A Field Guide for Identification and Interpretation of Ecosystems of the Rocky Mountain Trench, Prince George Forest Region

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A Field Guide for Identification and Interpretation of Ecosystems of the Rocky Mountain Trench, Prince George Forest Region

by

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1 INTRODUCTION

This field guide describes the ecological units of the Rocky Mountain Trench, Prince George Forest Region. It presents aids to the identification of these units and management interpretations for each.

Users of this guide must have been trained to identify vegetation and soil and site factors. Courses in identification are provided by the Prince George Regional Ecology Section (for details, contact the Regional Ecologist).

Units are described in the biogeoclimatic classification system. The classifications derived by the six forest regions are now being combined and correlated to ensure that no unit is described more than once, and that similar units are grouped. This has made it necessary to rename the biogeoclimatic units (subzones and variants) and the site units (formerly called "ecosystem associations", now "site series").

The ICH3J described by the Prince George Region, for instance, has been recognized as being very similar to the ICH4G, ICHG2, and ICHG3 described just east of the Coast Mountains in the Prince Rupert Region. As a result, the ICH3J has been renamed the ICHM2, the ICH4G has been renamed the ICHM2, and the ICHG2 and ICHG3 -- recognized as being very similar -- have both been renamed the ICHM3. Other name changes in this guide are summarized in Table 1. Eleven ICH subzones have been reduced to 7; 14 SSS subzones have been reduced to 9.

The site units have been correlated as well. The number of units has been reduced, and similar units in different variants have been given the same name. For instance, the units previously recognized as the IDHb/05, IDHJ/05, and IDK/07 are all now called "Ow -- Devil's Club -- Horsefall" units. The IDHb/03 and IDHb/04 have been lumped into one unit, as have the IDH/01 and IDH/05.

Until correlations of the ESSF and the wetland units have been completed, these should be referred to by their old names. When correlation is complete, the appropriate pages in this guide will be replaced with the new descriptions of the correlated units.

The guide is divided into eight sections: Section 2 describes the use of the guide; Section 3 describes the biogeoclimatic units (variants) included in the guide, and differentiates them; and Sections 4-9 describe the site units within each variant, and their management interpretations.

Previous publications on biogeoclimatic units of this area include MacKinnon and McLeod (1986), Utzig et al. (1986), McLeod et al. (1987a, 1987b), and Meindinger et al. (1987). Questions regarding the biogeoclimatic classification system in general, or the units described in this guide in particular, should be directed to: Regional Ecologist, Forest Sciences Section, B.C. Ministry of Forests and Lands, 1011 - 4th Avenue, Prince George, B.C. V2L 3H9, Telephone 565-6100.
### TABLE 1. New names for biogeoclimatic and site units in the Rocky Mountain Trench, Prince George Forest Region.

<table>
<thead>
<tr>
<th>Old Subzones and Ecosystem Associations</th>
<th>New Variants and Site Series</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All SSSF units</strong></td>
<td><strong>(no change yet)</strong></td>
</tr>
<tr>
<td><strong>ICH</strong></td>
<td></td>
</tr>
<tr>
<td>01 Thimbleberry - Lady Fern</td>
<td>01: CV - Devil's Club</td>
</tr>
<tr>
<td>02 Falsebox - Prince's Pine</td>
<td>02: HW - Falsebox</td>
</tr>
<tr>
<td>03 Red Twinberry - False Sarsaparilla</td>
<td>03: CV - Utah Honeysuckle - Oak Fern</td>
</tr>
<tr>
<td>04 Black Huckleberry - Sphy Wood Fern</td>
<td>03: CV - Utah Honeysuckle - Oak Fern</td>
</tr>
<tr>
<td>05 Red-osier Dogwood - Horsetail</td>
<td>04: CV - Devil's Club - Horsetail</td>
</tr>
<tr>
<td>06 Skunk Cabbage - Leafy Moss</td>
<td>05: CV - Skunk Cabbage</td>
</tr>
<tr>
<td><strong>ICH</strong></td>
<td></td>
</tr>
<tr>
<td>01 False Azalea - Queen’s Cup</td>
<td>01: HW - Step Moss, Oak Fern</td>
</tr>
<tr>
<td>02 Douglas-fir - Falsebox</td>
<td>02: HW - Bunchberry</td>
</tr>
<tr>
<td>03 Hemlock - Moss</td>
<td>03: HW - Step Moss, Douglas-fir</td>
</tr>
<tr>
<td>04 Oak Fern - Step Moss</td>
<td>04: CW - Oak Fern</td>
</tr>
<tr>
<td>05 Devil’s Club - Oak Fern</td>
<td>05: CW - Devil’s Club</td>
</tr>
<tr>
<td>06 Devil’s Club - Horsetail</td>
<td>06: CW - Devil’s Club - Horsetail</td>
</tr>
<tr>
<td>07 Black Spruce - Sphagnum</td>
<td>07: SB - Sphagnum</td>
</tr>
<tr>
<td>08 Skunk Cabbage - Sphagnum</td>
<td>08: Skunk Cabbage - Sphagnum</td>
</tr>
<tr>
<td><strong>ICH</strong></td>
<td></td>
</tr>
<tr>
<td>05(a) Oak Fern - Step Moss, Coarse-Tex</td>
<td>01(a): CV - Oak Fern, Coarse-Textured</td>
</tr>
<tr>
<td>05(b) Oak Fern - Step Moss, Fine-Tex</td>
<td>01(b): CW - Oak Fern, Fine-Textured</td>
</tr>
<tr>
<td>02 Hemlock - Lichen</td>
<td>02: HW - False Azalea - Lichen</td>
</tr>
<tr>
<td>03 Cedar - Moss</td>
<td>03: HW - Bunchberry</td>
</tr>
<tr>
<td>04 Hemlock - Step Moss</td>
<td>04: HW - Step Moss</td>
</tr>
<tr>
<td>05 Scramble - Step Moss</td>
<td>05: CW - Oak Fern</td>
</tr>
<tr>
<td>06 Devil’s Club - Oak Fern, Coarse-Tex</td>
<td>06: CV - Devil’s Club, Coarse-Textured</td>
</tr>
<tr>
<td>06(b) Devil’s Club - Oak Fern, Fine-Tex</td>
<td>06(b): CW - Devil’s Club, Fine-Textured</td>
</tr>
<tr>
<td>07(a) Black Twinberry - Horsetail, Fluval</td>
<td>07(a): CW - Devil’s Club - Horsetail, Fluval</td>
</tr>
<tr>
<td>07(b) black Twinberry - Horsetail, Lac</td>
<td>07(b): CW - Devil’s Club - Horsetail, Lacust.</td>
</tr>
<tr>
<td>08.1 Hemlock - Horsetail - Step Moss</td>
<td>07: CW - Horsetail - Sphagnum</td>
</tr>
<tr>
<td>08.2 Hemlock - Horsetail - Sphagnum</td>
<td>08: Skunk Cabbage - Sphagnum</td>
</tr>
<tr>
<td>09 Mountain Alder - Skunk Cabbage</td>
<td>09: Mountain Alder - Skunk Cabbage</td>
</tr>
<tr>
<td>10 Pine - Sphagnum</td>
<td>10: Pl - Sphagnum</td>
</tr>
</tbody>
</table>

| **SSSH**                               | **SBSS**                     |
| 01.1 Spirea - Moss - Thimbleberry      | 01: Fd - Sx - Rough-leaved Bluegrass |
| 01.2 Spirea - Moss - Velvet-leaved Blue | 02: Fd - Sx - Rough-leaved Bluegrass |
| 02 Pine - Lichen                       | 02: Pl - Velvet-leaved Blue - Lichen |
| 03 Douglas-fir - Lichen                | 03: Fd - Lichen               |
| 04 Pine - Scopeloloid                   | 04: Pl - Pinegrass - Feathermoss |
| 05.1 Pl - Lab. Tea - Short-Awed Ricegrass | 05: Pl - Labrador Tea         |
| 05.2 Pl - Labrador Tea - Horsetail     | 05: Pl - Labrador Tea         |
| 06 Thimbleberry - Wild Sarsaparilla    | 06: Pl - Sx - Thimbleberry    |
| 07 Spruce - Horsetail                  | 07: SK - Horsetail            |
| 08 Black Spruce - Moss                 | 08: SB - Moss                |
| 09 Black Spruce - Sphagnum             | 09: SB - Sphagnum            |

*aSSSF and wetland units have not yet been correlated.
bThese ecosystem associations have been combined into one site series in this variant.
2 USE OF THE GUIDE

2.1 Identifying Biogeoclimatic Units

Biogeoclimatic units are most easily identified from maps. Figure 1 provides an overview of the distribution of these units within the area covered by this guide. Biogeoclimatic unit maps at a scale of 1:250000 are available from the Ministry of Forests and Lands (MOFL) District Office in McRae, or from Ecology, Forest Sciences Section, MOFL, Prince George.

If an area lies near a mapped biogeoclimatic unit boundary and it is not clear which biogeoclimatic unit it belongs to, the user should compare the site units found in the area to those described for both biogeoclimatic units, and select the appropriate unit accordingly.

2.2 Identifying Site Units

Site units can be identified by a combination of soil, site and vegetation factors, which together are used to derive ecological moisture and nutrient regimes for the site. Having selected the appropriate biogeoclimatic unit (Section 2.1), the user should inspect the area under consideration to determine if there are obvious moisture or nutrient differences which have led to the development of several vegetation units on the site. If several site units appear to be present, the user should stratify the area before identifying these units. At each different site unit, the user then records site features (2.2.1) and vegetation features (2.2.2), and uses these to determine moisture and nutrient regimes (2.2.3).

2.2.1 Soils and topographic features

The most important topographic characteristics to note are:

- slope position (Appendix 1), slope gradient, and aspect. The most important soil characteristics to note are:

  - soil texture (procedures for determining soil texture are given in Appendix 2); coarse fragment %; humus form and depth (procedures for determining humus form are given in Appendix 3); depth to water table; and rooting depth.

2.2.2 Vegetation features

The plant species on the site and their relative abundance should be noted. Vegetation as described in this guide is for climax or near-climax ecosystems; caution must be exercised in using vegetation to classify disturbed sites. Plant guides such as "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1983) or "Some Common Plants of the Skeena Region" (Coupe et al. 1982) are helpful, and may be available from Ecology, Forest Sciences Section, MOFL, Prince George.
FIGURE 1. Biogeoclimatic units of the Rocky Mountain Trench area, Prince George Forest Region.
2.2.3 Moisture and nutrient regimes

The information from soils, topography and vegetation is used to estimate the relative amounts of moisture and nutrients available for plant growth. The guide user must keep two important factors in mind:

1. Moisture and nutrient regimes are relative within a bioclimatic unit. For instance, a site that is average in moisture regime in the IDAHO3 will be wetter than a site that is average in moisture regime in the IDASH.

2. All factors must be taken into account when soil moisture and nutrient regime are determined. One factor may compensate for another; for instance, a coarse-textured soil, which might be expected to be dry, might be wetter if it occurred at the base of a slope.

Moisture and nutrient regimes can be estimated using the keys in Appendices 4 and 5.

2.2.4 Identification of units

After gathering soils, topographic, and vegetation information, the user should now proceed to:

1. the edaphic grid (e.g., Figure 2) where the moisture and nutrient regime can be used to locate the site unit on the grid; or

2. the key to site units, where dichotomous keys use the soils, topographic, and vegetation features to identify a site unit.

The edaphic grid and the key to site units will direct the user to a particular site unit, or units. Soils, topographic, and vegetation features on the site can then be compared with those summarized for the particular site unit(s) to ensure the proper site unit is identified. Soil and site features considered characteristic of a certain site unit, or particularly useful in distinguishing it from other site units, are marked with an asterisk (*).

2.3 Management Interpretations

Once the site unit has been identified, the management interpretations for that unit are available on the page adjacent to the site unit description. Interpretations are offered as guidelines to the preparation of management prescriptions; they detail the opportunities and constraints that a resource manager must consider when dealing with a particular ecosystem.
3 BIOGEOCLIMATIC UNITS

The southeastern corner of the Prince George Forest Region is the most climatically diverse part of the region. It lies primarily in the Rocky Mountain Trench, bordered by the Cariboo Mountains to the west and the Rocky Mountains to the east. Four biogeoclimatic zones are represented in this region: the Interior Cedar - Hemlock (ICH) and Sub-Boreal Spruce (SBS) zones on the valley floor and lower mountain slopes; and the Engelmann Spruce - Subalpine Fir (ESSF), and Alpine Tundra (AT) zones at higher elevations.

Six biogeoclimatic units have been described within the study area, three in the ICH (ICHw1k, ICHmcl, ICHw1k3), one in the SBS (SBSd1h), and two in the ESSF (ESSFb, ESSFo).

No units have been described in the Alpine Tundra zone and therefore this zone is not included in this guide.

3.1 Interior Cedar - Hemlock (ICH) Zone

The ICH zone within the study area can be found on the lower to mid-mountain slopes, or occasionally in the valley bottom at its northern extent. Below the ICH, in areas receiving cold air drainage, lies the SBS zone; above it, at subalpine elevations, lies the ESSF.

Within the ICH there is considerable climatic variation, especially in precipitation. The range in annual precipitation is from 712 mm in the ICHmcl to 1510 mm in the ICHw1k1.

The ICH forests differ from the SBS and ESSF forests in having climax forests dominated by western redcedar or western hemlock, rather than spruce, subalpine fir, or Douglas-Fir.

Figure 1 shows the distribution of the biogeoclimatic units within the ICH, and Table 2 shows distinguishing vegetation features of the units.

3.1.1 ICHw1k1 (previously ICHb)

The ICHw1k1 occurs on slopes above McNaughton Lake, near the southern end of canoe Reach. On the western side of the lake it occurs as far north as Baker Creek and on the eastern side as far north as Windfall Creek. Elevation ranges from 710 to 1370 m. The climate is considerably moister than the other ICH biogeoclimatic units in the study area (see Table 3). This is primarily because of the high snowfall received by this area. Seasonal (May - Sept.) precipitation is comparable to other ICH subzones.

The vegetation is composed mainly of mature western redcedar and western hemlock forests. Subalpine fir and hybrid white spruce are common in many ecosystems, tending to dominate sites influenced by cold air. Douglas-Fir and western white pine are important seral tree species, primarily on drier sites. Cottonwood is commonly found on fluvial floodplains.
TABLE 2. Differentiating combinations of species for nect site in ICH variants in the Rocky Mountain Trench, Prince George Forest Region.

<table>
<thead>
<tr>
<th>Species</th>
<th>Biogeoclimatic variant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ICHv1</td>
</tr>
<tr>
<td>Trema:</td>
<td></td>
</tr>
<tr>
<td>Tsuga heterophylla</td>
<td>V-4b</td>
</tr>
<tr>
<td>Thuja plicata</td>
<td>IV-2</td>
</tr>
<tr>
<td>Abies lasiocarpa</td>
<td>III-2</td>
</tr>
<tr>
<td>Picea glauca x engelmannii</td>
<td>III-4</td>
</tr>
<tr>
<td>Shrub:</td>
<td></td>
</tr>
<tr>
<td>Loenica utahensis</td>
<td>III-1</td>
</tr>
<tr>
<td>Qotopanax horridus</td>
<td>V-34</td>
</tr>
<tr>
<td>Acer glabrum</td>
<td>III-1</td>
</tr>
<tr>
<td>Monznica ferruginea</td>
<td>II-1</td>
</tr>
<tr>
<td>Spiraea betulifolia</td>
<td></td>
</tr>
<tr>
<td>Herb:</td>
<td></td>
</tr>
<tr>
<td>Circeae alpina</td>
<td>IV-1</td>
</tr>
<tr>
<td>Athyrium filicinum</td>
<td>V-22</td>
</tr>
<tr>
<td>Viola spp.</td>
<td>V-0</td>
</tr>
<tr>
<td>Dryopteris asarina</td>
<td>IV-11</td>
</tr>
<tr>
<td>Gymnocarpium dryopteris</td>
<td>V-16</td>
</tr>
<tr>
<td>Lycopodium annotinum</td>
<td>II-0</td>
</tr>
<tr>
<td>Chimaphila umbellata</td>
<td>III-1</td>
</tr>
<tr>
<td>Goodyera repens</td>
<td></td>
</tr>
<tr>
<td>Pyrola chlorantha</td>
<td>II-0</td>
</tr>
<tr>
<td>Melantherum canadense</td>
<td>I-0</td>
</tr>
<tr>
<td>Moss:</td>
<td></td>
</tr>
<tr>
<td>Mnium spp.</td>
<td>III-8</td>
</tr>
<tr>
<td>Brachythecium spp.</td>
<td>II-7</td>
</tr>
<tr>
<td>Hyphiderpia robusta</td>
<td>II-2</td>
</tr>
<tr>
<td>Hylcomium splendens</td>
<td>V-0</td>
</tr>
<tr>
<td>Pteridium aquilinum</td>
<td>II-1</td>
</tr>
<tr>
<td>Epilium crista-castrensis</td>
<td>I-1</td>
</tr>
<tr>
<td>Phylidophorus triquetus</td>
<td>V-17</td>
</tr>
</tbody>
</table>

*a* Only those species occurring in maturing seral to climax ecosystems are used.

*b* These numbers indicate the constancy (the % of sample plots in which the species occurs) and mean % cover for each species. Constancy: I:present in 1-20% of sample plots; II:present in 21-40% of sample plots; III:present in 41-60% of sample plots; IV:present in 61-80% of sample plots; V:present in 81-100% of sample plots. Mean % cover: given as a %. "IV-15", for example, indicates a species present in 61-80% of sample plots, with a mean cover of 15%. Missing symbols indicate that a species was not present or was very rare.
<table>
<thead>
<tr>
<th>BGC unit</th>
<th>Seasonal precipitation (mm) Mean Range</th>
<th>Annual precipitation (mm) Mean Range</th>
<th>Seasonal mean temperature May-Sept (°C) Mean Range</th>
<th>Annual mean temperature (°C) Mean Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBSCh</td>
<td>229 177-278 568 423-743</td>
<td>12.4 10.6-13.1 +3.1 +1.7+-4.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lCHvl</td>
<td>159 309-680 1510 1229-1730</td>
<td>12.6 11.0-13.6 +3.1 +2.1+-4.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lCHmcI</td>
<td>283 233-326 712 570-867</td>
<td>12.1 11.9-12.3 +4.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lCHwk3</td>
<td>402 205-482 1006 720-1185</td>
<td>10.8 10.1-11.5 +3.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lBSFb</td>
<td>510 414-587 2071 1677-2402</td>
<td>8.3 7.1-9.9 +0.3 -0.1+-1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lBSFo</td>
<td>308 217-369 816 553-998</td>
<td>8.4 6.6-10.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AT</td>
<td>417 340-490 1031 813-1250</td>
<td>5.4 4.2-6.6 -1.5 -1.3+-1.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

aData from remote stations are normalized to a base station by Air Studies Branch, B.C. Ministry of Environment.

bData from Environment Canada (1980) and B.C. Ministry of Environment.
3.1.2 ICHkcl (previously ICHj)

The ICHkcl extends from near the southern end of Canoe Reach on McNaughton Lake to just north of McBride, at an elevation range from 710 to 1370 m. It is the driest and warmest of the ICH biogeoclimatic units in the study area (Table 3).

Climax forests in the ICHkcl are dominated by western redcedar and western hemlock, and include lesser amounts of spruce and subalpine fir. Western white pine is found in a few isolated pockets, reaching its northern limit in this unit.

Seral stands composed mostly of Douglas-fir, lodgepole pine, and trembling aspen are more common in this variant of the ICH than in any other for two possible reasons: the drier climate leads to drier forest fuel during summer lightning season; and a number of fires were lit during railroad construction approximately 60 years ago.

3.1.3 ICHkV3 (previously ICHK)

The ICHkV3 is found in the Rocky Mountain Trench from just north of McBride to near Done Creek. Elevation ranges from 690 to 1370 m. The climate of the ICHkV3 is moister than the ICHkcl but drier than the ICHV1 (Table 3).

Climax forests in the ICHkV3 are dominated by western redcedar and western hemlock, and include minor amounts of spruce and subalpine fir. Douglas-fir is a long-lived seral species that is occasionally present on moister or drier sites in this variant. Seral stands are composed primarily of trembling aspen; paper birch and Douglas-fir are uncommon. Lodgepole pine is generally restricted to the driest sites (where it occurs with western hemlock) and the wettest sites (where it occurs with black spruce).

