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

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

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**This field Guide is Dedicated to**

**Dr. Vladimir J. Krajina**

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Dr. Vladimir J. Krajina

*(1905 – 1993)*

Professor Krajina’s 40 years of teaching and research in ecology and conservation in British Columbia have inspired many of us to seek a better understanding of the natural world. His life’s work provided the foundation for ecologically based forest management in British Columbia.
ACKNOWLEDGEMENTS

This field guide represents the synthesis of over 15 years of ecological sampling and analysis within the Prince Rupert Forest Region. The classification and interpretations presented in this guide have evolved through the collective work of a great many individuals involved in various phases of the ecosystem classification project since the mid 1970s.


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Engelmann spruce
*Picea engelmannii*

Sitka spruce
*Picea sitchensis*

Black spruce
*Picea mariana*
1 INTRODUCTION

1.1 Objectives and Scope

This guide presents site identification and interpretation information for forest ecosystems of the Prince Rupert Forest Region (PRFR) (Figure 1.1). Site identification is based on the biogeoclimatic ecosystem classification (BEC) initially developed by Dr. V.J. Krajina at the University of British Columbia 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; and
- to improve the users’ ability to prescribe and monitor site-specific treatments.

This guide results from the recently completed provincial correlation of the BEC system. It replaces previously published site identification field guides (a list is provided in Appendix 1, Section 1). Correlation tables of names of classification units used in previous guides and those used in the 1993 guide are provided in Appendix 2.

This guide has two principal goals:

- to assist users in describing and identifying forest ecosystems; and
- 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 biogeoclimatic maps that display the distribution of zones, subzones, and variants found within the PRFR (Pojar et al. 1988). These maps use pre-correlation units (see Appendix 2 for a listing of old and new names). More complete descriptions of the BEC system can be found in Biogeoclimatic Ecosystem Classification in British Columbia (Pear et al. 1987), Use of the Biogeoclimatic Ecosystem Classification in British Columbia (MacKinnon et al. 1992a), and Ecosystems of British Columbia (Meidinger and Pojar 1991). For a more detailed discussion of the methodology used to describe ecosystems, refer to Describing Ecosystems in the Field (2nd edition) (Luttmerding et al. 1990). A synopsis of the revised coastal site classification is provided in Banner et al. (1990). Silviculture and wildlife interpretive reports for this region are listed in Appendix 1, Sections 2 and 3. Comprehensive descriptions of plant species and their uses are found in Indicator Plants of Coastal British
Introduction

FIGURE 1.1. Location of the Prince Rupert Forest Region and Forest Districts (FD).

*Columbia* (Klinka et al. 1989) and *Plants of Northern British Columbia* (MacKinnon et al. 19929). Additional references for plant identification are provided in Appendix 1, Section 4.
1.3 Guide Content and Limitations

This guide has seven chapters. Chapter 2 is an overview of the BEC system. Chapter 3 outlines the process of identifying biogeoclimatic units, and includes the procedures for describing and analyzing environmental and vegetation features to identify site units. It also outlines how to ecologically map sites for management purposes. Chapter 4 describes characteristics of the biogeoclimatic units (zones, subzones, variants, and phases) found in the PRFR. Chapter 5 provides a synopsis of all site units recognized for each biogeoclimatic unit in the region. It includes edatopic grids, and environmental and vegetation summaries. Wildlife interpretations are found in Chapter 6. Information is presented on important habitats, wildlife species of management concern, and silviculture/wildlife considerations. Chapter 7 provides silvicultural interpretations and includes information on site productivity, site-limiting factors, vegetation potential, tree species selection, reforestation considerations, grass and legume seeding, and forest health. More detailed reference material, such as stocking standards and field tools for site description and identification, are contained in the appendices.

In this guide, we have synthesized the knowledge and experience acquired during 15 years of forest ecosystem sampling, monitoring of management practices, and research in the PRFR. Some biogeoclimatic zones (the BWBS, ESSF, MH, SWB, and AT) have been less intensively sampled than others.

No guide can encompass all the complexity and diversity in the landscape. The recognized site units cover relatively common ecosystems sampled throughout the major ranges of the biogeoclimatic units. Users are bound to encounter sites that do not appear to “fit” the classification. In these cases, an understanding of basic ecological factors (e.g., climate, soil moisture, soil nutrients), silvics, and the effects of management practices is required. It is important to recognize that the guide can only help users develop management prescriptions. Users are reminded that the guide represents but one piece of the decision-making puzzle.

1.4 Format of the Guide

This field guide is available in two formats: the office version is a single volume in a large three-ring binder; the field version is two parts in fieldsized binders on waterproof paper. The content of the two is identical.

