimize site degradation during ground-based harvesting:⁷

GROUND SKIDDING

- Time operations to drier soil conditions; have an alternative if conditions are not appropriate.
- Do not run equipment in wet areas; fall away and line logs out of wet areas.
- Run on slash where possible.
- Keep the blade up; avoid unnecessary excavation and scalping.
- Keep passes over the same ground to three or less unless on designated skidtrails.
- Stop operations if rutting >15 cm is occurring.
- Use designated skidtrails for Low to Moderate sensitivity sites or for areas requiring multiple entries. Machine traffic is restricted to properly built skidtrails, with all logs lined to trails.
- Only use dispersed skidding on Low sensitivity sites.

⁷ Modified from Laird and Green (1993).

HOE FORWARDING/FELLERBUNCHING

- Minimize the number of passes on trails (1-3 passes) by scheduling refueling and maintenance.
- Avoid wet areas.
- Avoid scalping or excavating soil.
- Use then remove puncheon.
- Stop operations if rutting >15 cm is occurring.
- Orient trails along the contour.
- Time operations during drier soil conditions; have an alternative if conditions are not appropriate.

6.5.4 Background information

Additional information on harvesting strategies to minimize site degradation can be found in the following references:

- Butt, G. and T.P Rollerson. 1988. Prediction of forest soil compaction. *In* Degradation of forest land: "Forest soils at risk". Proceedings of the 10th B.C. soil science workshop, February 1986. J.D. Lousier and G.W. Still (editors.). B.C. Min. For., Land Manage. Rep. No. 56, Victoria, B.C.
- Chatwin, S.C., D.E. Howes, J.W. Schwab, and D.N. Swanston. 1991. A guide for management of landslide-prone terrain in the Pacific Northwest. B.C. Min. For., Land Manage. Handb No. 18, Victoria, B.C.
- Laird, R.M. and R.N. Green. 1991. Site degradation guidelines for the Vancouver Forest Region. *In* Pre-harvest silviculture prescription - procedures and guidelines for the Vancouver Forest Region, Vancouver Circular VR91-554.
- Laird, R.M. and R.N. Green. 1993. Understanding coastal forest site degradation - a "tailgate" seminar for operators. B.C. Min. For., Victoria, B.C. Unpubl. rep.
- Lewis, T. and the Timber Harvesting Subcommittee. 1991. Developing timber harvesting prescriptions to minimize site degradation. B.C. Min. For., Land Manage. Rep. No. 62, Victoria, B.C.

6.6 Pest Risks of Major Conifer Species⁸

Insects, diseases, and mammals are normal components of forests. Each of these groups of organisms plays a role in ecosystem processes, such as nutrient cycling and forest succession. When their activities negatively affect forest management objectives, however, they are deemed to be pests. Timber harvesting and silviculture activities greatly affect the incidence and impact of forest pests. To help minimize pest-related losses and maximize forest productivity, managers need to be aware of the effects of various forest management activities. The most critical stage to assess and prescribe treatments for pest problems is during the development of pre-harvest silviculture prescriptions. A prescription that does not adequately account for potential pest impacts can greatly erode forest productivity. Conversely, the proper assessment of, and prescription for, pests may substantially improve the yield from a site.

The following *pest risk tables* are based on information and experience of forest health specialists within the Ministry of Forests and Forestry Canada. The tables refer to the major pest species that are most likely to be important when prescribing a commercial conifer species for reforestation. Additional pest species may need to be considered when dealing with atypical circumstances or tree species. This information is intended to help field personnel assess a "reasonable pest risk" when developing silviculture prescriptions. This represents a first approximation of pest risks that will be fine-tuned as more data become available.

The tables provide host-specific ratings of the expected risk of pest impacts in a biogeoclimatic subzone or variant. The *persistent* or *periodic* nature of these pests is also indicated. Pest risk is a function of occurrence, intensity, and impact of the pest. A high risk rating within a specific biogeoclimatic variant indicates that there is a high probability that the pest will occur and cause unacceptable levels of damage if the stands involved are susceptible or will become so. Susceptibility is influenced by tree species, age, climate, stand conditions, etc. Risk ratings are not comparable between types of pests; for example, a high rating for an insect is not comparable to a high rating for a disease. A legend explaining symbols used in the tables is shown in Figure 14.

⁸ Prepared by J.G. Fournier, Forest Pathologist, and D.G. Heppner, Forest Entomologist, Ministry of Forests, Vancouver Forest Region.

FOREST PEST RISK	PEST INCIDENCE	
	persistent	periodic
low	■	□
medium	■■	□□
high	■■■	□□□

? - assessment speculative or pest activity anticipated but significance unconfirmed

FIGURE 14. Legend for symbols used in pest risk tables

DOUGLAS-FIR

Grid No: and Subzone	INSECTS			MAMMALS			DISEASES		
	Douglas-fir beetle	western spruce budworm	seedling 1 Weevil ¹	deer 2	voles	porcupine	Amillaria 3 root rot	black stain 4 root disease	laminated 5 root rot
1 CDFmm				■	□		■	■	■
2 CWHdm				■	□		■	■	■
3 CWHds1	□	■		■	□		■	■	■
4 CWHds2	□				□		■	■	■
5 CWHmm1							■		■
6 CWHmm2							■		■
7 CWHms1	□	□		■		■	■		■
8 CWHms2					□		■		
9 CWHvh1									
10 CWHvh2									
11 CWHvm1		□		■			■		
12 CWHvm2				■			■		
13 CWHwh1									
14 CWHwh2									
15 CWHws2									
16 CWHxm		□	■	■	□		■	■	■
17 ESSFmw	□	■		■	□		■		
18 IDFww	□	■		■	□		■	?	■
19 MHmm1									
20 MHmm2									
21 MHwh									

¹ Isolated localities within noted variants.

² Incidence is higher on some islands; e.g., Texada Island.

³ Greatest impact in coast/interior transition.

⁴ Greatest impact on coarse-textured, heavily disturbed sites.

⁵ Greatest impact on slightly dry to moist sites.

WESTERN HEMLOCK

Grid No: and Subzone	INSECTS			MAMMALS		DISEASES		
	blackheaded budworm	hemlock sawfly	seedling 1 weevil	voles 1	Anomus 9 root rot	Amillaria 3 root rot	hemlock 6 dwarf mistletoe	laminated 5 root rot
1 CDFmm								
2 CWHdm				□	■	■	■	■
3 CWHds1				□	?	■	?	■
4 CWHds2				□	?	■	?	■
5 CWHmm1	□				■	■	■	?
6 CWHmm2					■	■	■	■?
7 CWHms1				□	■	■	■	?
8 CWHms2				□	■	■	■	?
9 CWHvh1	□		□	□	■	■	■	
10 CWHvh2			□		■	■	■	
11 CWHvm1	□		□		■	■	■	
12 CWHvm2					■	■	■	
13 CWHwh1	□	□	□		■	■	■	
14 CWHwh2	□	□	□		■	■	■	
15 CWHws2					?	■	?	?
16 CWHxm				□	■	■	■	■
17 ESSFmw								
18 IDFww								
19 MHmm1								
20 MHmm2								
21 MHwh								

¹ Isolated localities within noted variants.

³ Greatest impact in coast/interior transition.

⁵ Greatest impact on slightly dry to moist sites.

⁶ Greatest impact on less productive sites where infected overstory perimeter exist.

⁹ Greatest impact where root grafting occurs and in juvenile spaced stands.

WESTERN REDCEDAR**LODGEPOLE PINE**

Grid No: and Subzone	MAMMALS		DISEASES		INSECTS		DISEASES	
	deer ²	voles	<i>Amillaria</i> root rot ³	laminated root rot ⁵	mountain pine beetle	pitch moth	<i>Amillaria</i> root rot ³	pine dwarf mistletoe ⁸
1 CDFmm	█	□			█			
2 CWHdm	█	□	█		█			
3 CWHds1	█	□	█		□	█		
4 CWHds2	□		█		□	█		
5 CWHmm1			█					
6 CWHmm2			█					
7 CWHms1	█		█ ?					
8 CWHms2		□	█					
9 CWHvh1			□ ?					
10 CWHvh2			□ ?					
11 CWHvm1	█		█ ?					
12 CWHvm2	█		█ ?					
13 CWHwh1	█							
14 CWHwh2	█		?					
15 CWHws2			█ ?					
16 CWHxm	█	□	█		█			
17 ESSFmw					□			
18 IDFww	█		█ ?	█ ?	□	█ ?	█ ?	
19 MHmm1								
20 MHmm2								
21 MHwh		?						

² Higher incidence on some islands; e.g., Texada Island.

³ Greatest impact in coast/interior transition.

⁵ Cedar strain possible; greatest impact on slightly dry to moist sites.

⁸ Greatest impact on less productive sites where infected overstorey perimeter exists.

GRAND FIR

Grid No: and Subzone	INSECTS		MAMMALS		DISEASES		
	balsam woolly 7	deer	Anomos 9 root rot	Armillaria 3 root rot	laminated 5 root rot		
1 CDFmm	■	■	■	■	■	■	■
2 CWHdm	■		■	■	■	■	■
3 CWHds1	■	■					
4 CWHds2							
5 CWHmm1							
6 CWHmm2				?	?	?	
7 CWHms1	■			?	■	?	
8 CWHms2							
9 CWHvh1							
10 CWHvh2							
11 CWHvm1							
12 CWHvm2							
13 CWHwh1							
14 CWHwh2							
15 CWHws2	■						
16 CWHxm	■		?	■	■	?	
17 ESSFmw							
18 IDFww		■			?	■	?
19 MHmm1							
20 MHmm2							
21 MHwh							

³ Greatest impact in coast/interior transition.

⁵ Greatest impact on slightly dry to moist sites.

⁷ Within the zone of infestation only.

⁹ Greatest impact where root grafting occurs and in juvenile spaced stands.

AMABILIS FIR**SUBALPINE FIR**

Grid No: and Subzone	INSECTS		DISEASES			INSECTS	
	<i>balsam woolly 7</i>	<i>balsam bark beetle</i>	<i>Anomos 9 root rot</i>	<i>Armillaria 3 root rot</i>	<i>laminated 5 root rot</i>	<i>balsam bark beetle</i>	
1 CDFmm							
2 CWHdm							
3 CWHds1							
4 CWHds2							
5 CWHmm1	■		■ ?	■ ?			
6 CWHmm2	■		■ ?	■ ?			
7 CWHms1			■	■			
8 CWHms2			■	■			
9 CWHvh1		?	■				
10 CWHvh2		?	■				
11 CWHvm1	■		■	■			
12 CWHvm2	■		■ ?	■			
13 CWHwh1							
14 CWHwh2							
15 CWHws2		■	■				
16 CWHxm							
17 ESSFmw	■	?	?			■	
18 IDFww							
19 MHmm1			?				
20 MHmm2	■		?				
21 MHwh							

³ Greatest impact in coast/interior transition.

⁵ Greatest impact on slightly dry to moist sites.

⁷ Within the zone of infestation only.

⁹ Greatest impact where root grafting occurs and in juvenile spaced stands.

FOREST PEST RISK

ENGELMANN SPRUCE

MOUNTAIN HEMLOCK

Grid No: and Subzone	INSECTS			DISEASES				DISEASES	
	spruce weevil	spruce beetle	Anthonomus 9 root rot	Armillaria 3 root rot	Laminated 5 root rot	Tomentosus root rot	hemlock 6 dwarf mistletoe		
1 CDFmm									
2 CWHdm									
3 CWHds1	■		■	■ ?	■ ?	■ ?			
4 CWHds2	■		■ ?	■ ?		■ ?			
5 CWHmm1									
6 CWHmm2	■		■ ?	□	?				
7 CWHms1	■	■	■ ?	■ ?					
8 CWHms2	■		■ ?	■		■ ?			
9 CWHvh1									
10 CWHvh2									
11 CWHvm1									
12 CWHvm2									
13 CWHwh1									
14 CWHwh2									
15 CWHws2	*	*	■	■					
16 CWHxm									
17 ESSFmw	■	■	■	■	?	■			
18 IDFww									
19 MHmm1			?					■	
20 MHmm2			?					■	?
21 MHwh								■	

3 Greatest impact in coast/interior transition.

5 Greatest impact on slightly dry to moist sites.

6 Greatest impact on less productive sites where infected overstorey perimeter exists.

9 Greatest impact where root grafting occurs and in juvenile spaced stands.

* Sxs only; Se not recommended.

SITKA SPRUCE

Grid No: and Subzone	INSECTS			DISEASES		
	spruce weevil	spruce aphid	seedling 1 weevil ¹	Anomos 9 root rot	Armillaria 3 root rot	laminated 5 root rot
1 CDFmm	█	█				
2 CWHdm	█	█		█	█	█
3 CWHds1	█					
4 CWHds2	█	█	*	?	█	?
5 CWHmm1	█			█	█	?
6 CWHmm2						
7 CWHms1						
8 CWHms2	█			█	█	
9 CWHvh1	█	█	□	?		
10 CWHvh2	█		□	?		
11 CWHvm1	█	█	□	█	?	
12 CWHvm2	█			█	?	
13 CWHwh1		█	□	█		
14 CWHwh2			□	█		
15 CWHws2						
16 CWHxm	█	█		█	█	█
17 ESSFmw	█	□?		?	?	
19 MHmm1						
20 MHmm2						
21 MHwh			?			

¹ Isolated localities within noted variants.

³ Greatest impact in coast/interior transition.

⁵ Greatest impact on slightly dry to moist sites.

⁹ Greatest impact where root grafting occurs and in juvenile spaced stands.

* In the Bella Coola area only; unknown in other portions of CWHds2.

6.7 Wildlife Diversity and Habitat Relationships ⁹

6.7.1 Introduction

A description of ecosystems without a discussion of wildlife would ignore a major dynamic element of those systems. The term "wildlife" is usually used to describe all vertebrates, but interest in invertebrate animals is increasing. Wildlife are important components in forests ecosystems and play a role in nutrient cycling, seed dispersal, plant distribution, predator-prey relationships, and herbivore-plant relationships, and sometimes have a major economic impact through damage to forest crops. Without doubt, the conservation of biological diversity will have a large impact on forestry practices and the forests of the future. The maintenance of biological diversity should be an integral part of all forest management.

In the past, wildlife habitat management was a byproduct of forest management. However, as public awareness grows, there has been greater emphasis on forest management specifically for wildlife. Timber management *is* wildlife management, but the degree to which it is *good* wildlife management depends on how effectively it addresses the requirements of wildlife.

This section provides a very brief discussion of some of the wildlife habitats and issues in the areas covered by this handbook.

6.7.2 Biological diversity

Biodiversity refers to the full range of life in all its natural forms, including genes, species, ecosystems, and ecological processes. All species in an ecosystem are important components of biodiversity, but some may be of greater concern to the manager because:

⁹ Prepared by A.E. Derocher, Research Wildlife Ecologist, Vancouver Region. Information presented here has been compiled from several sources, including W. Klenner, unpub.; D. Seip, unpub.; Meidinger and Pojar (1991); Banner *et al.* (1993); Backhouse (1993); and Steeger and Fenger (1992). Specific references are not cited in the text.

- they are considered at risk.
- they create habitat used by other species (e.g., primary cavity nesters).
- they require specific habitats that are adversely affected by land use practices.
- they are commercially important.
- they are of public interest.

Recognizing that the public views wildlife to include a wider spectrum of wild species than just terrestrial vertebrates and freshwater fish, and the need to manage on an ecosystem basis, the Provincial Wildlife Strategy is directed to all wild vertebrates and the habitat they depend on, as well as invertebrates and plants considered to be vulnerable, threatened, or endangered. B.C. currently classifies all indigenous terrestrial and freshwater fish. The criteria used to classify species are: abundance, distribution, habitat integrity, population trend, reproductive potential, threats to the population, susceptibility to large-scale disturbances, national status, and international status. Species are classified as "Species at Risk" or "Species Not at Risk." Species at risk are subdivided into two groups:

RED LIST

This group includes:

- *Extirpated*¹⁰ species: any formerly indigenous species or subspecies no longer existing in the wild in B.C., but that occurs elsewhere.
- *Endangered* species: any indigenous species or subspecies threatened with imminent extinction or extirpation throughout all or a significant portion of its range in B.C.
- *Threatened* species: any indigenous species or subspecies that is likely to become endangered in B.C. if factors affecting its vulnerability are not reversed.

BLUE LIST

- *Sensitive* or *vulnerable* species that are not threatened but are particularly at risk.

Species Not at Risk are placed in the *Yellow List*.

¹⁰ Extirpated refers to extinction of local populations.

YELLOW LIST

- Species that are monitored to ensure that they do not become more vulnerable.
- Species that are habitat sensitive.
- Species viewed or harvested by the public.
- Species that are an important component of the fauna of B.C.
- Species for which B.C. has a large proportion of the global population.
- Non-native species.

6.7.3 Wildlife habitats and habitat components

The *B.C. Wildlife Act* defines habitat as "the air, soil, water, food, and cover components of the environment on which wildlife depend directly or indirectly in order to carry out their life processes."

