# 2007 Terrestrial Ecosystem Mapping Final Report:

# Lheidli T'enneh Community Forest

*Prepared for:*

Lheidli T'enneh Community Forest

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# 1 INTRODUCTION

The Lheidli T'enneh Community Forest (LTCF) land base is diverse and supports numerous habitat types and growth potential. Venture Forestry Consulting Inc. (Venture), on behalf of Ainsworth Lumber Company Ltd., contracted Timberline Natural Resource Group to produce a Terrestrial Ecosystem Mapping (TEM) product for the community forest that can be used for multiple purposes such as site productivity estimates, timber supply review, landscape and site level planning, habitat identification, biodiversity management, species and ecosystem at risk monitoring, and other sustainable forest management related activities. The detailed TEM product will provide them with a useful foundation for these and other land use planning purposes.

A previously completed Predictive Ecosystem Mapping (PEM) product for the Prince George Timber Supply Area (PGTSA) provided the ecosystem linework information used for the Lheidli T'enneh Community Forest TEM. The PGTSA PEM was built on a foundation using integrated Vegetation Resources Inventory (VRI) and terrain mapping, as well as TRIM and Biogeoclimatic line work, as such terrain information was also available for this TEM.

This TEM is consistent with the concepts laid out in the following documents:

- *Standards for Terrestrial Ecosystem Mapping in British Columbia (RIC 1998)* Resource Inventory Committee;
- *Standard for Terrestrial Ecosystem Mapping (TEM) Digital Data Capture in British Columbia: Ecosystem Technical Standards and Database Manual. Version 3.0 (2000),.* Resource Inventory Committee;
- *Standards for Terrestrial Ecosystem Mapping (TEM) Digital Data Capture in British Columbia, Version 3.0 (2000), Errata No 1.0.* Resource Inventory Committee; and
- *Standard for Digital Terrain Data Capture Errata 2006-1-LBIP* . Resource Inventory Committee.

## 1.1 Project Area

The community forest is comprised of two parcels of land, one north of Prince George in the Salmon River area, referred to as the Salmon Unit, and the other south of Prince George, to the east of Fyfe Lake, referred to as the Fyfe Unit. The community forest is 13,092 hectares in size. Mature trembling aspen and lodgepole pine are the dominant tree species in both units. The location and boundaries of the community forest were chosen based on the requirements of a predominantly deciduous annual allowable cut (AAC).

The Salmon unit falls within the Nechako Lowlands Ecosection. The Nechako Lowlands is a large, flat, glaciated plain. It contains portions of the Nechako, Stuart and Fraser rivers and

hundreds of small lakes and wetlands linked by very slow-moving, meandering streams. The Nechako Lowland has experienced high levels of timber harvesting and periodic wildfires. Major urban and agricultural development exists along the major highways and rail lines and virtually no large tracts of the Ecosection remain undisturbed. The Fyfe unit falls within the Quesnel Lowlands Ecosection. The Quesnel Lowlands Ecosection is a similar lowland area to the Nechako Lowlands but has a slightly warmer and drier climate than the latter.

The climate of the project area can be described using biogeoclimatic units. The entire project area is within the Sub-Boreal Spruce Zone. This zone is characterized by a continental climate with extremes in temperature. Summers are short but warm and moist, with daytime temperatures that occasionally reach into the 30's. Winters can be severe, with extended periods below $-10^0$C and extremes that can reach into the -30's.

The Sub-Boreal Spruce Zone is further divided into the following three subzone/variants in the project area:

SBSmk1: Mossvale Moist Cool Sub-Boreal Spruce (Salmon unit)
SBSdw3: Stuart Dry Warm Sub-Boreal Spruce (Fyfe unit)
SBSmh: Moist Hot Sub-Boreal Spruce (Fyfe unit)

The SBSdw3 and the SBSmh both occur in the Fyfe Unit, with the SBSmh forming a narrow band along the Fraser River. The SBSmk1 occurs solely in the northern Salmon River Unit.

# 2 METHODS

## 2.1 Existing Data Sources and Support Materials

The following data sources and support materials were used to produce this TEM:

a) Biogeoclimatic Ecosystem Classification version 6 (BC, MoFR, 2005)
b) Ecosystem field sample plots: 80 GIF plots and 131 visual plots
c) 1:35 000 color digital air photo imagery (BC BMGS), 2003
d) The Lheidli T'enneh Community Forest Boundary
e) Ecosystem linework and reference attributes from *Predictive Ecosystem Mapping of the Prince George and Fort St. James Forest Districts* (Timberline Natural Resource Group, 2006). Refer to *Predictive Ecosystem Mapping of the Prince George and Fort St James Forest Districts: Input Data Quality Assessment and Metadata Report* (Timberline Natural Resource Group, 2006) for more information regarding polygon linework generation, BAPID, 4052.

f) Terrain information and attributes from Bioterrain Mapping of the Summit Bioterrain/VRI (Timberline, 2005), Canfor (Prince George) Buckhorn Terrain/VRI Mapping (GeoWest, 2004) and the Prince George Timber Supply Area Vegetation Terrain Inventory Bioterrain Database (Pelican TEM (Bioterrain)/Vegetation Resource Inventory (Timberline, 2004).

## 2.2 Development of TEM Polygons

This TEM project utilized existing ecosystem linework and reference attributes from *Predictive Ecosystem Mapping of the Prince George and Fort St. James Forest Districts (2006).* Refer to *Predictive Ecosystem Mapping of the Prince George and Fort St James Forest Districts: Input Data Quality Assessment and Metadata Report* (Timberline, 2006) for more information regarding polygon linework generation, A GIS overlay process was used to extract the PEM linework for the LTCF landbase in March of 2007, using the current proposed community forest boundary approved by Ministry of Forest and Range officials. A GIS hardline and elimination process was used to remove sliver polygons created along the study area boundary during the GIS overlay process.

Terrain attributes were extracted from the three terrain projects for the LTNCF TEM polygons. Terrain attributes were adjusted only if field plot data supported changes.