We have structured the guide in a modular format to allow users to modify it to suit their needs. All pages have headers on the upper left or right indicating chapter topics and the relevant zone, subzone, or variant.

Users can produce their own “customized” field guides containing only the chapters, subzones, and appendices relevant to their area of operations.
1.5 Training Courses

We have assumed that users of this guide have completed the BEC training program offered by the Regional Forest Sciences Section, in which basic concepts and methods of ecosystem description and assessment are introduced. Field courses co-ordinated by Regional Forest Sciences staff are held periodically in most forest districts in the PRFR, depending on demand. For information about these training courses, contact the Forest Science Officer, PRFR. For information about courses on Pre-Harvest Silviculture Prescriptions (PHSPs) and silviculture surveys (both of which have an ecological classification component), contact the Regional Silviculture Officer, PRFR. Regional Forest Sciences staff are available to assist with problems associated with field descriptions, identification, and management interpretations.

Introduction

Devil's club
Oplopanax horridus
2 BIOGEOCLIMATIC ECOSYSTEM CLASSIFICATION

The BEC system groups and classifies similar segments of the landscape ("ecosystems") to form categories of a hierarchical classification system. An ecosystem is the result of a complex interaction of vegetation, animals, micro-organisms, and the physical environment. For the 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, ecosystems more often tend to grade slowly from one to another.

Climate is the most important factor influencing the development of terrestrial ecosystems. The spruce-pine forests in the interior reflect a much colder, drier climate than the moist western redcedar-hemlock forests near Prince Rupert; the cold, snowy forests of the Babine Mountain Range reflect another distinct climate. Within each of these climatic areas, ecosystems vary because of differences in topography and soil. Ridge crests are relatively drier than lower slopes and valley bottoms.

Vegetation is important when developing an ecological classification because it is readily visible, and it reflects the environment, biology, and history of a site. However, vegetation changes over time — a process called succession. It is the more stable plant communities of later successional stages ("late seral" or "near climax") that the classification is based on, and that are most useful for identifying site units.

2.1 The Classification System

The BEC system is a hierarchical classification with four major components: climate, vegetation, site, and seral. The vegetation classification is important for developing the system, but will not be described here. A successional or "seral" classification is being developed, but is still in its infancy. The climate and site classifications are most relevant to field application. Within these two classifications are several hierarchical categories ranging from general to specific levels of detail (Figure 2.1).

2.2 Climate Classification

Broad geographic areas influenced by similar regional climates are classified into biogeoclimatic units in the climate classification of the BEC system. Because vegetation best reflects the influence of regional climate, the stable mature or "near-climax" plant communities found on zonal sites are used to classify biogeoclimatic units. Zonal sites are intermediate in soil moisture and nutrients within a biogeoclimatic unit.

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1 Modified from Meidinger and Pojar (1991), Lloyd et al. (1990), and Green et al. (in prep.).
Zonal sites have the following features:

- mid-slope positions in mountainous terrain, upper-slope positions in subdued terrain;
- moderately deep to deep soils (> 50 cm) with loamy textures, less than 50% coarse fragments, and unrestricted drainage; and
- locations not subject to local variation in climatic conditions (e.g., frost pockets or steep southern exposures).

The vegetation on “non-zonal” sites—areas that are wetter, drier, richer, or poorer than zonal sites—does not provide as clear a reflection of the regional climate because of the influence of site factors such as slope position or soil characteristics.

![Climate Site Classification Diagram]

FIGURE 2.1. The hierarchical structure of the climate and site classification in the BEC system.

Several categories are recognized in the climate classification: zone, subzone, and variant. Broad climatic patterns are expressed regionally and elevationally. Biogeoclimatic zones are generalized units representing extensive areas of broad, homogeneous macroclimates. They are characterized by shade-tolerant “climax” tree species, an example being the Coastal Western Hemlock zone, characterized by western hemlock.

Zones are subdivided into biogeoclimatic subzones that represent the basic and most commonly used category in BEC. Subzones have characteristic plant communities occurring on zonal sites. An example is the Very Wet Maritime Coastal Western Hemlock subzone, characterized by the HwBa - Blueberry plant community on zonal sites. Further inland is the Wet Submaritime Coastal Western Hemlock subzone, characterized by the HwBa - Bramble plant community on zonal sites. It receives less precipitation and has less of a maritime influence.

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2 Tree species abbreviations are found in Appendix 3.
Subzones can contain considerable climatic variation, and so 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 the Montane (higher elevation, snowier, and cooler) and Submontane (lower elevation, warmer, and less snow) variants.