3.2 Sub-Boreal Spruce (SBS) Zone

The SBS zone in the study area is found in the valley bottoms which receive cold air drainage. It generally occurs below the ICH zone, except on the east side of the Rocky Mountain Trench between Horse Creek and Dave Henry Creek, where it extends right up to the ESSF. Forests in the SBS are dominated by spruce, Douglas-fir, subalpine fir, or lodgepole pine. Figure 1 shows the distribution of the biogeoclimatic units within the SBS.
3.2.1 SBSg undifferentiated (previously SBSg)

The SBSg is found in valley bottoms between McBride and Dome Creek below the ICHK, or in higher elevations in some of the river valleys above the ICHK and below the BSSFG. Elevation ranges from approximately 700 to 1350 m. The SBSg is wetter than the SBSdh.

Climax forests are dominated by spruce and subalpine fir. Cedar and hemlock can be found regenerating under these stands, especially where the subzone borders the ICH.

The SBSg was not included in the correlation procedure because of a lack of sampling. For the purposes of this guide it will be treated as SBS undifferentiated and not dealt with again in the text. For interpretations for units, the user should follow the SBSvk (SBSf).

3.2.2 SBSdh (previously SBSdh)

The SBSdh is found in the valley bottom of the Rocky Mountain Trench between McBride and Weiski, and the lower elevations of the northeast wall of the trench between Valemount and Dunster. The elevation ranges from a minimum of about 700 m along the Fraser River to approximately 1370 m.

The SBSdh is, in relative terms for the Prince George Region, dry and warm. It is the driest subzone in the Rocky Mountain Trench (Table 3), being especially dry during the summer months. The primary reason for the relatively dry climate is that the subzone lies in the rainshadow of the high mountains to the west (the Peace Range).

Because of the extensive fire history of the subzone, the dominant trees are lodgepole pine and Douglas-fir. Although they are primarily seral species in this subzone, they do form the climax canopy on drier sites. Because of the fire history in the area, hybrid white spruce and subalpine fir climax stands are rare, only occurring as pure stands on wetter sites or on cooler northeast aspects. Trembling aspen, paper birch, and cottonwood are seral components of some ecosystems. Black spruce is present on poorly to very poorly drained sites. Western redcedar occurs sporadically throughout the subzone, usually on wetter, cooler sites.
3.3 Engelmann Spruce - Subalpine Fir (ESSF) Zone

The ESSF is the subalpine zone above the TCM or STS. It generally occurs between the elevations of 1370 and 2200 m. Climatic data are minimal (Table 3), but in general the zone is characterized by higher precipitation, cooler temperatures, and a shorter growing season than the zones below it. Climax forests are dominated by subalpine fir and Engelmann spruce. At the upper elevations of this zone, where the climate becomes more severe, the forests begin to open, and eventually form clumped, stunted stands. This area is referred to as the parkland.

The distributions of the two subzones described are shown in Figure 1.

3.3.1 ESSFd

The ESSFd occurs in the southern end of the area covered by this guide. It occurs as far north as Baker Creek on the eastern side of the valley and Windfall Creek on the western side. The elevation ranges from approximately 1200 to 2200 m.

The ESSFd is the wetter of the two subzones (see Table 3), with both higher rainfall and snowfall. The two subzones have a similar temperature regime.

High levels of precipitation have limited the occurrence of wildfires so that extensive older climax stands are frequent. The general absence of seral tree species and the dominance of Engelmann spruce and subalpine fir distinguishes this subzone from the lower elevation TCMvl. The presence of hemlock and absence of lodgepole pine distinguishes it from the ESSFo.

3.3.2 ESSFo

The ESSFo occurs in the northern half of the area covered by this guide. It borders the ESSFd in the south, and stretches as far north as the Gore River on the western side of the valley, and Forgetmenot Creek on the eastern side.

The ESSFo is drier than the ESSFd (it is one of the driest ESSF subzones in the Prince George Region), but has a similar temperature regime (see Table 3). Climax forests are dominated by Engelmann spruce and subalpine fir. Wildfires are more common in this subzone than in the ESSFd, and thus seral species such as lodgepole pine and limber pine are present, especially on drier sites.
FIGURE 2. Geographic location of the ICHVki variant in the Prince George Forest Region.
FIGURE 3. Site grid for the ICMvkl variant.
KEY TO SITE UNITS OF THE JCHMK1

1a Organic or mineral soils; water table present at or near surface; herb layer dominated by *Lyncthetum americanum* (skunk cabbage)

1b Mineral soils; water table absent, or occasionally present at depth; *Lyncthetum americanum* low cover (<1%) or absent

2a Lower slope to toe or depression; water table may be present at depth; *Cornus sericea* (p. 8) and *Equisetum* spp. (p. 24) abundant (>5% each)

2b Lower to upper slope; water table rarely present; *Cornus sericea* and *Equisetum* spp. low cover (<1% each) or absent

3a Usually mid-slope on morainal materials; shrub layer with *Rubus parviflorus* (p. 12), herb layer with *Athyrium filix-femina* (p. 23), moss layer with *Molinia* spp. (pp. 60–61)

3b Upper slope, or mid- to lower slope on coarse-textured materials; *Rubus parviflorus*, *Athyrium filix-femina* and *Molinia* spp. low cover (usually <1%) or absent

4a Upper to lower slope, soils usually not shallow to bedrock; Douglas-fir and/or hybrid white spruce commonly present in the canopy; *Ptelea tomentosa* (p. 19), *Dryopteris interstincta* (p. 27), and *Gymnocarpium dryopteris* (p. 26) present

4b Upper slope to crest, soils often shallow to bedrock; Douglas-fir and hybrid white spruce commonly absent from the canopy; *Ptelea tomentosa*, *Dryopteris interstincta* and *Gymnocarpium dryopteris* absent

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).
Vegetation:

Tree Layer: 40% cover
- Western red cedar
- Western hemlock
- Hybrid white spruce

Shrub Layer: 45% cover
- Opoponax horridus
- Vaccinium ovalifolium (oval-leaved blueberry)
- Rubus parviflorus (thimbleberry)
- Western hemlock
- Western red cedar

Herb Layer: 65% cover
- Gymnocarpium dryopteris (oak fern)
- Tiarella uniflora (one-leaved foamflower)
- Athyrium filix-femina (lady fern)
- Galium triflorum (sweet-scented bedstraw)
- Streptopus roseus (rosy twistedstalk)
- Streptopus amplexifolius (clasping twistedstalk)
- Dryopteris assimilis (spiny wood fern)
- Clintonia uniflora (queen's cup)
- Circaea alpina (enchanter's nightshade)
- Cornus canadensis (bunchberry)
- Viola canadensis (Canada violet)

Moss Layer: 20% cover
- Polytrichum spp.
- Leafy mosses

Soil and Site:

- Moisture Regime: meseic - subhygic
- Nutrient Regime: very poor - poor
- Slope Gradient (%): 24 (9-55)
- Parent Material: fluvial, colluvial, and morainal
- Soil Texture: medium - coarse
- Coarse Fragments (%): 40 (0-60)
- Seepage Water: very rarely present

Distribution: very common
CW - DEVIL'S CLUB (TCHV1/01)

INTERPRETATIONS

Management objectives:
- manage for Pd or Sx peeler logs on a 75-year rotation.
- salvage before rehabilitation.

Concerns:
- snow-breach

Logging:
- clearcut

Site preparation:

Objectives:
- reduce organic layers; reduce heavy slash;
- prepare planting spots; minimize future brush competition; improve planter access

Mechanical:
- mounding may be useful on medium-textured soils;
- V-plows on coarse-textured soils when the soils are dry; PMC with 6-way blade on finer-textured soils or steeper slopes

Prescribed fire:
- broadcast burn (remove L and F horizons)

Species choice:

Preferred
- Pd, Sx

Acceptable
- Cw, Pw, Pl

Brush hazard:
- high (thimbleberry, red raspberry, fireweed, lady fern)

Silviculture applications:
- expect and maintain natural regeneration of Cw, Pw and Pl to augment planted stock.
- wide screening (30 cm X 30 cm) will be beneficial for seedling survival and growth
- expect Cw, Pw and Pl to be pole size at 40 years; look at a possible commercial thinning at this time.
- a brushing and weeding program will probably be required.
- use large planting stock.

Silviculture problems:
- high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting; the use of herbicides to control brush may also be required.
- Pw blister rust may kill stems within 40 years but by this time Pw will likely be pole size and perhaps of an economical size to justify a commercial thinning.
- the extremely high snowpack in the subzone may damage young Pd.
Vegetation

Tree Layer: 55% cover
- Western hemlock, western redcedar

Shrub Layer: 30% cover
- Vaccinium membranaceum
- Vaccinium ovalifolium
- Paeonia americana
- Lonicera utahensis
- Taxus brevifolia
- Lonicera weddelliana
- Western hemlock
- Western redcedar

Herb Layer: 10% cover
- Clintonia uniflora
- Orthilia secunda
- Goodyera oblongifolia
- Cornus canadensis
- Chamaephyllum umbrinum
- Tiarella uniflora
- Linnaea borealis
- Viola arboleslata
- Pyrola asarifolia

Moss Layer: 5% cover
- Pleurozium schreberi
- Hylocomium splendens
- Rhytidiopsis robusta

Soil and Site

Moisture Regime: xeric - subxeric
Nutrient Regime: very poor - medium
Slope Gradient (%): 30 (0-72)
Parent Material: variable
Soil Texture:
* Coarse Fragments (%): 42 (0-70)
* Soil Drainage: well - rapidly

Distribution: common
INTERPRETATIONS

Management objectives:  - manage for Pd sawlog on an 85-year rotation.
                          - salvage before rehabilitation.

Concerns:   - snow-break

Logging:    - clearcut

Site preparation:  - maintain organic layers; reduce debris; prepare
                   site for natural regeneration; control mistletoe;
                   remove undesirable advance regeneration (He, U1)

Mechanical       - scarification with Leno or drag on
                   slopes >30%

Prescribed fire  - do not burn

Species choice:

Preferred
  - Pd

Acceptable
  - Lw

Brush hazard:  - moderate (black huckleberry, fireweed)

Silviculture applications:  - if natural regeneration unsuccessful, plant Pd.
                               - complete planting by mid-June.
                               - may need a juvenile spacing program approximately
                                 10 years after natural regeneration is
                                 established.

Silviculture problems:  - moderate brush competition will likely occur
                         within 3 years of harvesting; sites should
                         therefore be inspected at 3 years to determine if
                         any further treatments are required.
                         - the very high snowpack in this subzone may damage
                           young Pd.
CW - UTAH HONEYSLAKE - OAK FERN

VEGETATION

Tree Layer: 45% cover
Western hemlock, western redcedar, hybrid white spruce, Douglas-fir

Shrub Layer: 25% cover
Vaccinium ovalifolium
Vaccinium membranaceum
Lonicera utahensis
Oplopanax horridus
Taxus brevifolia
Paxistima myrtifolium
western hemlock
western redcedar

Herb Layer: 45% cover
Corpus canadensis
Dryopteris assimilis
Gymnocarpium dryopteris
Cimicifuga uniflora
Tlepolema unifoliata
Rubus pedatus
Goodenia oblongifolia
Aralia nudicaulis
Streptopus rosus

Moss Layer: 45% cover
Rhytidium robustum
Pleurozium schreberi

SOIL AND SITE

Moisture Regime: submesic - mesic
Nutrient Regime: very poor - very rich
Slope Gradient (%): 34 (0-70)
Parent Material: variable
Soil Texture: medium - coarse
Coarse Fragments (%): 45 (0-89)
* Soil Drainage: moderately well - well

DISTRIBUTION: common
Management objectives: 
- manage for Pd sawlog on a 75-year rotation.
- salvage before rehabilitation.

Concerns: 
- snow-break

Logging: 
- clearcut

Site preparation:

Objectives 
- reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; improve planter access

Mechanical 
- patch scarifiers or disc trenchers for lighter slash; V-plows or patch scarifiers with V-plow or brush blade for heavier slash; PWC with 6-way blade for steeper slopes or finer-textured soils

Prescribed fire 
- broadcast burn (remove L and F horizons)

Species choice:

Preferred 
- Pd

Acceptable 
- Pw, Pl, Lw

Brush hazard: 
- moderate (black huckleberry, bracken fern, fireweed)

Silviculture applications: 
- expect and maintain natural regeneration of Pw, Pl and Lw.
- Pw, Pl and Lw will likely be pole size 40 years after plantation establishment; can look at a possible commercial thin at this time.
- complete planting by mid-June.
- use large planting stock.
- may need a juvenile spacing program approximately 10 years after planting.

Silviculture problems: 
- moderate competition will likely occur within 2 years of harvesting; sites should be inspected at 2 years to determine if any further treatments are required.
- Pw blister rust may kill stems within 40 years but by this time Pw will likely be pole size and perhaps of an economical size to justify a commercial thin.
- the extremely high snowpack in this subzone may damage young Pd.
CW - DEVIL'S CLUB - HORSETAIL

VEGETATION

Tree Layer: 40% cover
- Hybrid white spruce, western redcedar, black cottonwood

Shrub Layer: 55% cover
- Cornus sericea (red-osier dogwood)
- Vaccinium ovalifolium (oval-leaved blueberry)
- Oplopanax horridus (devil's club)
- Rubus parviflorus (thimbleberry)
- Lonicera involucrata (black twinberry)
- Western redcedar
- Hybrid white spruce
- Western hemlock

Herb Layer: 50% cover
- Galium triflorum (sweet-scented bedstraw)
- Equisetum arvense (common horsetail)
- Gymnocarpium dryopteris (oak fern)
- Tiarella unifoliata (one-leaved foamflower)
- Streptopus roseus (rosy twistedstalk)
- Erythraea alpina (rosy wintergreen)
[Asplenium filix-femina (lady fern)]
[Dryopteris assimilis (spiny wood fern)]

Moss Layer: 35% cover
- Mnium spp. (leafy mosses)
- Rhytidium pulchrum squarrosus (bent-leaf moss)

SOIL AND SITE

Moisture Regime: subhygric - hygric
Nutrient Regime: medium - very rich
Slope Gradient (%): 2 (0-18)
Soil Texture: (medium -) moderately coarse - coarse
Coarse Fragments (%): 15 (0-37)
* Seepage Water: may be present at depth
* Soil Drainage: moderately well - well

DISTRIBUTION: uncommon
CW - DEVIL'S CLUB - HORSETAIL (I01/67/04)

INTERPRETATIONS

Management objectives:
- Manage for 6x ponder log on a 75-year rotation,
- Salvage before rehabilitation,
- Protect the high fisheries and wildlife values.

Concerns:
- Snow break
- High windthrow hazard
- High fish and wildlife values

Logging:
- Clearcut

Site preparation:

Objectives
- Reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; prepare planting spots above water table; improve planter access

Mechanical
- May be limited by trafficability; mounding will be feasible on some sites with medium-textured soils

Prescribed fire
- Broadcast burn (remove L and F horizons) within 1 year of harvesting, or burn and burn

Species choice:

Preferred
- 6x

Acceptable
- CW

Brush hazard:
- Very high (thimbleberry, black twinberry, lady fern)

Silviculture applications:
- Expect and maintain natural regeneration of CW.
- Planting can take place at any time of the growing season.
- Use large planting stock.
- Wide spacing (30 cm X 30 cm) will be beneficial for seedling survival and growth.
- Will likely need a juvenile spacing program approximately 10 years after planting.
- CW will likely be pole size at 40 years, therefore, consider removing CW as part of any commercial thinning project.

Silviculture problems:
- Very high brush competition will require an inspection of harvested sites at time periods 2 and 4 years after planting
- If commercial thinning is undertaken, extreme care must be taken to minimize windthrow.
CW - SKUNK CABBAGE

VEGETATION

Tree Layer: 30% Cover
- Western hemlock, western redcedar, (hybrid white spruce)

Shrub Layer: 20% cover
- Alnus barrowsii
- Vaccinium angustifolium
- Labrador tea
- western hemlock
- western redcedar

Herb Layer: 80% cover
- Athyrium filix-femina (lady fern)
- Lythrum salicaria (bunchberry)
- Gymnocarpium dryopteris (oak fern)
- Tiarella unifoliata (one-leaved foamflower)
- Lycopodium annotinum (stiff club-moss)
- Rubus pedatus (five-leaved bramble)
- Equisetum arvense (wood horsetail)
- Equisetum arvense (common horsetail)
- Clintonia uniflora (queen's cup)
- Galium triflorum (sweet-scented bedstraw)
- Stroptopus rosus (royal twistedstake)
- Stroptopus amplexifolius (clasping twistedstake)
- Stroptopus streptopoides (small twistedstake)

Moss Layer: 80% cover
- Mnium spp. (leafy mosses)
- Sphagnum spp. (sphagnous mosses)
- Pleurozium schreberi (red-stemmed feathermoss)
- Barbilliophotis lycopodioides (common leafy liverwort)

SOIL AND SITE

- Moisture Regime: bygic - subbygic
- Nutrient Regime: poor - very rich
- Slope Gradient (%): 15 (0-25)
- Parent Material: often organic
- Soil Texture: variable
- Coarse Fragments (%): 15 (0-45)
- Soil Drainage: imperfectly - very poorly
- Seepage Water: always present

DISTRIBUTION: uncommon
CW - SKUNK CABBAGE (ICHV1/05)

INTERPRETATIONS

Management objectives:
- manage for SX smalga on a 75-year rotation.
- manage for CW poles.
- this association will likely be an inclusion within a treatment unit, because it generally is small in size.

Concerns:
- snow-break
- high water table

Logging:
- clearcut

Site preparation:
Objectives
- reduce organic layers; reduce debris; elevate seedlings above water table; minimize future brush competition

Mechanical
- will usually be limited by trafficability; mounding may be feasible on some sites with medium-textured soils during very dry summers

Prescribed fire
- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn

Species choice:
Preferred
- SX

Acceptable
- CW, BI

Brush hazard:
- high (lady fern, thimbleberry)

Silviculture applications:
- expect and maintain natural regeneration of CW and BI.
- plant after water table drops below ground level and put SX on drier microsites (i.e., mounds).
- use large planting stock.
- wide spacing (30 cm x 30 cm) will be beneficial for seedling survival and growth.
- may need a juvenile spacing program approximately 10 years after planting.