Mapsheet lines were hardlined in the PGTSA PEM and were therefore also hardlined in the Lheidli T'enneh Community Forest TEM as part of the ecosystem linework. The resulting TEM linework therefore maintains its relationship to the original VRI/Terrain linework which will simplify future anayses combining VRI and TEM attributes such as SIBEC (Site Index Biogeoclimatic Ecosystem Classification).

## 2.3 Field Sampling

Preliminary field work for the TEM began in the summer of 2006, when a SIBEC project was completed throughout the proposed community forest land base. At this time field sampling to support a TEM product was also completed. Additional field sampling necessary to complete a TEM at a survey intensity level 4 was completed in the 2007 field season.

A survey intensity level 4 (ESIL4) was selected for this project which provides a reasonable balance between cost and reliability. Field sampling is considered a critical component to the accuracy and reliability of a TEM. It is required to confirm ecosystem and terrain map unit designations and boundaries, to collect field data for ecosystem descriptions and to develop or refine the classification of ecosystem units.

The determination of ESIL4 for this project is based on the size of the project area (# samples per 100ha), rather than on a proportion of polygons visited. This sampling strategy was chosen to permit the ecologist to focus on visual signatures/patterns within a polygon, which sometimes require multiple inspections within a single polygon.

The 1998 RISC standards (Table 6.4) require 60-100 field inspections per 15,101 hectares for a level 4 TEM. The community forest is 13,069 ha. Due to the diverse nature of the project area the maximum number of plots was completed. Typically, field plots are carried out in a 5:20:75 proportion (full plots (FS882): ground inspection forms (GIFs): Visuals. Permission was received from Corey Erwin (pers. comm, 2006) to convert required FS882s into GIFs at a ratio of 2:1 (ie. 2 GIFs for each FS882). This means that the GIF:Visuals ratio for this project area was 30:75.

A total of 208 plots (81 GIF and 127 Visual inspections) were completed during the 2006 and 2007 field sampling programs. Due to changes in the LTCF boundary, finalized in March 2007, 74 plots from the 2006 field season fell outside of the new boundary. Of the plots that fell outside of the revised community forest boundary, 20 of them were within 500m of the boundary and provided useful reference for TEM classification. A total of 134 plots (51 GIFs and 83 visual inspections) fall within the current community forest boundary.

Data from the GIF plots and the visual inspections (2007 field sampling) were digitally captured using VENUS 5.0 (tem_4523_eci.mdb). The visual inspections from the 2006 field season were also digitally captured in an Excel spreadsheet (tem_4523_eci.csv).

Road access into the community forest was a limiting factor for distributing the field inspections throughout the project area. As a result, the field plots tended to be clustered. Transects were used to extend the sampling into the community forest; field plots (GIF and visuals) were established along these transects to document changes in ecosystem and/or terrain attributes.

Past plot work, from the PGTSA PEM, PGTSA SIBEC and PGTSA Terrain/Bioterrain was explored to determine if existing data could be used to augment the TEM product. However, based on the community forest boundary used for this TEM project, no additional samples from these projects fall inside the study area boundary.

## 2.4 Ecosystem Classification

Ecosystem classification for this TEM project was completed using 1:35 000 digital color imagery in a PurView™ GIS mapping environment. PurView™ is a fully integrated

stereoscopic image display and viewing extension for ArcGIS®. Information on PurView™ can be found at the following website: http://www.mypurview.com/.

Core ecological polygon attributes were recorded for the polygons as per the following standards:

- *Standard for Terrestrial Ecosystem Mapping in British Columbia*, (RIC 1998);
- *Standards for Terrestrial Ecosystem Mapping (TEM) Digital Data Capture in British Columbia, Errata 1.0 (2000); and*
- *Standard for Digital Terrain Data Capture Errata 2006-1-LBIP.*

The ecosystem attributes that were classified for the Lheidli T'enneh Community Forest included:

- Biogeoclimatic zone, subzone, variant and phase(Bgc_Zone, Bgc_Subzon, Bgc_Vrt, Bgc_Phase);
- Site series, up to three components (Site_S1, Site_S2, Site_S3);
- Site series map code for each site series component (Site_MC1, Site_MC2, Site_MC3);
- Site series proportion for each site series component (Sdec_1, Sdec_2, Sdec_3);
- Atypical site modifiers for each site series component (Site_m1a, Site_m1b, Site_m2a, Site_m2b, Site_m3a, Site_m3b);
- Structural stage for each site series component (Strct_S1, Strct_S2, Strct_S3);
- Structural stage modifier for each structural stage component (Strct_M1, Strct_M2, Strct_M3).
- Terrain texture1, up to three components (Ttex_1a, Ttex2a, Ttex3a)
- Terrain texture2, up to three components (Ttex_1b, Ttex2b, Ttex3b)
- Terrain texture3, up to three components (Ttex_1c, Ttex2c, Ttex3c)
- Surficial material, up to three components (Surfm_1, Surfm_2, Surfm_3)
- Surficial material qualifier, up to three components (Surfm_Q1, Surfm_Q2, Surfm_Q3)
- Surface expression1, up to three components (Surf_E1a, Surf_E2a, Surf_E3a)
- Surface expression2, up to three components (Surf_E1b, surf_E2b, Surf_E3b)
- Surface expression3, up to three components (Surf_E1c, Surf_E2c, Surf_E3c)
- Subterrain texture1, up to three components (Sttex_1a, Sttex_2a, Sttex_3a)
- Subterrain texture2, up to three components (Sttex_1b, Sttex_2b, Sttex_3b)
- Subterrain texture3, up to three components (Sttex_1c, Sttex_2c, Sttex_3c)