Although not a formal category in BEC, a further subdivision, called a biogeoclimatic phase, is sometimes identified. Phases accommodate the local variation in climate that usually results from local relief. An example might be an extensive frost pocket area in the valley bottom of mountainous terrain, that is atypical for the regional climate.

### 2.2.1 Naming of biogeoclimatic units

Zones are named after one or more of the dominant climax tree species on zonal sites, and sometimes include a geographic or climatic modifier. A two- to four-letter code is used to abbreviate the name (e.g., ICH denotes the Interior Cedar — Hemlock zone and ESSF denotes the Engelmann Spruce — Subalpine Fir zone). Subzone names reflect climate and are derived from relative precipitation and from continentality or temperature. A two-letter code is added to the zone name: the first letter connotes precipitation; the second connotes continentality or temperature (Table 2.1).

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Code</th>
<th>Continentality/ Temperature</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>dry</td>
<td>d</td>
<td>hypermaritime</td>
<td>h</td>
</tr>
<tr>
<td>moist</td>
<td>m</td>
<td>maritime</td>
<td>m</td>
</tr>
<tr>
<td>wet</td>
<td>w</td>
<td>submaritime</td>
<td>s</td>
</tr>
<tr>
<td>very wet</td>
<td>v</td>
<td>warm</td>
<td>w</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cool</td>
<td>k</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cold</td>
<td>c</td>
</tr>
<tr>
<td></td>
<td></td>
<td>very cold</td>
<td>v</td>
</tr>
</tbody>
</table>

For example, ICHmc represents the Moist Cold ICH subzone. Variants are named by geographic labels reflecting their general distribution within a subzone, and coded with a number (e.g., ICHmc1 and ICHmc2 represent the Nass and Hazelton variants of the ICHmc, respectively). The ICHmc1a denotes the amabilis fir phase of the ICHmc1. The following displays the coding convention:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Subzone</th>
<th>Variant</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICH</td>
<td>mc</td>
<td>1</td>
<td>a</td>
</tr>
</tbody>
</table>

precipitation  continentality/temperature
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 into site units according to their potential to produce similar “stable” plant communities at late successional stages. Sites with similar stable plant communities reflect similar environmental properties, particularly soil moisture and soil nutrient regimes. Site units can be identified according to these characteristic environmental properties, as well as characteristic climax plant communities. It is important to recognize that a particular site unit (e.g., a zonal Hw - Step moss) can support a variety of plant communities depending on the successional stage, but it has the potential to result in one kind of near-climax or climax plant community.

Three categories are recognized in the site classification of BEC: site association, site series, and site type (Figure 2.1). The site series represents the most commonly used category for field use. Site series refers to sites capable of producing the same mature or climax plant communities within a biogeoclimatic subzone or variant. The site series is approximately equivalent to the “ecosystem association” used in previous field guides. Although a site series is specific to a subzone or variant, the stable, near-climax plant community encompassed by the site series may occur within more than one biogeoclimatic unit. Site associations represent sites capable of producing the same near-climax vegetation, regardless of biogeoclimatic unit. For example, the Hw - Step moss site association spans the ICHmc1, ICHmc2, ICHvc, and ICHwc. Although site series within a site association occur on ecologically equivalent sites, they may occupy different positions on a relative scale of moisture and nutrients for different biogeoclimatic units. Therefore, the Hw - Step moss site association occurs on zonal sites (mesic) in the ICHmc1 and ICHmc2 variants, but is restricted to sites that are drier than zonal in the ICHwc and ICHvc subzones. Because site associations are more variable than site series, they are less predictable for management application.

The site type, the most detailed category of the site level, is not used in this field guide. For a detailed definition of this term, consult Meidinger and Pojar (1991). The site phase is used to allow better site differentiation and identification for operational considerations, although it is not a formal category in BEC. Site phases are differentiated by edaphic characteristics. For example, recognizing two distinct differences in particle size classes (coarse and fine) within a widespread site series gives much more meaning to silvicultural interpretations for these sites. A site phase may also be differentiated on the basis of slope class, aspect, parent material, soil climate, humus form, soil chemistry, or bedrock geology.

Lastly, a site variation is used to describe vegetative trends or floristic features related to short-term successional factors, recent stand history, or local climate or site factors. For example, in several site units in the ICHvc, we
recognize Hw and Bl variations, reflecting the influence of cold air drainage.

2.3.1 Naming and numbering of site units

Site associations are named using one or two tree species, followed by one or two understory plant species derived from the near-climax plant community on which they are based. While the species chosen for naming the site association are often predominant in these communities, less common but characteristic species are sometimes used to ensure that the site unit has 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. Each site series is given a two-digit numerical code. For example, $ICHmc1 / Hw$ - Step moss or $ICHmc1/01$ represents the zonal site series inter ICHmc1 variant. Forested site series are numbered from 01 to 29; 01 is always zonal and site series are then numbered from dry to wet and secondarily from very poor to very rich. Non-forested wetlands are numbered from 31 to 49, seral associations from 51 to 79 (these names are preceded by a $\$), and non-forested grasslands from 81 to 99.