Silviculture problems:
- this association is critical to the control of runoff and stream flow.
- water table will likely rise above the ground surface in the spring causing seedling mortality.
- herbicide use to control brush competition may conflict with the need to protect fish and wildlife values.
- high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting.
FIGURE 4. Geographic location of the ICHmc1 variant in the Prince George Forest Region.
**Site Series**

- **Hw**: Step Moss, Oak Fern
- **Hw**: Bunchberry
- **Hw**: Step Moss, Douglas-fir
- **Cw**: Oak Fern
- **Cw**: Devil's Club
- **Cw**: Devil's Club-Horsetail
- **SB**: Sphagnum
- **Skunk Cabbage**: Sphagnum

**FIGURE 5.** Edatopic grid for the XG1c1 variant
KEY TO SITE UNITS OF THE ICNcl

1a Black spruce in canopy; organic soil; water table close to surface

1b Black spruce low cover or absent; mineral soil; water table variable

2a Canopy dominated by Douglas-fir; mid- to upper slopes; slope greater than 50%; south to west aspect; Pseudotsuga menziesii (p. 16) moderate to high cover (>10%)

2b Canopy dominated by western redcedar, western hemlock or a mixed canopy; mid- to lower slope or, if upper slope, canopy dominated by western hemlock; slopes usually less than 40%; aspect variable; Pseudotsuga menziesii low cover (< 1%) or absent

3a Tree canopy (western hemlock, western redcedar, hybrid white spruce) poorly developed and low cover (<30%); water table close to surface; Lysichiton americanum (skunk cabbage) moderate to high cover (>10%)

3b Tree canopy well developed and moderate to high cover (>50%); water table not close to surface; Lysichiton americanum low cover (<1%) or absent

4a Lower to toe slope; Oplepanax horridus (p. 10) moderate to high cover (>15%)

5a Canopy primarily western redcedar; humus thickness greater than 30 cm; permanent seepage; Equisetum spp. (p. 24) moderate to high cover (usually >10%)

5b Canopy a mixture of western redcedar and western hemlock; humus thickness less than 30 cm; temporary seepage; Equisetum spp. low cover (usually < 1%) or absent

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-boreal Spruce Zone" (Zojar et al. 1982).
4b Mid- to lower slope: Oplopanax horridus low cover (<5%) or absent

6a Mid- to lower slope; Gymnocarpium dryopteris moderate to high cover (>15%)  
ICHmol/04

6b Usually mid- to upper slope, or level; Gymnocarpium dryopteris low cover (usually <5%) or absent

7a Canopy of Hw. Ow. Sx and Bl, often with a minor component of Fo or Pi; herb layer moderately poorly developed (<15% cover), with Clintonia uniflora (p. 22) and Gymnocarpium dryopteris (p. 26) sometimes present  
ICHmol/01

7b Canopy of Hw, sometimes with a minor component of Ow; herb layer extremely poorly developed (<10% cover), with Clintonia uniflora and Gymnocarpium dryopteris absent  
ICHmol/03
HW - STEP MOSS, OAK FERN

VEGETATION

Tree Layer: 75% cover
Hybrid white spruce, subalpine fir, western hemlock, western redcedar

Shrub Layer: 25% cover
Vaccinium membranaceum  (black huckleberry)
Menziesia ferruginea  (false azalea)
Rubus parviflorus  (thimbleberry)
Ribes lacustre  (black goosberry)
Sorbus acupolina  (western mountain-ash)

Herb Layer: 20% cover
Coronopus canadensis  (bunchberry)
Cyanocarpum dyropterin  (oak fern)
Clinoporia uniflora  (queen's cup)
Smilacina racemosa  (false Solomon's-seal)
Omphalodes maculata  (one-sided wintergreen)
Linnaea borealis  (twincflower)
Goodenia obtusifolia  (rattlesnake-platant)
Sirettonus amplosifolius  (clumping twistedstalk)

Moss Layer: 75% cover
Pleurozium schreberi  (red-stemmed feathermoss)
Ptilium crista-castrensis  (knight's plume)
Hylocomium splendens  (electrified cat's-tail)

SOIL AND SITE

Moisture Regime: submesic - mesic
Nutrient Regime: poor - medium
Slope Gradient (%): 19 (0-42)
* Slope Position: usually mid
Parent Material: (glacio)fluvial, morainal
* Soil Texture: medium - coarse
Coarse Fragments (%): 29 (0-87)
Site Index: PI 31 (30-32)
Pd 32 (30-35)
Sx 30 (28-35)

COMMENTS
Coarse-textured soils receive some seepage during the growing season.

DISTRIBUTION: common
Management objectives:  
- manage for Fd or Sx peeler logs on an 80-year rotation.
- salvage before rehabilitation.

Concerns:  
- possible cankers

Logging:  
- clearcut

Site preparation:

Objectives  
- reduce organic layers; reduce debris; prepare planting spots; improve planter access; remove undesirable advance regeneration

Mechanical  
- patch scarifiers or disc trenchers for lighter slash; V-plows, brush blades or Eden rake for heavier slash; PVC with 6-way blade for steeper slopes or finer-textured soils

Prescribed fire  
- broadcast burn (remove L horizon) or windrow and burn

Species choice:

Preferred  
- Fd, Sx

Acceptable  
- Pl, FW

Brush hazard:  
- low/moderate (chimbleberry, fireweed)

Silviculture applications:  
- accept and maintain Pl and FW component.
- accept Cw at up to 300 stems per hectare.
- wide screening (30 cm X 30 cm) will be beneficial for seedling survival and growth.
- complete planting by mid-June.
- Pl, FW and Cw will likely be pole size at 40 years, therefore consider removing merchantable stems as part of any commercial thinning project.
- a juvenile spacing project may be required at 10-20 years after planting, but retain as much of a Cw component as possible.
- plant submerses sites within 3 weeks of snow melt and in most microsites.
- assess presence of dwarf mistletoe in Pl types and apply necessary sanitation practices.

Silviculture problems:  
- the humus forms on these sites are thin and removal of more than the litter layer will probably seriously affect site productivity.
**HW - BUNCHBERRY**

**VEGETATION**

- **Tree Layer:** 70% cover of Douglas-fir, western redcedar, Lodgepole pine, hybrid white spruce.
- **Shrub Layer:** 50% cover of *Paxistima myrsinites*, *Moenkhausia ferruginea*, *Shepherdia canadensis*, western redcedar, subalpine fir.
- **Herb Layer:** 6% cover of *Chimaphila umbellata* (Prince's pine).
- **Moss Layer:** 50% cover of *Pleurozium schreberi* (red-stemmed feathermoss).

**SOIL AND SITE**

- **Moisture Regime:** Xeric
- **Nutrient Regime:** Very poor - Poor
- **Aspect:** W to SSW
- **Slope Gradient (%):** 64 (50-70)
- **Slope Position:** Upper to mid
- **Parent Material:** Usually colluvial
- **Soil Texture:** Coarse
- **Coarse Fragments (%):** 70 (50-80)
- **Site Index:** PI 28
- **PI 30**

**COMMENTS**

There is often a fairly high cover of cobbles and stones on the surface although most of them are covered with bryophytes or lichens. Limited data because of the rarity of the ecosystem.

**DISTRIBUTION:** Uncommon
NW - BUNCHBERRY (ICHwcl/02)

INTERPRETATIONS

Management objectives:
- non-commercial at this time.
- leave sites until future technological improvements occur.
- sites will probably be inclusions within a treatment unit.

Concerns:
- possible cankers

Logging:
- clearcut

Site preparation:

Objectives
- maintain organic layers; reduce debris; prepare site for natural regeneration; control mistletoe; remove undesirable advance regeneration (Hw, Bl)

Mechanical
- scarification with Leno or drag on slopes 30%

Prescribed fire
- do not burn

Species choice:
Preferred
- P1
Acceptable
- Fd

Brush hazard:
- low (false azalea)

Silviculture applications:
- promote a Fd and P1 mixture on the sites.
- possible to direct seed P1 over the site but should check rodent populations first.
- practice sanitation procedures on P1 when necessary.

Silviculture problems:
- pine beetle and dwarf mistletoe can be problems on P1 along with canker infestations on Fd.
- monitor rodent populations and consider their impact when deciding on stocking levels.
HW-STEP MOSS, DOUGLAS-FIR

VEGETATION

Tree Layer: 85% cover
Western hemlock, western redcedar, (subalpine fir, Douglas-fir)

Shrub Layer: 30% cover
Menziesia ferruginea (false azalea)
Vaccinium membranaceum (black huckleberry)
western hemlock
western redcedar

Herb Layer: 10% cover
Cornus canadensis (bunchberry)
Orthilia secunda (one-sided wintergreen)
Chimaphila umbellata (prince's pine)
Rubus pedatus (five-leaved bramble)
Linnaea borealis (twinflower)

Moss Layer: 100% cover
Pleurozium schreberi (red-stemmed feathermoss)
Hylocomium splendens (step moss)
Ptilium crista-castrensis (knight's plume)

SOIL AND SITE

Moisture Regime: subnecic - subxeric
Nutrient Regime: poor
Slope Gradient (%): 35 (0-75)
Slope Position: variable, commonly mid - crest
Parent Material: variable
Soil Texture: coarse - moderately coarse
Coarse Fragments (%): 0-74 (usually greater than 20)
Site Index:
P1 28
Rd 28
Sx 24

DISTRIBUTION: fairly common
Management objectives:  - manage for Fd or Sx peeler logs on an 80-year rotation.
   - salvage before rehabilitation.

Concerns:  - possible cankers

Logging:  - clearcut

Site preparation:

Objectives  - reduce organic layers; reduce debris; prepare planting spots; improve planter access; remove undesirable advance regeneration

Mechanical  - patch scarifiers or disc trenchers for lighter slash; V-plows, brush blades or Eden rake for heavier slash; PMC with 6-way blade for steeper slopes or finer-textured soils

Prescribed fire  - broadcast burn (remove L horizon) or windrow and burn

Species choice:

Preferred  - Fd, Sx
Acceptable  - P1, Pw

Brush hazard:  - low/moderate (thimbleberry, fireweed)

Silviculture applications:  - accept and maintain P1 and Pw component.
   - accept Cw at up to 300 stems per hectare.
   - wide seeding (30 cm x 30 cm) will be beneficial for seedling survival and growth.
   - complete planting by mid-June.
   - P1, Pw and Cw will likely be pole size at 40 years, therefore consider removing merchantable stems as part of any commercial thinning project.
   - a juvenile spacing project may be required at 15-20 years after planting, but retain as much of a Cw component as possible.
   - plant submesic sites within 3 weeks of snow melt and in most microsites.
   - assess presence of dwarf mistletoe in P1 types and apply necessary sanitation practices.

Silviculture problems:  - the humus forms on these sites are thin and removal of more than the litter layer will probably seriously affect site productivity.
CW - OAK FERN

VEGETATION

Tree Layer: 75% cover
- Western hemlock, western redcedar, (hybrid white spruce, subalpine fir)

Shrub Layer: 25% cover
- Menziesia ferruginea (false azalea)
- Vaccinium membranaceum (black huckleberry)
- Dolopanax horridus (devil's club)
- Western hemlock
- Western redcedar

Herb Layer: 55% cover
- Gymnocarpium dryopteris (oak fern)
- Cornus canadensis (bunchberry)
- Tiarella unifoliate (one-leaved foamflower)
- Orthilia secunda (one-sided wintergreen)
- Clintonia uniflora (queen's cup)
- Streptopus roseus (rosy twistedstalk)
- Menziesia uniflora (single delight)

Moss Layer: 60% cover
- Hylocomium splendens (step moss)
- Pleurozium schreberi (red-stemmed feathermoss)
- Pellium eriact-Castrensis (knight's plume)

SOIL AND SIZE

Moisture Regime: subhydric
Nutrient Regime: poor - very rich
* Slope Gradient (%): 19 (8-39)
* Slope Position: mid- to lower
Parent Material: variable
Soil Texture: variable (moderately fine, medium and moderately coarse)
Coarse Fragments (%): 29 (0-91)
* Seepage Water: may be present
Site Index:
  Cw 26 (23-29)
  Sx 30 (24-40)

COMMENTS:
Seepage water may be present as these sites receive some seepage early in the growing season and possibly after heavy precipitation.

DISTRIBUTION: common
Management objectives: - manage for Pl sawlogs on a 70-year rotation and Sx sawlogs on an 80-year rotation, - salvage before rehabilitation.

Concerns: - fine-textured moraines may be subject to compaction and may create windthrow problems

Logging: - clearcut

Site preparation:

Objectives - reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; improve planter access

Mechanical - patch scarifiers or disc trenchers for lighter slash; V-plows, or patch scarifiers with V-plow or brush blade for heavier slash; PMC with 6-way blade for steeper slopes or fine-textured soils

Prescribed fire - broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn

Species choice:

Preferred - Fd, Sx
Acceptable - Pl, Pw

Brush hazard: - low/moderate (thimbleberry, false azalea, fireweed)

Silviculture applications: - accept and maintain Pl and Pw component.
- accept Cw at up to 300 stems per hectare.
- wide screening (30 cm x 30 cm) will be beneficial for seedling survival and growth.
- if considering a commercial thinning, plant an additional 200 stems per hectare.
- plant Sx on fine-textured sites and Fd on coarser sites.

Silviculture problems: - moderate brush competition will likely occur within 3 years of harvesting, so sites should be inspected at 3 years to determine if any further treatment is required.
- windthrow potential and compaction problems may be of concern on fine-textured moraines.
CW - DEVIL'S CLUB

VEGETATION

Tree Layer: 70% cover
- Western redcedar, western hemlock, (hybrid white spruce, subalpine fir)

Shrub Layer: 60% cover
- Oplopanax horridus (devil's club)
- Ribes lacustre (black gooseberry)
- Menziesia ferruginea (false azalea)
- Rubus parviflorus (chimbleberry)
- Western redcedar
- Western hemlock

Herb Layer: 45% cover
- Gymnocarpium dryopteris (oak fern)
- Tiarella unifoliata (one-leaved foamflower)
- Streptopus amplexifolius (clasping twistedstalk)
- Cornus canadensis (bunchberry)
- Spilacina racemosa (false Solomon's-seal)
- Orthilia secunda (one-sided wintergreen)
- Dryopteris assimilis (spiny wood fern)
- Streptopus rosus (rosy twistedstalk)

Moss Layer: 40% cover
- Mniurum spp. (leafy mosses)
- Hylocomium splendens (strap moss)
- Pleurozium schreberi (red-stemmed feathermoss)
- Ptilium crista-castrense (knight's plume)
- Rhytidolepbus triquetrus (electrified cat's-tail moss)

SOIL AND SITE

Moisture Regime: subhygic - hygric
Nutrient Regime: poor - very rich
* Slope Gradient (%): 26 (4-75)
* Slope Position: commonly lower - toe
Soil Texture: dominantly medium and coarse textured
Coarse Fragments (%): 36 (6-80)
Seepage Water: may be present
Site Index: Cw 26 (25-27); Sk 31 (29-34)

COMMENTS
Coarse-textured soils compensated by seepage. All sites receive some seepage during the growing season.

DISTRIBUTION: very common
CW - DEVIL'S CLUB (ICMC1/05)

INTERPRETATIONS

Management objectives:  
- manage for Sx sawlogs on an 80-year rotation and Sx pulp logs on a 100-year rotation.  
- salvage before rehabilitation.

Concerns:  
- high windthrow hazard  
- soil compaction

Logging:  
- clearcut

Site preparation:  

Objectives  
- reduce organic layers; reduce heavy slash;  
- prepare planting spots; minimize future brush competition; improve planter access

Mechanical  
- mounding may be useful on medium-textured soils;  
- V-plows on coarse-textured soils when the soils are dry;  
- FMC with 6-way blade on finer-textured soils or steeper slopes

Prescribed fire  
- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn

Species choice:  

Preferred  
- Sx

Acceptable  
- Cw, B1

Brush hazard:  
- high (thimbleberry, red raspberry, fireweed)

Silviculture applications:  
- accept and maintain Cw and B1 component.  
- wide screening (30 cm X 30 cm) will be beneficial for seedling survival and growth.  
- if considering a commercial thin, plant an additional 200 stems per hectare.  
- planting can take place anytime throughout growing season.  
- use large planting stock.

Silviculture problems:  
- high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting.  
- do not commercial thin if windthrow is considered to be a high hazard on the site.
CW - DEVIL'S CLUB - HORSETAIL

VEGETATION

Tree Layer: 70% cover
- Western redcedar, (hybrid white spruce, subalpine fir, western hemlock)

Shrub Layer: 40% cover
- Ophiopogon horridus (devil's club)
- Acer glabrum (Douglas maple)
- Viburnum edule (highbush cranberry)
- Ribes lacustre (black gooseberry)
- western redcedar
- subalpine fir

Herb Layer: 75% cover
- Equisetum arvense (common horsetail)
- Equisetum pratense (meadow horsetail)
- Gymnocarpium dryopteris (oak fern)
- Cornus canadensis (bunchberry)
- Mitrella nudu (common mitrewort)
- Equisetum arvense (dwarf scouring rush)

Moss Layer: 50% cover
- Mnium spp. (leafy mosses)
- Hyptididiopogon triquetrus (electric cat's tail moss)
- Hylocomium splendens (step moss)
- Brachythecium spp.

SOIL AND SITE

Moisture Regime: hygic
Nutrient Regime: rich - very rich
* Slope Gradient (%): 15 (0-30)
* Slope Position: lower - toe
* Parent Material: lacustrine, or organic over fluvial
* Soil Texture: variable
* Coarse Fragments (%): usually 0
* Seepage Water: present
* Site Index:
  - BI 34
  - CW 28
  - SX 33

COMMENTS:
- Limited data because of the rarity of the ecosystem.

DISTRIBUTION: uncommon
CW-DEVIL'S CLUB - HORSETAIL (ICh#1/06)

INTERPRETATIONS

Management objectives:
- non-commercial at this time.
- very rare occurrence.

Concerns:
- high water table

Logging:
- avoid logging
SB - SPHAGNUM

VEGETATION

Tree Layer: 25% cover
Black spruce, (lodgepole pine)

Shrub Layer: 20% cover
Ledum groenlandicum (Labrador tea)
Kalmia microphylla spp. occidentalis (bog-laurel)
western hemlock
(lodgepole pine, black spruce)

Herb Layer: 75% cover
Carex spp. (sedges)
Cornus canadensis (bunchberry)
Equisetum sylvaticum (wood horsetail)

Moss Layer: 90% cover
Sphagnum spp. (sphagnum)

SOIL AND SITE

Moisture Regime: subhygric
Nutrient Regime: very poor - poor
Slope Gradient (%): 0
*Slope Position: depression
Parent Material: organic
*Water Table (cm): 0-30
Coarse Fragments (%): 0

COMMENTS
Bog ecosystems are very rare in this subzone.
Nutrient-poorer bogs have a lower cover of sedges.
Limited data because of the rarity of the ecosystem.

DISTRIBUTION: rare
SB - Sphagnum (ICHmcl/07)

INTERPRETATIONS

Management objective:  - non-commercial at this time.
Concerns:  - high water table
  - cold, unproductive sites
Logging:  - avoid logging
SKUNK CABBAGE - SPHAGNUM

**Vegetation**

Tree Layer: 25% cover
- Western hemlock, western redcedar, (hybrid white spruce, subalpine fir)

Shrub Layer: 60% cover
- Vaccinium ovalifolium (oval-leaved blueberry)
- Kenziesia ferruginea (false azalea)
- western hemlock
- western redcedar

Herb Layer: 50% cover
- Lysichiton americanum (skunk cabbage)
- Carex spp. (sedges)
- Rubus pedatus (five-leaved bramble)
- Cornus canadensis (bunchberry)
- Gymnocarpium dryopteris (oak fern)
- Dryopteris asarifolia (uply wood fern)
- Equisetum sylvaticum (wood horsetail)

Moss Layer: 95% cover
- Sphagnum spp. (sphagnum)
- Pleurozium schreberi (red-stemmed feathermoss)
- Mnium spp. (leafy mosses)

**Soil and Site**

Moisture Regime: subhygric
Nutrient Regime: poor - medium
* Slope Gradient (%): 1 (0-5)
* slope Position: depression
Parent Material: usually organic
Coarse Fragments (%): usually 0
Seepage Water (cm): 0-30

**Comments**
Limited data because of rarity of ecosystem. Seepage water moves very slowly through these sites.

**Distribution:** rare
SKUNK CABBAGE - SPHAGNUM (ICHmcl/08)

INTERPRETATIONS

Management objectives:
- non-commercial at this time.
- very rare occurrence.