- Subsurficial material, up to three components (Ssurf_1, Ssurf_2, Ssurf_3)
- Subsurficial material qualifier, up to three components (Ssurf_Q1, Ssurf_Q2, Ssurf_Q3)
- Subsurface expression1, up to three components (Ssurf_E1a, Ssurf_E2a, Ssurf_E3a)
- Subsurface expression2, up to three components (Ssurf_E1b, Ssurf_E2b, Ssurf_E3b)
- Subsurface expression3, up to three components (Ssurf_E1c, Ssurf_E2c, Ssurf_E3c)
- Geomorphological process, up to 3 classes, (Geop_1, Geop_2, Geop_3)
- Geomorphological process subclass1, up to 3 components (Geop_Scm1a, Geop_Scm2a, Geop_Scm3a)
- Geomorphological process subclass2, up to 3 components (Geop_Scm1b, Geop_Scm2b, Geop_Scm3b)
- Geomorphological process subclass3, up to 3 components (Geop_Scm1c, Geop_Scm2c, Geop_Scm3c)
- Soil drainage class, up to 2 classes (Drain_11, Drain_2)
- Soil drainage separator (Drain_Sep)

### 2.5 GIS

GIS work was completed by the Timberline GIS group in Prince George, BC. The spatial files generated for this project were:

- Polygon layer with imbedded TEM attributes (tem_4523_ecp.e00); and
- Ground sample point locations (tem_4523_eci.e00)

## 3 RESULTS

### 3.1 Map Legend and Expanded Legend

A map legend provides a summarized description of all map unit components and map codes, together with other supporting information including survey objectives, survey intensity, data sources, and aerial photograph references. All ecosystem units mapped and associated map codes were described in the map legend (Appendix I). This legend is equivalent to the map codes definition and map entity lists commonly referred to in other types of ecosystem mapping approaches such as Predictive Ecosystem Mapping (PEM). The legend follows the

standards outlined in *Standards for Terrestrial Ecosystem Mapping in British Columbia* (RIC, 1998). This information is also delivered as *tem_4523_ml.pdf*.

An expanded legend provides additional information on plant species composition by structural stage for each map unit. Since field sampling was focused on structural stages 5 (young forest) and 6 (mature forest), the expanded legend (Appendix II) provides plant species composition for all ecosystem map units for young and mature forests (Venus 5.0 summary reports) as well as the plant species composition described in *Land Management Handbook 51* (Delong 2003) and *Land Management Handbook 24* (Delong et. al, 1993). The expanded legend is also delivered as an independent file, *tem_4523_el.pdf*.

## 3.2 Ecosystem Distribution

An area summary was developed to provide an overview of the abundance, by area (in hectares), of forested ecosystem units, wetlands, non-vegetated, sparsely vegetated, and anthropogenic sites for the Lheidli T'enneh Community Forest. An area summary for all map units in the Lheidli T'enneh Community Forest is shown in Table 3.1. The Conservation Data Center's red and blue listed ecosystems are highlighted in red/blue in the area summary table; see section 4.2 of this report for a summary of potential rare plant communities within the TEM project area.

**Table 3.1 Ecosystem Abundance by Area (hectares)**

| Ecosystem Abundance Area (ha) | | | | | |
|---|---|---|---|---|---|
| Map Code (Ecosystem Association) | Site Series | Biogeoclimatic Subzone/Variant | | | Grand Total (ha) |
| | | SBS dw 3 | SBS mh | SBS mk 1 | |
| SB | 01 | 0 | 0 | 4345.4 | 4345.4 |
| SN | 01 | 0 | 58.7 | 0 | 58.7 |
| SP | 01 | 1259.4 | 0 | 0 | 1259.4 |
| DC | 02 | 1.7 | 0 | 0 | 1.7 |
| LM | 02 | 0 | 0 | 0 | 0.0 |
| LC | 03 | 7.3 | 0 | 33.6 | 40.9 |
| DD | 04 | 0 | 0.2 | 0 | 0.2 |
| DK | 04 | 0 | 0 | 29.3 | 29.3 |
| SR | 04 | 158.9 | 0 | 0 | 158.9 |
| BF | 05 | 12.0 | 0 | 0 | 12.0 |
| SF | 05 | 0 | 46 | 0 | |
| BH | 06 | 0 | 0 | 920.7 | 920.7 |
| SS | 06 | 375.7 | 0 | 0 | 375.7 |
| SC | 06 | 0 | 24.6 | 0 | 24.6 |
| ST | 05 | 0 | 0 | 758.3 | 758.3 |
| | 07 | 802.6 | 0 | 0 | 802.6 |

| Ecosystem Abundance Area (ha) | | | | | |
|---|---|---|---|---|---|
| Map Code (Ecosystem Association) | Site Series | Biogeoclimatic Subzone/Variant | | | Grand Total (ha) |
| | | SBS dw 3 | SBS mh | SBS mk 1 | |
| SD | 07 | 0 | 4.9 | 0 | 4.9 |
| | 08 | 0 | 0 | 201.3 | 201.3 |
| SO | 07 | 0 | 0 | 1762.4 | 1762.4 |
| | 08 | 388.9 | 0 | 0 | 388.9 |
| OF | 08 | 0 | 2.4 | 0 | 2.4 |
| SH | 09 | 145.3 | 1.6 | 694.7 | 841.6 |
| BS | 10 | 2.1 | 0 | 0 | 2.1 |
| BB | 10 | 0 | 0 | 119.0 | 119.0 |
| Fl05 | 00 | 5.2 | 0 | 0 | 5.2 |
| Wb13 | 00 | 0 | 0 | 204.7 | 204.7 |
| Wf05 | 00 | 0 | 0 | 59.1 | 59.1 |
| Wm01 | 00 | 6.9 | 0 | 16.9 | 23.8 |
| Wm02 | 00 | 7.6 | 0 | 0 | 7.6 |
| Ws04 | 00 | 0 | 0 | 99.8 | 99.8 |
| Ws50 | 00 | 0 | 0 | 112.8 | 112.8 |
| GB | 00 | 0 | 0 | 56.8 | 56.8 |
| GP | 00 | 0 | 0 | 5.4 | 5.4 |
| LA | 00 | 0 | 0 | 238.3 | 238.3 |
| OW | 00 | 3.2 | 0 | 7.8 | 11.0 |
| PD | 00 | 0 | 0 | 13.7 | 13.7 |
| RN | 00 | 0 | 0 | 18.7 | 18.7 |
| RZ | 00 | 0.6 | 0 | 11.8 | 12.3 |
| RI | 00 | 0 | 0 | 42.4 | 42.4 |
| TA | 00 | 0 | 0 | 1.1 | 1.1 |
| Grand Total | | 3177.3 | 137.9 | 9754.0 | 13069.2 |