Site phases and variations are named according to the differentiating criteria and given either an alphabetic or numeric code after the site series number (e.g., $ICHmc1/01a$ denotes a mesic phase; $ICHvc / 01(1)$ or $ICHvc/01(2)$ denote Hw or Bl variations).

2.4 Seral Classification

The seral classification in BEC integrates both the site and vegetation classifications with the structural stage of development (Figure 2.2), and follows the approach outlined by Hamilton (1988).

![FIGURE 2.2 An illustration of the structural and developmental stages used in seral classification (from Hamilton 1988).](image)
Managed and natural forests have complex patterns on seral ecosystems and most of the successional pathways are not adequately described. However, for some biogeoclimatic units and site series, common seral plant communities have been classified, and are included in this field guide.

In the ICH, four seral associations have been formally described because of their predominance across the landscape. While these seral associations may occur more commonly on a particular site series, their occurrence is often related to the type and intensity of disturbance, not just to site conditions. Thus, a particular seral association might occur on one or more site series. For example, ICHmc2/52, $SxEp - Thimbleberry - Hazelnut represents a common seral plant community that occurs on mesic to subhygric, medium to rich sites about 40 to 50 years following a stand-destroying disturbance (usually fire).

Also, in most subzones, disclimax ecosystems such as avalanche tracks and slide alder thickets have been described.

### 2.5 Ecoregion Classification

Also used in British Columbia is the Ecoregion Classification, developed by the Ministry on Environment, Lands and Parks. This classification system provides a systematic view on the broad geographic relationships of the province and is based on macroclimatic processes (Marsh 1988) and landforms (Holland 1976). It focuses on the extent on critical habitat and the relationships between habitats. The major practical difference between the Ecoregion Classification and BEC is that, in mountainous terrain, the former stratifies the landscape into geographical units that circumscribe all elevations, whereas the latter delineates altitudinal belts on ecological zones within geographical units.

The Ecoregion Classification divides the PRFR into five levels of units: ecodomains, ecodivisions, ecoprovinces, ecoregions, and ecossections. Ecodomains and ecodivisions are very broad and place British Columbia in a global context. The lower three classes describe areas of similar climate, physiography, zonation, and wildlife potential. In the PRFR, there are 4 ecoprovinces, 16 ecoregions, and 26 ecossections.

Appendix 4 describes the Ecoregion Classification units for the PRFR in more detail.

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3 From Meidinger and Pojar (1991); contributed by D.A. Demarchi.
3 PROCEDURES FOR SITE DESCRIPTION, IDENTIFICATION, AND MAPPING

Site identification involves two major steps. The first is to identify the biogeoclimatic subzone or variant; the second is to determine the site unit. These are accomplished through field assessment of site characteristics and comparison of these characteristics with information presented in this field guide. To make the identification process easier, especially for those new to an area, a variety of tools is included here, such as maps, summaries of vegetation and site characteristics, flowcharts for identifying site units, edatopic grids, and site unit descriptions. As users gain experience in a particular subzone, they will become more familiar with the ecosystems and less reliant on these tools.

The vegetation, soils, environment, and mensuration data collected for ecosystem classification has other uses as well. For example, the site information collected can be applied directly to PHSPs, regeneration surveys, site degradation surveys, and wildlife habitat studies occurring at the same location. With such a wide potential application of the ecological data, it is therefore important that accurate site information be collected.

This chapter is essentially the “how-to” part of the field guide. It describes the procedures for identifying biogeoclimatic units, using the tables and information provided in chapter 4; and the procedures for describing and identifying site units, using the various tools provided in Chapter 5 and in the appendices. Section 3.3 outlines procedures for mapping site units.

3.1 Identifying Biogeoclimatic Units

Chapter 4 of this guide provides information for determining the biogeoclimatic subzone and variant. Included are maps that show the distribution of all subzones within the region, tables and figures that summarize and compare key environmental and floristic features of the subzones, and a description of each subzone.

The first step is to determine which subzones potentially occur in the area. Small-scale maps are available and should be used to identify probable biogeoclimatic units in an unfamiliar area. A published 1:500 000 colour map (consisting of two map sheets) titled Biogeoclimatic and Ecoregion Units of the Prince Rupert Forest Region (Pojar et al. 1988) is available from the PRFR office in Smithers and Forest Service Map Sales in Victoria.