Concerns:
- high water table

Logging:
- avoid logging
FIGURE 6. Geographic location of the ICIBk3 variant in the Prince George Forest Region.
FIGURE 7. Edaphic grid for the ICMwK3 variant.
KEY TO SITE UNITS OF THE ICHwk3

1a Black spruce in canopy; organic soils; water table close to surface; 
Sphagnum spp. (p. 53)* dominant; bog

ICHwk3/09

1b Black spruce absent from canopy; mineral soils; water table variable; 
Sphagnum spp. low cover (<2%) or absent

ICHwk3/02

2a Lodgepole pine in canopy; with western hemlock; dry rock outcrop; 
moderate to high cover (>30%) of lichens

ICHwk3/08

2b Lodgepole pine absent; not on a dry rock outcrop; lichens low cover (<10%)

ICHwk3/06

3a Narrow drainage channel; very uneven, open canopy; moderate to high cover of Lysichiton americanus (skunk cabbage); water table close to surface

ICHwk3/00

3b Not a narrow drainage channel; well-developed canopy; Lysichiton americanus low cover (<1%) or absent; water table variable

4a Mid- to lower slope or level; Oplopanax horridus (p. 16) present, usually moderate to high cover (>10%)

ICHwk3/07

5a Water table close to surface (within 50 cm); level; 
lacustrine parent material; tree canopy often stunted and with poor form; Sphagnum spp. (p. 63) moderate to high cover (>10%)

ICHwk3/04

5b Water table at depths greater than 50 cm; parent materials 
variable; Sphagnum spp. low cover (<1%) or absent

6a Hybrid white spruce and subalpine fir greater than 50% 
of tree canopy; water table usually within 50 cm of surface; Equisetum spp. (p. 24) moderate to high cover (>10%)

ICHwk3/06

6b Western redcedar and western hemlock dominate canopy; 
water table variable; Equisetum spp. low cover (<1%) 
or absent

7a Lower slope to level; seepage water often present; 
Oplopanax horridus high cover (>20%)

ICHwk3/05

7b Slope position variable; seepage water rarely 
present; Oplopanax horridus low to moderate cover (<20%)

ICHwk3/01

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).
4b Often upper slope to crest: *Glopanax horridus* absent

8a Generally not occurring on steep (>50%) slopes and soils not shallow (<1 m deep); *Gymnocarpium dryopteris* (p. 26) moderate to high cover (>10%)

8b Occurring on steep slopes or shallow soils; *Gymnocarpium dryopteris* usually low cover (<10%) or absent

9a Occurring on steep slopes (>50%); aspect usually SE to SW; *Gymnocarpium dryopteris* absent

9b Occurring on gentle slopes (<10%); aspect variable; *Gymnocarpium dryopteris* present
CW - OAK FERN, COURSE-TEXTURED

VEGETATION

Tree Layer: 70% cover
Western redcedar, western hemlock (subalpine fir, hybrid white spruce)

Shrub Layer: 30% cover
- **Gaultheria procumbens** (devil's club)
- **Vaccinium membranaceum** (black huckleberry)
- **Vaccinium ovalifolium** (oval-leaved blueberry)
- **Salix lasiandra** (black gooseberry)
- **Menziesia ferruginea** (false azalea)
western redcedar
western hemlock
subalpine fir

Herb Layer: 70% cover
- **Gymnocarpium dryopteris** (oak fern)
- **Cornus canadensis** (bunchberry)
- **Tiarella unifoliata** (one-leaved foamflower)
- **Tiarella trifoliata** (three-leaved foamflower)
- **Rubus pedatus** (five-leaved bramble)
- **Clintonia uniflora** (queen's cup)
- **Goodyera oblongifolia** (rattlesnake-plantain)

Moss Layer: 70% cover
- **Hylocomium splendens** (step moss)
- **Rhytiidium triquetrus** (elecrtified cat's-tail moss)
- **Pleurozium schreberi** (red-stemmed feathermoss)
- **Ptilium crista-castrensis** (knight's plume)

SOIL AND SITE

- **Moisture Regime:** submesic - subhygric
- **Nutrient Regime:** poor - medium
- **Slope Gradient (%):** 21 (5-67)
- **Slope Position:** usually mid
- **Parent Material:** morainal or fluvial
- **Soil Texture:** medium - moderately coarse
- **Coarse Fragments (%):** 25 (0-54)
- **Seepage Water:** rarely present
- **Site Index:** CW 23 (21-25)
  6x 23 (22-24)

DISTRIBUTION: very common
CW - OAK PENV, COARSE-TEXTURED (IChWc3/01(a))

INTERPRETATIONS

Management objectives:
- manage for Fd or Sx sawlogs on a 65-year rotation or peeler logs on an 85-year rotation.

Concerns:
- windthrow in Sx
- possible moisture deficit over dry summers on submesic sites

Logging:
- clearcut

Site preparation:

Objectives
- reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; improve planter access

Mechanical
- patch scarifiers or disc trenchers for lighter slash; V-plows, or patch scarifiers with V-plow or brush blade for heavier slash; PMC with 6-way blade for steeper slopes or finer-textured soils

Prescribed fire
- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn

Species choice:

Preferred
- Sx

Acceptable
- Fd

Brush hazard:
- low to moderate (thimbleberry, red raspberry, fireweed)

Silviculture applications:
- maintain CW at up to 300 stems per hectare
- do not remove humus layers; burn lightly or mix with mineral soil.
- wide macrofencing (30 cm x 30 cm) will be beneficial for seedling survival and growth.
- possibly fertilize after commercial thinning; if considering a commercial thin, plant an additional 200 stems per hectare.

Silviculture problems:
- moderate brush competition will likely occur within 3 years of harvesting, so sites should be inspected at 3 years to determine if any further treatment is required.
CW - OAK FERN, FINE-TEXTURED

**VEGETATION**

**Tree Layer:** 70% cover
- Western redcedar, western hemlock (subalpine fir, hybrid white spruce)

**Shrub Layer:** 30% cover
- **Opsopanax horridus** (devil's club)
- Vaccinium membranaceum (black huckleberry)
- Vaccinium ovalifolium (oval-leaved blueberry)
- Rubus lacustris (black gooseneberry)
- Menziesia ferruginea (false azalea)
- western redcedar
- western hemlock
- subalpine fir

**Herb Layer:** 70% cover
- **Gymnocarpium dryopteris** (oak fern)
- Cornus canadensis (bunchberry)
- Tiarella unifoliata (one-leaved foamflower)
- Tiarella trifoliata (three-leaved foamflower)
- Rubus pedatus (five-leaved bramble)
- Clintonia uniflora (queen's cup)
- Goodyera oblongifolia (rattlesnake-plantain)

**Moss Layer:** 70% cover
- **Hylomnium splendens** (step moss)
- Hylocomium splendens (electrified cat's-tail moss)
- Pleurozium schreberi (red-stemmed feathermoss)
- Ptilium cristae-castrensis (knight's plume)

**SOIL AND SITE**

- **Moisture Regime:** mesic - subhygrolic
- **Nutrient Regime:** medium - rich
- **Slope Gradient (%):** 7 (0-11)
- **Slope Position:** usually mid
- **Parent Material:** lacustrine
- **Soil Texture:** medium - fine
- **Coarse Fragments (%):** usually 0
- **Seepage Water:** rarely present
- **Site Index:** CW 22 (20-23), SX 28 (26-33)

**DISTRIBUTION:** very common
CW - OAK PERN. FINE-TEXTURED (TC\#k3/01(b))

INTERPRETATIONS

Management objective: - manage for Sx sawlogs on an 80-year rotation.

Concerns: - windthrow in Sx
- frost heaving
- soil compaction

Logging: - clearcut

Site preparation:

Objectives - reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; improve planter access; avoid soil compaction

Mechanical - not recommended

Prescribed fire - broadcast burn (remove L and F horizons)

Species choice:
Preferred - Sx

Brush hazard: - moderate (thimbleberry, red raspberry, firerweed)

Silviculture applications: - maintain CW at up to 300 stems per hectare
- do not remove humus but reduce hazard on site by light burning or by clean logging.
- no mechanical treatments should be allowed.
- wide spacing (30 cm X 30 cm) will be beneficial for seedling survival and growth.
- if considering a commercial thin, plant an additional 200 stems per hectare and juvenile space.
- possibly fertilize after commercial thinning.

Silviculture problems: - moderate brush competition will likely occur within 3 years of harvesting, so sites should be inspected at 3 years to determine if any further treatment is required.
HW - FALSE AZALEA - LICHEN

VEGETATION

Tree Layer: 35% cover
- western hemlock, lodgepole pine

Shrub Layer: 65% cover
- Menziesia ferruginea (false azalea)
- Vaccinium membranaceum (black huckleberry)
- Vaccinium ovalifolium (oval-leaved blueberry)
- western hemlock
- lodgepole pine

Herb Layer: 5% cover
- Empetrum nigrum (crowberry)

Moss Layer: 100% cover
- Pleurozium schreberi (red-stemmed feathermoss)
- Cladina spp.
- Cladonia spp.
- Stereocaulon paschale

SOIL AND SITE

- Moisture Regime: xeric
- Nutrient Regime: very poor - poor
- Slope Gradient (%): 5 (0-30)
- * Slope Position: crest - upper
- * Parent Material: bedrock, and shallow veneer over bedrock
- Soil Texture: medium - coarse
- Coarse Fragments (%): 4 (0-10)
- Site Index: PI 9

COMMENTS
- High cover (35%) of exposed bedrock. Limited data because of the rarity of the ecosystem.

DISTRIBUTION: very rare
Management objective: non-commercial at this time.

Concerns: fragile ecosystems; easily damaged

Logging: avoid logging

Site preparation:
Objectives: maintain organic layers; prepare site for natural regeneration; control mistletoe; remove undesirable advance regeneration (Ha)

Mechanical: drag scarification

Prescribed fire: do not burn

Species choice:
Preferred: P1

Brush hazard: low

Silviculture applications: if this ecosystem is contained within a treatment unit, clearcut to remove Ha seed source.
- planting is probably not justified because of the very low productivity of the sites.
- let sites regenerate naturally.

Silviculture problems: very fragile ecosystem with low productivity.
- will likely take a long time to regenerate if logged, so could have a large impact if located in a visual corridor.
- do not burn.
**HW - BUNCHBERRY**

**VEGETATION**

**Tree Layer:** 50% cover  
Western redcedar, western hemlock, hybrid white spruce, subalpine fir

**Shrub Layer:** 15% cover  
- *Acer glabrum*  (Douglas maple)  
- *Ribes lacustre*  (black gooseberry)  
- *Amelanchier alnifolia*  (saskatoon)  
- *Spiraea betulifolia*  (birch-leaved spirea)  
- Western redcedar  
- Western hemlock

**Herb Layer:** 15% cover  
- *Chimaphila umbellata*  (pine's pine)  
- *Gymnocarpium dryopteris*  (oak fern)  
- *Smilacina racemosa*  (false Solomon's-seal)  
- *Orthilia secunda*  (one-sided wintergreen)  
- *Clintonia uniflora*  (queen's cup)  
- *Disporum hookeri*  (Hooker's fairybells)

**Moss Layer:** 50% cover  
- *Pleurozium schreberi*  (red-stemmed feathermoss)  
- *Hylocomium splendens*  (step moss)  
- *Rhytidolepidothecium triquetrum*  (electrified cat's-tail moss)  
- *Ptilium crista-castrense*  (knight's plume)

**SOIL AND SITE**

- **Moisture Regime:** subseric  
- **Nutrient Regime:** poor - medium  
- *Aspect:* usually SE - SW  
- *Slope Gradient (%):* 72 (55-82)  
- *Slope Position:* upper  
- **Parent Material:** colluvial and steep lacustrine  
- **Soil Texture:** moderately fine - moderately coarse  
- **Coarse Fragments (%):** 28 (0-84; greater than 50 if non-lacustrine)  
- **Site Index:** 5X 23 (21-26)

**COMMENTS**

This ecosystem could occur on other parent materials within the subzone.

**DISTRIBUTION:** uncommon
Management Objectives:
- Manage for Fd sawlogs on a 100-year rotation.
- Salvage before rehabilitation.

Concerns:
- Moisture deficits

Logging:
- Clearcut

Site Preparation:

Objectives
- Maintain organic layers; reduce debris; control mistletoe; remove undesirable advance regeneration (Hw, Bl)

Mechanical
- Slopes generally prohibitive

Prescribed Fire
- Once rehabilitated, site should have light spring burn to remove litter

Species Choice:
- Preferred: Fd
- Acceptable: P1

Brush Hazard:
- Low

Silviculture Applications:
- Maintain 3w at up to 300 stems per hectare
- During site preparation, attempt to retain P and H horizons.
- If possible, attempt to obtain natural Fd regeneration.
- Plant before mid-June.
- Site does not justify any intensive silviculture treatments under present-day criteria.

Silviculture Problems:
- These sites occupy very steep sidehills where access is difficult.
- Moisture deficits are enhanced by the steepness of these sites.
- Control of burning will be very difficult.
HW - STEP MOSS

VEGETATION

Tree Layer: 60% cover
Western hemlock, Douglas-fir

Shrub Layer: 25% cover
Manzeliella ferruginea (false azalea)
Vaccinium ovalifolium (oval-leaved blueberry)
western hemlock
western redcedar
subalpine fir

Herb Layer: 10% cover
Cornus canadensis (bunchberry)
Chimaphila umbellata (Prince's pine)
Osmunda regalis (one-sided wintergreen)
Clintonia uniflora (queen's cup)
Gaylussacia baccata (creeping-snowberry)
Goodyera oblongifolia (rattlesnake-plantain)

Moss Layer: 100% cover
Hylompermopsis splendens (step moss)
Pleurozium schreberi (red-stemmed feathermoss)
Pratia cristae-cristata (knight's plume)
Pedicularis spp.
Climacium mitis
Barbiliophozia spp.

SOIL AND SITES

Moisture Regime: subxeric - xeric
Nutrient Regime: medium - rich
Slope Gradient (%): 7 (3-8)
* Slope Position: crest - upper
Parent Material: lacustrine veneer or blanket over bedrock
* Soil Texture: fine and moderately fine
Coarse Fragments (%): 9 (3-15)
Site Index: Fd 19

COMMENTS
Limited data because of the rarity of the ecosystem.

DISTRIBUTION: rare
**Management objectives:**
- usually found with 01(b) association.
- manage for Fd sawlogs on a 50-year rotation.
- very rare association.

**Concerns:**
- frost heaving
- moisture deficits
- soil compaction

**Logging:**
- clearcut

**Site preparation:**
**Objectives**
- maintain organic layers; reduce debris; control mistletoes; remove undesirable advance regeneration (Rw, B1)

**Mechanical**
- drag scarification where feasible

**Prescribed fire**
- once rehabilitated, site should have light spring burn to remove litter

**Species choice:**
- Preferred: Fd
- Acceptable: B1

**Brush hazard:**
- low (false azalea)

**Silviculture applications:**
- plant before mid-June.

**Silviculture problems:**
- when this ecosystem does occur, it is usually on the upper slope or crest position.
- this association occurs on a thin lacustrine veneer over bedrock and is subject to serious erosion if not harvested carefully.
CW - Devil's Club, Coarse-Textured

Vegetation

Tree Layer: 65% cover  
western redcedar, western hemlock, hybrid white spruce,  
(subalpine fir)

Shrub Layer: 75% cover  
Oplepanax horridus  
Ribes lacustre  
Acer glabrum  
western redcedar  
western hemlock

Herb Layer: 75% cover  
Gymnocarpium dryopteris  
Dryopteris assimilis  
Tiarella unifoliata  
Tiarella trifoliata  
Rubus parviflora  
Cornus canadensis  
Goodenia oblongifolia  
Streptopus roseus  
Salix triiflora  
Circaea alpina  
Athyrium filix-femina

Moss Layer: 75% cover  
Hylocomium splendens  
Hymn app.  
Ptitlin crist-taste-nalis  
Rhytidodiaphus trico-ratus  
Pleurotus echbardi

Soil and Site

Moisture Regime: subhygic  
Nutrient Regime: poor - medium  
Slope Gradient (%): 12 (0-54)  
Slope Position: lower - level  
Parent Material: fluvial, colluvial and morainal  
Soil Texture: medium - coarse  
Coarse Fragments (%): 38 (0-65)  
Site Index: Cw 28  
Sx 28 (26-30)

Distribution: common
CW - DEVIL'S CLUB, COARSE-TEXTURED (ICHDM3/05(a))

INTERPRETATIONS

Management objective:  - manage for Sz sawlogs on a 65- or 70-year rotation.

Concerns:  - windthrow in Sz

Logging:  - clearcut

Site preparation:

Objectives  - reduce organic layers; reduce heavy slash; prepare planting spots; minimize future brush competition; improve planter access

Mechanical  - mounding may be useful on medium-textured soils; V-plows on coarse-textured soils when the soils are dry; PMC with 6-way blade on steeper slopes

Prescribed fire  - broadcast burn (remove L and F horizons) or windrow and burn within 1 year of harvesting, or brown and burn

Species choice:

Preferred  - Sz

Acceptable  - CW

Brush hazard:  - high (devil's club, thimbleberry, fireweed)

Silviculture applications:  - accept and maintain CW component.
  - use large planting stock.
  - wide screening (30 cm x 30 cm) will be beneficial for seedling survival and growth.
  - if considering a commercial thin, plant an additional 200 stems per hectare.

Silviculture problems:  - high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting.
CW - DEVIL'S CLUB, FINE-TEXTURED

VEGETATION

Tree Layer: 65% cover
Western red cedar, western hemlock, hybrid white spruce, (subalpine fir)

Shrub Layer: 75% cover
Oplopanax horridus (devil's club)
Ribes lacustre (black gooseberry)
Acer glabrum (Douglas maple)
western red cedar
western hemlock

Herb Layer: 75% cover
Gymnocarpium dryopteris (oak fern)
Dryopteris asperula (spiny wood fern)
Tiarella unifoliata (one-leaved foamflower)
Tiarella trifoliata (three-leaved foamflower)
Rubus pedatus (five-leaved bramble)
Cornus canadensis (bunchberry)
Goodyera oblongifolia (rattlesnake-plantain)
Streetopus roseus (rosy twistedstalk)
Galium triflorum (sweet-scented bedstraw)
Circaea alpina (enchanter's nightshade)
Asplenium filix-femina (lady fern)

Moss Layer: 75% cover
Hylocomium splendens (step moss)
Mnium spp. (leafy mosses)
Ptilium crista-castrensis (knight's plume)
Rhytidium rugosum (electrified cat's-tail moss)
Pleurozium schreberi (red-stemmed feathermoss)

SOIL AND SITE

Moisture Regime: subhygic
Nutrient Regime: medium - rich
Slope Gradient (%): usually 0
* Slope Position: lower - level
* Parent Material: lacustrine
Soil Texture: medium - fine
Coarse Fragments (%): usually 0

COMMENTS
Limited data for fine-textured phase.

DISTRIBUTION: common
CW - DEVIL'S CLUB, FINE-TEXTURED (ICH\#3/05(b))

INTERPRETATIONS

Management objective:  - manage for 6x sawlogs on a 65- or 70-year rotation.

Concerns:  - high windthrow hazard
           - soil compaction

Logging:  - clearcut

Site preparation:
  Objectives  - reduce organic layers; reduce heavy slash;
                prepare planting spots; minimize future brush
                competition; improve planter access; avoid soil
                compaction
  Mechanical  - mounding may be useful on medium-textured soils;
                PMC with 6-way blade on steeper slopes
  Prescribed fire  - broadcast burn (remove L and F horizons) or
                    windrow and burn within 1 year of harvesting, or
                    brown and burn

Species choice:
  Preferred  - 6x
  Acceptable  - CW

Brush hazard:  - high (devil's club, thimbleberry, fireweed)

Silviculture applications:  - accept and maintain CW component.
                           - use large planting stock.
                           - wide screening (30 cm x 30 cm) will be beneficial
                             for seedling survival and growth.
                           - windthrow hazard negates commercial thinning
                             options.

Silviculture problems:  - high brush competition will likely occur within
                        2 years of harvesting, so large stock types
                        should be planted immediately after harvesting.
CW-DEVIL'S CLUB- HORSETAIL, FLUVIAL

VEGETATION

Tree Layer: 70% cover
- Hybrid white spruce, subalpine fir, paper birch, (black cottonwood, trembling aspen, western redcedar)

Shrub Layer: 60% cover
- *Cephalanthera horridus* (devil's club)
- *Rubus parviflorus* (thimbleberry)
- *Lonicera involucrata* (black twinberry)
- *Viburnum edule* (highbush cranberry)
- *Sambucus racemosa* (red elderberry)
- paper birch
- hybrid white spruce

Herb Layer: 50% cover
- *Athyrium filix-femina* (lady fern)
- *Circaea alpina* (enchanter's nightshade)
- *Equisetum arvense* (common horsetail)
- *Aralia nudicaulis* (wild sarsaparilla)
- *Viola spp.* (violets)
- *Dryopteris assimilis* (spiny wood fern)
- *Osmocarpum drypoteris* (oak fern)

Moss Layer: 50% cover
- *Sphagnum triquetrus* (electrified cat's-tail moss)
- *M Necklace* (leafy mosses)
- *Hylocomium splendens* (step moss)

SOIL AND SITE

- Moisture Regime: hygric
- Nutrient Regime: poor - medium
- Slope Gradient (%): 0
- *Slope Position: lower - level
- *Parent Material: fluvial
- Soil Texture: medium - coarse
- Coarse Fragments (%): 0
- *Seepage Water: may be present; fluctuating water table

- Site Index: BI 27 (24-31)
- SX 31 (30-33)

DISTRIBUTION: uncommon
CW - DEVIL'S CLUB - HORIZONTIL, FLUVIAL (ICIN65/06(a))

INTERPRETATIONS

Management objectives:
- manage for 6x sawlogs on a 65- or 70-year rotation.
- protect the high fisheries and wildlife values.