***Note: CDC Red-listed ecosystems are highlighted in red; CDC Blue-listed ecosystems are highlighted in blue.**

# 4 DISCUSSION

## 4.1 TEM Methodology

Ecosystem mapping methods vary widely, depending on the objectives of mapping projects, the size of mapping areas, and resource availability. The TEM method (RISC 1998) has been a common method to map ecosystems over relatively small landbases and/or areas with significant ecological complexity. The TEM process uses a method of aerial photo interpretation of individual map polygons based on field data sources, and the mapping ecologist's knowledge and experience. Depending on the scale of the mapping and resolution of the aerial photographs, the TEM method has potential to capture a wide range of

ecosystem units including common ecosystems as well as uncommon/rare ecosystems. Minor ecosystem components that normally intermix with common or matrix ecosystems may also be captured during the aerial photo interpretation process.

The final map accuracy of a TEM product is highly dependent on the consistency of the mapping, experience of the individual mapper, and the quantity and quality of the field data sources. Final map accuracy is determined by third party quality assurance by a qualified professional according to Protocol for Accuracy Assessment of Ecosystem Maps (Meidinger, 2003. The external map accuracy assessment will be completed in 2008.

The Lhedli T'enneh Community Forest TEM adhered to the provincial TEM standards with the following exeptions:

a) Permission was received from Corey Erwin (pers. comm, 2006) to convert required FS882s into GIFs at a ratio of 2:1 (ie. 2 GIFs for each FS882). This means that the GIF:Visuals ratio for this project area was 30:75.
b) Ecosystem linework derived from *Predictive Ecosystem Mapping of the Prince George and Fort St. James Forest Districts* (Timberline Natural Resource Group, 2006). Refer to *Predictive Ecosystem Mapping of the Prince George and Fort St James Forest Districts: Input Data Quality Assessment and Metadata Report* (Timberline Natural Resource Group, 2006) for more information regarding polygon linework generation, BAPID, 4052. The *2007 Terrestrial Ecosystem Mapping Sampling Plan: Lheidli T'enneh Community Forest* (Timberline Natural Resource group, 2007) described this methodology and was approved by Craig Delong, Prince George Regional Ecologist (pers. comm., 2007).
c) Permission was received from Corey Erwin (pers. Comm., 2006) to produce a modified version of the expanded legend. Since field sampling was focused on structural stages 5 (young forest) and 6 (mature forest), the expanded legend (Appendix II) provides plant species composition for all ecosystem map units for young and mature forests (Venus 5.0 summary reports) as well as the plant species composition described in *Land Management Handbook 51* (Delong 2003) and *Land Management Handbook 24* (Delong et. al, 1993).

## 4.2 Rare Plant Communities

Rare ecosystems in British Columbia are identified, tracked and monitored by the BC Conservation Data Centre (CDC). While most rare ecosystems and plant communities are normally found in wetlands across B.C., Table 4.1 is an up-to-date list from the CDC of rare upland ecosystems in the BGC units present across the mapping area (http://www.env.gov.bc.ca/cdc/, January 2008). Table 4.1 also summarizes the frequency of

rare ecosystem polygons that were mapped in this project. Table 3.1 summarizes the area (hectares) of rare ecosystems in the project area.

The Conservation Data Centre defines red and blue listed ecosystems by the following criteria (http://www.env.gov.bc.ca/cdc/, January 2008):

> **Red**: Includes any ecological community that is Extirpated, Endangered, or Threatened in British Columbia. Extirpated ecological communities no longer exist in British Columbia, but do occur elsewhere. Endangered ecological communities are facing imminent extirpation or elimination. Threatened ecological communities are likely to become endangered if limiting factors are not reversed. Placing ecological communities on these lists flags them as being at risk and requiring investigation.
>
> **Blue:** Includes any ecological community considered to be of Special Concern (formerly Vulnerable) in British Columbia. Ecological communities of concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Blue-listed ecological communities are at risk, but are not extirpated, endangered or threatened.

The Lheidli T'enneh Community Forest TEM provides the potential spatial locations of these ecosystems, which is of use for future identification through field visitation, monitoring and operational and strategic management. Potential at-risk ecosystems should be field verified, mapped, documented and assessed by a qualified registered professional. The professional will provide a report of the ecosystem Element Occurrence status and, if necessary, will work with the CDC to recommend a protection strategy for the Lheidli T'enneh Community Forest.

**Table 4.1 Potential and Mapped CDC Red- and Blue-listed Ecosystems in the Lheidli T'enneh Community Forest**

| Scientific Name | English Name | B.C. Status | BEC Units | Mapped Polygon Frequency |
|---|---|---|---|---|
| *Carex lasiocarpa / Drepanocladus aduncus* | Slender sedge / common hook-moss | Blue | SBSmk1/Wf05 | 10 |
| *Carex limosa – Menyanthes trifoliate / Sphagnum spp.* | Shore sedge – buckbean / peat mosses | Blue | SBSmk1/Wb13 | 28 |
| *Equisetum fluviatile – Carex utriculata* | Swamp horsetail – beaked sedge | Blue | SBSdw3/Wm02 | 2 |
| *Picea engelmannii x glauca – Betula papyrifera / Oplopanax horridus* | Hybrid white spruce – paper birch / devil's club | Blue | SBSmh/07 | 1 |
| *Picea engelmannii x glauca / Matteuccia struthiopteris* | Hybrid white spruce / ostrich fern | Red | SBSmh/08 | 1 |
| *Picea engelmannii x glauca / Spirea douglasii – Rosa acicularis* | Hybrid white spruce / hardhack – prickly rose | Blue | SBSdw3/06 | 24 |
| *Pinus contorta – Picea mariana / Pleurozium schreberi* | Lodgepole pine – black spruce / red-stemmed feathermoss | Blue | SBSdw3/05 | 3 |
| *Pseudotsuga menziesii / Acer glabrum / Hylocomnium splendens* | Douglas-fir / Douglas maple / step moss | Red | SBSmh/04 | 1 |
| *Pseudotsuga menziesii – Picea engelmannii x glauca / Ptilium crista-castrensis* | Douglas –fir – hybrid white spruce / knight's plume | Blue | SBSmk1/04 | 5 |
| *Pseudotsuga menziesii – Picea engelmannii x glauca / Rubus parviflorus* | Douglas-fir – hybrid white spruce / thimbleberry | Blue | SBSmh/01<br>SBSmh/05<br>SBSmh/06 | 11<br>10 |
| *Pseudotsuga menziesii – Pinus contorta / Cladonia spp.* | Douglas fir – lodgepole pine / clad onia lichens | Blue | SBSdw3/02<br>SBSmh02<br>SBSmh/03 | 0 |
| *Scheuchzeria palustris / Sphagnum spp.* | Scheuchzeria / peat-mosses | Blue | SBSdw3/Wb12 | 0 |