The next step is to go into the field to confirm or identify the correct subzone or variant. While driving or walking, the user should check the elevation and general floristic features (e.g., dominant tree and understory plant species) of the area. Subzone identification should be based as much as possible on the examination of zonal or mesic sites; that is, sites that represent average soil moisture and nutrient conditions for the subzone (see Section 2.2). This information should be compared to the environmental tables in Chapter 4. These tables compare environmental characteristics among zones and among subzones within zones. Floristic
information can be compared to the vegetation tables in Chapter 4. These tables outline the relative abundance of plant species that characterize the various zones and subzones. Chapter 4 also provides a written summary for each zone that describes the location, distribution, climate, soils, and other differentiating features to assist in distinguishing between zones and between subzones and variants. It is important to use at least two available tools to verify the biogeoclimatic unit.

If an area is located in the transition between two subzones, or if doubt remains even after the verification step using the information in Chapter 4, then the site units for both possible subzones should be identified. The descriptions and interpretations for both subzones should be compared, and any interpretations and prescriptions should reflect the transitional nature of the site.

3.2 Describing and Identifying Site Units

3.2.1 Describing site units

Accurate descriptions of the site, soil, and vegetation features of all ecosystems within a given management unit (e.g., a proposed cutblock or treatment area) must be completed in the field. Appendix 5 contains a sample of a plot description form. It outlines the kind of information required for assessing a site. Standard PHSP forms can also be used to record this information. The flowchart in Figure 3.1 outlines the steps involved and the tools that should be used to describe and identify site units.

Before site units are described and identified within a management unit, the first step is to prestratify aerial photographs into ecological strata (areas that are relatively uniform in landform, slope gradient and position, aspect, and forest cover type). This is an essential step if an ecosystem map is to be produced (see Section 3.3). A few minutes spent stratifying an aerial photograph can provide valuable information on site variability and increase the efficiency of the field survey. Potential sampling sites can be identified ahead of time on the photographs, thus ensuring sufficient numbers of samples in each of the strata.

The next step is to walk the area, noting any pronounced changes in topography, vegetation, and soil drainage features. Following this general reconnaissance of the area, changes in strata should be marked on a map of the area.

Within each stratum, a homogeneous, representative site should then be selected and its vegetation, soil, and environmental features described in more detail. Where possible, collect information over a plot of at least 20 x 20 m. Watch for pronounced differences in topography, drainage, or vegetation that may indicate the presence of more than one stratum. Begin site sampling by walking the plot, noting general site features such as landscape position, slope, aspect, and elevation. Dig a soil pit at least 60 cm deep and describe the soil profile. Note the depth, soil texture, coarse
Site Identification Procedure

Identify the biogeoclimatic unit using the 1:500 000 regional map.

Confirm on the ground by examining zonal site features and comparing with the environment, climate, vegetation tables in Chapter 4.

Describe the physiography, soil and vegetation for representative examples of all ecological units in the area.

Recently disturbed sites:
Classify the site using a combination of the
• edatopic grid
• landscape profile
• environmental table
• site unit descriptions
from Chapter 5.

Sites with mature seral or climax stands:
Classify the site using a combination of the
• edatopic grid
• landscape profile
• environment table
• site unit flowchart
• vegetation table
• site unit descriptions
from Chapter 5.

FIGURE 3.1. A flowchart outlining the procedure for identifying site units.

fragment content, colour, and structure of each soil horizon, the parent material, effective rooting depth (from the top of the “F” organic horizon), water table or seepage depth, depth to impermeable layer, and depth and type of humus form. The appendices contain several keys to assist in the description and identification of parent materials, soil texture, soil classification, and humus forms (Appendices 6 through 13). Avoid placing
the pit in disturbed areas such as on skid roads, and in atypical substrates such as decaying logs or wet depressions unless these substrates comprise a significant proportion of the ground surface.

Record the plant species present (trees, shrubs, herbs, mosses, liverworts, and lichens) and estimate the percent cover of the major species. Use the chart in Appendix 15 as an aid in estimating percent cover. Several plant guides are available to help users identify plant species in this region (see Appendix 1, Section 3). A list of the most common plant species found in this region is in Appendix 14. 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. The PRFR has a herbarium to assist in identification of unknown species.

3.2.2 Identifying site units

Once site, soil, and vegetation information have been recorded for a given area, the site unit (i.e., site series or phase) must be identified and named. Several tools are presented in Chapter 5 to assist in the identification of site units. The degree to which the user must rely on these tools depends on several factors, such as the complexity of the unit, its successional stage, and the user’s experience in a particular subzone. The site unit cannot be identified unless the correct biogeoclimatic unit has been selected (see Section 3.1). This guide is based on identifying late seral to climax ecosystems. Section 3.2.3 provides some guidelines for identifying more problematic, recently disturbed seral ecosystems.