Concerns:
- cottonwood competition
- water table near surface
- frost pockets
- high fish and wildlife value
- high erosion potential

Logging:
- clearcut

Site preparation:

Objectives
- reduce organic layers; reduce debris; prepare planting spots above a high water table; minimize future brush competition

Mechanical
- trafficability will usually be limiting; mounding may be feasible on medium-textured soils

Prescribed fire
- broadcast burn (remove L and F horizons) within 1 year of harvesting, or burn and burn

Species choice:

Preferred
- 6x

Brush hazard:
- very high (devil's club, black twinberry, thimbleberry, lady fern)

Silviculture applications:
- maintain Ow at up to 300 stems per hectare
- remove cottonwood seed source.
- plant in mid-summer after water table drops.
- use large planting stock.
- juvenile spacing or conifer release of 6x from cottonwood overstory likely required at age 10 years.

Silviculture problems:
- very high brush competition will require a seed tree control program and inspection of harvested sites at time periods 2 and 4 years after planting.
- these inspections may indicate a need for further conifer release projects.
**CW - Devil's Club - Horsetail, Lacustrine**

### Vegetation

<table>
<thead>
<tr>
<th>Layer</th>
<th>Cover Percentage</th>
<th>Species</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree Layer</td>
<td>70%</td>
<td>Hybrid white spruce, subalpine fir, paper birch, (black cottonwood, trembling aspen, western red cedar)</td>
<td></td>
</tr>
<tr>
<td>Shrub Layer</td>
<td>60%</td>
<td><strong>Oplopanax horridus</strong> (devil's club)</td>
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<tr>
<td></td>
<td></td>
<td><strong>Rubus parviflorus</strong> (thimbleberry)</td>
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<td></td>
<td></td>
<td><strong>Lonicera involucrata</strong> (black twinberry)</td>
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<td></td>
<td><strong>Viburnum edule</strong> (highbush cranberry)</td>
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<td></td>
<td></td>
<td><strong>Zambium racemosa</strong> (red elderberry)</td>
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<td></td>
<td></td>
<td>paper birch</td>
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<tr>
<td></td>
<td></td>
<td>hybrid white spruce</td>
<td></td>
</tr>
<tr>
<td>Herb Layer</td>
<td>65%</td>
<td><strong>Athyrium filix-femina</strong> (lady fern)</td>
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<td><strong>Circular alpina</strong></td>
<td>(enchanter's nightshade)</td>
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<td></td>
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<td><strong>Equisetum arvense</strong> (common horsetail)</td>
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<td></td>
<td></td>
<td><strong>Aralia nudicaulis</strong> (wild sarsaparilla)</td>
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<td></td>
<td></td>
<td><strong>Viola spp.</strong></td>
<td>(violets)</td>
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<td></td>
<td></td>
<td><strong>Dryopteris assimilis</strong> (spiny wood fern)</td>
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<td></td>
<td></td>
<td><strong>Gymnocarpium dryopteris</strong> (oak fern)</td>
<td></td>
</tr>
<tr>
<td>Moss Layer</td>
<td>60%</td>
<td><strong>Physciadiophum tricuercus</strong> (elecrtified cat's-tail moss)</td>
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<tr>
<td></td>
<td></td>
<td>Mnium spp.</td>
<td>(leafy mosses)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Hylocomium splendens</strong></td>
<td>(step moss)</td>
</tr>
</tbody>
</table>

### Soil and Site

- **Moisture Regime:** Hygric
- **Nutrient Regime:** Rich - very rich
- **Slope Gradient (%):** 4 (0-7)
- **Slope Position:** Lower - level
- **Parent Material:** Lacustrine
- **Soil Texture:** Moderately fine - fine
- **Coarse fragments (%):** 0
- **Seepage Water:** Usually present
- **Site Index:** BI 24, CM 23, SX 26 (27-30)

### Comments

These ecosystems usually occur near boundaries with the SBSg (undifferentiated) subzone.

### Distribution

Uncommon
CW - DEVIL'S CLUB - HORSETAIL. LACTUCEA (ICHNL3/05(b))

INTERPRETATIONS

Management objectives:
- manage for Sx sapsucks on a 70-year rotation.
- protect the high fisheries and wildlife values.

Concerns:
- slope instability
- cottonwood competition
- water table near surface
- frost pockets
- soil compaction
- high erosion potential
- high fish and wildlife values

Logging:
- clearcut

Site preparation:

Objectives
- reduce organic layers; reduce debris; elevate
  seedlings above water table; minimize future
  brush competition; avoid soil compaction

Mechanical
- usually not possible without unacceptable soil
  compaction

Prescribed fire
- broadcast burn (remove L and P horizons) within
  1 year of harvesting, or brown and burn

Species choice:

Preferred
- Sx

Brush hazard:
- very high (devil's club, black twinberry,
  thimbleberry, lady fern)

Silviculture applications:
- maintain CW at up to 300 stems per hectare.
- remove cottonwood seed source.
- plant in mid-summer after water table drops.
- use large planting stock.
- juvenile spacing or conifer release of Sx from
  cottonwood overstory likely required at age 10
  years.

Silviculture problems:
- very high brush competition will require a seed
  tree control program and inspection of harvested
  sites at time periods 2 and 4 years after
  planting.
- these inspections may indicate a need for further
  conifer release projects.
CW-HORSETAIL-SPHAGNUM

VEGETATION

Tree Layer: 65% cover
Western hemlock, hybrid white spruce, subalpine fir

Shrub Layer: 28% cover
Vaccinium ovalifolium (oval-leaved blueberry)
Vaccinium membranaceum (black huckleberry)
Menziesia ferruginea (false azalea)
western hemlock
subalpine fir

Herb Layer: 60% cover
Equisetum sylvaticum (wood horsetail)
Rubus pedatus (five-leaved bramble)
Osmocarpum dryopteris (oak fern)
Cornus canadensis (bunchberry)
Orthilia secunda (one-sided wintergreen)
Lycomium annotinum (stiff club-moss)
Athyrium filix-femina (lady fern)
Dryopteris arenaria (shaggy wood fern)
Linnnea borealis (twinflower)
Eiretropous roseus (rosy twistedstalk)

Moss Layer: 95% cover
Sphagnum spp.
Hylocomium splendens (step moss)
Ditillium cristis-cristatis (knight's plume)
Pleurozium schreberi (red-stemmed feathermoss)

SOIL AND SITE

Moisture Regime: hygric
Nutrient Regime: poor - medium
* Slope Gradient (%): 1 (0-5)
* Slope Position: level
* Parent Material: lacustrine
Soil Texture: moderately fine - fine
Coarse Fragments (%): 3 (0-16)
* Seepage Water: present
Site Index:

DISTRIBUTION: common
CW - HORNSEAT - SPHAGNUM (ICRM3/07)

INTERPRETATIONS

**Management objective:** - manage for Sx sawlogs on a 100-year rotation.

**Concerns:**
- high water table
- cold soils
- soil compaction
- high windthrow
- poor trafficability

**Logging:**
- clearcut

**Site preparation:**

**Objectives**
- reduce organic layers; reduce debris; elevate seedlings above water table

**Mechanical**
- usually limited by trafficability

**Prescribed fire**
- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn

**Species choice:**

**Preferred**
- Sx

**Acceptable**
- CW

**Brush hazard:**
- low/moderate (false azalea, lady fern)

**Silviculture applications:**
- use large planting stock.
- plant on existing mounds.

**Silviculture problems:**
- cold soils and high water table lower the productivity of these sites.
MOUNTAIN ALDER - SKUNK CABBAGE

VEGETATION

Tree Layer: 30% cover
- Western redcedar, western hemlock, hybrid white spruce, subalpine fir

Shrub Layer: 50% cover
- Alnus incana ssp. tenuifolia (mountain alder)
- Vaccinium ovalifolium (oval-leaved blueberry)
- Lonicera involucrata (black twinberry)
- Menziesia ferruginea (false azalea)
- Ribes lacustre (black gooseberry)
- Viburnum edule (highbush cranberry)
- western redcedar
- western hemlock
- subalpine fir

Herb Layer: 50% cover
- Glyceria elata (tall mannagrass)
- Lysichiton americanum (skunk cabbage)
- Thelypteris phegopteris (beach fern)
- Carex disperma (soft-loved sedge)
- Equisetum arvense (common horsetail)

Moss Layer: 95% cover
- Mnium spp. (leafy mosses)
- Rhizidiadelphus triquetrus (eleuthroid cat's-tail moss)
- Calliergon spp.
- Drepanocladius spp.

SOIL AND SITE

Moisture Regime: subhydric
Nutrient Regime: rich – very rich
* Slope Gradient (%): 0 (0-2)
* Slope Position: depression
Parent Material: fluvial and lacustrine
Soil Texture: variable
Coarse Fragments (%): 0
Seepage Water: present; water table near surface

COMMENTS
Limited data as the ecosystem is rare. Occurs in narrow drainage channels.

DISTRIBUTION: rare
Management objective:  - non-commercial at this time.

Concerns:  
- high water table
- unproductive ecosystems for forestry

Logging:  
- avoid logging
PINE - SPHAGNUM

**VEGETATION**

Tree Layer: 10% cover
- Black spruce, lodgepole pine

Shrub Layer: 30% cover
- *Ledum groenlandicum* (Labrador tea)
- *Betula glandulosa* (scrub birch)
- Lodgepole pine
- Black spruce
- Western hemlock

Herb Layer: 50% cover
- *Carex app.* (sedges)
- *Vaccinium oxycoccos* (bog cranberry)
- *Andromeda polifolia* (bog rosemary)
- *Eriophorum angustifolium* (narrow-leaved cotton-grass)
- *Eriophorum chamissoi* (Chamisso's cotton-grass)
- *Gaultheria hispidula* (creeping-snowberry)
- *Pozara rotundifolia* (round-leaved sundew)

Moss Layer: 95% cover
- *Sphagnum app.* (sphagnum)
- *Polytrichum aciculare* (red-stemmed feathermoss)

**SOIL AND SITE**

- Moisture Regime: *subhydric*
- Nutrient Regime: *very poor - medium*
- Slope Gradient (%): 0
- *Slope Position: level - depression*
- Parent Material: *lacustrine, organic, and organic veneer over lacustrine*
- Soil Texture: *fibric and mucky*
- Coarse Fragments (%): 0
- Water Table: *close to surface*

**COMMENTS**

These bog ecosystems are variable, differing in the depth of organic material and the "richness" of the water moving through the site. Most of the bogs are in shallow depressions over lacustrine material.

**DISTRIBUTION:** uncommon
PINE - SPHAGNUM (ICW3/09)

INTERPRETATIONS

Management objective: non-commercial at this time.

Concerns:
- high windthrow
- soil compaction
- frost heaving
- high water table

Logging:
- clearcut

Site preparation:

Objective
- elevate seedlings above the water table

Mechanical
- frost will not usually penetrate soil, so mechanized site preparation will be unreliable

Prescribed fire

Species choice:

Preferred
- Sx

Acceptable
- P1

Brush hazard:
- very high

Silviculture applications:
- this association will likely be an inclusion within a treatment unit; if so, remove seed sources of Hw and alder and plant Sx on drier microsites (i.e., mounds).
- P1 will regenerate naturally on many of these sites
- water table will likely rise above the ground surface in the spring causing seedling mortality.
- use large planting stock.

Silviculture problems:
- is critical to the control of runoff and streamflow.
Figure 8. Geographic location of the SSSdh subzone in the Prince George Forest Region.
FIGURE 9. Edaphic grid for the S8S9d subzone
KEY TO SITE UNITS OF THE NARRH

1a Black spruce dominant in canopy; organic soils; water table close to surface

2a Betula glandulosa (p. 8)* usually absent; moss layer dominated by
  feathermosses (pp. 61–62)

2b Betula glandulosa usually present; moss layer dominated by sphagnum
  mosses (p. 63)

1b Black spruce not dominant in canopy; mineral soils; water table variable

3a Level, fluvial deposit; close to stream; seepage water often present;
  hybrid white spruce or spruce-cottonwood canopy; high shrub and herb
  cover; Potentilla spp. (p. 26)* moderate to high cover (>10%)

3b Not as above

4a Canopy dominated by a single species

5a Main canopy all lodgepole pine or with minor (<5%) Douglas-fir

6a Level; high cover (usually >10%) of Ledum groenlandicum
  (p. 9)

6b Slope position variable; Ledum groenlandicum low cover
  (<2%) or absent

7a Shepherdia canadensis (p. 13) high cover (>15%); moss layer dominated by feathermosses

7b Shepherdia canadensis (p. 13) low cover (<2%) or
  absent, moss layer dominated by lichens

5b Main canopy dominated by Douglas-fir or hybrid white spruce

*Note: Page numbers refer to the publication "Some Common Plants of the
Sub-Boreal Spruce Zone" (Pajar et al. 1982)
8a Main canopy dominated by Douglas-fir

9a Steep slope (>50%); mid- to upper slope; southeast to southwest aspect; moderate cover (usually >10%) of lichens

9b Slope usually less than 50%; mid-slope, or lower to level and coarse-textured; lichens low cover (<2%) or absent

8b Main canopy all hybrid white spruce (or may contain trembling aspen)

10a Lower slope to level; moderate to high shrub cover (>30%) dominated by Rubus parviflorus (p. 12), Cornus sericea (p. 8), Viburnum edule (p. 15), and Lonicera involucrata (p. 9)

10b Often mid-slope; low to moderate shrub cover (<30%) dominated by Spiraea latifolia (p. 13) and Rosa acicularis (p. 11)

9b Main canopy mixed (lodgepole pine, Douglas-fir, hybrid white spruce, subalpine fir)

11a Steep slope (>50%), mid- to upper slope; southeast to southwest aspect; moderate cover (>10%) of lichens

11b Slope usually less than 50%; various slope positions; various aspects; lichens low cover (usually <5%) or absent

12a Level, or mid- to upper slope; moderate to high cover (usually >5%) of Shepherdia canadensis

12b Level, or mid- to lower slope; Shepherdia canadensis low cover (<5%) or absent

13a Lower slope to level; moderate to high shrub cover (>30%) dominated by Rubus parviflorus, Cornus sericea, Viburnum edule, and Lonicera involucrata

13b Often mid-slope; low to moderate shrub cover (<30%) dominated by Spiraea latifolia and Rosa acicularis
FD-SX-ROUGH-LEAVED RICEGRASS

VEGETATION

Tree Layer: 65% cover
- Douglas-fir, lodgepole pine, (hybrid white spruce)

Shrub Layer: 20% cover
- Spiraea betulifolia (birch-leaved spirea)
- Rosa acicularis (prickly rose)
- Rubus parviflorus (thimbleberry)
- Viburnum edule (highbush-cranberry)
- Amelanchier alnifolia (maakatoon)
- Subalpine fir

Herb Layer: 50% cover
- Orthilia secunda (one-sided wintergreen)
- Chamaedaphne calyculata (prince's pine)
- Linnaea borealis (twining)
- Goodenia oblongifolia (rattlesnake plantain)
- Salix rugosa (false Solomon's-seal)
- Pyrola chlorantha (green wintergreen)
- Cornus canadensis (bunchberry)
- Aralia nudicaulis (wild sarsaparilla)
- Oxypropis asperifolia (rough-leaved ricegrass)
- Menziesia canadensis (wild lily-of-the-valley)

Moss Layer: 45% cover
- Pleurozium schreberi (red-stemmed feathermoss)
- Hygrodiadelphus trigonatus (electrified cat's-tail moss)
- Hylocomium splendens (step moss)
- Dicranum polysetum

SOIL AND SITE

Moisture Regime: submesic - mesic
Nutrient Regime: poor - rich
* Slope Gradient (%): 15 (0-33)
* Slope Position: variable
Parent Material: commonly fluviatile or morainal
* Soil Texture: medium - coarse
Coarse Fractures (%): 35 (0-77)
Site Index: B1 31 (27-36)
Fd 30 (26-36)
P1 30 (25-35)
Sx 30 (21-35)

COMMENTS
Coarse-textured soils on too to level slope positions. Medium to moderately coarse-textured soils on mid-slope positions.

DISTRIBUTION: common
FD - SX - ROUGH-LEAVED RICEGRASS (SBG4h/01)

INTERPRETATIONS

Management objective: - manage for Fd sawlogs on an 80-year rotation.

Concerns: - deer browse
          - moisture deficit

Logging: - two-pass system
         - clearcut (small clearcut in visually sensitive areas)
         - clearcut with seed tree

Site preparation:

Objectives - reduce slash; improve planter access; site preparation may not be required

Mechanical - drag scarification

Prescribed fire - light broadcast burn (remove L and F horizons) or windrow and burn

Species choice:

Preferred - Fd
Acceptable - Pl

Brush hazard: - low/moderate (pinegrass, fireweed)

Silviculture applications: - leave 30-50 genetically superior seed trees per hectare if using the seed tree option.
                          - use the two-pass system only when visual impact or recreation values warrant (this system recommended for Mt. Robson corridor and Mt. Terry Fox).
                          - expect natural regeneration of Fd and Pl.
                          - overstocking of Fd or Pl may occur; if so, may need to juvenile space 10 years after harvesting.

Silviculture problems: - do not use skidders if adopting the two-pass system because of soil compaction problems.
                        - supervision of contractors mandatory if the two-pass system is to work.
                        - horse logging, small cat or cable system may need to be used to protect residual stems.
                        - mistletoe clause may be required.
**PL - VELVET-LEAVED BLUEBERRY - LICHEN**

**VEGETATION**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Cover</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree Layer</td>
<td>35%</td>
<td>Lodgepole pine</td>
</tr>
<tr>
<td>Shrub Layer</td>
<td>15%</td>
<td><em>Vaccinium myrtillusoides</em> (velvet-leaved blueberry) lodgepole pine</td>
</tr>
<tr>
<td>Herb Layer</td>
<td>20%</td>
<td><em>Arctostaphylos uva-ursi</em> (kinnikinnick)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Kalmeyrum lineare</em> (cow-wheat)</td>
</tr>
<tr>
<td>Moss Layer</td>
<td>60%</td>
<td><em>Cladina</em> spp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Peltigera</em> spp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Cladonia</em> spp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Dicranum polysetum</em> (wavy-leaved moss)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Pleurozium schreberi</em> (red-stemmed feathermoss)</td>
</tr>
</tbody>
</table>

**SOIL AND SITE**

- Moisture Regime: xeric (- subxeric)
- Nutrient Regime: very poor - poor
- Slope Gradient (%): 7 (5-15)
- Slope Position: variable
- Parent Material: glaciofluvial or solian
- Soil Texture: coarse
- Coarse Fragments (%): 16 (0-80)
- Site Index: PI 20 (17-24)

**COMMENTS**

Moss layer of these sites is dominated by lichens.

**DISTRIBUTION:** common
PL - VELVET-LEAVED BLUEBERRY - LICHEN (SBS4h/02)

INTERPRETATIONS

Management objectives:
- non-commercial at this time.
- alluvial deposits are the most common parent materials underlying these sites.
- logging could initiate dune movement.

Concerns:
- extreme moisture deficit

Logging:
- avoid logging
**FD-lichén**

**Vegetation**

**Tree Layer:** 50% cover  
- Douglas-fir, lodgepole pine

**Shrub Layer:** 15% cover  
- *Spiraea betulifolia* (birch-leaved spirea)  
- *Rhododendron canadense* (scolellie)  
- *Rosa acicularis* (prickly rose)  
- *Alnus viridis* ssp. *sinuata* (Sitka alder)  
- *Picea mariana* (Douglas-fir)

**Herb Layer:** 20% cover  
- *Calamagrostis rubescens* (pinegras)  
- *Arctostaphylos uva-ursi* (kinnikinnick)  
- *Solidago spathulata* (spike-like goldenrod)  
- *Aster conspicuus* (showy aster)  
- *Campanula rotundifolia* (common harebell)  
- *Lythrum innovatus* (fuzzy-spiked wildrye)

**Moss Layer:** 35% cover  
- *Pleurozium schreberi* (red-stemmed feathermoss)  
- *Dicranum polysetum* (wavy-leaved moss)  
- *Ptilium crista-castrense* (knight’s plume)  
- *Polytrichum juniperinum* (juniper haircap moss)  
- *Cladina* app.