OLD-GROWTH FORESTS have a major ecological role in contributing to biodiversity. Some species in the Vancouver Forest Region are either partially or totally dependent on old-growth habitats for all or part of their life cycle, while many other species are most abundant in old-growth ecosystems. The diminishing amount of old-growth forest has made it the focus of the biodiversity strategy. These ecosystems are the subject of ongoing research.

The features that make old-growth forests important habitat are:

- multiple canopy layers.
- wide variation in trees sizes and spacing.
- canopy gaps.
- large trees with large limbs suitable for nesting for many birds.
- large volume of coarse woody debris in all stages of decay and wide range of sizes.
- numerous snags and wildlife trees.
- broken top trees that provide nesting habitat for large birds and Vaux's Swift.
- cool, moist, and moderated environment.
- abundant understorey vegetation.
- abundant epiphytic lichens that provide food.
- abundant mycorrhizal fungi that are food for several mammals.
- high snow interception.

Three species of special management concern that use old-growth in the Vancouver Forest Region are the Spotted Owl, Marbled Murrelet, and Keen's long-eared myotis (a species of bat).

RIPARIAN AREAS are adjacent to and influenced by lakes, rivers, streams, and wetlands. These sites vary from narrow bands along wetlands and lakes and small streams to large floodplains, and are important or critical habitat for many species.

The features that contribute to the ecological importance of riparian habitats are:

- lush understorey vegetation providing abundant food and cover.
- high horizontal and vertical structure providing a diversity of niches.
- moderate and stable environment.
- proximity to salmon and invertebrates as food sources.
- moist microclimate and access to water.
- corridors for dispersal.

In general, the majority of the structural components in riparian ecosystems must be maintained to allow them to remain functionally intact. Development in these areas should closely follow the *B.C. Coastal Fisheries Forestry Guidelines* to maintain their integrity.

WETLANDS are the primary habitat of many wildlife species. They are highly productive areas and provide important forage for waterfowl, shorebirds, amphibians, and mammals. Many cavity-nesting birds (e.g., Goldeneye, Wood Ducks, and Bufflehead) use the forest fringe of wetlands. Rodent populations can be high in these areas. Marshes are the most productive and bogs the least productive wetlands, but both support a diversity of species.

DECIDUOUS FORESTS in the Vancouver Forest Region are comprised of alder, black cottonwood, vine maple, bigleaf maple, birch, trembling aspen, cherry, and Garry oak. Deciduous forests are typically early to middle seral stages that established after disturbance. As succession proceeds, the deciduous forests are replaced by mixed coniferous and deciduous forests, which continue to provide forage and nesting habitats. Even when deciduous forests occur in small (< 1 ha) patches, they can be important habitats for many species.

SHORELINE FORESTS AND ESTUARIES provide habitat for those species adapted to marine, estuarine, and forest habitats. Estuaries are important as rearing and staging grounds for migratory salmon. The deltas at the mouth of rivers and streams provide important habitat for grizzly bears and migratory birds. The Ancient Murrelet found in the Queen Charlotte Islands is a typical shoreline forest-user and nests in colonies under the roots of large trees or logs.

SOUTH ASPECTS are important habitats for species such as deer and elk. These areas tend to have lower snow accumulations due to the greater exposure to the sun. South aspects provide forage earlier in the spring.

6.7.4 Important habitat components at the stand level

WILDLIFE TREES

These are living or dead, naturally occurring trees that provide present or future important habitat for the maintenance or enhancement of wildlife. Without careful management, we will face a shortage of wildlife trees as old-growth forests are replaced by second-growth stands. More than 16% of our native wildlife species can be considered wildlife tree users. Wildlife trees provide critical habitat for nest cavities, nest platforms, dens, roosts, hunting perches, foraging sites, and display stations during breeding. The value of a wildlife tree varies with factors such as age, size, structure, rot, species, elevation, and proximity to critical habitats. Implementing a successful wildlife tree management program will, however, result in greater volumes of timber left standing on-site.

Snags and moribund trees are critical habitat elements for many primary¹¹ and secondary cavity nesters such as Woodpeckers, Chickadees, some Owls, Wood Ducks, marten, fisher, ermine, northern flying squirrels, Keen's long-eared myotis, and black bears. Snags are also used as perches by birds of prey and insectivorous birds (e.g., Swallows and Flycatchers), which help control forest pests. Taller and larger-diameter snags are used by more species

¹¹Primary cavity excavators are birds such as Woodpeckers, Nuthatches, and Chickadees that are able to excavate their own nest holes. Woodpeckers make new holes each year as part of their courtship ritual, and will not accept nest boxes. Secondary cavity users are animals that utilize tree holes they have not excavated themselves (either abandoned woodpecker cavities or holes formed naturally through decay).

than smaller snags. A wildlife tree classification system has been developed for B.C. (Backhouse 1993)

Deciduous trees provide an important component of habitat diversity. Deciduous trees provide important foraging and nesting habitat for songbirds such as warblers, vireos, and flycatchers. Some of these are migrant species that winter south of B.C. and use deciduous trees for resting areas or breeding habitat. Deciduous trees are particularly useful to cavity-nesters because they die early in competition with conifers. Cottonwood are often used by Bald Eagles for nesting and roosting.

Large veteran trees are important as future snags and coarse woody debris. Veteran trees are often in early stages of decay and can be used by cavity nesters and birds that forage for bark insects. Birds of prey and Great Blue Herons often use veterans for perching or nesting.

COARSE WOODY DEBRIS (CWD)

This includes large woody material in the form of logs, root wads, bark, limbs, and stumps in various stages of decay on the forest floor. CWD is the primary habitat of many wildlife species. Many invertebrates, amphibians, reptiles, birds, and mammals utilize CWD as food, den sites, and breeding habitat. Some species, such as the clouded salamander, require the humid micro-climate and cover provided by CWD. Black bear and marten commonly den in large stumps and hollow logs. In streams, CWD creates habitat for amphibians, fish, and invertebrates. Maintenance of CWD after logging of second-growth forests is particularly important.

EDGES

These occur in the transition zone between habitats and are highly diverse in structure. Edge-using species are able to exploit the benefits of two habitats and numerous species, such as elk, thrive in these areas. Some species, however, do not thrive in edge habitats and require "*interior forest conditions*." Excessive edge is a feature of habitat fragmentation and can lead to a reduction in biodiversity.

INTERIOR FOREST CONDITIONS

These are limited to the centre portions of large, undisturbed tracts of forest. The ecological conditions of greater humidity, lower temperatures, reduced temperature fluctuations, and reduced wind velocity are important for species such as amphibians. In addition, predation of bird nests by crows, ravens, and jays is reduced in forest interiors. Marbled murrelets may require interior forest conditions.

FOREST CANOPY GAPS

These are important in maintaining understorey vegetation, which in turn, provides horizontal and vertical structure. Canopy gaps occur when a tree or a group of trees fall, letting sunlight reach the forest floor, and allowing the growth of herbs and shrubs. In young closed-canopy forests, small openings can be important for providing forage and hunting habitat for many species. Creation of canopy gaps in second-growth forests is important for maintaining grizzly bear and black-tailed deer forage. Berry-producing species may be present under a closed-canopy forest but do not receive sufficient sunlight to produce berries.

6.7.5 Biogeoclimatic zones and wildlife

The Vancouver Forest Region supports a wide variety of wildlife species. The following is a brief description of some wildlife issues by biogeoclimatic zone. Some of the *Red* or *Blue* list species are given.

COASTAL DOUGLAS-FIR ZONE

Wildlife species found in this zone are strongly influenced by the mild, moist winters and the warm, dry summers. Low snowfall is also an important feature. Many species of waterbirds winter on estuaries and sheltered waters. Mature and old-growth coniferous forests are important for birds that eat conifer seeds or wood-boring insects. Black-tailed deer, black bear, and cougar are common large mammals.

Some species of management concern are:

- sharp-tailed snake (*Red*)
- Marbled Murrelet (*Blue*)
- Bald Eagle (*Blue*)
- Great Blue Heron (*Blue*)

- Western wolverine (*Blue*)
- Vancouver Island wolverine (*Red*)
- Keen's long-eared myotis (*Red*)
- cougar (*Yellow*)
- black-tailed deer (*Yellow*)

COASTAL WESTERN HEMLOCK ZONE

The CWH is rich in species compared to interior and northern areas owing to the great diversity and abundance of habitat elements. Habitats such as bogs, talus slopes, small coastal islands, coastal plains, estuaries, avalanche tracks, and large areas of contiguous forest contribute to the rich biodiversity of this zone. The range in elevation (sea level to 1050 m) and the mild maritime climate are also important features. Many bird species winter in this zone.

Old-growth forests provide food and nesting habitat for a wide variety of birds. Some species such as the Spotted Owl and Marbled Murrelet appear to be dependent on old growth. Many species of amphibians, including four species of salamander, are present due to the moist litter and coarse woody debris on the forest floor. The Pacific giant salamander and tailed frog require steep cold mountain streams in old-growth forests to reproduce. Anadromous salmon are an important source of food for many wildlife species.

Black-tailed deer, cougar, black bear, grizzly bear, and gray wolf are common large mammals. Hunting for large mammals is a common recreational pursuit. Fur harvest is low despite large furbearer populations.

Some species of management concern are:

- Pacific giant salamander (*Red*)
- tailed frog (*Blue*)
- Spotted Owl (*Red*)
- Marbled Murrelet (*Blue*)
- Peales' Peregrine Falcon (*Blue*)
- Bald Eagle (*Blue*)
- Great Blue Heron (*Blue*)
- Queen Charlotte ermine (*Red*)
- Vancouver Island wolverine (*Red*)
- mountain beaver (*Red*, in Fraser Valley)

- Vancouver Island marmot (*Red*)
- fisher (*Blue*)
- grizzly bear (*Blue*)
- black bear (*Yellow*)
- Keen's long-eared myotis (*Red*)
- black-tailed deer (*Yellow*)
- elk (*Blue* and *Yellow*, depends on location)

MOUNTAIN HEMLOCK ZONE

Long, cool, and wet winters with heavy snow cover and short cool summers influence the species in this zone. Relative to other zones, the MH has fewer wildlife species. Large mammals in this zone rely on special edaphic units such as avalanche tracks, south-facing rock outcrops, and subalpine parklands.

In winters with heavy snowfall, mountain goats can migrate into the MH. Coastal grizzly bears often den over winter in the forests of this zone. Some species such as Clark's Nuthatch, Gray Jays, and Raven are common.

Some species of management concern are:

- Pacific giant salamander (*Red*)
- tailed frog (*Blue*)
- Vancouver Island marmot (*Red*)
- Vancouver Island wolverine (*Red*)
- western wolverine (*Blue*)
- grizzly bear (*Blue*)
- mountain beaver (*Red*)
- mountain goat (*Yellow*)
- elk (*Blue* and *Yellow*, depends on location)

INTERIOR DOUGLAS-FIR ZONE

The wildlife species in this zone are influenced by the continental climate, with cool winters and warm dry summers, and the extensive Douglas-fir forests with variable canopy closure. Low-elevation, south-facing aspects are important for many of the ungulates. The diversity of overstorey and understorey vegetation supports a varied assemblage of wildlife. Riparian areas are critical habitats.

Moose, black bears, grizzly bears, black-tailed and mule deer, and cougar are common larger mammals. Harvesting of furbearers and hunting can be important in this zone.

Some species of management concern are:

- Great Blue Heron (*Blue*)
- Yellow-headed Blackbird (*Yellow*)
- Bald Eagle (*Blue*)
- Vaux's Swift (*Yellow*)
- Lewis' Woodpecker (*Blue*)
- Townsend's big-eared bat (*Red*)
- lynx (*Yellow*)
- black bear (*Yellow*)
- grizzly bear (*Blue*)
- mule deer (*Yellow*)

ENGELMANN SPRUCE - SUBALPINE FIR ZONE

The ESSF is characterized by a continental climate with short, cool summers and long, cold, snowy winters. This zone is one of the most productive for grizzly bears and provides some seasonal habitats and denning areas. Many wildlife species use the forested land adjacent to avalanche tracks as cover. Furbearers such as marten, fisher, lynx, and wolverine are important in this zone.

Some species of management concern are:

- tailed frog (*Blue*)
- American Peregrine Falcon (*Red*)
- mink (*Yellow*)
- fisher (*Blue*)
- western wolverine (*Blue*)
- grizzly bear (*Blue*)
- Cascade mantled ground squirrel (*Blue*)

ALPINE TUNDRA

Harsh climate and rugged topography are the key factors influencing wildlife species in this zone. Low rates of annual productivity and the short snow-free season limit the diversity of wildlife species and their

abundance. The species found in this zone are influenced by the underlying subalpine zone, typically the Mountain Hemlock.

Mountain goats that use the Alpine Tundra near the coast are forced to lower elevations in winter by the deep snowpack. The endangered Vancouver Island marmot occurs in this zone.

Some species of management concern are:

- Vancouver Island White-tailed Ptarmigan (*Blue*)
- Vancouver Island marmot (*Red*)
- grizzly bear (*Blue*)
- western wolverine (*Blue*)
- mountain goat (*Yellow*)

6.7.6 General guidelines for maintaining wildlife habitat values at the stand level

HABITAT FEATURES

All forests should be managed to maintain or enhance biodiversity. However, some stands should receive greater emphasis than others. This is particularly the case when:

- The stand is surrounded by even-aged, uniform stands.
- The stand contains attributes that provide habitat for important, threatened, or endangered species. Such stands will have to be managed in ways that ensure the retention of that habitat.
- The stand has the potential to become a habitat link between specially managed or protected areas.

Not all desirable habitat features will be present in any one stand. At a minimum, each stand will have to be managed for its existing attributes, or the attributes that can be created at each stage in its development. If warranted from a landscape-level perspective, less emphasis on maintaining biodiversity may be possible in some instances.

The following information is a general guide to some of the important issues relating to stand-level management of biodiversity. Sources such as the *Guidelines for maintaining biodiversity during juvenile spacing* and *Wildlife/danger tree assessor's course workbook*,

contain specific recommendations for biodiversity management and should be consulted.

Wildlife trees

- **DO NOT compromise worker safety.**
- Retain snags within no-work zones during harvesting.
- Plan for recruitment of new snags by retaining green trees during harvesting as a source of large-diameter snags in the subsequent rotation.
- Favour stand conditions that will result in the production of future snags.
- Retain snags during spacing and thinning when possible.
- As a last resort, consider creating snags.
- Maintain snags in a range of decay stages.
- All tree species can provide snags.
- The number of wildlife trees to be maintained will vary according to ecosystem, topography, adjacent stands, and overall landscape condition.
- Wildlife trees should be as large as possible, with > 3 stems/ha in the upper 10% of the diameter range of the stand.
- Clumping of wildlife trees is acceptable.
- Select windfirm trees for retention.

Coarse woody debris (CWD)

- CWD is typically abundant in the CWH after harvest of old growth.
- Larger pieces are preferable and should be retained in the stand when utilization standards are being applied and site preparation treatments are planned.
- Second-growth stands may require special management to ensure some CWD remains after harvest.

Large green trees

- At the time of harvest, retain several per hectare - dispersed or clumped.
- These can be retained through a variety of silvicultural techniques (e.g., seed tree or shelterwood systems, patch retention).

Trees species diversity

- A variety of tree species including hardwoods should be retained in a stand.
- Manage through harvesting, site preparation, regeneration, and stand tending.

Understorey diversity

- Maintain the full range of native plants and plant communities.
- Plan the forest to include a partially open or patchy canopy.
- Understorey diversity can be achieved with site preparation, vegetation management, and pruning.
- Retain woody forage species such as willow, elderberry, dogwood, huckleberry, salmonberry, devil's club, and twinberry.

Diversity in vertical and horizontal structure

- Maintain variable stand and understorey densities.
- Create canopy gaps.
- Vertical and horizontal structure can be created or maintained by using partial cutting silvicultural systems.
- Variable stocking and stand tending techniques can be used to enhance stand structure.

MANAGEMENT PRACTICES

Clearcutting

- Retain some safe snags and green trees wherever possible.
- Retain snags in safe no-work zones.
- Cutblock size will vary.

Partial cutting

- Some or all of the leave trees should be retained throughout the rotation.
- Designate no-work zones for snag retention.

Harvesting and utilization standards

- The harvesting system influences the ability to retain wildlife trees.

- If mechanical harvesters are used, attempt to leave some high stumps.
- If using grapple yarders, slash should be left distributed on the cutblock.
- In second growth, some marginal-value logs should be left to provide CWD.

Site preparation

- Slashburning can be incompatible with the retention of green trees.
- Charring wood may reduce its value to some wildlife species.
- Do not burn slash unless essential for regeneration or reducing fuel loads.

Regeneration

- Stands should be regenerated with a mixture of tree species.
- Promote spatial diversity, vary density of stock.

Vegetation management

- Retain some untreated patches or shrub-rows.
- Spot treatment is preferable.
- Untreated buffers 3-5 m wide should be retained along permanent streams, creeks, and some roadways.
- Difficult sites, such as wet areas, should not be treated if successful control is unlikely and the site will provide important forage for wildlife.
- Retain a hardwood component in the stand.