In Chapter 5, the distinguishing features of each site series are described briefly, followed by a landscape profile, edatopic grid, flowchart to identify site series, and summaries of vegetation and environment data. It is important to use all of these tools to confirm site identification.

Edatopic grid

The identification of soil moisture regime and soil nutrient regime is often the first step in site identification. The edatopic grid is a two-dimensional representation of soil moisture and soil nutrient regimes (Figure 3.2).

**Relative soil moisture regime** refers to the *relative* amount of soil moisture available for plant growth in a subzone. It is located on the left vertical axis, ranging from driest (very xeric or 0) to wettest (subhydric or 7). Soil moisture regimes represent the soil’s ability to receive and store moisture and can be determined from slope position and gradient, soil depth and texture, coarse fragment content, aspect, and sources of seepage. On xeric sites for example, precipitation may be the only source of moisture. This moisture may be lost rapidly due to any combination of factors: shallow soils, steep slopes, or coarse-textured soils. Appendix 7 provides a key to the identification of relative soil moisture regime.

**Absolute soil moisture regime** shown in a bar on the right hand side of the grid refers to the moisture regime of a site, using a more quantitative water balance approach. It is used in Chapter 5 to group and describe site
FIGURE 3.2. An example of an edatopic grid.

Soil nutrient regime indicates, in a relative way, the soil’s ability to supply the major nutrients required for plant growth. It is found on the horizontal axis and ranges from very poor (A) to very rich (E). Many factors can influence the ability of the soil to store nutrients, including soil depth, texture, and coarse fragment content. Other factors affecting the nutrient status of the soil include seepage water, humus form, and geological source of the parent material. Appendix 8 summarizes the role and relative importance of these factors.

An edatopic grid displays the range of soil moisture and nutrient regimes for all site series within a subzone. Chapter 5 shows edatopic grids for each subzone and variant. Site units are displayed in such a way that there appears to be no overlap among the units. This was done to simplify presentation; where two or three site units are shown to share a grid cell (i.e., each occupies a portion of the cell) it means that each unit potentially occupies the entire cell.

It should be remembered that these grids are a qualitative representation of the moisture and nutrient status of sites within a subzone, inferred from site, soil, and vegetation characteristics. In most cases there are no (or very limited) chemical or moisture data to quantify these relationships.
Vegetation tables are provided in Chapters 4 and 5, comparing floristic features among zones, subzones/variants, and site series within subzones and variants (Figure 3.3). The tables display classes of either abundance values (Chapter 4) or prominence values (Chapter 5) for characteristic plant species, grouped into tree, shrub, herb, and moss/lichen layers. Scientific names are displayed on the left side of the table and common names on the right side.

**Abundance value** indicates the relative abundance of a plant throughout a biogeoclimatic unit (i.e., all site series combined). **Prominence value** (PV) is a combined measure of plant cover and frequency of occurrence \((PV = \text{mean cover} \times \sqrt{\text{frequency}})\) for plants characteristic of a specific site series within a biogeoclimatic unit. Five prominence classes are recognized. Abundance and prominence are represented schematically as follows:

<table>
<thead>
<tr>
<th>Chapter 4</th>
<th>Chapter 5</th>
<th>Schematic representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abundance value</td>
<td>Prominence value</td>
<td>Prominence class</td>
</tr>
<tr>
<td>absent</td>
<td>&lt; 5</td>
<td>0</td>
</tr>
<tr>
<td>rare</td>
<td>5 - 15</td>
<td>1</td>
</tr>
<tr>
<td>uncommon</td>
<td>16 - 50</td>
<td>2</td>
</tr>
<tr>
<td>common</td>
<td>51 - 100</td>
<td>3</td>
</tr>
<tr>
<td>abundant</td>
<td>101 - 200</td>
<td>4</td>
</tr>
<tr>
<td>widespread</td>
<td>&gt; 200</td>
<td>5</td>
</tr>
</tbody>
</table>

**FIGURE 3.3.** An example of a vegetation table.
These vegetation tables are general guides to the dominant and indicator species that best characterize each of the units. Users should keep in mind that the actual abundance of plant species on any given site will depend on several factors, including the successional status of the site, and the type and degree of disturbance that initiated succession. The vegetation tables in Chapter 5 are derived from data collected in the sample plots used to classify and describe site units within a biogeoclimatic unit. The plots were taken mostly in mature and old-growth forests (80 years or older).