**Soil and Site**

- **Moisture Regime:** xeric - subxeric  
- **Nutrient Regime:** poor  
- **Aspect:** southerly  
- **Slope Gradient (%):** 66 (50-75)  
- **Slope Position:** mid - upper  
- **Parent Material:** colluvial or (glacio)fluvial  
- **Soil Texture:** coarse - medium  
- **Coarse Fragments (%):** 52 (0-80)  
- **Site Index:**  
  - FD 22 (18-26)  
  - FD 21 (19-24)

**Distribution:** rare
FD - LICHEN (SBS4h/03)

INTERPRETATIONS

Management objectives:
- reserved for wildlife.
- class 1 wildlife lands.
- represents critical wintering grounds.
- this is a rare association in this subzone and occurs as small pockets on very steep terrain.

Logging:
- avoid logging
PL - PINEGRASS - FEATHERMoss

**VEGETATION**

Tree Layer: 45% cover
- Lodgepole pine, Douglas-fir

Shrub Layer: 35% cover
- **Shepherdia canadensis** (gooseberry)
- *Betula pumila* (birch-leaved spirea)
- *Vaccinium myrtillus* (velvet-leaved blueberry)
- *Rosa arctica* (prickly rose)
- *Amelanchier alnifolia* (saskatoon)
- **Douglas-fir**

Herb Layer: 50% cover
- *Linnaea borealis* (twining)
- *Chimonanthus umbellatus* (prince's pine)
- *Cornus canadensis* (bunchberry)
- *Melanthemum canadense* (wild lily-of-the-valley)
- *Orthilia secunda* (one-sided wintergreen)
- *Godoza oblongifolia* (zabblesnake-plantain)
- *Arctostaphylos uva-ursi* (kinnikinnick)
- *Elymus innovatus* (fuzzy-spiked wildrye)
- *Melamovum lineare* (cow-wheat)
- *Oxyodes asperifolia* (rough-leaved ricegrass)

Moss Layer: 80% cover
- *Sphagnum schreberi* (red-stemmed feathermoss)
- *Dicranum polysetum* (wavy-leaved moss)

**SOIL AND SITE**

- Moisture Regime: subxeric - xerimic
- Nutrient Regime: poor (~ medium)
- Slope Gradient (%): 3 (0-14)
- Slope Position: mid- to upper, or level
- Parent Material: (glacial) fluvial, morainal
- Soil Texture: moderately coarse - coarse
- Coarse Fragments (%): 38 (0-85)
- Site Index: 21 24 (22-28)

**DISTRIBUTION:** very common
PL - PINEGRASS - FEATHERMOSS (SSSH/04)

INTERPRETATIONS

Management objective: - manage for Pl sawlog on a 90-year rotation.

Concerns: - deer browse
- dwarf mistletoe
- high moisture deficits

Logging: - clearcut
- selective logging
- two-pass system
- clearcut with seed tree

Site preparation:

Objectives - maintain organic layers; reduce debris; prepare site for natural regeneration

Mechanical - drag scarify if winter logged

Prescribed fire

Species choice:

Preferred - Pl, Fd

Brush hazard: - low (fireweed, pine grass)

Silviculture applications: - leave 30-50 genetically superior seed trees per hectare if using the seed tree option.
- use the two-pass system only when visual impact or recreation values warrant (this system recommended for Mt. Robson corridor and Mt. Terry Fox).
- drought level duration could result in serious seedling mortality.
- complete planting by mid-June.
- range values are moderate to high on these sites.
- practice dwarf mistletoe control techniques.
- fall all Pl over 1 m to reduce dwarf mistletoe infection of new stand.
PL - LABRADOR TEA

VEGETATION

Tree Layer: 50% cover
Lodgepole pines

Shrub Layer: 65% cover
Ledum groenlandicum (Lodgepole tea)
Vaccinium myrtillus (velvet-leaved blueberry)
Shepherdia canadensis (creeping willow)
Salix spp. (willows)
Rosa acicularis (prickly rose)
Spiraea betulifolia (birch-leaved spirea)
Lodgepole pine
Trembling aspen
Hybrid white spruce

Herb Layer: 50% cover
Vaccinium vitis-idaea (lingonberry)
Cornus canadensis (bunchberry)
Arctostaphylos uva-ursi (kinnikinnick)
Linnnea borealis (twinflower)
Lycopodium complanatum (ground-cedar)
Melanthenum canadense (wild lily-of-the-valley)
Oryzopsis asperifolia (rough-leaved ricegrass)
Lathyrus ochroleucus (creamy peavine)

Moss Layer: 95% cover
Pleurozium schreberi (red-stemmed feathermoss)
Pogonatum polysetum (wavy-leaved moss)
Peltigera spp. (Iichens)
Cladina spp. (Iichens)
Hylocomium splendens (step moss)

SOIL AND SITE

Moisture Regime: (subxeric - ) submesic - mesic
Nutrient Regime: very poor - poor
Slope Gradient (%): 1 (0-2)
* Slope Position: level
* Parent Material: loam
* Soil Texture: coarse
Coarse Fragments (%): 1 (0-2)
Site Index: PI 25.5 (25-26)

DISTRIBUTION: uncommon
PL - LABRADOR TEA (SH5ch/05)

INTERPRETATIONS

Management objective:
- manage for P1 pulplogs on an 80-year rotation.

Concerns:
- dwarf mistletoe

Logging:
- clearcut

Site preparation:
- prepare site for natural regeneration; control mistletoe
  - light drag scarify if winter logged
  - do not burn

Species choice:
- P1

Preferred
- P1

Acceptable

Brush hazard:
- low (firewood)

Silviculture applications:
- does not justify any silvicultural investment other than drag scarification.
- practice dwarf mistletoe control techniques.
PL-SX-THIMBLEBERRY

VEGETATION

Tree Layer: 65% cover
- Hybrid white spruce, Douglas-fir, trembling aspen, lodgepole pine, (subalpine fir)

Shrub Layer: 45% cover
- Rubus parviflorus
- Cornus sericea
- Viburnum edule
- Lonicera involucrata
- Spiraea betulifolia
- Amelanchier alnifolia
- Hybrid white spruce
- (subalpine fir)

Herb Layer: 55% cover
- Aralia nudicaulis
- Linnaea borealis
- Orthilia secunda
- Cornus canadensis
- Epilobium roseum
- Malanthemum canadense
- Galium triflorum
- Pipsisseva hookeri
- Corynepodium asperifolia
- Claenophila umbellata
- Chlorogala uniflora
- (wild sarsaparilla)
- (twinflower)
- (one-sided wintergreen)
- (bunchberry)
- (false Solomon’s-seal)
- (wild lily-of-the-valley)
- (sweet-scented bedstraw)
- (hooker’s fairybells)
- (rough-leaved ricegrass)
- (prince’s pine)
- (queen’s cup)

Moss Layer: 40% cover
- Pleurozium schreberi
- Rhytidodium triquetrum
- (red-stemmed feather moss)
- [Phyllium cristata-castrensis]
- (knight’s plume)
- [Hylocomium splendens]
- (stop moss)

SOIL AND SITE

Moisture Regime: (mesic ---> subhygric)
Nutrient Regime: poor - rich
* Slope Gradient (%): 6 (0-13)
* Slope Position: lower to level
* Parent Material: variable
* Soil Texture: variable
* Coarse Fragments (%): 16 (0-40)
* Seepage Water: may be present
* Site Index:
  - PA 33 (29-37)
  - PI 29 (26-32)
  - Site 31 (28-36

DISTRIBUTION: common, especially on sites that receive limited seepage
PL - SX - THIMBLEBERRY (9/29/86)

INTERPRETATIONS

Management objectives:
- manage for Ft sawlogs on a 70-year rotation or Sx sawlogs on an 80-year rotation.
- protect wildlife values.

Concerns:
- high windthrow hazard
- good moose habitat

Logging:
- clearcut

Site preparation:

Objectives
- reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; avoid soil compaction on finer-textured soils

Mechanical
- patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; PMT with 6-way blade on finer-textured soils or steep slopes

Prescribed fire
- broadcast burn (remove L horizon)

Species choice:
- Preferred: Ft, Sx
- Acceptable: Pw

Brush hazard:
- moderate to high (thimbleberry, fireweed)

Silviculture applications:
- seed tree control of alder and aspen.
- complete planting by mid-June.
- use large planting stock.

Silviculture problems:
- high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting.
- use of herbicides to help control brush competition may conflict with protection of wildlife values.
**VEGETATION**

**Tree Layer:** 65% cover  
Hybrid white spruce, (black cottonwood, subalpine fir)

**Shrub Layer:** 35% cover  
*Cornus sericea*  
*Viburnum edule*  
*Lonicera involucrata*  
*Rosa acicularis*  
hybrid white spruce

**Herb Layer:** 60% cover  
*Equisetum arvense*  
*Equisetum pratense*  
*Galium triflorum*  
*Coronopus canadensis*  
*Aralia nudicaulis*  
*Smilacina racemosa*  
*Rubus pubescens*  
*Gymnocarpium dryopteris*  
(common horsetail)  
(meadow horsetail)  
(sweet-scented bedstraw)  
(bunchberry)  
(wild sarsaparilla)  
(false Solomon's-seal)  
(trailing raspberry)  
(oak fern)

**Moss Layer:** 30% cover  
*Rhytidiadelphus triquetrus*  
*Niphocerium velegrandes*  
*Pratia crispa-caesarmenis*  
*Pleurozium schreberi*  
(electrified cat's-tail moss)  
(step moss)  
(knight's plume)  
(red-stemmed feathermoss)

**SOIL AND SITE**

- **Moisture Regime:** subhygic - hygic
- **Nutrient Regime:** medium - very rich
  - **Slope Gradient (%):** 0 (0-2)
  - **Slope Position:** level
  - **Parent Material:** fluvial
  - **Soil Texture:** medium - coarse
  - **Coarse Fragments (%):** 18 (0-86)
  - **Seepage Water:** often present
  - **Site Index:** P1 32 (30-34)  
  S1 32 (27-37)

**COMMENTS**
These sites often have a fluctuating water table.

**DISTRIBUTION:** common, but small in size. Occur along rivers and creeks.
SX - HORSE TAIL (GBGH/07)

INTERPRETATIONS

Management objectives:
- manage for SX sawlogs on a 70-year rotation,
- protect high fisheries (salmon) and high wildlife values.

Concerns:
- high salmon and moose values
- good windthrow hazard
- high water table

Logging:
- clearcut

Site preparation:

Objectives
- reduce organic layers; reduce debris; elevate seedlings above water table; minimize future brush competition; improve planter access

Mechanical
- trafficability may be a limiting factor; mound where possible

Prescribed fire
- broadcast burn (remove L horizon) or window and burn

Species choice:

Preferred
- SX

Acceptable
- Pw

Brush hazard:
- very high

Silviculture applications:
- use of herbicides not recommended.
- seed tree control of alder, willow and cottonwood.
- juvenile spacing or conifer release of SX from cottonwood overstory likely required at age 10 years.

Silviculture problems:
- very high brush competition will require a seed tree control program and inspection of harvested sites at time periods 2 and 4 years after planting.
- these inspections may indicate a need for further conifer release projects.
VEGETATION

Tree Layer: 65% cover
- Black spruce, (lodgepole pine)

Shrub Layer: 10% cover
- Ledum groenlandicum (Labrador tea)
- Alnus incana ssp. bussei (mountain alder)
- Black spruce

Herb Layer: 25% cover
- Carex spp. (sedges)
- Cornus canadensis (bunchberry)
- Equisetum arvense (common horsetail)

Moss Layer: 99% cover
- Pleurozium schreberi (red-stemmed feathermoss)
- Hylocomium splendens (step moss)
- Ptilium crista-castrensis (knight's plume)
- Rhytidiadelphus triquetrus (electric cat's-tail moss)

SOIL AND SITE

Moisture Regime: hygic (- subhygic)
Nutrient Regime: poor
Slope Gradient (%): 2
* Slope Position: depression
* Parent Material: organic veneer
* Coarse Fragments (%): 3
* Water Table: close to surface

COMMENTS
Limited data because of the rarity of the ecosystem.

DISTRIBUTION: rare
Management objectives:
- non-commercial at this time.
- very rare association.

Concerns:
- high water table

Logging:
- avoid logging
**VEGETATION**

**Tree Layer:** 15% cover  
- Black spruce

**Shrub Layer:** 65% cover  
- Betula glandulosa  
- Ledum groenlandicum  
- Salix sp.  
- *Juniperus communis*  
- Black spruce

**Herb Layer:** 60% cover  
- Carex sp.  
- *Vaccinium oxyccoccos*  
- *Drosera rotundifolia*  
- *Sphagnum trilobata*  
- *Vaccinium vitis-idaea*  
- *Rubus arcticus*  
- *Sphagnum*  
- *Tomenthynum nitens*  
- *Aulacomnium palustre*  
- *Pleuroziun schreberi*  
- *Polytrichum* sp.

**Moss Layer:** 95% cover

**SOIL AND SITES**

- **Moisture Regime:** subhydric
- **Nutrient Regime:** very poor – poor
- **Slope Gradient (%):** 0 (0-2)
- **Slope Position:** level or depression
- **Parent Material:** organic
- **Coarse Fragments (%):** 0
- **Water Table:** close to surface

**DISTRIBUTION:** common
SB - SPHAGNUM (SBSdn/09)

INTERPRETATIONS

Management objective: - non-commercial at this time.

Concerns: - high water table
- unproductive sites for forestry

Logging: - avoid logging
FIGURE 10. Geographic location of the ESSFb subzone in the Prince George Forest Region.
**FIGURE 11** Ectopic grid for the ESSFb subzone.
KEY TO SITE UNITS OF THE RHSFB

1a Sites not forested, or with a few scattered trees

2a Rich, often fluvial sites, lower to toe of slope or level; no trees, shrub layer dominated by Shepherdia canadensis (p. 13)* and willows, herb layer with Dryas drummondii (yellow mountain-avens)

2b Poorer sites, often organic soils, level or depression; scattered subalpine fir, shrub layer dominated by mountain hemlock and/or subalpine fir regeneration, herb layer dominated by sedges (pp. 36-38)

1b Sites forested

3a Oplopanax horridus (p. 10) moderate cover (usually<10%); slope position lower to toe

3b Oplopanax horridus low cover (<5%) or absent; slope position variable

4a Toe of slope or level; often by flowing or standing water; herb layer dominated by Equisetum spp. (p. 24)

4b Usually mid- to upper slope; Equisetum spp. low cover (<2%) or absent

5a Usually mid-slope; ferns [Gymnocarpium dryopteris (p. 26), Dryopteris assimilis (p. 23) and Athyrium filix-femina (p. 22)] dominate herb layer

5b Usually upper slope to crest; ferns low cover (<5%) or absent

6a Upper slope to crest, soils shallow (usually < 50 cm to bedrock); herb layer poorly developed (< 20% cover), Gymnocarpium dryopteris absent

6b Upper slope, soils greater than 1 m in depth; herb layer moderately poorly developed (>25% cover), Gymnocarpium dryopteris usually present

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).
SMALL-FLOWERED WOODRUSH - SPINY WOOD FERN

VEGETATION

Tree Layer: 35% cover
- Engelmann spruce, subalpine fir, western hemlock

Shrub Layer: 55% cover
- Vaccinium membranaceum (black huckleberry)
- Vaccinium ovalifolium (oval-leaved blueberry)
- Rhododendron albiflorum (white-flowered rhododendron)
- [Menziesia ferruginea (false azalea)]
- subalpine fir
- Engelmann spruce

Herb Layer: 45% cover
- Valeriana sitchensis (beach valerian)
- Tiarella unifoliata (one-leaved foamflower)
- Streptopus roseus (rosy twistedstalk)
- Dryopteris asplenifolia (spiny wood fern)
- Osmorhiza claytoniana (spiny wood fern)
- Rubus pedatus (five-leaved bramble)
- Lysimachia parviflora (small-flowered woodrush)
- Veratrum viride (Indian hellebore)

Moss Layer: 55% cover
- Barbiola lysophila (common leafy liverwort)
- Nutium radatum
- [Pleurozium schreberi (red-stemmed feathermoss)]

SOIL AND SITE

- Moisture Regime: submesic - mesic
- Nutrient Regime: poor - medium
- Slope Gradient (%): 26 (0-70)
- * Slope Position: mid; upper if W aspect; lower if coarse-textured
- * Soil Texture: moderately coarse - medium
- Coarse Fragments (%): 42 (20-65)
- Soil Drainage: moderately well - well
- Humus Thickness (cm): 2-7

DISTRIBUTION: common
SMALL-FLOWERING WOODRUSH - SPINNY WOOD FERN (ESSFD/01)

INTERPRETATIONS

Management objective:  manage for 50 sawlogs on an 80-year rotation.

Concerns:  snowpack; watershed management

Logging:  clearcut

Site preparation:
  Objectives  reduce organic layers; reduce debris; prepare planting spots; improve planter access; minimize future brush competition
  Mechanical  patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; RMC with 6-way blade on finer-textured soils or steep slopes
  Prescribed fire  broadcast burn (remove L and S layers) within 1 year of harvesting, or brown and burn

Species choice:
  Preferred  Se
  Acceptable  Bl

Brush hazard:  moderate to high (white-flowered rhododendron, fireweed)

Silviculture applications:  these sites have been selectively logged in the Nelson Region.
  accept and maintain Bl component.
  harvest sites in the winter.
  burn in the summer.
  summer planting.
  use large planting stock.
  brushing and weeding may be required.

Silviculture problems:  getting the appropriate conditions to achieve a good prescribed burn is not likely to occur unless burning is conducted during the summer.
  moderate to high brush competition will require an inspection of harvested sites 4 years after planting. These inspections may indicate the need for further brushing and weeding to keep back brush competition.
  mechanical site preparation equipment should try to create raised planting spots.
  compaction will be a serious problem on lacustrine soils; these sites must be logged during the winter using a good snowpack.
**RHODODENDRON - FIVE-LEAVED BRAMBLE**

**VEGETATION**
- **Tree Layer:** 25% cover
  - Subalpine fir, Engelmann spruce, western hemlock
- **Shrub Layer:** 55% cover
  - *Vaccinium membranaceum* (black huckleberry)
  - *Rhododendron albiflorum* (white-flowered rhododendron)
  - *subalpine fir*
- **Herb Layer:** 15% cover
  - *Rubus pedatus* (five-leaved bramble)
- **Moss Layer:** 75% cover
  - *Dicranum fuscescens* (curly heron's-bill moss)

**SOIL AND SIZE**
- **Moisture Regime:** xeric - subxeric (- submesic)
- **Nutrient Regime:** very poor - poor
- **Slope Position:** crest - upper
- **Soil Texture:** moderately coarse - medium
- **Soil Depth:** usually less than 1 m to bedrock
- **Slope Gradient (%):** 31 (0-65)
- **Parent Material:** usually morainal or colluvial veneer, rarely organic veneer
- **Coarse Fragments (%):** 49 (0-80)
- **Soil Drainage:** well - rapidly

**DISTRIBUTION:** uncommon
RHODODENDRON - FIVE-LEAVED BRAMBLE (BSSPB/02)

**INTERPRETATIONS**

<table>
<thead>
<tr>
<th>Management objective:</th>
<th>- manage for 5e sawlogs on a 90-year rotation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerns:</td>
<td>- snowpack; possible moisture deficits</td>
</tr>
<tr>
<td>Logging:</td>
<td>- clearcut</td>
</tr>
<tr>
<td>Site preparation:</td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td>- maintain organic layers; reduce debris; improve planter access; prepare plantable spots</td>
</tr>
<tr>
<td>Mechanical</td>
<td>- no mechanical site preparation on steep slopes or shallow soils; patch scarifiers can be used (carefully!) on sites with deeper soils</td>
</tr>
<tr>
<td>Prescribed fire</td>
<td>- broadcast burn (remove 1. horizon)</td>
</tr>
<tr>
<td>Species choice:</td>
<td></td>
</tr>
<tr>
<td>Preferred</td>
<td>- 5e</td>
</tr>
<tr>
<td>Acceptable</td>
<td></td>
</tr>
<tr>
<td>Brush hazard:</td>
<td>- low to moderate (white-flowered rhododendron)</td>
</tr>
<tr>
<td>Silviculture applications:</td>
<td>these sites have been selectively logged in the Nelson Region.</td>
</tr>
<tr>
<td></td>
<td>- 51 is not an acceptable species on this unit.</td>
</tr>
<tr>
<td>Silviculture problems:</td>
<td>- steep slopes and coarse, shallow to bedrock soils will lead to moisture deficits and erosion hazards on some sites.</td>
</tr>
</tbody>
</table>
RHODODENDRON - ONE-LEAVED FOAMFLOWER

Vegetation

Tree Layer: 65% cover
Engelmann spruce, subalpine fir

Shrub Layer: 50% cover
*Vaccinium membranaceum* (black huckleberry)
*Rhododendron albiflorum* (white-flowered rhododendron)
*Vaccinium ovalifolium* (oval-leaved blueberry)
*[Kraslesia ferruginea]* (false azalea)
subalpine fir

Herb Layer: 30% cover
*Tiarella unifoliata* (one-leaved foamflower)
*Rubus pedatus* (five-leaved bramble)
*Valeriana sitchensis* (Sitka valerian)
*Gymnocarpium dryopteris* (oak fern)
*Sedum rosea* (rosy twistedstalk)

Moss Layer: 65% cover
*[Barbiliophyton lycopodioides]* (common leafy liverwort)
*[Pleurozium schreberi]* (red-stemmed feathermoss)
*[Brachythecium hylotepeus]*

Soil and Site

Moisture Regime: submeric - submesic
Nutrient Regime: poor - medium
Slope Position: mid- to upper
Soil Texture: moderately coarse - coarse
Slope Gradient (%): 23 (0-75)
Soil Drainage: (moderately well -) well
Humus Thickness (cm): 7 (1-20)

Distribution: fairly common
RHODODENDRON - ONE-LEAVED ROSEFLOWER (ESS62/03)

INTERPRETATIONS

Management objective: - manage for 5e sawlogs on an 80-year rotation.