Spacing and commercial thinning

- Retain safe snags and wildlife trees.
- Retain live tree (vets) left over from previous harvest.
- Promote a variable stand density:
 - some areas should be left unthinned so that dense patches develop;
 - wider spacing should be used in other areas to maintain a partially open canopy that will promote understorey vegetation.
- A mixed-species stand, including hardwoods, should be promoted.
- Do not cut Pacific yew trees.

- Pre-existing wildlife trails should be left unobstructed through directional falling and/or slash removal.
- Create breaks in slash to allow wildlife to move across treatment unit.
- If required for screening wildlife from view, maintain an unspaced buffer strip of adequate width, but only along specified roads.
- Some of the trees to be removed should be left dead and standing to create small snags.

Pruning

- A visual barrier of unpruned trees should be left along roadways to reduce disturbance to wildlife.
- Some unpruned patches should be retained within large pruning blocks to promote structural diversity.
- Use pruning to maintain or enhance the understorey vegetation.

Pest management

- Root rot pockets provide snags and gaps in the forest; consider retention of some root rot before treatments are prescribed.
- Where green tree retention conflicts with mistletoe (or other pathogen) control, selection of less-infected trees and other tree species should be considered for green tree retention.
- If infected trees must be killed, retain them as snags.
- Dwarf mistletoe may improve forest structure and increase biodiversity by creating nesting platforms.

Environmentally Sensitive Areas (ESAs)

Ew1: Areas of critical importance to wildlife for food, shelter, and reproduction. Included are habitat areas for endangered and threatened species, Spotted Owls, Marbled Murrelets, deer, elk, and moose winter ranges, and other special wildlife areas identified by B.C. Ministry of Environment, Lands and Parks. Net-down is usually 100%.

Ew2: Areas where a significant portion of the timber is important to wildlife. Included are deer winter range in low snowfall areas; grizzly bear habitat; Riparian Management Zones; areas for Forest Ecosystem Network linkages; and areas under short-term deferral to protect nesting sites for Eagles, Osprey, Herons, etc., and under

temporary deferral (until further data are available) for Marbled Murrelet nest corridors. Net-down is usually 50%.

6.7.7 Background information

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APPENDIX 1a: Indicator species - latin names

No.	Latin name	Common name	MI # ¹	NI # ¹
1	<i>Abies amabilis</i>	amabilis fir	4	
2	<i>Acer circinatum</i>	vine maple	4	3
3	<i>Acer glabrum</i>	Douglas maple		3
4	<i>Acer macrophyllum</i>	bigleaf maple	4	3
5	<i>Achillea millefolium</i> var. <i>lanulosa</i>	western yarrow	2	2
6	<i>Achlys triphylla</i>	vanilla leaf		3
7	<i>Actaea rubra</i>	baneberry	4	3
8	<i>Adenocaulon bicolor</i>	pathfinder	3	3
9	<i>Adiantum pedatum</i>	maidenhair fern	4	3
10	<i>Agrostis aequivalvis</i>	northern bentgrass	5	2
11	<i>Aira caryophyllea</i>	silver hairgrass	1	
12	<i>Aira praecox</i>	early hairgrass	1	1
13	<i>Allium acuminatum</i>	Hooker's onion	2	2
14	<i>Allium cernuum</i>	nodding onion		2
15	<i>Allotropa virgata</i>	candystick	2	1
16	<i>Alnus rubra</i>	red alder		3
17	<i>Alnus crispa</i> ssp. <i>sinuata</i>	Sitka alder	4	3
18	<i>Amelanchier alnifolia</i>	saskatoon	3	2
19	<i>Andromeda polifolia</i>	bog-rosemary	6	1
20	<i>Angelica genuflexa</i>	kneeling angelica	6	3
21	<i>Antennaria neglecta</i>	field pussytoes	2	
22	<i>Apocynum androsaemifolium</i>	spreading dogbane	2	2
23	<i>Aquilegia formosa</i>	red columbine	4	3
24	<i>Aralia nudicaulis</i>	wild sarsaparilla	4	3
25	<i>Arbutus menziesii</i>	arbutus	2	
26	<i>Arctostaphylos columbiana</i>	hairy manzanita	2	1
27	<i>Arctostaphylos uva-ursi</i>	kinnikinnick	2	1
28	<i>Arnica cordifolia</i>	heart-leaved arnica	3	2
29	<i>Arnica latifolia</i>	mountain arnica	4	2
30	<i>Aruncus dioicus</i>	goatsbeard	4	3
31	<i>Asarum caudatum</i>	wild ginger	4	3
32	<i>Aster ciliolatus</i>	fringed aster	3	2
33	<i>Aster conspicuus</i>	showy aster	3	3
34	<i>Athyrium filix-femina</i>	lady fern	5	3
35	<i>Atrichum selwynii</i>	no common name	4	3
36	<i>Atrichum undulatum</i>	no common name	4	3
37	<i>Aulacomnium palustre</i>	glow moss	6	2
38	<i>Barbilophozia floerkei</i>	mountain leafy liverwort	3	1

¹ MI#: Moisture indicator species group number; NI#: nutrient indicator species group number.

APPENDIX 1a: Indicator species - latin names

No.	Latin name	Common name	MI #	NI #
39	<i>Barbilophozia lycopodioides</i>	common leafy liverwort	3	1
40	<i>Bazzania tricrenata</i>	no common name	4	1
41	<i>Blechnum spicant</i>	deer fern	4	1
42	<i>Boschniakia hookeri</i>	groundcone		1
43	<i>Boykinia elata</i>	coast boykinia	4	3
44	<i>Brachythecium albicans</i>	lawn moss	3	2
45	<i>Bromus carinatus</i>	California brome	2	2
46	<i>Bromus vulgaris</i>	Columbia brome		3
47	<i>Calamagrostis canadensis</i>	bluejoint	5	2
48	<i>Calamagrostis nutkaensis</i>	Pacific reedgrass	5	2
49	<i>Calamagrostis rubescens</i>	pinegrass	2	2
50	<i>Caltha biflora</i>	marsh-marigold	5	3
51	<i>Caltha leptosepala</i>	marsh-marigold	5	3
52	<i>Calypogeja trichomanis</i>	no common name	4	1
53	<i>Calypso bulbosa</i>	fairy-slipper	3	2
54	<i>Camassia leichtlinii</i>	great camas	3	3
55	<i>Camassia quamash</i>	common camas	3	3
56	<i>Campanula scouleri</i>	Scouler's harebell	2	1
57	<i>Cardamine breweri</i>	Brewer's bitter-cress	6	3
58	<i>Cardamine pulcherrima</i>	Nuttall's bitter-cress	5	3
59	<i>Carex anthoxanthea</i>	sweet sedge	6	2
60	<i>Carex deweyana</i>	Dewey's sedge	4	3
61	<i>Carex hendersonii</i>	Henderson's sedge	5	3
62	<i>Carex inops</i>	long-stoloned sedge	3	2
63	<i>Carex laeviculmis</i>	smooth-stemmed sedge	6	2
64	<i>Carex livida</i>	pale sedge	6	2
65	<i>Carex mertensii</i>	Mertens' sedge	4	3
66	<i>Carex obnupta</i>	slough sedge	6	3
67	<i>Carex rossii</i>	Ross' sedge	2	2
68	<i>Carex sitchensis</i>	Sitka sedge	6	3
69	<i>Cassiope mertensiana</i>	white mountain-heather	3	1
70	<i>Cassiope stelleriana</i>	Alaskan mountain-heather	4	1
71	<i>Cassiope tetragona</i>	four-angled mountain-heather	4	2
72	<i>Ceanothus sanguineus</i>	redstem ceanothus	2	2
73	<i>Ceanothus velutinus</i>	snowbrush	3	2
74	<i>Chimaphila menziesii</i>	Menzies' pipsissewa	3	2
75	<i>Chimaphila umbellata</i>	prince's pine	2	1
76	<i>Cinna latifolia</i>	nodding wood-reed	4	3
77	<i>Circaeа alpina</i>	enchanter's nightshade	4	2
78	<i>Circaeа pacifica</i>	enchanter's nightshade	4	3
79	<i>Cladina arbuscula</i>	no common name	1	1
80	<i>Cladina impexa</i>	no common name	1	1

APPENDIX 1a: Indicator species - latin names

No.	Latin name	Common name	MI #	NI #
81	<i>Cladina mitis</i>	green reindeer lichen	1	1
82	<i>Cladina rangiferina</i>	reindeer lichen	1	1
83	<i>Cladina stellaris</i>	no common name	1	1
84	<i>Cladonia bellidiflora</i>	no common name	2	1
85	<i>Cladonia gracilis</i>	no common name	1	1
86	<i>Cladothamnus pyroliflorus</i>	copperbush		1
87	<i>Claytonia sibirica</i>	Siberian miner's-lettuce	4	3
88	<i>Clintonia uniflora</i>	queen's cup	3	1
89	<i>Collinsia parviflora</i>	blue-eyed Mary	2	2
90	<i>Conocephalum conicum</i>	alligator-skin liverwort	5	3
91	<i>Coptis asplenifolia</i>	fern-leaved goldthread	4	1
92	<i>Coptis trifolia</i>	three-leaved goldthread	5	1
93	<i>Corallorrhiza maculata</i>	spotted coralroot	3	1
94	<i>Corallorrhiza mertensiana</i>	western coralroot	3	1
95	<i>Cornus canadensis</i>	bunchberry		1
96	<i>Cornus nuttallii</i>	flowering dogwood	3	3
97	<i>Cornus stolonifera</i>	red-osier dogwood	5	3
98	<i>Cornus unalaschkensis</i>	Cordilleran bunchberry	4	1
99	<i>Corylus cornuta</i>	beaked hazelnut	3	3
100	<i>Crataegus douglasii</i>	black hawthorn	5	3
101	<i>Cryptogramma crispa</i>	parsley fern	2	1
102	<i>Cystopteris arostichoides</i>	fragile fern	4	2
103	<i>Cytisus scoparius</i>	Scotch broom	2	2
104	<i>Danthonia intermedia</i>	timber oatgrass	2	1
105	<i>Danthonia spicata</i>	poverty oatgrass	2	1
106	<i>Deschampsia caespitosa</i>	tufted hairgrass	5	3
107	<i>Dicentra formosa</i>	bleeding heart	4	3
108	<i>Dicranum fuscescens</i>	curly heron's-bill moss	2	1
109	<i>Dicranum howellii</i>	no common name	3	1
110	<i>Dicranum pallidisetum</i>	no common name	3	1
111	<i>Dicranum tauricum</i>	broken-leaf moss	2	1
112	<i>Disporum hookeri</i>	Hooker's fairybells	4	3
113	<i>Disporum smithii</i>	Smith's fairybells	4	3
114	<i>Disporum trachycarpum</i>	rough-fruited fairybells		3
115	<i>Dodecatheon hendersonii</i>	broad-leaved shootingstar	3	3
116	<i>Dodecatheon pulchellum</i>	few-flowered shootingstar	3	3
117	<i>Drosera rotundifolia</i>	round-leaved sundew	6	1
118	<i>Dryopteris expansa</i>	spiny wood fern	4	2
119	<i>Dryopteris filix-mas</i>	male fern	4	3
120	<i>Elymus glaucus</i>	blue wildrye	3	3
121	<i>Elymus hirsutus</i>	hairy wildrye	5	3
122	<i>Elymus spicata</i>	bluebunch wheatgrass	1	3
123	<i>Empetrum nigrum</i>	crowberry		1

APPENDIX 1a: Indicator species - latin names

No.	Latin name	Common name	MI #	NI #
124	<i>Epilobium angustifolium</i>	fireweed		3
125	<i>Epilobium latifolium</i>	broad-leaved willowherb		3
126	<i>Equisetum arvense</i>	common horsetail		2
127	<i>Equisetum hyemale</i>	scouring-rush	4	3
128	<i>Equisetum sylvaticum</i>	wood horsetail	5	1
129	<i>Equisetum telmateia</i>	giant horsetail	4	3
130	<i>Erigeron peregrinus</i>	subalpine daisy	4	3
131	<i>Eriophorum angustifolium</i>	narrow-leaved cotton-grass	6	1
132	<i>Eriophyllum lanatum</i>	woolly eriophyllum	1	2
133	<i>Erythronium oregonum</i>	white fawn lily	3	2
134	<i>Erythronium revolutum</i>	pink fawn lily	4	3
135	<i>Fauria crista-galli</i>	deer-cabbage	6	1
136	<i>Festuca occidentalis</i>	western fescue		1
137	<i>Festuca subulata</i>	bearded fescue	4	3
138	<i>Festuca subuliflora</i>	crinkle-awned fescue	4	3
139	<i>Fragaria vesca</i>	wood strawberry	3	2
140	<i>Fragaria virginiana</i>	wild strawberry		2
141	<i>Fritillaria affinis</i>	chocolate lily		3
142	<i>Galium aparine</i>	cleavers		3
143	<i>Galium triflorum</i>	sweet-scented bedstraw	4	3
144	<i>Gaultheria humifusa</i>	alpine-wintergreen	4	1
145	<i>Gaultheria ovatifolia</i>	western tea-berry	2	1
146	<i>Gaultheria shallon</i>	salal		1
147	<i>Gentiana douglasiana</i>	swamp gentian	6	1
148	<i>Gentiana sceptrum</i>	king gentian	6	2
149	<i>Geocaulon lividum</i>	bastard toad-flax		1
150	<i>Geranium molle</i>	dovefoot geranium	2	2
151	<i>Geum macrophyllum</i>	large-leaved avens	4	3
152	<i>Goodyera oblongifolia</i>	rattlesnake-plantain	3	1
153	<i>Gymnocarpium dryopteris</i>	oak fern	4	3
154	<i>Hemitomes congestum</i>	gnome-plant	4	2
155	<i>Heracleum lanatum</i>	cow-parsnip	4	3
156	<i>Heuchera micrantha</i>	small-flowered alumroot		3
157	<i>Hieracium albiflorum</i>	white-flowered hawkweed	3	
158	<i>Hippuris montana</i>	mountain mare's-tail	5	2
159	<i>Holcus lanatus</i>	Yorkshire fog	4	2
160	<i>Holodiscus discolor</i>	ocean-spray	2	2
161	<i>Hookeria acutifolia</i>	no common name	5	1
162	<i>Hookeria lucens</i>	no common name	5	1
163	<i>Huperzia haleakalae</i>	fir club-moss	3	1
164	<i>Hylocomium splendens</i>	step moss		1
165	<i>Hypericum formosum</i>	western St. John's-wort	4	2
166	<i>Hypopitys monotropa</i>	pinesap	3	1

APPENDIX 1a: Indicator species - latin names

No.	Latin name	Common name	MI #	NI #
167	<i>Isopterygium elegans</i>	elegant moss	4	1
168	<i>Juncus effusus</i>	common rush	5	2
169	<i>Juncus ensifolius</i>	dagger-leaved rush	5	2
170	<i>Juniperus communis</i>	Rocky Mountain juniper	1	2
171	<i>Juniperus sibirica</i>	common juniper	2	2
172	<i>Kalmia microphylla</i> ssp. <i>occidentalis</i>	bog-laurel	6	1
173	<i>Kindbergia oregana</i>	Oregon beaked moss	3	
174	<i>Kindbergia praelonga</i>	no common name	5	3
175	<i>Lactuca muralis</i>	wall-lettuce	4	3
176	<i>Lathyrus nevadensis</i>	purple peavine	3	3
177	<i>Lathyrus ochroleucus</i>	creamy peavine	3	3
178	<i>Ledum groenlandicum</i>	Labrador tea	6	1
179	<i>Lepidozia reptans</i>	no common name	4	1
180	<i>Leptarrhena pyrolifolia</i>	leatherleaf saxifrage	5	2
181	<i>Leucolepis menziesii</i>	palm tree moss	5	3
182	<i>Lilium columbianum</i>	tiger lily	3	2
183	<i>Linnaea borealis</i>	twinflower	3	
184	<i>Listera caurina</i>	northwestern twayblade	4	2
185	<i>Listera convallarioides</i>	broad-leaved twayblade	4	3
186	<i>Listera cordata</i>	heart-leaved twayblade		1
187	<i>Loiseleuria procumbens</i>	alpine-azalea	5	1
188	<i>Lomatium dissectum</i>	fern-leaved desert-parsley	2	3
189	<i>Lonicera ciliosa</i>	western trumpet honeysuckle	2	2
190	<i>Lonicera hispidula</i>	hairy honeysuckle	2	2
191	<i>Lonicera involucrata</i>	black twinberry	5	3
192	<i>Lonicera utahensis</i>	Utah honeysuckle		2
193	<i>Luetkea pectinata</i>	partridgefoot	4	2
194	<i>Lupinus arcticus</i>	arctic lupine		3
195	<i>Lupinus nootkatensis</i>	Nootka lupine		3
196	<i>Luzula multiflora</i>	many-flowered woodrush	1	1
197	<i>Luzula parviflora</i>	small-flowered woodrush	4	2
198	<i>Lycopodium alpinum</i>	alpine clubmoss	3	2
199	<i>Lycopodium annotinum</i>	stiff clubmoss	3	2
200	<i>Lycopodium clavatum</i>	running clubmoss	3	1
201	<i>Lycopodium complanatum</i>	ground-cedar	3	1
202	<i>Lycopodium obscurum</i>	ground-pine	4	1
203	<i>Lycopodium sitchense</i>	Alaska clubmoss	4	1
204	<i>Lysichiton americanum</i>	skunk cabbage	6	3
205	<i>Madia madioides</i>	woodland tarweed	2	2
206	<i>Mahonia aquifolium</i>	tall Oregon-grape	2	2
207	<i>Mahonia nervosa</i>	dull Oregon-grape	3	2
208	<i>Maianthemum dilatatum</i>	false lily-of-the-valley	5	3