## 4.3 Ecosystem Connectivity and Biodiversity

At a landscape planning level, ecosystem connectivity can be used as a strategy for maintaining plant and animal diversity and distribution. In the same manner that varying forest structural stages can be recognized using TEM, so too can a series or connection of ecosystems be identified across a landscape. A Forest Ecosystem Network (FEN) that incorporates riparian connectivity could also have positive benefits for water quality and fish habitat. Linking specific TEM attributes that are indicative of riparian ecosystems, such as specific site series and fluvial parent materials, can produce derivative riparian connectivity maps. These maps can then be used to plan operational activities in a manner that maintains the integrity of the FEN or other important form of riparian connectivity

*Biodiversity and Forest Management* (http://www.forestbiodiversityinbc.ca/manage_approach.asp) represents a collaborative effort of the former BC Ministry of Sustainable Resource Management, the BC Ministry of Forests and Range, the former BC Ministry of Water, Land and Air Protection, the Centre for Applied Conservation Research at the University of British Columbia, and Forrex. The primary goal of the website is to provide information that can be used to manage the impacts of timber harvesting on biodiversity. The website outlines three approaches to biodiversity management:

a) Species management to maintain viable populations.
b) Area protection to ensure a portion of all ecosystems are set aside in ecological reserves (referred to as ecosystem representation).
c) Management of changes to land outside ecological reserves resulting from resource extraction (referred to as 'matrix management').

The official definition of biodiversity, developed for the province of British Columbia, states that "Biodiversity is life in all its forms and the habitat and natural processes that support it" (BC Ministry of Environment, http://www.env.gov.bc.ca/wld/,). The indicators of biodiversity described within the *Biodiversity and Forest Management* website have been implemented or are being explored by some of the larger forest companies in BC for their forest certification endeavors.

The Forest Practices Act provides the legislation for biodiversity management in forested landscapes in British Columbia; The Forest Planning and Practices Regulation, Section 9, states:

> The objective set by government for wildlife and biodiversity at the landscape level is, without unduly reducing the supply of timber from British Columbia's forests and to the extent practicable, to design areas on which timber harvesting is to be carried out

that resemble, both spatially and temporally, the patterns of natural disturbance that occur within the landscape.

The following paragraphs discuss some key elements in managing for biodiversity in the Lheidli T'enneh Community Forest.

A continual and integrated inventory of ecosystem (TEM) and vegetation (VRI) mapping now occurs across the Lheidli T'enneh Community Forest land base. This mapping makes it possible to manage for biodiversity at a variety of levels, from the operational to the landscape level. Biodiversity hierarchy theory suggests that what happens at higher levels of ecological organization, such as the landscape or ecosystem level, may have impacts on or place constraints on the lower levels, such as the species or genetic level (Gaines, W. et al., 1999). Monitoring biodiversity at the landscape level provides a workable umbrella approach to species conservation. Considering that the habitat requirements of most species are not known, the individual species approach to managing biodiversity is largely unworkable. The landscape approach to managing biodiversity is a holistic approach, which is more in line with Traditional Environmental Knowledge (TEK) values. Managing for the full range of habitats represented in and across a landscape, including large contiguous areas helps ensure species persistence (Delong, pers. Comm., 2007)

Endemic species, which are species with a small geographic range and narrow habitat specificity, as well as species with large geographic ranges, often slip through the coarse filter approach of monitoring biodiversity at the landscape level. In such instances, a more intensive fine filter approach of understanding individual species population trends on the landscape ought to be employed. For example, habitat ratings can be developed for individual species; the ratings are then applied to the integrated ecosystem and vegetation inventory to develop species-specific habitat capability / suitability maps which can provide the basis for an evaluation and monitoring program.

At the landscape level, attributes that can be monitored include the identity, character, distribution, and proportions of each habitat type. Trends in landscape diversity, habitat availability and distribution, and landscape elements such as edge fragmentation can be quantified using a variety of fragmentation metrics/indices of landscape pattern and historic reference conditions in a GIS environment.

The landscape ecology concept of the matrix, patch, and corridor (Forman 1995, Forman and Godron 1986) provides for three general patterns on the landscape. The matrix or predominant habitat type on the landscape (typically the 01 or zonal site series and potentially circum-mesic components), the patch which may include rarer site series on the landscape as well as natural (fire / insect) and anthropogenic (cutblocks) disturbances, and

the corridor which may include watercourses and associated riparian ecosystems, interior forest corridors as well as disturbance corridors such as roads/seismic lines.

Integral to the landscape ecology approach is the analysis of disturbance regimes, both natural and anthropogenic; the structure of mosaics of disturbance patches (e.g., patch size and shape) is an important parameter to assess landscape structure (Forman 1995, Forman and Godron 1986). The British Columbia Natural Disturbance Database has made available spatial information regarding historical insect outbreaks in BC, as well as spatial information for fire history, both of which could aid in the analysis of disturbance regimes.