Some plants may be unique to a particular unit. This usually occurs at the extremes of the environmental gradient (e.g., in the driest or wettest units). Most sites, however, do not have exclusive plants, and it is usually the relative abundance as well as the presence or absence of a group of plants that distinguishes one site unit from another.

**Flowcharts for identifying site series**

Flowcharts have been devised to help users identify site units for each of the subzones and variants. The flowcharts guide users through a series of statements about site characteristics associated with one or a group of units. In each case, the user successively chooses the statement that best fits the field observations until the site is ultimately “keyed out” to a unique site series. The keys generally contain abbreviated information extracted from the vegetation and environment tables and site unit descriptions. We have emphasized in the flowcharts features that can be identified quickly and easily.

**Environment tables**

Tables summarizing environmental features associated with each site unit are also presented for each subzone. The tables provide the soil moisture regime, soil nutrient regime, mesoslope position (Figure 3.4) and gradient, parent material, soil particle size, soil classification, humus form and depth, and other important site features.

**FIGURE 3.4. Mesoslope position diagram.**
Appendix 9 is a key to landforms and Appendix 10 is a key to rock types. Parent material abbreviations used in the environment tables and landscape profiles are defined in Table 3.1.

**TABLE 3.1. Abbreviations used to describe parent materials (modified from Howes and Kent 1988)**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Symbol</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Colluvial</td>
<td>M</td>
<td>Morainal</td>
</tr>
<tr>
<td>E</td>
<td>Eolian</td>
<td>O</td>
<td>Organic</td>
</tr>
<tr>
<td>F</td>
<td>Fluvial</td>
<td>R</td>
<td>Bedrock</td>
</tr>
<tr>
<td>FG</td>
<td>Glaciofluvial</td>
<td>S</td>
<td>Weathered bedrock (saprolite)</td>
</tr>
<tr>
<td>L</td>
<td>Lacustrine</td>
<td>W</td>
<td>Marine</td>
</tr>
</tbody>
</table>

A lowercase “v” following the parent material symbol denotes a veneer (a layer 10 cm – 1 m thick). A slash indicates that one type of parent material overlies another (e.g., Ov/M denotes an organic veneer overlying a morainal deposit).

The **soil particle size** refers to soil texture and family particle size (Table 3.2). Fragmental soils are symbolized by “f” and consist of at least 80% coarse fragments (stones, cobbles, and gravel) with too little fine earth to fill interstices larger than 1 mm. Skeletal soils are symbolized by “s” and are defined as soils having 35% or more by volume of coarse fragments, with enough fine earth to fill interstices larger than 1 mm (Agriculture Canada Expert Committee on Soil Survey 1987). Appendix 11 contains a key for classifying soil texture and particle size in the field.

**TABLE 3.2. Abbreviations used to describe soil particle size (modified from Agriculture Canada Expert Committee on Soil Survey 1987)**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Soil particle size</th>
<th>Symbol</th>
<th>Soil particle size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Clayey</td>
<td>$</td>
<td>Silty</td>
</tr>
<tr>
<td>FL</td>
<td>Fine loamy</td>
<td>O</td>
<td>Organic</td>
</tr>
<tr>
<td>KL</td>
<td>Coarse loamy</td>
<td>f</td>
<td>Fragmental</td>
</tr>
<tr>
<td>L</td>
<td>Loamy</td>
<td>s</td>
<td>Skeletal</td>
</tr>
<tr>
<td>S</td>
<td>Sandy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Soils are classified according to the Agriculture Canada Expert Committee on Soil Survey (1987) and a soil classification key is provided in Appendix 12. Abbreviations for soils are presented in Table 3.3. Humus form classification is according to Green *et al.* (1993). A key to humus form classification is provided in Appendix 13.

The environment tables may also indicate other important site features, including localized climate conditions such as wind or insolation, and soil features of interpretive importance.
TABLE 3.3. Abbreviations for soil classification used in this field guide

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Soil classification</th>
<th>Symbol</th>
<th>Soil classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>GL</td>
<td>Gray Luvisol</td>
<td>LG</td>
<td>Luvic Gleysol</td>
</tr>
<tr>
<td>HFP</td>
<td>Humo-Ferric Podzol</td>
<td>HG</td>
<td>Humic Gleysol</td>
</tr>
<tr>
<td>HP</td>
<td>Humic Podzol</td>
<td>M</td>
<td>Mesisol</td>
</tr>
<tr>
<td>FHP</td>
<td>Ferro-Humic Podzol</td>
<td>H</td>
<td>Humisol</td>
</tr>
<tr>
<td>DYB</td>
<td>Dystric Brunisol</td>
<td>F</td>
<td>Fibrisol</td>
</tr>
<tr>
<td>EB</td>
<td>Eutric Brunisol</td>
<td>LFO</td>
<td>Lithic Folisol</td>
</tr>
<tr>
<td>SB</td>
<td>Sombric Brunisol</td>
<td>HFO</td>
<td>Humic Folisol</td>
</tr>
<tr>
<td>MB</td>
<td>Melanic Brunisol</td>
<td>FO</td>
<td>Folisol</td>
</tr>
<tr>
<td>G</td>
<td>Gleysol</td>
<td>R</td>
<td>Regosol</td>
</tr>
</tbody>
</table>