APPENDIX 1a: Indicator species - latin names

No.	Latin name	Common name	MI #	NI #
209	<i>Malus fusca</i>	Pacific crab apple	6	3
210	<i>Marchantia polymorpha</i>	green-tongue liverwort	5	
211	<i>Melica subulata</i>	Alaska oniongrass	4	3
212	<i>Menyanthes trifoliata</i>	buckbean	6	2
213	<i>Menzesia ferruginea</i>	false azalea	4	1
214	<i>Mitella breweri</i>	Brewer's mitrewort	5	3
215	<i>Mitella nuda</i>	common mitrewort	4	2
216	<i>Mitella ovalis</i>	oval-leaved mitrewort	5	3
217	<i>Mitella pentandra</i>	five-stamened mitrewort	5	3
218	<i>Mnium spinulosum</i>	red-mouthed leafy moss	3	2
219	<i>Moehringia macrophylla</i>	big-leaved sandwort	3	3
220	<i>Moneses uniflora</i>	single delight	4	2
221	<i>Monotropa uniflora</i>	Indian-pipe	4	2
222	<i>Montia parvifolia</i>	small-leaved montia		2
223	<i>Myrica gale</i>	sweet gale	6	2
224	<i>Nuphar polysepala</i>	Rocky Mountain cow-lily	6	
225	<i>Oemleria cerasiformis</i>	Indian-plum	4	3
226	<i>Oenanthe sarmentosa</i>	water-parsley	6	3
227	<i>Olsynium douglasii</i>	satin-flower	2	2
228	<i>Oplopanax horridus</i>	devil's club	5	3
229	<i>Orthilia secunda</i>	one-sided wintergreen	3	1
230	<i>Osmorrhiza chilensis</i>	mountain sweet-cicely	4	3
231	<i>Parnassia fimbriata</i>	fringed grass-of-Parnassus	5	3
232	<i>Paxistima myrsinoides</i>	falsebox	3	1
233	<i>Pedicularis bracteosa</i>	bracted lousewort	4	2
234	<i>Pedicularis racemosa</i>	sickletop lousewort	3	2
235	<i>Pellia neesiana</i>	shiny liverwort	5	3
236	<i>Peltigera aphthosa</i>	freckled lichen	2	1
237	<i>Peltigera canina</i>	dog lichen	2	2
238	<i>Peltigera membranacea</i>	no common name	2	1
239	<i>Perideridia gairdneri</i>	yampah	3	2
240	<i>Petasites frigidus</i>	sweet coltsfoot	5	3
241	<i>Petasites frigidus</i> var. <i>palmatus</i>	palmate coltsfoot	5	3
242	<i>Phegopteris connectilis</i>	beech fern	4	3
243	<i>Philadelphus lewisii</i>	mock-orange	3	2
244	<i>Philonotis fontana</i>	no common name	6	2
245	<i>Phyllodoce empetriformis</i>	pink mountain-heather	3	1
246	<i>Phyllodoce glanduliflora</i>	yellow mountain-heather	3	2
247	<i>Physocarpus capitatus</i>	Pacific ninebark	5	3
248	<i>Picea sitchensis</i>	Sitka spruce		3
249	<i>Pinus albicaulis</i>	whitebark pine	3	2
250	<i>Pinus ponderosa</i>	ponderosa pine	2	2

APPENDIX 1a: Indicator species - latin names

No.	Latin name	Common name	MI #	NI #
251	<i>Plagiochila poreolloides</i>	cedar-shake liverwort	4	2
252	<i>Plagiomnium insigne</i>	coastal leafy moss	5	3
253	<i>Plagiothecium undulatum</i>	flat moss	4	1
254	<i>Platanthera dilatata</i>	white bog-orchid	6	2
255	<i>Platanthera orbiculata</i>	round-leaved rein-orchid	3	1
256	<i>Pleurozium schreberi</i>	red-stemmed feathermoss		1
257	<i>Pogonatum contortum</i>	no common name	4	2
258	<i>Polystichum braunii</i>	Braun's holly fern	4	3
259	<i>Polystichum lonchitis</i>	mountain holly fern	3	2
260	<i>Polystichum munitum</i>	sword fern		3
261	<i>Polytrichum alpinum</i>	no common name	4	
262	<i>Polytrichum piliferum</i>	awned haircap moss	1	1
263	<i>Populus tremuloides</i>	trembling aspen		3
264	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	4	3
265	<i>Potentilla glandulosa</i>	sticky cinquefoil	3	2
266	<i>Prenanthes alata</i>	western rattlesnake-root	4	3
267	<i>Prunus virginiana</i>	choke cherry	3	3
268	<i>Pterospora andromeda</i>	pinedrops	2	2
269	<i>Ptilium crista-castrensis</i>	knight's plume moss		1
270	<i>Pyrola asarifolia</i>	pink wintergreen	3	2
271	<i>Pyrola chlorantha</i>	green wintergreen	3	2
272	<i>Pyrola picta</i>	white-veined wintergreen	3	2
273	<i>Quercus garryana</i>	Garry oak	2	
274	<i>Ranunculus eschscholtzii</i>	subalpine buttercup	5	2
275	<i>Ranunculus occidentalis</i>	western buttercup		2
276	<i>Ranunculus repens</i>	creeping buttercup	5	3
277	<i>Ranunculus uncinatus</i>	little buttercup	4	3
278	<i>Rhacomitrium canescens</i>	grey frayed-cap rock moss	1	1
279	<i>Rhacomitrium heterostichum</i>	yellow-green rock moss	1	1
280	<i>Rhamnus purshiana</i>	cascara	5	3
281	<i>Rhizomnium glabrescens</i>	large leafy moss	4	2
282	<i>Rhizomnium magnifolium</i>	no common name	6	3
283	<i>Rhizomnium nudum</i>	leafy moss	5	2
284	<i>Rhododendron albiflorum</i>	white-flowered rhododendron	3	1
285	<i>Rhynchospora alba</i>	beak-sedge	6	1
286	<i>Rhytidadelphus loreus</i>	lanky moss	4	1
287	<i>Rhytidadelphus triquetrus</i>	electrified cat's-tail moss		2
288	<i>Rhytidopsis robusta</i>	pipecleaner moss		1
289	<i>Ribes bracteosum</i>	stink currant	5	3
290	<i>Ribes divaricatum</i>	wild gooseberry	3	2
291	<i>Ribes lacustre</i>	black gooseberry		3

APPENDIX 1a: Indicator species - latin names

No.	Latin name	Common name	MI #	NI #
292	<i>Ribes laxiflorum</i>	trailing black currant	5	3
293	<i>Ribes lobbii</i>	gummy gooseberry	2	2
294	<i>Ribes sanguineum</i>	red-flowering currant	2	2
295	<i>Rosa acicularis</i>	prickly rose	3	2
296	<i>Rosa gymnocarpa</i>	baldhip rose	2	2
297	<i>Rosa nutkana</i>	Nootka rose	4	3
298	<i>Rubus idaeus</i>	red raspberry	4	3
299	<i>Rubus laciniatus</i>	evergreen blackberry	4	3
300	<i>Rubus leucodermis</i>	black raspberry	3	3
301	<i>Rubus parviflorus</i>	thimbleberry		3
302	<i>Rubus pedatus</i>	five-leaved bramble	4	1
303	<i>Rubus pubescens</i>	trailing raspberry	4	3
304	<i>Rubus spectabilis</i>	salmonberry	5	3
305	<i>Rubus ursinus</i>	trailing blackberry	3	2
306	<i>Salix bebbiana</i>	Bebb's willow		2
307	<i>Salix hookeriana</i>	Hooker's willow	5	2
308	<i>Salix scouleriana</i>	Scouler's willow		2
309	<i>Salix sitchensis</i>	Sitka willow		2
310	<i>Sambucus racemosa</i>	red elderberry	4	3
311	<i>Sanguisorba canadensis</i>	Sitka burnet	5	
312	<i>Sanguisorba officinalis</i>	great burnet	5	2
313	<i>Sanicula crassicaulis</i>	Pacific sanicle	2	3
314	<i>Sanicula graveolens</i>	Sierra sanicle	2	3
315	<i>Satureja douglasii</i>	yerba buena	3	3
316	<i>Saxifraga tolmiei</i>	Tolmie's saxifrage	5	2
317	<i>Scapania bolanderi</i>	scapania	4	1
318	<i>Scirpus microcarpus</i>	small-flowered bulrush	6	3
319	<i>Sedum spathulifolium</i>	broad-leaved stonecrop	1	1
320	<i>Selaginella wallacei</i>	Wallace's selaginella	2	1
321	<i>Senecio sylvaticus</i>	wood groundsel	3	3
322	<i>Senecio triangularis</i>	arrow-leaved groundsel	5	3
323	<i>Senecio vulgaris</i>	common groundsel		3
324	<i>Shepherdia canadensis</i>	soopolallie	2	2
325	<i>Sibbaldia procumbens</i>	sibbaldia	4	1
326	<i>Siphula ceratites</i>	no common name	6	1
327	<i>Smilacina racemosa</i>	false Solomon's-seal		3
328	<i>Smilacina stellata</i>	star-flowered false Solomon's-seal		3
329	<i>Sorbus scopulina</i>	western mountain ash	3	2
330	<i>Sorbus sitchensis</i>	Sitka mountain ash	3	1
331	<i>Sphagnum capillifolium</i>	common red sphagnum	6	1
332	<i>Sphagnum fallax</i>	poor-fen moss	6	1
333	<i>Sphagnum fuscum</i>	brown sphagnum	6	1

APPENDIX 1a: Indicator species - latin names

No.	Latin name	Common name	MI #	NI #
334	<i>Sphagnum girsensohnii</i>	green sphagnum	5	1
335	<i>Sphagnum papillosum</i>	no common name	6	1
336	<i>Sphagnum tenellum</i>	no common name	6	1
337	<i>Spiraea betulifolia</i>	birch-leaved spirea	2	2
338	<i>Spiraea densiflora</i>	subalpine spirea	4	2
339	<i>Spiraea douglasii</i>	hardhack	5	2
340	<i>Spiraea menziesii</i>	pink spirea	5	3
341	<i>Stachys cooleyae</i>	Cooley's hedge-nettle	5	3
342	<i>Stachys mexicana</i>	Mexican hedge-nettle	5	3
343	<i>Stellaria calycantha</i>	northern starwort	5	4
344	<i>Stellaria crispa</i>	crisp starwort	5	3
345	<i>Stenanthium occidentale</i>	mountainbells	4	3
346	<i>Stereocaulon tomentosum</i>	no common name	1	1
347	<i>Streptopus amplexifolius</i>	clasping twistedstalk	4	3
348	<i>Streptopus roseus</i>	rosy twistedstalk	4	3
349	<i>Streptopus streptopoides</i>	small twistedstalk	4	1
350	<i>Symporicarpos albus</i>	common snowberry		3
351	<i>Symporicarpos mollis</i> var. <i>hesperius</i>	trailing snowberry	2	2
352	<i>Tellima grandiflora</i>	tall fringecup	4	3
353	<i>Thalictrum occidentale</i>	western meadowrue	4	3
354	<i>Tiarella laciniata</i>	cut-leaved foamflower	4	3
355	<i>Tiarella trifoliata</i>	three-leaved foamflower	4	3
356	<i>Tiarella unifoliata</i>	one-leaved foamflower	4	2
357	<i>Timmia austriaca</i>	false-polytrichum		2
358	<i>Tofieldia glutinosa</i>	sticky false asphodel	6	
359	<i>Tolmiea menziesii</i>	piggy-back plant	4	3
360	<i>Torreyochloa pauciflora</i>	weak false-manna	6	3
361	<i>Trachybryum megaptilum</i>	no common name	2	1
362	<i>Trautvetteria caroliniensis</i>	false bugbane	4	3
363	<i>Trichophorum caespitosum</i>	tufted clubrush	6	1
364	<i>Trientalis arctica</i>	northern starflower	6	1
365	<i>Trientalis latifolia</i>	broad-leaved starflower	3	2
366	<i>Trillium ovatum</i>	western trillium	4	3
367	<i>Trisetum cernuum</i>	nodding trisetum	4	3
368	<i>Urtica dioica</i> ssp. <i>gracilis</i>	stinging nettle	4	3
369	<i>Vaccinium alaskaense</i>	Alaskan blueberry	4	1
370	<i>Vaccinium caespitosum</i>	dwarf blueberry	4	1
371	<i>Vaccinium deliciosum</i>	blue-leaved huckleberry	4	1
372	<i>Vaccinium membranaceum</i>	black huckleberry	3	1
373	<i>Vaccinium myrtilloides</i>	velvet-leaved blueberry		1
374	<i>Vaccinium ovalifolium</i>	oval-leaved blueberry	4	1
375	<i>Vaccinium ovatum</i>	evergreen huckleberry	3	1

APPENDIX 1a: Indicator species - latin names

No.	Latin name	Common name	MI #	NI #
376	<i>Vaccinium oxycoccus</i>	bog cranberry	6	1
377	<i>Vaccinium parvifolium</i>	red huckleberry		1
378	<i>Vaccinium scoparium</i>	grouseberry		1
379	<i>Vaccinium uliginosum</i>	bog blueberry	5	1
380	<i>Vahlodea atropurpurea</i>	mountain hairgrass	4	2
381	<i>Valeriana scouleri</i>	Scouler's valerian	4	3
382	<i>Valeriana sitchensis</i>	Sitka valerian	4	3
383	<i>Veratrum viride</i>	Indian hellebore	5	3
384	<i>Veronica americana</i>	American brooklime	4	3
385	<i>Viburnum edule</i>	highbush-cranberry	4	3
386	<i>Viburnum trilobum</i>	American bush-cranberry	4	3
387	<i>Vicia americana</i>	American vetch	3	2
388	<i>Viola adunca</i>	early blue violet	2	2
389	<i>Viola glabella</i>	stream violet	5	3
390	<i>Viola orbiculata</i>	round-leaved violet	3	2
391	<i>Viola palustris</i>	marsh violet	6	
392	<i>Viola sempervirens</i>	trailing yellow violet	3	2

APPENDIX 1a: Indicator species - common names

No.	Common name	Latin name	MI # ¹	NI # ¹
16	alder, red	<i>Alnus rubra</i>		3
17	alder, Sitka	<i>Alnus crispa</i> ssp. <i>sinuata</i>	4	3
187	alpine-azalea	<i>Loiseleuria procumbens</i>	5	1
144	alpine-wintergreen	<i>Gaultheria humifusa</i>	4	1
156	alumroot, small-flowered	<i>Heuchera micrantha</i>		3
20	angelica, kneeling	<i>Angelica genuflexa</i>	6	3
209	apple, Pacific crab	<i>Malus fusca</i>	6	3
25	arbutus	<i>Arbutus menziesii</i>	2	
28	arnica, heart-leaved	<i>Arnica cordifolia</i>	3	2
29	arnica, mountain	<i>Arnica latifolia</i>	4	2
330	ash, Sitka mountain	<i>Sorbus sitchensis</i>	3	1
329	ash, western mountain	<i>Sorbus scopulina</i>	3	2
263	aspen, trembling	<i>Populus tremuloides</i>		3
358	aspodel, sticky false	<i>Tofieldia glutinosa</i>	6	
32	aster, fringed	<i>Aster ciliolatus</i>	3	2
33	aster, showy	<i>Aster conspicuus</i>	3	3
151	avens, large-leaved	<i>Geum macrophyllum</i>	4	3
213	azalea, false	<i>Menziesia ferruginea</i>	4	1
7	baneberry	<i>Actaea rubra</i>	4	3
285	beak-sedge	<i>Rhynchospora alba</i>	6	1
143	bedstraw, sweet-scented	<i>Galium triflorum</i>	4	3
10	bentgrass, northern	<i>Agrostis aequivalvis</i>	5	2
57	bitter-cress, Brewer's	<i>Cardamine breweri</i>	6	3
58	bitter-cress, Nuttall's	<i>Cardamine pulcherrima</i>	5	3
299	blackberry, evergreen	<i>Rubus laciniatus</i>	4	3
305	blackberry, trailing	<i>Rubus ursinus</i>	3	2
107	bleeding heart	<i>Dicentra formosa</i>	4	3
89	blue-eyed Mary, small-flowered	<i>Collinsia parviflora</i>	2	2
369	blueberry, Alaskan	<i>Vaccinium alaskaense</i>	4	1
379	blueberry, bog	<i>Vaccinium uliginosum</i>	5	1
370	blueberry, dwarf	<i>Vaccinium caespitosum</i>	4	1
374	blueberry, oval-leaved	<i>Vaccinium ovalifolium</i>	4	1
373	blueberry, velvet-leaved	<i>Vaccinium myrtilloides</i>		1
47	bluejoint	<i>Calamagrostis canadensis</i>	5	2
172	bog-laurel	<i>Kalmia microphylla</i> ssp. <i>occidentalis</i>	6	1
254	bog-orchid, white	<i>Platanthera dilatata</i>	6	2
19	bog-rosemary	<i>Andromeda polifolia</i>	6	1

¹ MI#: Moisture indicator species group number; NI#: nutrient indicator species group number.