As a basis to any landscape plan, Forman (1995) outlines four indispensable landscape patterns for managing biodiversity that are widely applicable regardless of geographic location. These are landscape patterns that maintain:

- a few large natural vegetation patches;
- wide vegetated corridors protecting water courses;
- connections for dispersal of key species among the large patches; and
- small patches and corridors providing heterogeneous bits of natural habitat throughout disturbed areas.

Terrestrial Ecosystem Mapping, along with Vegetation Resources Inventory (VRI) and natural disturbance data, provides the required information to develop a sound biodiversity management strategy for the Lheidli T'enneh Community Forest. Developing a biodiversity management strategy will help Lheidli T'enneh Community Forest to meet the biodiversity requirements of the Forest and Range Practices Act as well as facilitate forest certification endeavors.

## 4.4 TEM and Traditional Environmental Knowledge (TEK)

The TEM inventory provides information on the distribution and abundance of ecological and vegetation attributes in the Lheidli T'enneh Community Forest. Building on this inventory the opportunity exists to integrate aspects of TEK with western science (Michel and Gayton, 2002). Any TEK with spatial features could also be incorporated into the ecosystem inventory. For example, culturally modified trees, cultural plant use, non timber forest products (NTFP), and other significant cultural features on the landscape could be incorporated into the inventory. This could be achieved by using GPS to record the location of significant features, or, in the case of NTFPs, the TEM can indicate where on the land base specific NTFPs would more likely be found.

# 5 CREDITS

Funding for this project was provided by Ainsworth Lumber Company Ltd. (Ainsworth), through the Forest Investment Account (FIA) Land Base Investment Program. This Project was coordinated on behalf of Ainsworth and the Lheidli T'enneh Community Forest by Jim Burbee of Venture Forestry Consulting Inc.

This project was managed by Patience Rakochy, RPF of Timberline Natural Resource Group Ltd (Timberline). Ecosystem photo interpretations, digital data capture, and final report were completed by Neil Tajcnar of Timberline. Field data collection was completed by Neil Lamont, Brent Thiessen, FIT/BIT, Kim Everett, Qinglin Li, and Ryan Zapisocki, of Timberline. Internal quality assurance conducted by Ksenia Konwicki, RPF and Frank Caffrey, RPF. GIS personnel were David Mahoney and Dana Schwehr of Timberline.

Review of field sampling plan was completed by Craig Delong, Prince George Regional Ecologist, Ministry of Forests and Range.

Project correlation was provided by Corey Erwin, Provincial Ecosystem Mapping Correlator, Ministry of Environment.

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# Appendix I – Map Legend

# Terrestrial Ecosystem Mapping of the Lheidli T'enneh Community Forest

## Map Legend

*Prepared for:*

Lheidli T'enneh Community Forest

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January, 2008

## INTRODUCTION

The project provides terrestrial ecosystem maps and descriptions for the Lheidli T'enneh Community forest at a scale of 1:20 000. As an integral part of the land base inventory, the detailed information on ecosystem distribution will aid in site-specific management planning and interpretations.

Mapping was completed as per 1998 *Standards for Terrestrial Ecosystem Mapping in British Columbia* (RIC 1998). The following variances from standard TEM procedures were applied to this project.

- Existing Vegetation Resources Inventory (VRI/PEM) polygons were used as TEM base polygons.
- No ecosystem forms (FS882) were completed in the field. Ground Inspection Form (GIF) and Visuals were completed at a 25 : 75 ratio.

Field work was completed over the 2006-2007 time period using a survey intensity level 4.

## ECOSECTIONS

The following table summarizes Ecosections present in the community forest, by unit.

| Unit | Ecosection | Ecosection Code |
|---|---|---|
| Salmon | Nechako Lowland | NEL |
| Fyfe | Quesnel Lowland | QUL |

## BIOGEOCLIMATIC UNITS

SBSmk1: Mossvale Moist Cool Sub-Boreal Spruce
SBSdw3: Stuart Dry Warm Sub-Boreal Spruce
SBSmh: Moist Hot Sub-Boreal Spruce

## MAPSHEET NUMBERS

093J016, 093J017, 093J026, 093J027, 093G067, 093J077

## ECOSYSTEM UNITS

| SBSmh - Moist Hot Sub-Boreal Spruce | | | | | |
|---|---|---|---|---|---|
| Map code | Site Series No. | Site Series Name | Assumed Modifiers | Typical Situation | Moisture Regime |
| SN | 01 | SxwFd - Hazelnut | d, j, m | gentle slope; deep, medium-textured soils. | mesic |
| DC | 02 | FdPl - Cladonia | j, r, s | gentle slope; crest position; shallow soil over bedrock | xeric |
| LV | 03 | FdPl - Velvet-leaved blueberry - Cladonia | c, d, j | gentle slope to level; deep, coarse- textured soils poor nutrient regime | subxeric |
| DD | 04 | Fd - Douglas maple - Step moss | d, m, w | significant slope; warm aspect; deep, medium- textured soils | subxeric - submesic |
| SF | 05 | SxwFd - Feathermoss | d, j, m | gentle slope; deep medium- textured soils | submesic - mesic |
| SC | 06 | SxwFd - Coltsfoot | d, j, m | gentle, lower slope receiving sites; deep, medium - textured soils | subhygric |
| SD | 07 | SxwEp - Devil's club | d, j, m | gentle, lower slope receiving sites; deep, medium-textured soils, rich nutrient regime; seepage | subygric - hygric |
| OF | 08 | Sxw - Ostrich fern | d, j, m | gentle slope; deep medium - textured soils; rich nutrient regime, floodplain, or toe slope | subhygric - hygric |
| SH | 09 | Sxw - Horsetail - Glow moss | d, j, m | gentle slope to level sites and depressions; deep medium - textured soils | hygric - subhydric |