Concerns: - snowpack

Logging: - clearcut

Site preparation:

Objectives - reduce organic layers; reduce debris; prepare planting spots; improve planter access; minimize future brush competition

Mechanical - patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; HKC with 6-way blade on finer-textured soils or steep slopes

Prescribed fire - broadcast burn (remove L horizon)

Species choice:

Preferred - 5e

Acceptable - B1

Brush hazard: - moderate (white-flowered rhododendron, fireweed)

Silviculture applications: - accept and maintain B1 component.
- these sites have been selectively logged in the Nelson Region.

Silviculture problems: - coarse-textured soils and upper slope positions may lead to moisture deficits on some sites.
## Devil's Club - Lady Fern

### Vegetation

**Tree Layer:** 35% cover
- Engelmann spruce, subalpine fir

**Shrub Layer:** 45% cover
- **Orobanche cordata**
- **Vaccinium angustifolium**
- **Vaccinium ovalifolium**
- **Rubus parviflorus**
- (subalpine fir)

**Herb Layer:** 55% cover
- **Gymnocarpium dryopteris**
- **Tiarella unifoliata**
- **Saxifraga rosacea**
- **Athyrium filix-femina**
- **Dryopteris asarifolia**
- **Valeriana itcherin**
- **Galium triflorum**
- **Rubus pubescens**
- **Streptopus amplexifolius**
- (red-stemmed feathermoss)

**Moss Layer:** 45% cover
- **Brachythecium spp.**
- **Menia nudicaulis**
- **Pleurozium schreberi**
- **(red-stemmed feathermoss)**

### Soil and Site

- **Moisture Regime:** music - subhygic (~ hygic)
- **Nutrient Regime:** medium - rich
- **Slope Position:** lower - toe: mid- if N aspect
- **Slope Gradient (%):**
  - 25 (4-50)
- **Soil Texture:** medium - moderately coarse (~ coarse)
- **Coarse Fragments (%)**
  - 41 (17-85)
- **Soil Drainage:** (poorly ~) imperfectly - well
- **Humus Thickness (cm):**
  - 8 (2-35; rarely more than 10)

### Distribution:
- common
DEVIL'S CLUB - LADY FERN  (ESSPD/04)

**INTERPRETATIONS**

<table>
<thead>
<tr>
<th>Management objective:</th>
<th>- manage for 80 sawlogs on a 75-year rotation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerns:</td>
<td>- high brush hazard; watershed management; snowpack; windthrow</td>
</tr>
<tr>
<td>Logging:</td>
<td>- clearcut</td>
</tr>
<tr>
<td><strong>site preparation:</strong></td>
<td></td>
</tr>
<tr>
<td>Objective</td>
<td>- reduce organic layers; reduce debris; prepare planting spots; improve planter access; minimize future brush competition</td>
</tr>
<tr>
<td>Mechanical</td>
<td>- patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; MMC with 6-way blade on finer-textured soils or steep slopes</td>
</tr>
<tr>
<td>Prescribed fire</td>
<td>- broadcast burn (remove L and F layers) within 1 year of harvesting, or brown and burn</td>
</tr>
<tr>
<td><strong>Species choice:</strong></td>
<td></td>
</tr>
<tr>
<td>Preferred</td>
<td>- So</td>
</tr>
<tr>
<td>Acceptable</td>
<td>- B1</td>
</tr>
<tr>
<td><strong>Brush hazard:</strong></td>
<td>- very high (thimbleberry, devil's club, fireweed, lady fern)</td>
</tr>
<tr>
<td><strong>Silviculture applications:</strong></td>
<td>- these sites have been selectively logged in the Nelson Region.</td>
</tr>
<tr>
<td></td>
<td>- accept and maintain B1 component.</td>
</tr>
<tr>
<td></td>
<td>- harvest sites in the winter.</td>
</tr>
<tr>
<td></td>
<td>- summer planting.</td>
</tr>
<tr>
<td></td>
<td>- use large planting stock.</td>
</tr>
<tr>
<td></td>
<td>- mechanical site preparation should create raised planting spots.</td>
</tr>
<tr>
<td><strong>Silviculture problems:</strong></td>
<td>- getting the appropriate conditions to achieve a good prescribed burn is not likely to occur unless burning is conducted during the summer.</td>
</tr>
<tr>
<td></td>
<td>- very high brush competition will require an inspection of harvested sites 2 years after planting. These inspections may indicate the need for further brushing and weeding to keep back brush competition.</td>
</tr>
<tr>
<td></td>
<td>- before planting there may be a need to use herbicides to reduce brush competition.</td>
</tr>
<tr>
<td></td>
<td>- compaction will be a serious problem on lacustrine soils; these sites must be logged during the winter using a good snowpack.</td>
</tr>
</tbody>
</table>
BLACK GOOSEBERRY - HORSETAIL

VEGETATION

Tree Layer: 30% cover
- Engelmann spruce, subalpine fir

Shrub Layer: 45% cover
- Vaccinium membranaceum (black huckleberry)
- Vaccinium ovalifolium (oval-leaved blueberry)
- Ribes lacustre (black gooseberry)
- Rhododendron alboflorum (white-flowered rhododendron)
- [Menziesia ferruginea (false azalea)]
- subalpine fir
- Engelmann spruce

Herb Layer: 70% cover
- Tiarella unifolia (one-leaved foamflower)
- Gymnocarpium dryopteris (oak fern)
- Strepocarpus excentricus (clamping twistedstake)
- Athyrium filix-femina (lady fern)
- Silica valeriana (Silica valeriana)
- Senecio triangularis (arrow-leaved groundsel)
- Equisetum arvense (common horsetail)
- Strepocarpus roseus (rosy twistedstake)

Moss Layer: 75% cover
- Brachythecium spp.
- [Pleurozium schreberi (red-stemmed feathermoss)]

SOIL AND SITE

- Moisture Regime: subhygic - hygic
- Nutrient Regime: medium - rich
- *Slope Position: toe - level
- *Slope Gradient: 9 (0-30)
- *Seepage Water: usually present
- Coarse Fragments (%): 40 (0-80)
- Parent Material: usually fluvial or organic
- Soil Drainage: moderately well - poorly
- Humus Thickness (cm): 15 (2-73; rarely more than 25)

DISTRIBUTION: common, often occurring as strips along the sides of bodies of water.
BLACK GOOSEBERRY - HORSETAIL (HSSP#05)

INTERPRETATIONS

Management objective: - manage for 50 sawlogs on an 80-year rotation.

Concerns: - snowpack; watershed management; windthrow

Logging: - clearcut

Site preparation:

Objectives - reduce organic layers; reduce debris; elevate
seedlings above water table; minimize future
brush competition

Mechanical - trafficability is usually a limiting factor;
create mounds in medium-textured soils if feasible

Prescribed fire - broadcast burn (remove L and F layers) within
1 year of harvesting, or burn and burn

Species choice:

Preferred
- Se

Acceptable
- Bi

Brush hazard: - moderate (white-flowered rhododendron, lady fern,
fireweed)

Silviculture applications: - these sites have been selectively logged in the
Nelson Region.
- accept and maintain Bi component.
- harvest sites in the winter.
- summer planting.
- use large planting stock.
- brushing and weeding may be required.

Silviculture problems: - getting the appropriate conditions to achieve a
good prescribed burn is not likely to occur
unless burning is conducted during the summer.
- moderate to high brush competition will require
an inspection of harvested sites 4 years after
planting. These inspections may indicate the
need for further brushing and weeding to keep
back brush competition.
- compaction will be a serious problem on
lacustrine soils; these sites must be logged
during the winter using a good snowpack.
SEDGE - SPHAGNUM

VEGETATION

Tree Layer: 10% cover
Subalpine fir

Shrub Layer: 45% cover
- Vaccinium ovalifolium (oval-leaved blueberry)
- Vaccinium membranaceum (black huckleberry)
- Rhododendron albidulum (white-flowered rhododendron)
- Mountain heath (mountain heath)
- Subalpine fir

Herb Layer: 70% cover
- Carex spp. (sedges)
- Veratrum viride (Indian balsam)
- Eriophorum vaginatum (rosette twisted stalk)
- Vaccinium angustifolium (mountain hairgrass)
- Luzula pectinata (partridgefoot)

Moss Layer: 75% cover
- Barbastanella floerkei
- Sphagnum capillaceum (common red sphagnum)
- Pseudomesum palustre (atmospheric moss)
- Sphagnum spp.

SOIL AND SITE:

Moisture Regime: hygic - subhydric
Nutrient Regime: poor - very poor
* Slope Position: toe, level, or depression
* Slope Gradient (%): 13 (0-25)
* Seepage Water (cm): 18 (0-70)
Parent Material: morainal, often capped with organic
Coarse Fragments (%): 25 (10-55)
Soil Drainage: (well-) imperfectly - poorly
Humus Thickness (cm): 13 (0-45; rarely greater than 20)

DISTRIBUTION: uncommon
SEDE - SPHAGNUM (ESSPH/06)

INTERPRETATIONS

Management objective: - non-commercial at this time.
WILLOW - YELLOW MOUNTAIN-AVENS

VEGETATION

Tree Layer: 0% cover

Shrub Layer: 45% cover
- Shepherdia canadensis (soapbark)
- Salix barclayi (Barclay's willow)
- black cottonwood
- Engelmann spruce
- subalpine fir

Herb Layer: 60% cover
- Dryas drummondii (yellow mountain-avens)
- Fragaria virginiana (wild strawberry)
- Orthilia secunda (one-sided wintergreen)

Moss Layer: 75% cover
- Cladonia chlorophaea
- [Barbula lycopodioides (common leafy liverwort)]

SOIL AND SITE:

- Moisture Regime: submesic - subhydric
- Nutrient Regime: rich
- Slope Gradient: 0
- Parent Material: usually fluvial
- Aspect: usually flat
- Slope Gradient (%): 5 (0-5)
- Slope Position: lower, toe, or level
- Coarse Fragments (%): 0
- Soil Drainage: imperfectly (- rapidly)
- Erosion Water: may be present
- Humus Thickness (cm): 3 (1-4)

DISTRIBUTION: uncommon
WILLOW - YELLOW MOUNTAIN-REVISED (ESSFD/07)

INTERPRETATIONS

Management objective: non-commercial at this time.
FIGURE 12. Geographic location of the ESSFo subzone in the Prince George Forest Region.
FIGURE 13. Biotopic grid for the HSSPo subzone
KEY TO SITE UNITS OF THE RSSPO

1a Organic soils; a bog

1b Mineral soils

2a Oplepodus horridus (p. 10)* and Mnium spp. (p. 61) abundant; seepage water may be present

2b Oplepodus horridus absent, Mnium spp. low cover (1%) or absent; seepage water usually absent

3a Gymnocarpium dryopteris (p. 26) abundant; lower slope to toe

3b Gymnocarpium dryopteris low cover (2%) or absent; mid- to upper slope

4a Vaccinium myrtillusoides (p. 15) and Cladina spp. (p. 35) abundant; colluvial veneer over bedrock

4b Vaccinium myrtillusoides and Cladina spp. low cover (usually 2% or less) or absent; various soil parent materials

5a Kalmia ferruginea (p. 10) and Rhododendron albiflorum (white-flowered rhododendron) low cover; colluvial veneer over bedrock, or glacioluvial

5b Kalmia ferruginea and Rhododendron albiflorum abundant; various soil genetic materials

6a Herb layer reasonably well developed (15% cover); Orthilia secunda (p. 30) and Lycopodium annotinum (p. 28) present; mid- to lower slope

6b Herb layer poorly developed (15% cover); Orthilia secunda and Lycopodium annotinum usually absent; upper slope

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982)
FALSE AZALEA - FEATHERMOSS

VEGETATION

Tree Layer: 50% cover
Engelmann spruce, subalpine fir

Shrub Layer: 20% cover

Hemirestes ferruginea (false azalea)
Vaccinium membranaceum (black huckleberry)
Ribes lacustre (black goosberry)
(Rhododendron albiflorum (white-flowered rhododendron])
subalpine fir

Herb Layer: 25% cover

Orthilia secunda (one-sided wintergreen)
Lycopodium annotinum (stiff club-moss)
Cornus canadensis (bunchberry)
Rubus pedatus (five-leaved bramble)
Fistula cordata (heart-leaved twayblade)

Moss Layer: 75% cover

Pleurozium schreberi (red-stemmed feathermoss)
Pilzium crista-castrensis (knight's plume)
Barbthamphozia lycopsidoides (common leafy liverwort)
Hylocomium splendens (step moss)

SOIL AND SITE

Moisture Regime: submesic - mesic
Nutrient Regime: poor - rich
Slope Gradient (%): 29 (0-52)
* Slope Position: mild - (lower)
Parent Material: variable
* Soil Texture: medium - (coarse)
Coarse Fragments (%): 45 (0-75)
Site Index:
BI 22 (15-30)
PI 19 (24-31)
Se 22 (17-29)

DISTRIBUTION: common
FALSE AZALEA - FURTHERMORE (RESSP/01)

INTERPRETATIONS

Management objective: - manage for-Se sawlog on an 80-year rotation.

Concerns: - drought
- watershed management
- blowdown

Logging: - clearcut

Site preparation:

Objective - reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; improve planter access

Mechanical - patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; PWG with 6-way blade on finer-textured soils or steep slopes

Prescribed fire - broadcast burn (remove L horizon)

Species choice:

Preferred - Se

Brush hazard: - moderate (false azalea, red raspberry, thimbleberry, Sitka alder, fireweed)

Silviculture applications: - maintain 81 at up to 300 stems per hectare
- do not plant during mid-summer.

Silviculture problems: - watershed management and microsite climate is of prime concern, so cutblock size should be examined.
- wind may funnel up many of the drainages in this subzone, causing trees to blow down along cutblock boundaries.
- moderate brush competition will likely occur within 3 years of harvesting; sites should be inspected at 3 years to determine if any further treatments are required.
BLACK HUCKLEBERRY - FEATHERMOSS

VEGETATION

Tree Layer: 25% cover
    Engelmann spruce, subalpine fir, (lodgepole pine)

Shrub Layer: 50% cover
    Vaccinium membranaceum
    (black huckleberry)
    subalpine fir

Herb Layer: 5% cover
    Chimaphila umbellata
    (prince's pine)

Moss Layer: 90% cover
    Pleurozium schreberi
    (red-stemmed feathermoss)
    Dicranum scoparium
    (broom moss)
    Aulacomnium palustre
    (glow moss)

SOIL AND SITES

Moisture Regime: xeric
Nutrient Regime: poor
* Aspect:
  * Slope Gradient (%):
    * Slope Position:
    * Parent Material:
    * Soil Texture:
    * Coarse Fragments (%):
    * Site index:

Site: 9
Soil: 16

COMMENTS:

Limited data because of the rarity of the ecosystem.

DISTRIBUTION: rare and small
BLACK HUCKLEBERRY - FEATHERMOSS (EFGF/02)
INTERPRETATION

**Management objectives:**
- non-commercial at this time.
- avoid broadcast burns.
- high wildlife values.

**Concerns:**
- drought
VELVET-LEAVED BLUEBERRY-LICHEN

<table>
<thead>
<tr>
<th>VEGETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree Layer: 25% cover</td>
</tr>
<tr>
<td><em>Engelmann spruce, subalpine fir, (lodgepole pine)</em></td>
</tr>
<tr>
<td>Shrub Layer: 55% cover</td>
</tr>
<tr>
<td><em>Vaccinium myrtillus</em> (velvet-leaved blueberry)</td>
</tr>
<tr>
<td><em>Vaccinium pensylvanicum</em> (black huckleberry)</td>
</tr>
<tr>
<td><em>Menziesia ferruginea</em> (false azalea)</td>
</tr>
<tr>
<td><em>Salix scouleriana</em> (Scouler's willow)</td>
</tr>
<tr>
<td>subalpine fir</td>
</tr>
<tr>
<td>lodgepole pine</td>
</tr>
<tr>
<td>Herb Layer: 5% cover</td>
</tr>
<tr>
<td><em>Corpus canadensis</em> (bunchberry)</td>
</tr>
<tr>
<td>Moss Layer: 80% cover</td>
</tr>
<tr>
<td><em>Pleurozium schreberi</em> (red-stemmed feathermoss)</td>
</tr>
<tr>
<td><em>Cladonia spp.</em></td>
</tr>
<tr>
<td><em>Cladina mitis</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOIL AND SITE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope Gradient (%): 12 (6-18)</td>
</tr>
<tr>
<td>Moisture Regime: xeric - subxeric</td>
</tr>
<tr>
<td>Nutrient Regime: poor</td>
</tr>
<tr>
<td>Aspect: usually southerly</td>
</tr>
<tr>
<td>Parent Material: glaciofluvial</td>
</tr>
<tr>
<td>Soil Texture: coarse or moderately coarse</td>
</tr>
<tr>
<td>Coarse Fragments (%): 65 (54-75)</td>
</tr>
<tr>
<td>Site Index: B1 18</td>
</tr>
<tr>
<td>P1 19 (17-20)</td>
</tr>
<tr>
<td>Se 17</td>
</tr>
</tbody>
</table>

| COMMENTS |
| Limited data because of the rarity of the ecosystem. |

| DISTRIBUTION: rare |
VELVET-LEAVED BLUEBERRY - LICHEN (ESSPO/03)

INTERPRETATIONS

Management objectives:
- Non-commercial at this time and there should be an on-site inspection before harvesting is allowed.
- High wildlife values.
RHODODENDRON - MOSS

VEGETATION

Tree Layer: 35% cover
- Subalpine fir, lodgepole pine, Engelmann spruce

Shrub Layer: 25% cover
- 
  - Menziesia ferruginea  (false azalea)
  - Rhododendron albiflorum  (white-flowered rhododendron)
  - Vaccinium membranaceum  (black huckleberry)
  - Subalpine fir
  - Engelmann spruce

Herb Layer: 10% cover
- Cornus canadensis  (bunchberry)

Moss Layer: 90% cover
- Pleurozium schreberi  (red-stemmed feather moss)
- Dicranum fuscescens  (curly heron's-bill moss)
- Barbiglophdia lycopedioides  (common leafy liverwort)
- Prorium eirista-castrensis  (knight's plume)

SOIL AND SITE

Moisture Regime: subxeric
Nutrient Regime: poor
Slope Gradient (%): 45 (22-60)
* Slope Position: upper
* Soil Texture: moderately coarse
* Coarse Fragments (%): 62 (25-75)
Site Index:
- BA 17 14-20
- PI 20 17-22
- SE 18 16-23

DISTRIBUTION: common
RHODODENDRON - MOSS (RSS04/04)

INTERPRETATIONS

Management objective: - manage for 8e sawlog on a 90-year rotation.

Concerns: - drought

Logging: - clearcut

Site preparation:

Objectives - maintain organic layers; reduce debris; improve planter access; prepare plantable upots

Mechanical - no mechanical site preparation on steep slopes or shallow soils; patch scarifiers can be used (carefully!) on sites with deeper soils

Prescribed fire - broadcast burn (remove L horizon), or brown and burn

Species choice:

Preferred - 8e
Acceptable - 8l

Brush hazard: - moderate (false azalea, fireweed)

Silviculture applications: - low fuel loadings may make it difficult to broadcast burn these sites. One may have to wait for invasion of the site by vegetation and then conduct a brown and burn program to treat the site for planting.