APPENDIX 1a: Indicator species - common names

No.	Common name	Latin name	MI #	NI #
43	boykinia, coast	<i>Boykinia elata</i>	4	3
302	bramble, five-leaved	<i>Rubus pedatus</i>	4	1
45	brome, California	<i>Bromus carinatus</i>	2	2
46	brome, Columbia	<i>Bromus vulgaris</i>		3
384	brooklime, American	<i>Veronica americana</i>	4	3
103	broom, Scotch	<i>Cytisus scoparius</i>	2	2
212	buckbean	<i>Menyanthes trifoliata</i>	6	2
362	bugbane, false	<i>Trautvetteria carolinensis</i>	4	3
318	bulrush, small-flowered	<i>Scirpus microcarpus</i>	6	3
95	bunchberry	<i>Cornus canadensis</i>		1
98	bunchberry, Cordilleran	<i>Cornus unalaschkensis</i>	4	1
312	burnet, great	<i>Sanguisorba officinalis</i>	5	2
311	burnet, Sitka	<i>Sanguisorba canadensis</i>	5	
386	bush-cranberry, American	<i>Viburnum trilobum</i>	4	3
276	buttercup, creeping	<i>Ranunculus repens</i>	5	3
277	buttercup, little	<i>Ranunculus uncinatus</i>	4	3
274	buttercup, subalpine	<i>Ranunculus eschscholtzii</i>	5	2
275	buttercup, western	<i>Ranunculus occidentalis</i>		2
55	camas, common	<i>Camassia quamash</i>	3	3
54	camas, great	<i>Camassia leichtlinii</i>	3	3
15	candystick	<i>Allotropa virgata</i>	2	1
280	cascara	<i>Rhamnus purshiana</i>	5	3
72	ceanothus, redstem	<i>Ceanothus sanguineus</i>	2	2
267	cherry, choke	<i>Prunus virginiana</i>	3	3
265	cinquefoil, sticky	<i>Potentilla glandulosa</i>	3	2
142	cleavers	<i>Galium aparine</i>		3
203	club-moss, Alaska	<i>Lycopodium sitchense</i>	4	1
198	club-moss, alpine	<i>Lycopodium alpinum</i>	3	2
163	club-moss, fir	<i>Huperzia haleakalae</i>	3	1
200	club-moss, running	<i>Lycopodium clavatum</i>	3	1
199	club-moss, stiff	<i>Lycopodium annotinum</i>	3	2
363	clubbrush, tufted	<i>Trichophorum caespitosum</i>	6	1
241	coltsfoot, palmate	<i>Petasites frigidus</i> var. <i>palmatus</i>	5	3
240	coltsfoot, sweet	<i>Petasites frigidus</i>	5	3
23	columbine, red	<i>Aquilegia formosa</i>	4	3
86	copperbush	<i>Cladothamnus pyroliflorus</i>		1
93	coralroot, spotted	<i>Corallorrhiza maculata</i>	3	1
94	coralroot, western	<i>Corallorrhiza mertensiana</i>	3	1
131	cotton-grass, narrow-leaved	<i>Eriophorum angustifolium</i>	6	1

APPENDIX 1a: Indicator species - common names

No.	Common name	Latin name	MI #	NI #
264	cottonwood, black	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	4	3
224	cow-lily, Rocky Mountain	<i>Nuphar polysepalum</i>	6	
155	cow-parsnip	<i>Heracleum lanatum</i>	4	3
376	cranberry, bog	<i>Vaccinium oxycoccus</i>	6	1
123	crowberry	<i>Empetrum nigrum</i>		1
294	currant, red-flowering	<i>Ribes sanguineum</i>	2	2
289	currant, stink	<i>Ribes bracteosum</i>	5	3
292	currant, trailing black	<i>Ribes laxiflorum</i>	5	3
130	daisy, subalpine	<i>Erigeron peregrinus</i>	4	3
393	death-camas, meadow	<i>Zygadenus venenosus</i>	2	2
135	deer-cabbage	<i>Fauria crista-galli</i>	6	1
220	delight, single	<i>Moneses uniflora</i>	4	2
188	desert-parsley, fern-leaved	<i>Lomatium dissectum</i>	2	3
228	devil's club	<i>Opopanax horridus</i>	5	3
22	dogbane, spreading	<i>Apocynum</i> <i>androsaemifolium</i>	2	2
97	dogwood, red-osier	<i>Cornus stolonifera</i>	5	3
96	dogwood, western flowering	<i>Cornus nuttallii</i>	3	3
310	elderberry, red	<i>Sambucus racemosa</i>	4	3
132	eriophyllum, woolly	<i>Eriophyllum lanatum</i>	1	2
53	fairy-slipper	<i>Calypso bulbosa</i>	3	2
112	fairybells, Hooker's	<i>Disporum hookeri</i>	4	3
114	fairybells, rough-fruited	<i>Disporum trachycarpum</i>		3
113	fairybells, Smith's	<i>Disporum smithii</i>	4	3
360	false-manna, weak	<i>Torreochloa pauciflora</i>	6	3
357	false-polytrichum	<i>Timmia austriaca</i>		2
232	falsebox	<i>Paxistima myrsinoides</i>	3	1
256	feathermoss, red-stemmed	<i>Pleurozium schreberi</i>		1
242	fern, beech	<i>Phegopteris connectilis</i>	4	3
258	fern, Braun's holly	<i>Polystichum braunii</i>	4	3
41	fern, deer	<i>Blechnum spicant</i>	4	1
102	fern, fragile	<i>Cystopteris arostichoides</i>	4	2
34	fern, lady	<i>Athyrium filix-femina</i>	5	3
9	fern, maidenhair	<i>Adiantum pedatum</i>	4	3
119	fern, male	<i>Dryopteris filix-mas</i>	4	3
259	fern, mountain holly	<i>Polystichum lonchitis</i>	3	2
153	fern, oak	<i>Gymnocarpium dryopteris</i>	4	3
101	fern, parsley	<i>Cryptogramma crispa</i>	2	1
118	fern, spiny wood	<i>Dryopteris expansa</i>	4	2
260	fern, sword	<i>Polystichum munitum</i>		3
137	fescue, bearded	<i>Festuca subulata</i>	4	3
138	fescue, crinkle-awned	<i>Festuca subuliflora</i>	4	3

APPENDIX 1a: Indicator species - common names

No.	Common name	Latin name	MI #	NI #
136	fescue, western	<i>Festuca occidentalis</i>		1
1	fir, amabilis	<i>Abies amabilis</i>	4	
124	fireweed	<i>Epilobium angustifolium</i>		3
354	foamflower, cut-leaved	<i>Tiarella laciniata</i>	4	3
356	foamflower, one-leaved	<i>Tiarella unifoliata</i>	4	2
355	foamflower, three-leaved	<i>Tiarella trifoliata</i>	4	3
352	fringecup, tall	<i>Tellima grandiflora</i>	4	3
223	gale, sweet	<i>Myrica gale</i>	6	2
148	gentian, king	<i>Gentiana sceptrum</i>	6	2
147	gentian, swamp	<i>Gentiana douglasiana</i>	6	1
150	geranium, dovefoot	<i>Geranium molle</i>	2	2
31	ginger, wild	<i>Asarum caudatum</i>	4	3
154	gnome-plant	<i>Hemitomes congestum</i>	4	2
30	goatsbeard	<i>Aruncus dioicus</i>	4	3
91	goldthread, fern-leaved	<i>Coptis asplenifolia</i>	4	1
92	goldthread, three-leaved	<i>Coptis trifolia</i>	5	1
291	gooseberry, black	<i>Ribes lacustre</i>		3
293	gooseberry, gummy	<i>Ribes lobbii</i>	2	2
290	gooseberry, wild	<i>Ribes divaricatum</i>	3	2
231	grass-of-Parnassus, fringed	<i>Parnassia fimbriata</i>	5	3
201	ground-cedar	<i>Lycopodium complanatum</i>	3	1
202	ground-pine	<i>Lycopodium obscurum</i>	4	1
42	groundcone	<i>Boschniakia hookeri</i>		1
322	groundsel, arrow-leaved	<i>Senecio triangularis</i>	5	3
323	groundsel, common	<i>Senecio vulgaris</i>		3
321	groundsel, wood	<i>Senecio sylvaticus</i>	3	3
378	grouseberry	<i>Vaccinium scoparium</i>		1
12	hairgrass, early	<i>Aira praecox</i>	1	1
380	hairgrass, mountain	<i>Vahlodea atropurpurea</i>	4	2
11	hairgrass, silver	<i>Aira caryophyllea</i>	1	
106	hairgrass, tufted	<i>Deschampsia cespitosa</i>	5	3
339	hardhack	<i>Spiraea douglasii</i>	5	2
56	harebell, Scouler's	<i>Campanula scouleri</i>	2	1
157	hawkweed, white-flowered	<i>Hieracium albiflorum</i>	3	
100	hawthorn, black	<i>Crataegus douglasii</i>	5	3
99	hazelnut, beaked	<i>Corylus cornuta</i>	3	3
341	hedge-nettle, Cooley's	<i>Stachys cooleyae</i>	5	3
342	hedge-nettle, Mexican	<i>Stachys mexicana</i>	5	3
383	hellebore, Indian	<i>Veratrum viride</i>	5	3
385	highbush-cranberry	<i>Viburnum edule</i>	4	3
190	honeysuckle, hairy	<i>Lonicera hispidula</i>	2	2
192	honeysuckle, Utah	<i>Lonicera utahensis</i>		2
189	honeysuckle, western trumpet	<i>Lonicera ciliosa</i>	2	2

APPENDIX 1a: Indicator species - common names

No.	Common name	Latin name	MI #	NI #
126	horsetail, common	<i>Equisetum arvense</i>		2
129	horsetail, giant	<i>Equisetum telmateia</i>	4	3
128	horsetail, wood	<i>Equisetum sylvaticum</i>	5	1
372	huckleberry, black	<i>Vaccinium membranaceum</i>	3	1
371	huckleberry, blue-leaved	<i>Vaccinium deliciosum</i>	4	1
375	huckleberry evergreen	<i>Vaccinium ovatum</i>	3	1
377	huckleberry, red	<i>Vaccinium parvifolium</i>		1
221	Indian-pipe	<i>Monotropa uniflora</i>	4	2
225	Indian-plum	<i>Oemleria cerasiformis</i>	4	3
171	juniper, common	<i>Juniperus communis</i>	2	2
170	juniper, Rocky Mountain	<i>Juniperus scopulorum</i>	1	2
27	kinnikinnick	<i>Arctostaphylos uva-ursi</i>	2	1
178	Labrador tea	<i>Ledum groenlandicum</i>	6	1
237	lichen, dog	<i>Peltigera canina</i>	2	2
236	lichen, freckled	<i>Peltigera aphthosa</i>	2	1
81	lichen, green reindeer	<i>Cladina mitis</i>	1	1
82	lichen, reindeer	<i>Cladina rangiferina</i>	1	1
141	lily, chocolate	<i>Fritillaria affinis</i>		3
134	lily, pink fawn	<i>Erythronium revolutum</i>	4	3
182	lily, tiger	<i>Lilium columbianum</i>	3	2
133	lily, white fawn	<i>Erythronium oregonum</i>	3	2
208	lily-of-the-valley, false	<i>Maianthemum dilatatum</i>	5	3
90	liverwort, alligator-skin	<i>Conocephalum conicum</i>	5	3
251	liverwort, cedar-shake	<i>Plagiochila poreloides</i>	4	2
39	liverwort, common leafy	<i>Barbilophozia lycopodioides</i>	3	1
210	liverwort, green-tongue	<i>Marchantia polymorpha</i>	5	
38	liverwort, mountain leafy	<i>Barbilophozia floerkei</i>	3	1
235	liverwort, shiny	<i>Pellia neesiana</i>	5	3
233	lousewort, bracted	<i>Pedicularis bracteosa</i>	4	2
234	lousewort, sickletop	<i>Pedicularis racemosa</i>	3	2
194	lupine, arctic	<i>Lupinus arcticus</i>		3
195	lupine, Nootka	<i>Lupinus nootkatensis</i>		3
26	manzanita, hairy	<i>Arctostaphylos columbiana</i>	2	1
4	maple, bigleaf	<i>Acer macrophyllum</i>	4	3
3	maple, Douglas	<i>Acer glabrum</i>		3
2	maple vine	<i>Acer circinatum</i>	4	3
158	mare's-tail, mountain	<i>Hippuris montana</i>	5	2
50	marsh-marigold	<i>Caltha biflora</i>	5	3
51	marsh-marigold	<i>Caltha leptosepala</i>	5	3
353	meadowrue, western	<i>Thalictrum occidentale</i>	4	3

APPENDIX 1a: Indicator species - common names

No.	Common name	Latin name	MI #	NI #
87	miner's-lettuce, Siberian	<i>Claytonia sibirica</i>	4	3
214	mitrewort, Brewer's	<i>Mitella breweri</i>	5	3
215	mitrewort, common	<i>Mitella nuda</i>	4	2
217	mitrewort, five-stamened	<i>Mitella pentandra</i>	5	3
216	mitrewort, oval-leaved	<i>Mitella ovalis</i>	5	3
243	mock-orange	<i>Philadelphus lewisii</i>	3	2
222	montia, small-leaved	<i>Montia parvifolia</i>		2
262	moss, awned haircap	<i>Polytrichum piliferum</i>	1	1
111	moss, broken-leaf	<i>Dicranum tauricum</i>	2	1
252	moss, coastal leafy	<i>Plagiomnium insigne</i>	5	3
108	moss, curly heron's-bill	<i>Dicranum fuscescens</i>	2	1
287	moss, electrified cat's-tail	<i>Rhytidiodelphus triquetrus</i>		2
167	moss, elegant	<i>Isopterygium elegans</i>	4	1
253	moss, flat	<i>Plagiothecium undulatum</i>	4	1
37	moss, glow	<i>Aulacomnium palustre</i>	6	2
278	moss, grey frayed-cap rock	<i>Rhacomitrium canescens</i>	1	1
269	moss, knight's plume	<i>Ptilium crista-castrensis</i>		1
286	moss, lanky	<i>Rhytidiodelphus loreus</i>	4	1
44	moss, lawn	<i>Brachythecium albicans</i>	3	2
283	moss, leafy	<i>Rhizomnium nudum</i>	5	2
173	moss, Oregon beaked	<i>Kindbergia oregana</i>		3
181	moss, palm tree	<i>Leucolepis menziesii</i>	5	3
288	moss, pipecleaner	<i>Rhytidopsis robusta</i>		1
332	moss, poor-fen	<i>Sphagnum fallax</i>	6	1
218	moss, red-mouthed leafy	<i>Mnium spinulosum</i>	3	2
164	moss, step	<i>Hylocomium splendens</i>		1
279	moss, yellow-green rock	<i>Rhacomitrium heterostichum</i>	1	1
70	mountain-heather, Alaskan	<i>Cassiope stelleriana</i>	4	1
71	mountain-heather, four-angled	<i>Cassiope tetragona</i>	4	2
245	mountain-heather, pink	<i>Phylodoce empetrifoloides</i>	3	1
69	mountain-heather, white	<i>Cassiope mertensiana</i>	3	1
246	mountain-heather, yellow	<i>Phylodoce glanduliflora</i>	3	2
345	mountainbells	<i>Stenanthium occidentale</i>	4	3
368	nettle, stinging	<i>Urtica dioica</i> ssp. <i>gracilis</i>	4	3
77	nightshade, alpine enchanter's	<i>Circaea alpina</i>	4	2
78	nightshade, Pacific enchanter's	<i>Circaea pacifica</i>	4	3
247	ninebark, Pacific	<i>Physocarpus capitatus</i>	5	3
273	oak, Garry	<i>Quercus garryana</i>	2	
105	oatgrass, poverty	<i>Danthonia spicata</i>	2	1
104	oatgrass, timber	<i>Danthonia intermedia</i>	2	1
160	ocean-spray	<i>Holodiscus discolor</i>	2	2
13	onion, Hooker's	<i>Allium acuminatum</i>	2	2