| SBSdw3 - Stuart Dry Warm Sub-Boreal Spruce | | | | | |
|---|---|---|---|---|---|
| Map code | Site Series No. | Site Series Name | Assumed Modifiers | Typical Situation | Moisture Regime |
| SP | 01 | SxwFd - Pinegrass | d, j, m | gentle slope; deep, medium - textured soils | mesic |
| DC | 02 | FdPl - Cladonia | c, d, w | significant slope, warm aspect deep, coarse -textured soils | xeric - subxeric |
| LC | 03 | Pl - Feathermoss - Cladina | c, d, j | level sites; deep coarse - textured soils | subxeric |
| SR | 04 | SxwFd - Ricegrass | c,d,j | gentle slope; deep coarse - textured soils | submesic |
| BF | 05 | PlSb - Feathermoss | d, j, m | gentle slope to level; deep, medium- textured soils; nutrient poor | submesic |
| SS | 06 | Sxw - Pink spirea - Prickly rose | d, f, j | gentle slope to level; deep, fine - textured soils | subhygric |
| ST | 07 | Sxw - Twinberry | d, f, g | gentle slope; lower receiving moisture position; deep fine - textured soil | subhygric |
| SO | 08 | Sxw - Oak fern | c, d, j | gentle, lower slope receiving positions; deep, coarse - textured soils | subhygric - hygric |
| SH | 09 | Sxw - Horsetail - Glow moss | d, j, m | toe slope to depression; deep, medium- textured soils; fluctuating water table | hygric |
| BS | 10 | Sb - Soft-leaved sedge - Sphagnum | d, j, m | organic bog wetland | subhydric |
| Fl05 | 00 | Drummond's willow - Bluejoint | | Flood plain ecosystem; soils silty to fine-sandy texture | hygric - subhydric |

| | | | | | |
|---|---|---|---|---|---|
| Wb12 | 00 | Scheuchzeria - Peat-moss | | peat moss bog; very poorly drained, fibric sphagnum peat, and can be floating mats; uncommon at elevations below 1000m** | subhydric |
| Wm01 | 00 | Beaked sedge - Water sedge | | Most common marsh site association in province; wide range of site conditions on mineral substrates with organic veneers | subhydric |
| Wm02 | 00 | Swamp horsetail - Beaked sedge | | uncommon at lower elevations throughout the BC Interior; silty or fine-sandy fluvium, deep limnic deposits at open margins of lakes, or recently flooded peat | subhydric |

## SBSmk1 - Mossvale Moist Cool Sub-Boreal Spruce

| Map code | Site Series No. | Site Series Name | Assumed Modifiers | Typical Situation | Moisture Regime |
|---|---|---|---|---|---|
| SB | 01 | Sxw - Black huckleberry - Highbush-cranberry | d, j, m | gentle slope; deep, medium - textured soil | mesic |
| LM | 02 | Pl - Cladina - Step moss | j, r, s | gentle slope; crest position shallow soil over bedrock | xeric |
| LC | 03 | Pl - Feathermoss - Cladina | c, d, j | level site; deep, coarse - textured soils | subxeric |
| DK | 04 | SxwFd - Knight's plume | d, m, w | significant slope; warm aspect; deep, medium - textured soil | subxeric - submesic |
| ST | 05 | SxwFd - Toad-flax | d, m, w | significant slope; warm aspect; deep, medium- textured soil | submesic - mesic |
| BH | 06 | Sb - Huckleberry - Spirea | d, j, m | gentle slope; deep, medium - textured soil; poor nutrient regime | submesic - mesic |
| SO | 07 | Sxw - Oak fern | d, j, m | gentle, lower slope, receiving sites; deep, medium - textured soil; rich nutrient regime | subhygric |
| SD | 08 | Sxw - Devil's club | d, j, m | gentle, lower slope, receiving sites; deep, medium - textured soil; rich nutrient regime | subhygric - hygric |
| SH | 09 | Sxw - Horsetail | d, j, m | gentle slope to level; deep, medium - textured soil | hygric |
| BB | 10 | Sb - Scrub birch - Sedge | d, j, p | organic bog wetland | subhydric |
| Wb13 | 00 | Shore sedge - Buckbean - Peat-moss | | acidic peatland; either grounded, highly saturated peat blankets, or floating mats; soils are deep sedge-derived Mesisols | subhydric |
| Wf05 | 00 | Slender sedge - Common hook-moss | | Common throughout the BC Interior at elevations below 1400m; deep peat deposits common but some sites occur on thin organic veneers | subhydric |
| Wm01 | 00 | Beaked sedge - Water sedge | | Most common marsh site association in province; wide range of site conditions on mineral substrates with organic veneers | subhydric |
| Ws04 | 00 | Drummond's willow - Beaked sedge | | sedge peat veneers or blankets over fine- to medium-textured fluvial or lacustrine materials | subhydric |
| Ws50 | 00 | Hardhack - Sitka sedge | | located in basins, gullies, and margins of waterbodies and peatlands; sites with prolonged saturation; soils typically Humisols and Gleysols; organic veneers may be present | subhydric |

# SITE MODIFIERS

| Code | Criteria |
|---|---|
| *Topography* | |
| a | active floodplain[1] – the site series occurs on an active fluvial floodplain (level or very gently sloping surface bordering a river that has been formed by river erosion and deposition), where evidence of active sedimentation and deposition is present. |
| g | gullying[1] occurring – the site series occurs within a gully, indicating a certain amount of variation from the typical, or the site series has gullying throughout the area being delineated. |
| h | hummocky[1] terrain (optional modifier) – the site series occurs on hummocky terrain, suggesting a certain amount of variability. Commonly, hummocky conditions are indicated by the terrain surface expression but occasionally they occur in a situation not described by terrain features. |
| j | gentle slope – the site series occurs on gently sloping topography (less than 25% in the interior, less than 35% in the CWH, CDF, and MH zones). |
| k | cool aspect – the site series occurs on cool, northerly or easterly aspects (285°–135°), on moderately steep slopes (25%–100% slope in the interior and 35%–100% slope in the CWH, CDF and MH zones). |
| n | fan[1] – the site series occurs on a fluvial fan (most common), or on a colluvial fan or cone. |
| q | very steep cool aspect – the site series occurs on very steep slopes (greater than 100% slope) with cool, northerly or easterly aspects (285°–135°). |
| r | ridge[1](optional modifier) – the site series occurs throughout an area of ridged terrain, or it occurs on a ridge crest. |
| t | terrace[1] – the site series occurs on a fluvial or glaciofluvial terrace, lacustrine terrace, or rock cut terrace. |
| w | warm aspect – the site series occurs on warm, southerly or westerly aspects (135°–285°), on moderately steep slopes (25%–100% slope in the interior and 35%–100% slope in the CWH, CDF and MH zones). |
| z | very steep warm aspect – the site series occurs on very steep slopes (greater than 100%) on warm, southerly or westerly aspects (135°–285°). |
| *Soil* | |
| c | coarse-textured soils[2] – the site series occurs on soils with a coarse texture, including sand and loamy sand; and also sandy loam, loam, and sandy clay loam with greater than 70% coarse fragment volume. |
| p | peaty material – the site series occurs on deep organics or a peaty surface (15–60 cm)[3] over mineral materials (e.g., on organic materials of sedge, sphagnum, or decomposed wood). |
| s | shallow soils – the site series occurs where soils are considered to be shallow to bedrock (20–100 cm). |
| v | very shallow soils – the site series occurs where soils are considered to be very shallow to bedrock (less than 20 cm). |