Landscape profiles

Slope profile diagrams that schematically depict the typical location and relative productivity of site units in the landscape have been developed for each subzone and variant (Figure 3.5). These diagrams show where different ecosystems are expected to establish. The occurrence of colluvial, morainal, fluvial, organic, and bedrock parent materials is outlined, and the dominant tree species are illustrated with schematic figures (see Appendix 3 for legend). Because one site factor can compensate for another (e.g., soil texture for slope position), a given site unit can potentially occupy a wide range of landscape positions. The size of the tree symbol on the landscape profile indicates the relative productivity of that species on the site.

FIGURE 3.5. An example of a landscape profile diagram.
The tools described above will assist in a preliminary identification of the site series or perhaps lead the user to a choice between two similar units. Final confirmation of the site unit must be done by comparing the site, soil, and vegetation information collected with site unit summary descriptions provided in the guide for each subzone and variant. The user should be looking for the unit having the best fit of plant indicator species and soil features. This does not mean that all the plant species or soil characteristics noted in the site series description page will necessarily match those described in the field. If a reasonable fit cannot be made at this stage, Regional Forest Sciences staff should be consulted.

### 3.2.3 Identifying seral ecosystems

The information presented in the tables, keys, and site unit descriptions pertains primarily to mature and climax stands (forest stands older than 80 years). Field foresters are increasingly working with non-climax (or seral) forests as more of the landscape comes under management. On these sites, site identification can be more problematic.

Seral plant communities (particularly the shrub-herb stages developing soon after disturbance) do not always reflect the moisture and nutrient status of the site as clearly as mature or climax communities do. Following disturbance, for example, species such as thimbleberry often increase, while other species such as devil’s club often decrease with exposure to light. During early establishment, the vegetation often reflects changes in light availability or surface disturbance, and not the actual soil nutrient and moisture regime of the site. For site identification, it is therefore necessary to rely more heavily on physical site indicators such as slope position and soil features rather than on plant indicators.

Describing all the seral units for each site series is prohibitively complex for most practical forestry situations and has only been undertaken for very common seral associations (see Section 2.4). Generalized seral vegetation complexes that are common throughout the PRFR are shown in Chapter 7, Section 7.2.4.

### 3.3 Mapping Site Units

An ecosystem map is a useful tool for effective integrated planning within a management unit. A map provides a permanent record of the location and distribution of ecosystems and thus acts as a spatial framework for developing site-specific management prescriptions for all potential resource values. A map also provides a means for the long-term monitoring of prescriptions and the subsequent refining of interpretations. For these and other administrative reasons, PHSPs are legally required to include an ecosystem map of proposed cutblocks.

The extra effort required to map a small management unit when carrying out an ecological stand survey is minimal. If the survey is initiated with mapping in mind, then a more systematic, efficient, and thorough survey will result. Figure 3.6 provides a brief outline of the mapping process. Appendix 16 provides a more detailed description.
Define survey objectives
Determine the purpose of the survey, the required survey intensity level, scale, and data needs beyond site classification.

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Produce preliminary legend
List the site series, phases and seral associations expected for each subzone within the map area. This may be developed during field work for PHSPs.

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Pre-stratify aerial photos
Consider landform, slope, topographic position, aspect, drainage pattern, and canopy characteristics. Polygons should not be smaller than 1 cm².

▼

Conduct systematic field survey
Refer to site series identification flowchart (Figure 3.1) for the required information. In addition to recording plot information, take notes and record changes as you walk to and from the site. Ensure two plots per type.

▼

Refine photo typing and labelling of map polygons
Base refinement—lumping or splitting—on field surveys and overall survey objectives. Finalize line work, polygon labels, and the legend.

▼

Produce the final map
The format will depend on proposed use, available production resources, and current Forest Service standards.

FIGURE 3.6. Flowchart outlining the ecosystem mapping process.
Western hemlock
_Tsuga heterophylla_

Mountain hemlock
_Tsuga mertensiana_

Amabilis fir
_Abies amabilis_

Subalpine fir
_Abies lasiocarpa_

Douglas-fir
_Pseudotsuga menziesii_