APPENDIX 1a: Indicator species - common names

No.	Common name	Latin name	MI #	NI #
14	onion, nodding	<i>Allium cernuum</i>		2
211	oniongrass, Alaska	<i>Melica subulata</i>	4	3
207	Oregon-grape, dull	<i>Mahonia nervosa</i>	3	2
206	Oregon-grape, tall	<i>Mahonia aquifolium</i>	2	2
193	partridgefoot	<i>Luetkea pectinata</i>	4	2
8	pathfinder	<i>Adenocaulon bicolor</i>	3	3
177	peavine, creamy	<i>Lathyrus ochroleucus</i>	3	3
176	peavine, purple	<i>Lathyrus nevadensis</i>	3	3
359	piggy-back plant	<i>Tolmiea menziesii</i>	4	3
250	pine, ponderosa	<i>Pinus ponderosa</i>	2	2
249	pine, whitebark	<i>Pinus albicaulis</i>	3	2
268	pinedrops	<i>Pterospora andromedea</i>	2	2
49	pinegrass	<i>Calamagrostis rubescens</i>	2	2
166	pinesap	<i>Hypopitys monotropa</i>	3	1
74	pipsissewa, Menzies'	<i>Chimaphila menziesii</i>	3	2
75	prince's pine	<i>Chimaphila umbellata</i>	2	1
21	pussytoes, field	<i>Antennaria neglecta</i>	2	
88	queen's cup	<i>Clintonia uniflora</i>	3	1
300	raspberry, black	<i>Rubus leucodermis</i>	3	3
298	raspberry, red	<i>Rubus idaeus</i>	4	3
303	raspberry, trailing	<i>Rubus pubescens</i>	4	3
152	rattlesnake-plantain	<i>Goodyera oblongifolia</i>	3	1
266	rattlesnake-root, western	<i>Prenanthes alata</i>	4	3
48	reedgrass, Pacific	<i>Calamagrostis nutkaensis</i>	5	2
255	rein-orchid, round-leaved	<i>Platanthera orbiculata</i>	3	1
284	rhododendron, white-flowered	<i>Rhododendron albiflorum</i>	3	1
296	rose, baldhip	<i>Rosa gymnocarpa</i>	2	2
297	rose, Nootka	<i>Rosa nutkana</i>	4	3
295	rose, prickly	<i>Rosa acicularis</i>	3	2
168	rush, common	<i>Juncus effusus</i>	5	2
169	rush, dagger-leaved	<i>Juncus ensifolius</i>	5	2
146	salal	<i>Gaultheria shallon</i>		1
304	salmonberry	<i>Rubus spectabilis</i>	5	3
219	sandwort, big-leaved	<i>Moehringia macrophylla</i>	3	3
313	sanicle, Pacific	<i>Sanicula crassicaulis</i>	2	3
314	sanicle, Sierra	<i>Sanicula graveolens</i>	2	3
24	sarsaparilla, wild	<i>Aralia nudicaulis</i>	4	3
18	saskatoon	<i>Amelanchier alnifolia</i>	3	2
227	satin-flower	<i>Olsynium douglasii</i>	2	2
180	saxifrage, leatherleaf	<i>Leptarrhena pyrolifolia</i>	5	2
316	saxifrage, Tolmie's	<i>Saxifraga tolmiei</i>	5	2
317	scapania	<i>Scapania bolanderi</i>	4	1
127	scouring-rush	<i>Equisetum hyemale</i>	4	3

APPENDIX 1a: Indicator species - common names

No.	Common name	Latin name	MI #	NI #
60	sedge, Dewey's	<i>Carex deweyana</i>	4	3
61	sedge, Henderson's	<i>Carex hendersonii</i>	5	3
62	sedge, long-stoloned	<i>Carex inops</i>	3	2
65	sedge, Mertens'	<i>Carex mertensii</i>	4	3
64	sedge, pale	<i>Carex livida</i>	6	2
67	sedge, Ross'	<i>Carex rossii</i>	2	2
68	sedge, Sitka	<i>Carex sitchensis</i>	6	3
66	sedge, slough	<i>Carex obnupta</i>	6	3
63	sedge, smooth-stemmed	<i>Carex laeviculmis</i>	6	2
59	sedge, sweet	<i>Carex anthoxantha</i>	6	2
320	selaginella, Wallace's	<i>Selaginella wallacei</i>	2	1
115	shootingstar, broad-leaved	<i>Dodecatheon hendersonii</i>	3	3
116	shootingstar, few-flowered	<i>Dodecatheon pulchellum</i>	3	3
325	sibbaldia	<i>Sibbaldia procumbens</i>	4	1
204	skunk cabbage	<i>Lysichitum americanum</i>	6	3
350	snowberry, common	<i>Symporicarpos albus</i>		3
351	snowberry, trailing	<i>Symporicarpos mollis</i> var. <i>hesperius</i>	2	2
73	snowbrush	<i>Ceanothus velutinus</i>	3	2
328	Solomon's-seal, star-flowered	<i>Smilacina stellata</i>		3
327	Solomon's-seal false	<i>Smilacina racemosa</i>		3
324	soopolallie	<i>Shepherdia canadensis</i>	2	2
333	sphagnum, common brown	<i>Sphagnum fuscum</i>	6	1
334	sphagnum, common green	<i>Sphagnum girgensohnii</i>	5	1
331	sphagnum, common red	<i>Sphagnum capillifolium</i>	6	1
337	spirea, birch-leaved	<i>Spiraea betulifolia</i>	2	2
340	spirea, pink	<i>Spiraea menziesii</i>	5	3
338	spirea, subalpine	<i>Spiraea densiflora</i>	4	2
248	spruce, Sitka	<i>Picea sitchensis</i>		3
165	St. John's-wort, western	<i>Hypericum formosum</i>	4	2
365	starflower, broad-leaved	<i>Trientalis latifolia</i>	3	2
364	starflower, northern	<i>Trientalis arctica</i>	6	1
344	starwort, crisp	<i>Stellaria crispa</i>	5	3
343	starwort, northern	<i>Stellaria calycantha</i>	5	
319	stonecrop, broad-leaved	<i>Sedum spathulifolium</i>	1	1
140	strawberry, wild	<i>Fragaria virginiana</i>		2
139	strawberry, wood	<i>Fragaria vesca</i>	3	2
117	sundew, round-leaved	<i>Drosera rotundifolia</i>	6	1
230	sweet-cicely, mountain	<i>Osmorhiza chilensis</i>	4	3
205	tarweed, woodland	<i>Madia madiooides</i>	2	2
145	tea-berry, western	<i>Gaultheria ovatifolia</i>	2	1
301	thimbleberry	<i>Rubus parviflorus</i>		3
149	toad-flax, bastard	<i>Geocaulon lividum</i>		1

APPENDIX 1a: Indicator species - common names

No.	Common name	Latin name	MI #	NI #
366	trillium, western	<i>Trillium ovatum</i>	4	3
367	trisetum, nodding	<i>Trisetum cernuum</i>	4	3
185	twayblade, broad-leaved	<i>Listera convallarioides</i>	4	3
186	twayblade, heart-leaved	<i>Listera cordata</i>		1
184	twayblade, northwestern	<i>Listera caurina</i>	4	2
191	twinberry, black	<i>Lonicera involucrata</i>	5	3
183	twinflower	<i>Linnaea borealis</i>	3	
348	twistedstalk, clasping	<i>Streptopus amplexifolius</i>	4	3
349	twistedstalk, rosy	<i>Streptopus roseus</i>	4	3
350	twistedstalk, small	<i>Streptopus streptopoides</i>	4	1
381	valerian, Scouler's	<i>Valeriana scouleri</i>	4	3
382	valerian, Sitka	<i>Valeriana sitchensis</i>	4	3
6	vanilla-leaf	<i>Achlys triphylla</i>		3
387	vetch, American	<i>Vicia americana</i>	3	2
388	violet, early blue	<i>Viola adunca</i>	2	2
391	violet, marsh	<i>Viola palustris</i>	6	
390	violet, round-leaved	<i>Viola orbiculata</i>	3	2
389	violet, stream	<i>Viola glabella</i>	5	3
392	violet, trailing yellow	<i>Viola sempervirens</i>	3	2
175	wall-lettuce	<i>Lactuca muralis</i>	4	3
226	water-parsley	<i>Oenanthe sarmentosa</i>	6	3
122	wheatgrass, bluebunch	<i>Elymus spicata</i>	1	3
120	wildrye, blue	<i>Elymus glaucus</i>	3	3
121	wildrye, hairy	<i>Elymus hirsutus</i>	5	3
306	willow, Bebb's	<i>Salix bebbiana</i>		2
307	willow, Hooker's	<i>Salix hookeriana</i>	5	2
308	willow, Scouler's	<i>Salix scouleriana</i>		2
309	willow, Sitka	<i>Salix sitchensis</i>		2
125	willowherb, broad-leaved	<i>Epilobium latifolium</i>		3
271	wintergreen, green	<i>Pyrola chlorantha</i>	3	2
229	wintergreen, one-sided	<i>Orthilia secunda</i>	3	1
270	wintergreen, pink	<i>Pyrola asarifolia</i>	3	2
272	wintergreen, white-veined	<i>Pyrola picta</i>	3	2
76	wood-reed, nodding	<i>Cinna latifolia</i>	4	3
196	woodrush, many-flowered	<i>Luzula multiflora</i>	1	1
197	woodrush, small-flowered	<i>Luzula parviflora</i>	4	2
239	yampah	<i>Perideridia gairdneri</i>	3	2
5	yarrow, western	<i>Achillea millefolium</i> var. <i>lanulosa</i>	2	2
315	yerba buena	<i>Satureja douglasii</i>	3	3
159	Yorkshire fog	<i>Holcus lanatus</i>	4	2

APPENDIX 2. Humus forms

DEFINITIONS

Humus form - the group of organic horizons, together with Ah mineral horizons, that occur at the soil surface.

L horizon - the litter horizon at the surface consisting of relatively fresh, undecomposed organic material.

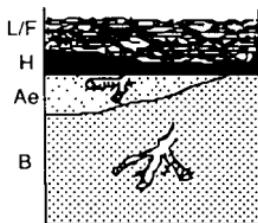
F horizon - the organic horizon consisting of partially decomposed organic material (below the L horizon).

H horizon - the organic horizon consisting of well-decomposed organic material (below the F horizon).

HUMUS FORM TYPES

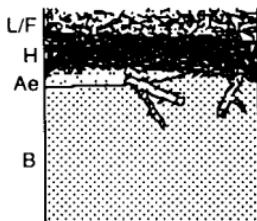
Mor

- L,F,H horizons prominent.
- F horizon matted; fungal mycelia abundant.
- "mushroom" smell.
- usually abrupt transition to mineral soil.



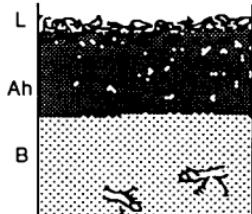
Moder

- L,F,H horizons prominent.
- F horizon loose and friable; fungal mycelia less abundant.
- common insects and droppings.
- rich, "potting soil" smell.
- may have thin Ah horizons.



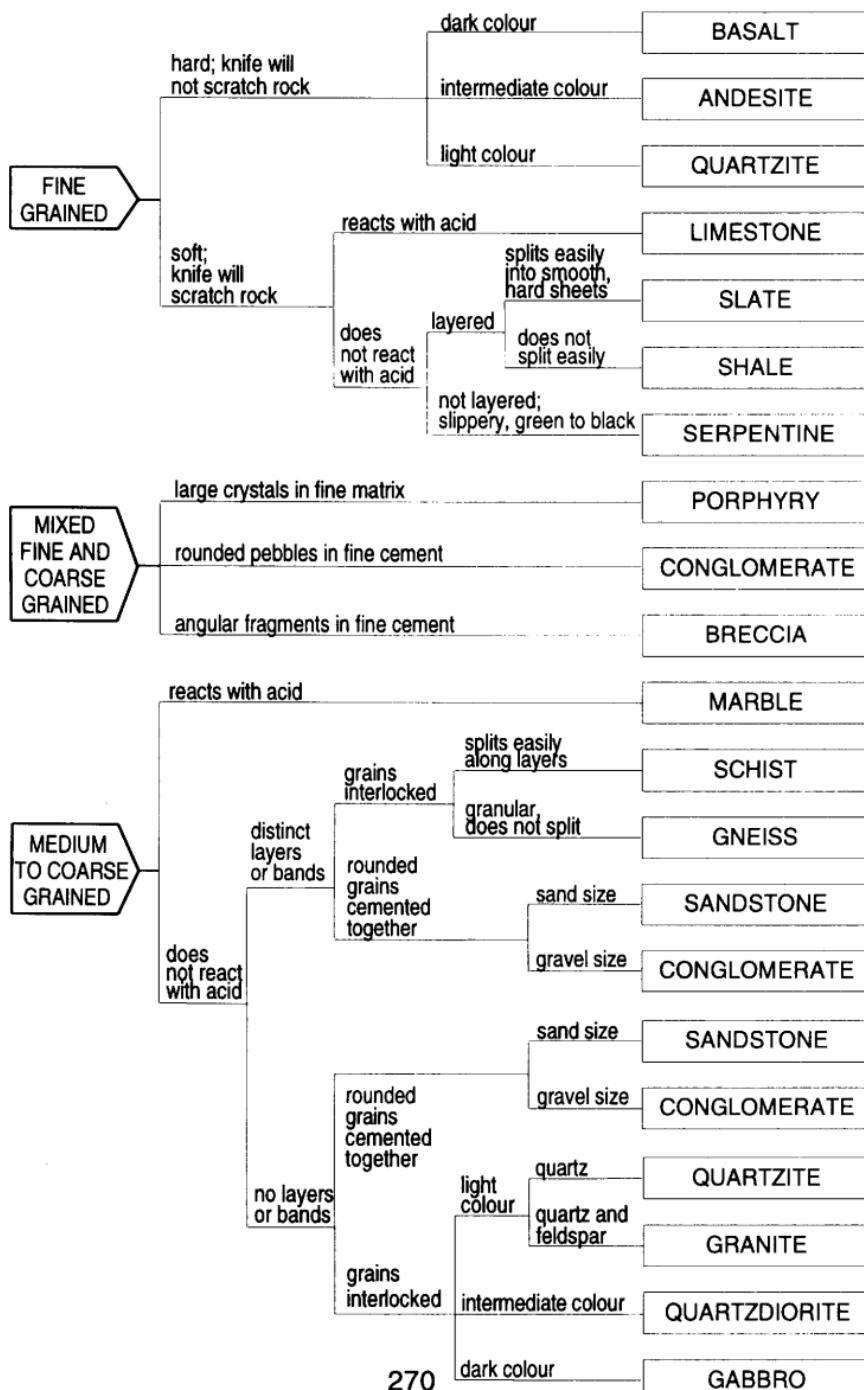
Mull

- Ah horizon prominent; F,H horizons < 2 cm, F horizon very friable.
- Ah horizon usually granular, with earthworms present.



APPENDIX 3. Key to bedrock

(modified from B.C. Department of Mines and Petroleum Resources 1970)



APPENDIX 4. Key to hand-texturing soil

Soil texture is the relative proportion of various "size fractions" of a soil.

The **fine fraction** consists of particles < 2 mm in diameter: % sand + % silt + % clay = 100% (fine fraction).

The **relative proportion of the fine fraction** particles (**sand**, **silt**, and **clay**) are estimated through the use of their unique "feel." Sand can be felt as individual grains. Dry silt feels like flour and wet silt is slippery or soapy, but not sticky. Clay forms hard lumps when dry, is very sticky when wet, and is plastic (like plasticene) when moist.

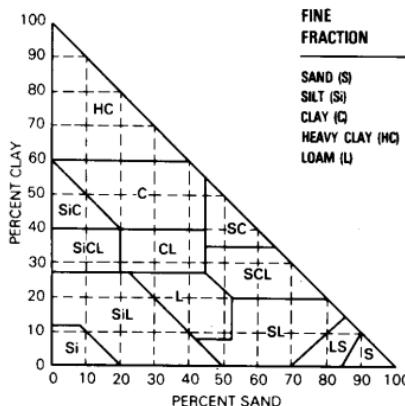
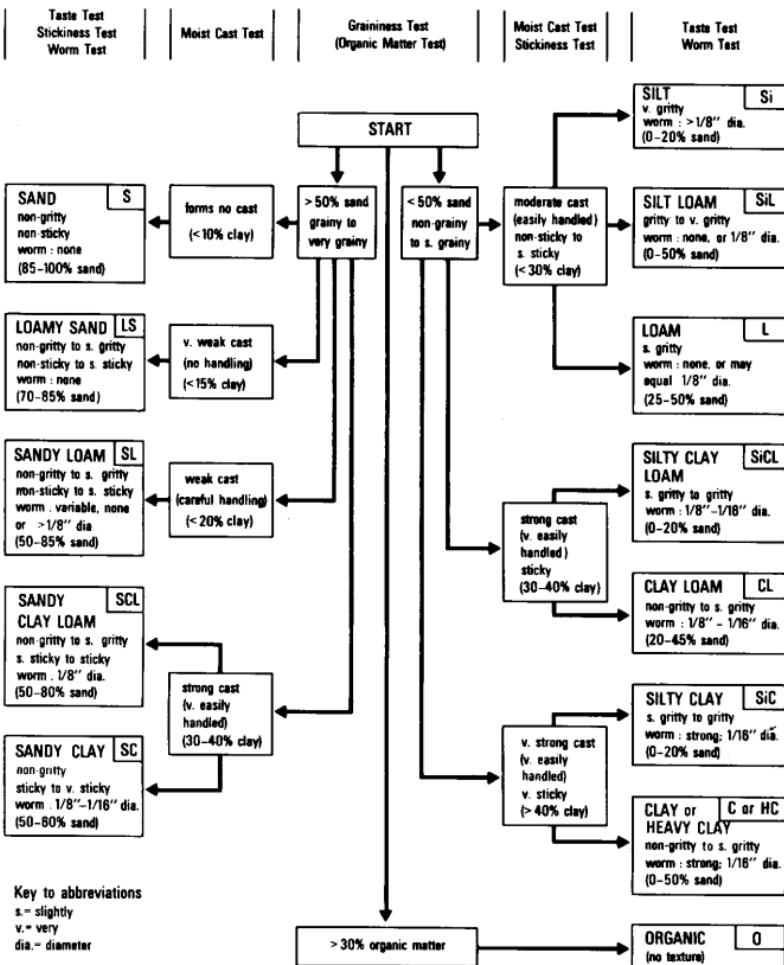
Most soils are a mixture of sand, silt, and clay, so the graininess, slipperiness, or stickiness will vary depending on how much of each particle size is present. As the amount of clay increases, soil particles bind together, form stronger casts, and longer, stronger worms. As sand and silt increase, the soil binding strength decreases, and only weak to moderately strong casts and worms can be formed. The various classes of soil texture, shown on the **textural triangle** in the accompanying figure, are named by a combination of the dominant particle size, with **loam** containing a relatively even mix of the three.