Silviculture problems: - wind may funnel up many of the drainages in this subzone causing trees to blow down along culvert boundaries.
- moderate brush competition will likely occur within 3 years of harvesting; sites should be inspected at 3 years to determine if any further treatments are required.
- 8l may be susceptible to snowpress damage.
FALSE AZALEA - OAK FERN

VEGETATION

Tree Layer: 40% cover
- Subalpine fir, Engelmann spruce

Shrub Layer: 35% cover
- Menziesia ferruginea (false azalea)
- Vaccinium membranaceum (black huckleberry)
- Vaccinium ovalifolium (oval-leaved blueberry)
- Ribes lacustre (black gooseberry)
- Rhododendron albiflorum (white-flowered rhododendron)

Herb Layer: 40% cover
- Rubus pedatus (five-leaved bramble)
- Lycopodium annotinum (stiff club-moss)
- Tiarella unifoliata (one-leaved foamflower)
- Gymnocarpium dryopteris (oak fern)
- Dryopteris carthusiana (spiny wood fern)
- Orthilia secunda (one-sided wintergreen)
- Listera cordata (heart-leaved twayblade)
- Corydalis canadensis (bunchberry)
- [Valeriana richardii] (stika valerian)

Moss Layer: 85% cover
- Pleurozium schreberi (red-stemmed feathermoss)
- Philonotis crista-castrensis (knight's plumes)
- Barbiglophosia lycopodioides (common leafy liverwort)
- [Hylocomium splendens] (step moss)

SOIL AND SITE

 Moisture Regime: subhygric - hygric
 Nutrient Regime: (poor-) rich
 Slope Gradient (%): 30 (7-64)
 Slope Position: lower to toe, or mid- with northerly aspect
 Parent Material: variable
 Soil Texture: variable
 Coarse Fragments (%): 42 (10-63)
 Site Index: B1 23 (19-34)
 Se 25 (18-32)

DISTRIBUTION: common
FALSE AZALEA - OAK FERN (BSF0/05)

INTERPRETATIONS

Management objectives: - manage for 8e sawlog on a 90-year rotation.

Concerns: - compaction
- high water table
- windthrow
- snowpack
- watershed management

Logging: - clearcut

Site preparation:

Objectives - reduce organic layers; reduce debris; prepare planting spots; improve planter access; minimize future brush competition; avoid compaction on finer-textured soils

Mechanical - patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; FMC with 6-way blade on finer-textured soils or steep slopes

Prescribed fire - broadcast burn in summer, or brown and burn.

Species choice:

Preferred - 8e

Acceptable

Brush hazard: - very high (false azalea, red raspberry, Sitka alder, devil's club, fireweed)

Silviculture applications: - maintain 8I at up to 300 stems per hectare
- harvest sites only in the winter.
- summer planting.
- use large planting stock.
- a brushing and weeding program will be required.

Silviculture problems: - getting the appropriate conditions to achieve a good prescribed burn is not likely to occur unless burning is conducted during the summer.
- very high brush competition will require an inspection of harvested sites at time periods 2 and 4 years after planting. These inspections may indicate the need for further brushing and weeding to keep back brush competition.
- use of cattle for vegetation control on 0-30% slopes could be beneficial.
DEVELO'S CLUB - LEAFY MOSS

VEGETATION

Tree Layer: 45% cover
- Engelmann spruce, subalpine fir

Shrub Layer: 75% cover
- Opopanax horridus (devil's club)
- Manzanita ferruginea (false azalea)
- Ribes lacustre (black currant)
- Vaccinium membranaceum (black huckleberry)

Herb Layer: 55% cover
- Gymnocarpium dryopteris (oak fern)
- Rubus pedatus (five-leaved bramble)
- Dryopteris asplenias (spiny wood fern)
- Cornus canadensis (bunchberry)
- Lycopodium annotinum (stiff club-moss)
- Tiarella unifolia (one-leaved foamflower)
- Strepoptus americans (clamping twistedstalk)
- Athyrium filix-femina (lady fern)

Moss Layer: 60% cover
- Pleuroeum schreberi (red-stemmed feathermoss)
- Pilium cristae-castrensis (knight's plume)
- Mniium spp. (leafy mosses)
- Barbirolephia lycoptiodes (common leafy liverwort)
- Hymenium splendens (step moss)

SOIL AND SITE

- Moisture Regime: (subhygic -) hygic
- Nutrient Regime: (poor -) rich
- Slope Gradient (%): 28 (7-52)
- Slope Position: lower - toe
- Parent Material: variable
- Soil Texture: variable
- Coarse Fragments (%): 49 (10-63)
- Site Index: BI 25 (19-31)
- SE 33 (25-37)

COMMENTS

This association is very similar to the ESSFo/05. Sites in the ESSFo/06 have a higher (greater than 50%) shrub cover and the presence of devil's club, frequently with lady fern. These sites are also more productive.

DISTRIBUTION: fairly common
DEVIL'S CLUB - LEAFY MOSS (ESG#06/08)

INTERPRETATIONS

Management objective: - manage for Se sawlog on a 90-year rotation.

Concerns: - compaction
- high water table
- windthrow
- snowpack
- watershed management

Logging: - clearcut

Site preparation:

Objective - reduce organic layers; reduce debris; prepare planting spots; improve planter access; minimize future brush competition; avoid compaction on finer-textured soils

Mechanical - patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; FMC with 6-way blade on finer-textured soils or steep slopes

Prescribed fire - broadcast burn in summer, or brown and burn

Species choice:

Preferred - Se

Brush hazard: - very high (red raspberry, devil's club, fireweed)

Silviculture applications: - harvest sites only in the winter.
- summer planting.
- use large planting stock.
- a brushing and weeding program will be required.

Silviculture problems: - getting the appropriate conditions to achieve a good prescribed burn is not likely to occur unless burning is conducted during the summer.
- very high brush competition will require an inspection of harvested sites at time periods 2 and 4 years after planting. These inspections may indicate the need for further brushing and weeding to keep back brush competition.
- use of cattle for vegetation control on 0-30% slopes could be beneficial.
LABRADOR TEA - HORSETAIL

VEGETATION

Tree Layer: 20% cover
Hybrid white spruce, subalpine fir, (lodgepole pine)

Shrub Layer: 55% cover
- Ledum groenlandicum (Labrador tea)
- Lonicera involucrata (black twinberry)
- Ribes Leucotr (black gooseberry)
- Menziesia ferruginea (false azalea)
- Salix spp. (willows)
- subalpine fir

Herb Layer: 65% cover
- Equisetum arvense (common horsetail)
- Carex diosperma (soft-leaved sedge)
- Calamagrostis canadensis (bluejoint)
- Petasites palustre (palate coltsfoot)
- Rubus pedatus (five-leaved bramble)
- Pyrola asarifolia (rosy wintergreen)
- Lycopodium annotinum (stiff club-moss)
- Cornus canadensis (bunchberry)
- Polygala angustifolia (fireweed)
- Gymnocarpium dryopteris (oak fern)
- Leptocarpa pyrolifolia (leatherleaf saxifrage)
- Vaccinium caespitum (dwarf blueberry)

Moss Layer: 65% cover
- Sphagnum capillare (common red sphennum)
- Pleurocarpum schreberi (red-stemmed feathermoss)
- Hylocomium splendens (step moss)
- Aulacomnium palustre (glow moss)
- Prullum crispa-castrensis (knight's plume)

SOIL AND SITE

Moisture Regime: subhydric
Nutrient Regime: oligotrophic
* Slope Gradient (%): 8 (5-13)
* Slope Position: (lower -) toe
* Parent Material: fluval, sometimes with organic capping
* Soil Texture: medium to fine or organic
* Coarse Fragments (%): 14 (0-25)
* Site Index: BI 16 (13-17)
* Se 17 (14-22)

DISTRIBUTION: rare and small in size
LABRADOR TEA - HORSETAIL (ESSFo/07)

INTERPRETATION

Management objective: non-commercial at this time.
10 LITERATURE CITED


APPENDIX 1. Meso slope position diagram

a. **Crest** - the generally convex uppermost portion of a hill (meso scale); it is usually convex in all directions; no distinct aspect.

b. **Upper Slope** - the generally convex upper portion of the slope of a hill (meso scale) immediately below the crest; it has a convex surface profile with a specific aspect.

c. **Middle Slope** - the area of the slope of a hill between the upper slope and the lower slope, where the slope profile is not generally concave or convex; it has a straight or somewhat sigmoid surface profile with a specific aspect.

d. **Lower Slope** - the area toward the base of the slope of the hill. It generally has a concave surface profile with a specific aspect.

e. **Top** - area defined by extent of homogeneous site of slight slope; clearly demarcated by an abrupt decrease to the slope (below and adjacent to the lower slope).

f. **Depression** - any area that is concave in all directions; generally at the foot of a meso scale hill or in generally level area.

g. **Level** - any level meso scale area not adjacent to a meso scale hill. The surface profile is generally horizontal with no significant aspect.
APPENDIX 2. Hand texturing field guide

Soil texture refers to the relative proportions of the sand, silt, and clay separates within a soil. These separates have their own distinctive properties of "feel", allowing one to estimate their proportions in a sample of soil by hand texturing. Texture can be estimated very roughly from a dry sample. Clayey materials are very hard, loamy and silty materials are slightly hard to soft, and sandy materials are loose grained. To be more precise, hand texturing should be done using the wet sample procedure given below.

Step 1

Obtain a small handful of soil, crush it in the hand, and remove coarse fragments (particles greater than 2 mm in diameter).

Step 2

Gradually add water to the soil and work it into a moist putty with a soil knife or fingers. The correct moisture content is important. If the putty flows with the force of gravity, then it is too wet. If it crumbles when rolled, then it is too dry. It should have the consistancy of a filler putty.

Step 3

Determine stickiness of the soil putty by working it between the thumb and forefinger, pressing and then separating the fingers. An estimate of clay content can be made in this way. (clay limits below are approximate).

NONSTICKY: practically no soil material adheres to the thumb and forefinger (less than 10% clay).

SLIGHTLY STICKY: soil material adheres only to one of the fingers and comes off the other rather cleanly. The soil does not stretch appreciably when fingers are separated (less than 25% clay).

STICKY: soil material adheres to both fingers and stretches slightly before breaking when fingers are pulled apart (25-40% clay).

VERY STICKY: soil putty adheres strongly to both fingers and stretches distinctly before breaking (greater than 40% clay).
Step 4

Determine the grittiness of the soil putty by rubbing it between thumb and forefinger. An estimate of sand content can be made in this way. (Sand limits below are approximate).

**Nongritty:** Little or no grit can be felt (less than 20% sand).

**Slightly Gritty:** Some grit is felt but nongritty material (silt and clay) is dominant (20-50% sand).

**Gritty:** Sand is felt as the dominant material. Some nongritty material can be felt between sand grains (50-80% sand).

**Very Gritty:** Sand is the only material that is felt. Little or no nongritty material present (greater than 80% sand).

Step 5

After stickiness and grittiness have been determined, the hand texturing table can be used as an approximate guide to the textural class of the soil. The textural triangle (Figure 14) can be used for a more accurate determination of the textural class.

<table>
<thead>
<tr>
<th></th>
<th><strong>Nongritty</strong> (≤20% sand)</th>
<th><strong>Slightly Gritty</strong> (20-50% sand)</th>
<th><strong>Gritty</strong> (50-80% sand)</th>
<th><strong>Very Gritty</strong> (≥80% sand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Sticky</td>
<td>SILTY CLAY</td>
<td>CLAY</td>
<td>SANDY CLAY</td>
<td>--</td>
</tr>
<tr>
<td>(≥40% clay)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sticky</td>
<td>SILTY CLAY</td>
<td>CLAY LOAM</td>
<td>SANDY CLAY</td>
<td>--</td>
</tr>
<tr>
<td>(25-40% clay)</td>
<td>LOAM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slightly Sticky</td>
<td>SILT LOAM</td>
<td>LOAM</td>
<td>SANDY LOAM</td>
<td>--</td>
</tr>
<tr>
<td>(10-25% clay)</td>
<td>or SILT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonsticky</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>LOAMY SAND or SAND</td>
</tr>
<tr>
<td>(≤10% clay)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Sand and clay limits are approximate.

*Loam is a textural class exhibiting physical properties intermediate between those of sand, silt, and clay.
FIGURE 14. Soil textural triangle.
APPENDIX 3. Identification of upland humus forms

Mors:  
- matted F horizon
- common fungal mycelium (white or yellow)
- little or no intermixing of organic and mineral materials
- abrupt boundary between organic and mineral horizons

Moders:  
- loosely arranged F horizon
- friable
- insect droppings
- fungal mycelium and soil organisms (arthropods and occasional earthworms)
- intermixing of organic and mineral horizons
- gradual transition between mineral and organic horizons

Nolls:  
- often no F or M horizons (thin if present)
- insect droppings abundant
- usually many soil organisms but may form from decomposition of a dense network of roots (N.B.: usually abundant earthworms)
- considerable of intermixing of mineral and organic layers, with incorporation of organic matter into surface mineral soil (Ah horizon)

F horizon: horizon in which partial (rather than entire), macroscopically recognizable vegetative structures are dominant, i.e., the horizon is partially decomposed.
APPENDIX 4. Key to the identification of potential moisture regime (part 1).
(from Green et al. 1984)

This key was devised to aid field staff in identifying potential moisture regimes using readily observable environmental features. It should be applied with caution on ridge crests, upper slopes, and middle slopes which have soils with thick (>20 cm) organic layers. Moisture regime in these cases will generally be higher than indicated. The table below provides definitions for the categories used in the key.

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridge crest</td>
<td>height of land; usually convex slope shape.</td>
</tr>
<tr>
<td>Upper slope</td>
<td>the generally convex shaped, upper portion of a slope.</td>
</tr>
<tr>
<td>Middle slope</td>
<td>the portion of a slope between the upper and lower slopes; the slope shape is usually straight.</td>
</tr>
<tr>
<td>Lower slope</td>
<td>the area towards the base of a slope; the slope shape is usually concave. It includes toe slopes which are generally level areas located directly below and adjacent to the lower slope.</td>
</tr>
<tr>
<td>Flat</td>
<td>any level area (excluding toe slopes); the surface shape is generally horizontal with no significant aspect.</td>
</tr>
<tr>
<td>Alluvium</td>
<td>post-glacial, active floodplain deposits along rivers and streams in valley bottoms; usually a series of low benches and channels.</td>
</tr>
<tr>
<td>Depression</td>
<td>any area that is concave in all directions; usually at the foot of a slope or in flat topography.</td>
</tr>
<tr>
<td>Soil depth</td>
<td>depth from the mineral soil surface to a restricting layer such as bedrock, strongly compacted, or strongly cemented materials (e.g. “hardpan”).</td>
</tr>
<tr>
<td>Gleyed</td>
<td>soils that have orange coloured mottles indicative of a fluctuating water table. Permanently gleyed soils are dull yellowish, blue, or olive in colour.</td>
</tr>
<tr>
<td>Soil particle</td>
<td>sandy&lt;sup&gt;a&lt;/sup&gt; with &gt;35% volume of coarse fragments, or size coarse loamy&lt;sup&gt;a&lt;/sup&gt; with &gt;70% volume of coarse fragments.</td>
</tr>
<tr>
<td>Fine texture</td>
<td>silty&lt;sup&gt;a&lt;/sup&gt; or clayey&lt;sup&gt;a&lt;/sup&gt; with low coarse fragment volume.</td>
</tr>
</tbody>
</table>

<sup>a</sup>sandy = LS, S; loamy = SL, L, SCL; clayey = SICL, CL, SC, SIC, C; silty = SL, S.
APPENDIX 4. Key to the identification of potential moisture regime (part 2)

Numbers on the right refer to moisture regime classes as used in the edaphic grid (FIGURE 3): 0.1 = xeric; 2 = subxeric; 3 = submesic; 4 = mesic; 5 = subhygry; 6 = hygry; 7 = subhydric.
APPENDIX 5. Key to determination of nutrient regime

1a Coarse-textured

2a Very high coarse fragments (>50%) or very shallow (<30 cm) soil.

3a Nor humus form

5 Very Poor

3b Moder humus form

Poor - Medium

2b Low or zero coarse fragments, deep soil

4a Nor humus form

Poor

4b Moder humus form

Medium

4c Mull humus form

Rich - Very Rich

1b Moderately coarse- and medium-textured

5a Very high coarse fragments (>50%); or very shallow soil (<30 cm); or shallow rooting depth

6a Nor humus form

Poor

6b Moder

Medium

5b Low or zero coarse fragments without restricted rooting depth

The presence of base-rich parent materials (limestone, shales, basalt) may improve the nutrient status.
7a Mor humus form  
7b Moder humus form  
7c Mull humus form  

1c Moderately fine- and fine-textured  
8a Very high coarse fragments (rare); or very shallow soil; or shallow rooting depth (<15 cm)  
9a Mor humus form  
9b Moder humus form  
9c Mull humus form  

Rich  
8b Low or zero coarse fragments, with good rooting depth (>20 cm)  
10a Mor humus form  
10b Moder humus form  
10c Mull humus form  

Very Rich
APPENDIX 6. Forest cover types associated with each site unit

<table>
<thead>
<tr>
<th>Ecosystem Unit</th>
<th>Forest Cover Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICHV1/01</td>
<td>HC, CH, C(H), H(C)</td>
</tr>
<tr>
<td>ICHV1/02</td>
<td>HC, CH</td>
</tr>
<tr>
<td>ICHV1/03</td>
<td>HC, CH</td>
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<tr>
<td>ICHV1/04</td>
<td>HC, H, H(C)</td>
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<tr>
<td>ICHV1/05</td>
<td>B, SC, B(Ac)</td>
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<tr>
<td>ICHV1/06</td>
<td>CH, HC</td>
</tr>
<tr>
<td>ICHV1/07</td>
<td>HC, CH, H(C), H, SB, BCF, SMB</td>
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<tr>
<td>ICHV1/08</td>
<td>F(P), F</td>
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<tr>
<td>ICHV1/09</td>
<td>HC, H(C), H(P), PH</td>
</tr>
<tr>
<td>ICHV1/10</td>
<td>CH, HC</td>
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<tr>
<td>ICHV1/11</td>
<td>CH, HC, SB, BS</td>
</tr>
<tr>
<td>ICHV1/12</td>
<td>C, CS</td>
</tr>
<tr>
<td>ICHV1/13</td>
<td>SB(P1)</td>
</tr>
<tr>
<td>ICHV1/14</td>
<td>H, HC</td>
</tr>
<tr>
<td>ICHV2/01</td>
<td>CH, HC</td>
</tr>
<tr>
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<td>HP1, P1H</td>
</tr>
<tr>
<td>ICHV2/03</td>
<td>CH, HC, CB</td>
</tr>
<tr>
<td>ICHV2/04</td>
<td>HP, PH</td>
</tr>
<tr>
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<td>CH, HC, SB, CS</td>
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<tr>
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<td>HC, H(C)</td>
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<td>CH, HC</td>
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<tr>
<td>ICHV2/09</td>
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<tr>
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<td>FPL1, F1P, F(P1,S), S(#,P1) with B, At, EP minors</td>
</tr>
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<tr>
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<tr>
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<tr>
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<td>SP (At,P1), S#(F,P1), S(At,F,Bi), AtB</td>
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<td>S, S(AC, At, B, P1), S#AC</td>
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<td>SB, SB(P1)</td>
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<td>SB</td>
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<tr>
<td>ESSFb/01</td>
<td>S, BB, SBH</td>
</tr>
<tr>
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<td>B(#), SB</td>
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<tr>
<td>ESSFp/03</td>
<td>S(#), SB, S(P1), P1</td>
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<tr>
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<td>B(P1), F(B), P1, occasionally B(S)</td>
</tr>
<tr>
<td>ESSFp/05</td>
<td>BB, S(B)</td>
</tr>
<tr>
<td>ESSFp/06</td>
<td>S(#), SB</td>
</tr>
<tr>
<td>ESSFp/07</td>
<td>SB, S(#), S(P1)</td>
</tr>
</tbody>
</table>