The field determination of soil texture is subjective and can only be done consistently with training and experience. The field tests described below and in the accompanying flowchart are provided to assist in estimating soil texture:

1. **Graininess test:** Rub the soil between your fingers. If sand is present it feels grainy. Estimate whether sand comprises more or less than 50%.
2. **Moist cast test:** Compress some moist soil by clenching it in your hand. If the soil holds together (e.g., forms a cast) then test the durability of the cast by tossing it from hand to hand. Increasing durability is associated with increasing clay.
3. **Stickiness test:** Wet the soil thoroughly and compress it between thumb and forefinger. Degree of stickiness is determined by noting how strongly the soil adheres to the fingers when pressure is released, and how much it stretches.
4. **Worm test:** Roll some moist soil between the palms of your hands to form the longest, thinnest worm possible. The more clay there is, the longer and thinner the worm will be.
5. **Taste test:** Work a small amount of soil between your front teeth. Silt particles feel like fine grit, while sand feels like individual grains. Clay has no grittiness.

Well-decomposed organic matter (humus) imparts silt-like properties to the soil but it is not used in determining soil texture. Estimates of silt content in humus-enriched soil should be reduced accordingly.

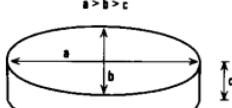
KEY TO HAND-TEXTURING SOIL



FINE FRACTION	PARTICLE DIAMETER
SAND (S)	2.05mm
SILT (Si)	.05-.002mm
CLAY (C)	<.002mm
HEAVY CLAY (HC)	>80% CLAY
LOAM (L)	MIX OF SAND, SILT & CLAY

COARSE FRAGMENTS	PARTICLE DIAMETER
STONES	> 250mm
COBBLES	250-75mm
GRAVELS	75-2mm

PRINCIPAL AXES OF A COARSE FRAGMENT



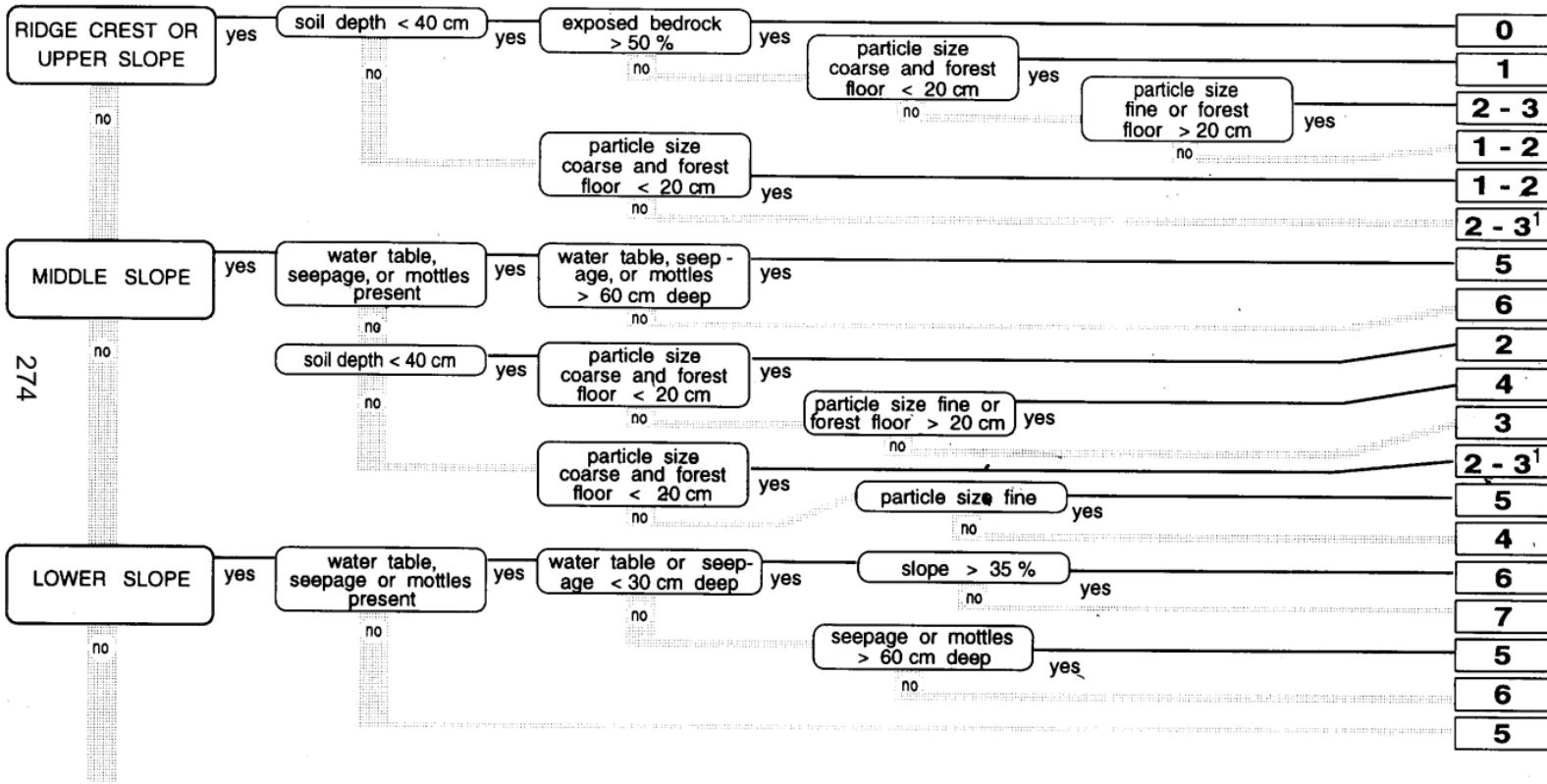
coarse fragment size is always determined along the b-axis

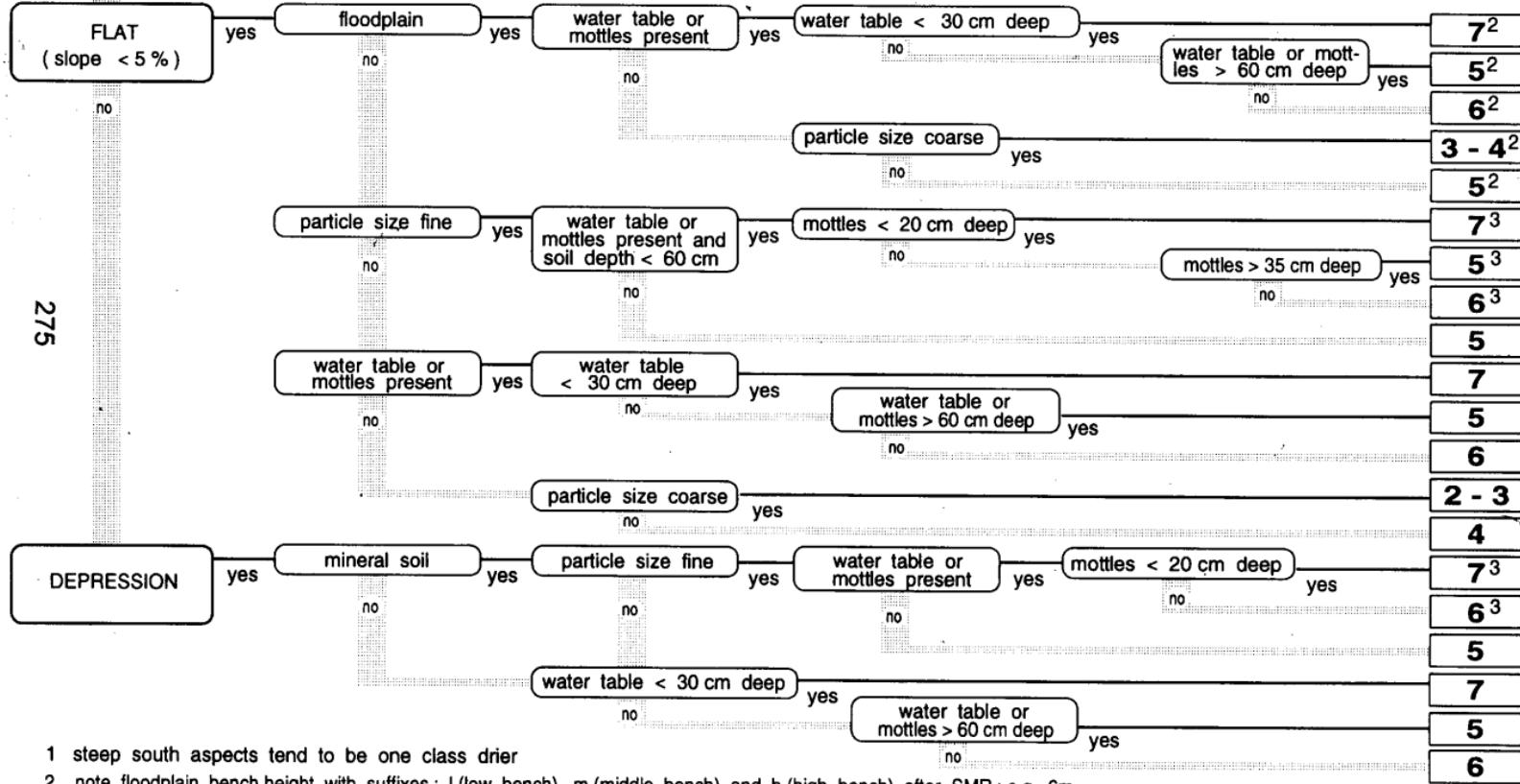
APPENDIX 5. Key to relative soil moisture regime

This key is designed to assist users in identifying relative soil moisture regime using environmental features described during site assessment. Always check the results against other site and vegetation information.

Term	Definition
Ridge crest	Height of land; usually convex slope shape.
Upper slope	The convex-shaped, upper (shedding) portion of a slope.
Middle slope	The portion of a slope between the upper and lower slopes; the slope shape is usually straight.
Lower slope	The moisture-receiving area towards the base of a slope; the slope shape is usually concave. It includes toe slopes, which are level areas directly below and adjacent to the lower slope.
Flat	Any level area (excluding toe slopes); the surface shape is straight with no significant aspect (< 5%).
Depression	Any area that is concave shaped; usually in flat or subdued topography.
Floodplain	Post-glacial alluvial deposits bordering rivers and streams, still under the influence of periodic flooding.
Soil depth	Depth from the ground surface to a restricting layer such as bedrock, strongly compacted, or strongly cemented material.
Particle size coarse	Sandy (LS, S) with > 35% coarse fragments; or loamy (SL, L, SCL) with > 70% coarse fragments.
Particle size fine	Silty (SiL, Si) or clayey (SiCL, CL, SC, SiC, C) with low coarse fragments.

KEY TO RELATIVE SOIL MOISTURE REGIME





1 steep south aspects tend to be one class drier

2 note floodplain bench height with suffixes : l (low bench), m (middle bench), and h (high bench) after SMR ; e.g., 6m

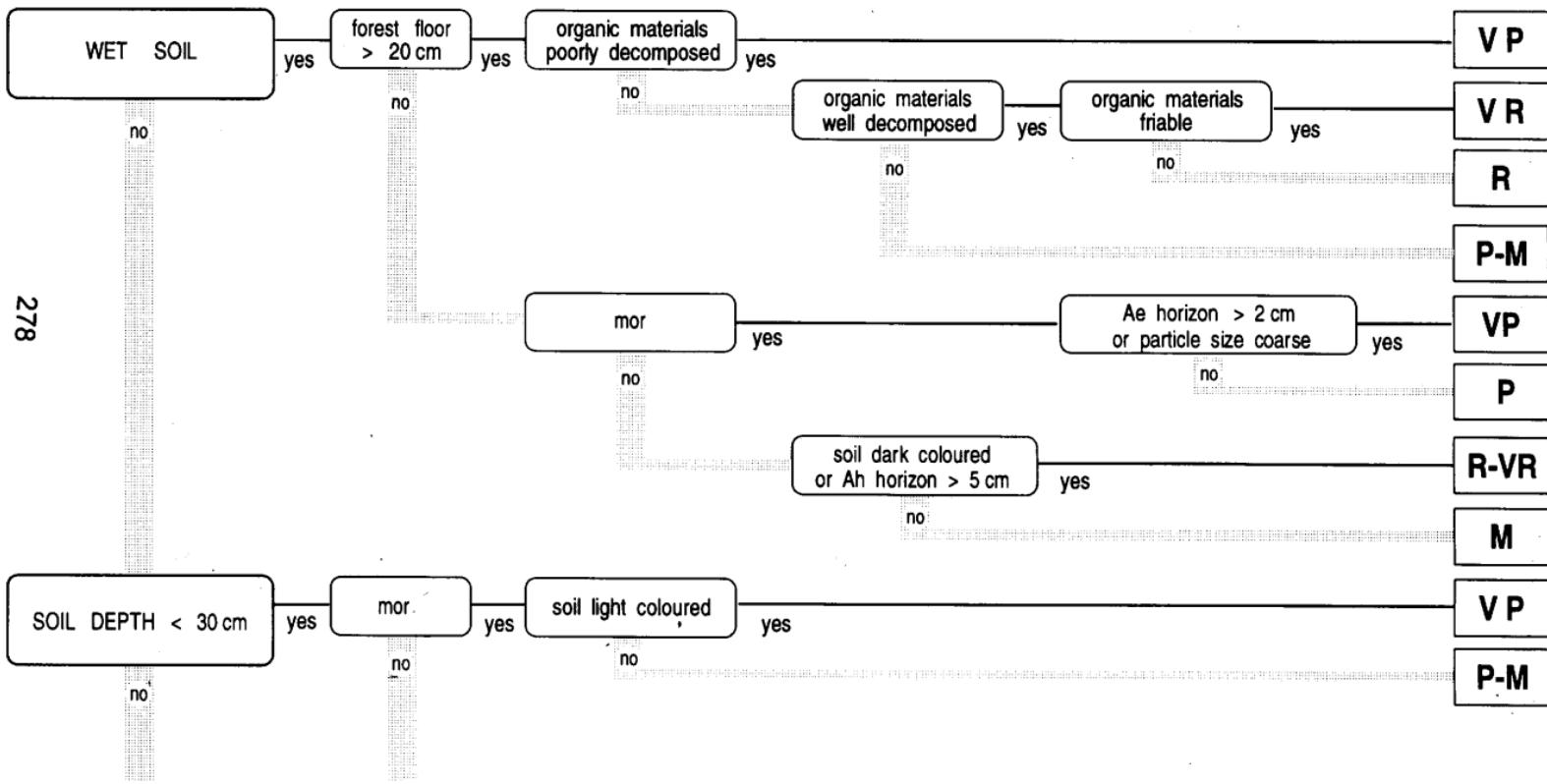
3 sites with strongly fluctuating water table ; use suffix "f" after SMR ; e.g., 5f

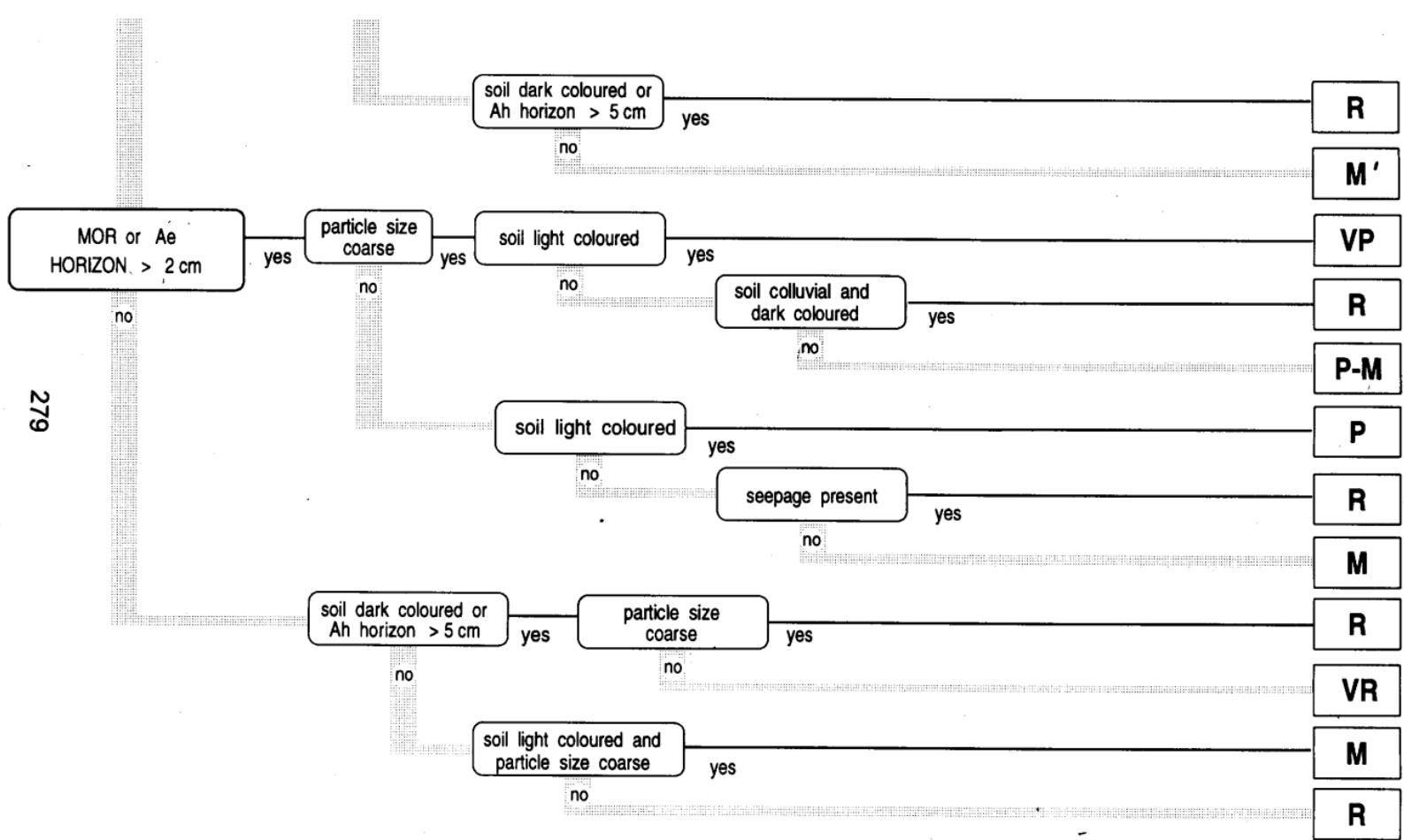
APPENDIX 6. Key to soil nutrient regime

This key is designed to assist users in identifying soil nutrient regime using environmental features described during site assessment. Always check the results against other site and vegetation information.

Term	Definition
Wet soil	Soil that has a growing season water table less than 30 cm from the ground surface.
Soil depth	Depth from the ground surface to a restricting layer such as bedrock, strongly compacted, or strongly cemented material.
Mor	A humus form comprised of L, F, and H horizons; the F horizon is matted and contains abundant fungal mycelia.
Forest floor	All organic material (L, F, and H horizons) on the mineral soil surface.
Organic materials friable	Well-decomposed organic material that dries out sufficiently during the growing season that it has a crumbly consistency.
Particle size coarse	Sandy (LS, S) with > 35% coarse fragments; or loamy (SL, L) with > 70% coarse fragments.
Soil dark coloured	Soil with high organic matter content, indicated by dark, chocolate-brown colours (Munsell colour value < 4).
Soil light coloured	Soil with very low organic matter content, indicated by very pale colours (Munsell colour value > 6).
Soil colluvial	Soils derived from colluvial parent materials.

KEY TO SOIL NUTRIENT REGIME



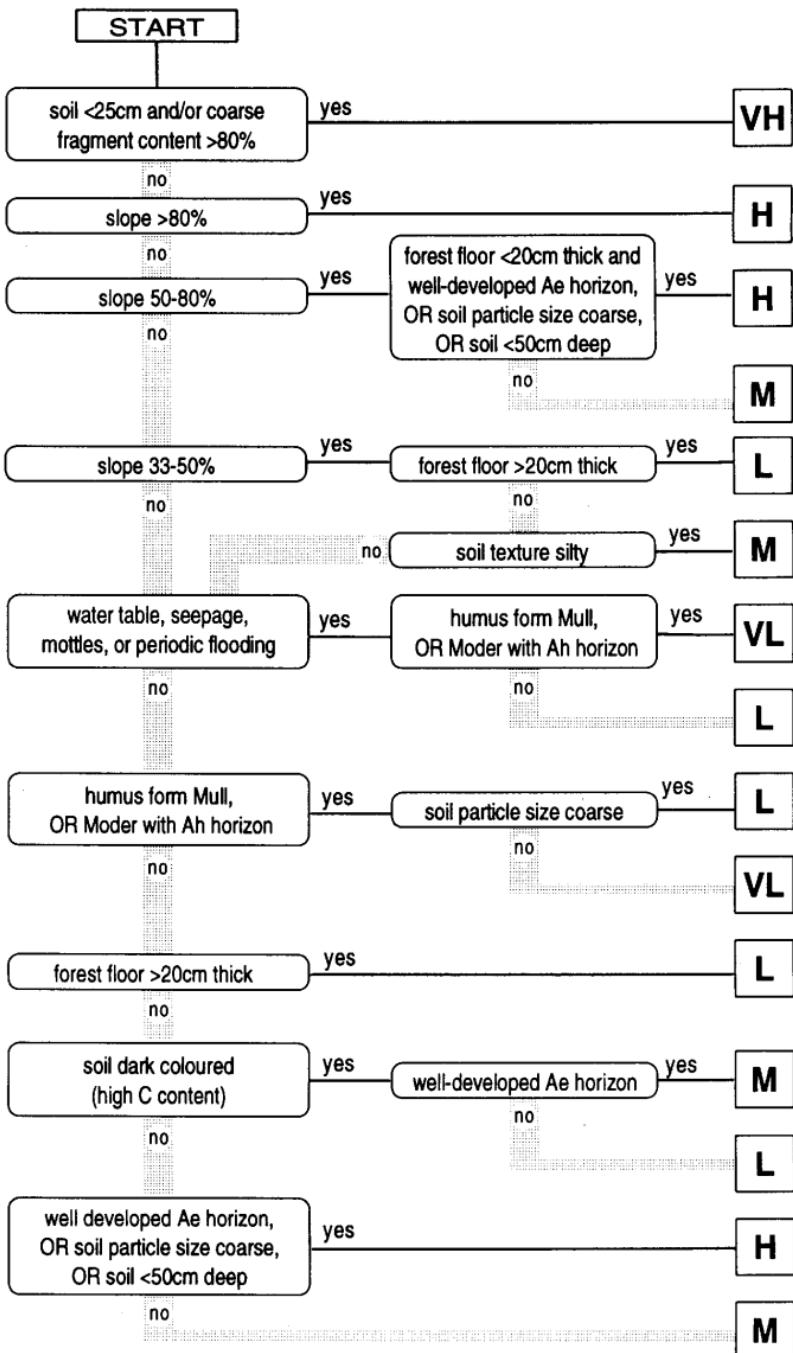


APPENDIX 7. Key to site sensitivity to slashburning

This key is designed to assist users in identifying classes of site sensitivity to slashburning using environmental features described during site assessment. These classes reflect the potential impact of slashburning on site productivity, and are used with other factors in making treatment decisions.

Term	Definition
Soil depth	Depth from the ground surface to a restricting layer such as bedrock, strongly compacted, or strongly cemented material.
Forest floor	All organic materials (L, F, and H horizons) on the mineral soil surface.
Ae horizon	A leached horizon at the mineral soil surface characterized by a greyish colour. A well-developed Ae horizon is > 2 cm thick.
Ah horizon	A dark coloured horizon at the mineral soil surface that is enriched with organic matter.
Particle size coarse	Sandy (LS, S) with > 35% coarse fragments; or loamy (SL, SCL) with > 70% coarse fragments.
Mull	A humus form comprised of very thin L (and F) horizons over a well-developed Ah horizon.
Moder	A humus form comprised of L, F, and H horizons; the F horizon is loose and friable with common insects.
Sensitivity class	VH - very high; H - high; M - medium; L - low; VL - very low.

KEY TO SITE SENSITIVITY TO SLASHBURNING



APPENDIX 8. Correlation of old and new biogeoclimatic and site units.

TABLE A-1. Biogeoclimatic units

New symbol	New name	Old symbol ^a
CDFmm	Moist Maritime CDF	CDFa
CWHdm	Dry Maritime CWH	CWHa2
CWHds1	Southern Dry Submaritime CWH	CWHc1
CWHds2	Central Dry Submaritime CWH	CWHc2, h1, h2
CWHmm1	Submontane Moist Maritime CWH	CWHb3
CWHmm2	Montane Moist Maritime CWH	CWHb4
CWHms1	Southern Moist Submaritime CWH	CWHb5
CWHms2	Central Moist Submaritime CWH	CWHb6, h3
CWHvh1	Southern Very Wet Hypermaritime CWH	CWHd1
CWHvh2	Central Very Wet Hypermaritime CWH	CWHd2, CCPH
CWHvm1	Submontane Very Wet Maritime CWH	CWHb1, i1
CWHvm2	Montane Very Wet Maritime CWH	CWHb2, i2
CWHwh1	Submontane Wet Hypermaritime CWH	CWHe1, g1
CWHwh2	Montane Wet Hypermaritime CWH	CWHe2, g2
CWHws2	Montane Wet Submaritime CWH	CWHb7, f2, i3
CWHxm1 ^b	Eastern Very Dry Maritime CWH	CDFb
CWHxm2 ^b	Western Very Dry Maritime CWH	CWHa1
ESSFmw	Moist Warm ESSF	ESSFf
IDFww	Wet Warm IDF	IDFe
MHmm1	Windward Moist Maritime MH	MHa, d
MHmm2	Leeward Moist Maritime MH	MHb, e
MHwh	Wet Hypermaritime MH	MHc, f

^a From Yole *et al.* (1982), Banner, *et al.* 1983, Green, *et al.* (1984), Pojar *et al.* (1988).

^b Combined into CWHxm in this guide because of floristic and management similarities.

APPENDIX 8. (Continued)

TABLE A-2. Site units

New grid # and BGC unit	Old grid # and BGC unit	New sites series #																
		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Old site unit #																		
1 CDFmm	6 CDF	3	1	2	4	5	6	7	*	*	8	9	*	*	*	*	*	*
2 CWHdm	8 CWHa2	4	1	2	3	5	6	7	8	*	*	9	10	*	*	*	*	*
3 CWHds1	18 CWHc1	3	1	1/3	2/4 ²	4	5	6	7	*	*	8	9	*	*	*	*	*
4 CWHds2	17 CWHc2	3	1	1/3	2/4 ²	4	5	6	7	*	*	8	9	*	*	*	*	*
5 CWHmm1	11 CWHb3	4	1	2	3	5	6	7	8	*	*	9	10	*	*	*	*	*
6 CWHmm2	12 CWHb4	4	1	2	3	5	6	*	7	8	9	*	*	*	*	*	*	*
7 CWHms1 ³	13 CWHb5	4	1	2	5	6	7	8	*	*	9	10	*	*	*	*	*	*
8 CWHms2 ³	14 CWHb6	4	1	2	5	6	7	8	*	*	9	10	*	*	*	*	*	*
9,10 CWHvh	18 CWHd	3	1	2	*	*	4	6	*	*	*	5	7	8	*	*	*	*
11 CWHvm1	9 CWHb1	3	1	2	*	4	5	6	6	7	*	*	*	8	9	*	*	*
12 CWHvm2	10 CWHb2	3	1	2	*	4	5	6	6	*	7	8	*	*	*	*	*	*
13,14 CWHhw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15 CWHws2 ³	15 CWHb7	4	1	2	5	6	7	8	*	*	9	10	*	*	*	*	*	*
16 CWHxm ⁴	7 CWHa1	4	1	2	3	5	6	7	8	*	*	9	10	*	*	*	*	*
17 ESSFmw ⁵	3 ESSFf	4	1	2	*	6	7	7	9	*	*	*	*	*	*	*	*	*
18 IDFww ⁶	4.5 IDFe	3	1	1	4	6	6	6	9	*	*	*	*	*	*	*	*	*
19 MHmm1	1 MHa	3	1,2 ⁷	4	5	6	5	6	7	8	*	*	*	*	*	*	*	*
20 MHmm2	2 MHb	3	1,2 ⁷	4	5	6	5	6	7	8	*	*	*	*	*	*	*	*
21 MHhw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

* No equivalent in Green *et al.* (1984)

¹ New site series includes portions of old site units 1 and 3

² New site series includes portions of old site units 2 and 4

³ No new equivalent for old site unit 3

⁴ CWHxm most closely represents the old CWHa1

⁵ No new equivalent for old site units 3,5, and 8

⁶ No new equivalent for old site units 2,5,7, and 8

⁷ New site series includes old site units 1 and 2

APPENDIX 9.

SITE ASSESSMENT FORM

Vancouver Forest Region

BLOCK IDENTIFICATION

ENVIRONMENTAL ANALYSIS

Physiographic features

ELEVATION _____ m	SLOPE GRADIENT _____ %	ASPECT _____ ° azimuth	
SLOPE POSITION	<input type="checkbox"/> ridge crest <input type="checkbox"/> lower slope <input type="checkbox"/> upper slope <input type="checkbox"/> flat <input type="checkbox"/> middle slope <input type="checkbox"/> depression	SLOPE SHAPE	<input type="checkbox"/> convex <input type="checkbox"/> straight <input type="checkbox"/> concave
MICROTOPOGRAPHY	<input type="checkbox"/> smooth <input type="checkbox"/> slightly mounded	<input type="checkbox"/> moderately mounded <input type="checkbox"/> strongly mounded	
EXPOSURE	<input type="checkbox"/> insolation <input type="checkbox"/> frost pocket <input type="checkbox"/> cold air drainage	<input type="checkbox"/> wind <input type="checkbox"/> salt spray <input type="checkbox"/> snow	<input type="checkbox"/> other

Soil features

SOIL DEPTH	<input type="checkbox"/> extremely shallow (<0.25m) <input type="checkbox"/> very shallow (0.25-0.5m)	<input type="checkbox"/> shallow (0.5-1 m) <input type="checkbox"/> deep (> 1 m)	
SOIL TEXTURE	<input type="checkbox"/> sandy (LS,S) <input type="checkbox"/> loamy (SL,L,SCL)	<input type="checkbox"/> silty (SiL,Si) <input type="checkbox"/> clayey (SiCL,CL,SC,SiC,C)	<input type="checkbox"/> organic
COARSE FRAGMENT CONTENT	<input type="checkbox"/> <10% <input type="checkbox"/> 35-70% <input type="checkbox"/> 10-35% <input type="checkbox"/> >70%	SOIL COLOUR	FLOODPLAIN
		<input type="checkbox"/> light (value >6) <input type="checkbox"/> medium (value 4-6) <input type="checkbox"/> dark (value <4)	<input type="checkbox"/> low bench <input type="checkbox"/> medium bench <input type="checkbox"/> high bench
GLEYING	<input type="checkbox"/> yes <input type="checkbox"/> no	depth of gleyed horizon _____ cm	
WATER TABLE	<input type="checkbox"/> yes <input type="checkbox"/> no	depth of watertable _____ cm	
LANDFORM		BEDROCK GEOLOGY	
A HORIZON	FOREST FLOOR THICKNESS	HUMUS FORM	
<input type="checkbox"/> Ae <input type="checkbox"/> Ah thickness _____ cm	cm	<input type="checkbox"/> Mor (matted F hor., fungal mycelia) <input type="checkbox"/> Moder (loose F hor., insects) <input type="checkbox"/> Mull (very thin L hor., Ah present)	

SITE ASSESSMENT

Soil moisture regime:	Soil nutrient regime:
Subzone / variant / site unit:	

APPENDIX 9. (Continued)

Species		Cover class or actual % cover	Moisture		Nutrient				
			ISG No:	Midpoint or actual % cover	ISG No:	Midpoint or actual % cover			
Total cover of all ISG's									
Cover class interval (%)	<1	1-5	>5-25	>25-50	>50-75	>75			
Cover class code	+	1	2	3	4	5			
Cover class midpoint (%)	0.5	3.0	15.0	37.5	62.5	87.5			
An ISG frequency equals its summed cover, divided by the total cover for all ISG's for that property (e.g., moisture or nutrients) by 100	Cover of moisture ISG					Cover of nutrient ISG			
	# 1	# 2	# 3	# 4	# 5	# 6	# 1	# 2	# 3
Summed cover									
ISG frequency									