## SPARSELY VEGETATED, NON-VEGETATED AND ANTHROPOGENIC UNITS

| Code | Name | Definition |
|---|---|---|
| CB | Cutbank | A part of a road corridor or river course situated upslope of the road or river, which is created by excavation and/or erosion of the hillside. |
| CF | Cultivated Field | A flat or gently rolling, non-forested, open area that is subject to human agricultural practices (including plowing, fertilization and non-native crop production), which often result in long-term soil and vegetation changes. |
| CL | Cliff | A steep, vertical or overhanging rock face. |
| ES | Exposed Soil | Any area of exposed soil that is not included in any of the other definitions. It includes areas of recent disturbance, such as mud slides, debris torrents, avalanches, and human-made disturbances (e.g., pipeline rights-of-way) where vegetation cover is less than 5%. |
| GB | Gravel Bar | An elongated landform generated by waves and currents and usually running parallel to the shore. It is composed of unconsolidated small rounded cobbles, pebbles, stones, and sand. |
| GP | Gravel Pit | An area exposed through the removal of sand and gravel. |
| LA | Lake | A naturally occurring static body of water, greater than 2 m deep in some portion. The boundary for the lake is the natural high water mark. |
| MI | Mine | An unvegetated area used for the extraction of mineral ore and other materials. |
| OW | Shallow Open Water | A wetland composed of permanent shallow open water and lacking extensive emergent plant cover. The water is less than 2 m deep. (If vegetated, these units should develop into site series groups for interpretation.) |
| PD | Pond | A small body of water greater than 2 m deep, but not large enough to be classified as a lake (e.g., less than 50 ha). |
| RI | River | A watercourse formed when water flows between continuous, definable banks. The flow may be intermittent or perennial. An area that has an ephemeral flow and no channel with definable banks is not considered a river. |
| RM | Reclaimed Mine | A mined area that has plant communities composed of a mixture of agronomic or native grasses, forbs, and shrubs. |
| RN | Railway Surface | A roadbed with fixed rails for possibly single or multiple rail lines. |
| RO | Rock Outcrop | A gentle to steep, bedrock escarpment or outcropping, with little soil development and sparse vegetative cover. |
| RW | Rural | Any area in which residences and other human developments are scattered and intermingled with forest, range, farm land, and native vegetation or cultivated crops. (Forested areas and cultivated fields should be mapped as separate units.)1 |
| RZ | Road Surface | An area cleared and compacted for the purpose of transporting goods and services by vehicles. |
| TA | Talus | Angular rock fragments of any size accumulated at the foot of steep rock slopes as a result of successive rock falls. It is a type of colluvium. |
| UR | Urban / Suburban | An area in which residences and other human developments form an almost continuous covering of the landscape. These areas include cities and towns, subdivisions, commercial and industrial parks, and similar developments both inside and outside city limits. |

## STRUCTURAL STAGES

| Code | Name | Criteria |
|---|---|---|
| 1a | Sparse | Less than 10% vegetation cover; |
| 1b | Bryoid | Bryophyte- and lichen-dominated communities (greater than 1/2 of total vegetation cover). |
| 2a | Forb-dominated | Herbaceous communities dominated (greater than 1/2 of the total herb cover) by non-graminoid herbs, including ferns. |
| 2b | Graminoid-dominated | Herbaceous communities dominated (greater than 1/2 of the total herb cover) by grasses, sedges, reeds, and rushes. |
| 2c | Aquatic | Herbaceous communities dominated (greater than 1/2 of the total herb cover) by floating or submerged aquatic plants; does not include sedges growing in marshes with standing water |
| 2d | Dwarf shrub 2 | Communities dominated (greater than 1/2 of the total herb cover) by dwarf woody species such as Phyllodoce empetriformis, Cassiope mertensiana, etc. |
| 3a | Low shrub | Communities dominated by shrub layer vegetation less than 2 m tall; may be perpetuated indefinitely by environmental conditions or repeated disturbance; |
| 3b | Tall shrub | Communities dominated by shrub layer vegetation that are 2–10 m tall; may be perpetuated indefinitely by environmental conditions or repeated disturbance; |
| 4 | Pole/Sapling | Trees greater than 10 m tall, typically densely stocked, have overtopped shrub and herb layers; younger stands are vigorous (usually greater than 10-15 years old); |
| 5 | Young Forest | Self-thinning has become evident and the forest canopy has begun differentiation into distinct layers (dominant, main canopy, and overtopped); time since disturbance is generally 40–80 years but may begin as early as age 30, depending on tree species and ecological conditions. |
| 6 | Mature Forest | Trees established after the last disturbance have matured; a second cycle of shade tolerant trees may have become established; understories become well developed as the canopy opens up |
| 7 | Old Forest | Old, structurally complex stands composed mainly of shade-tolerant and regenerating tree species, although older seral and long-lived trees from a disturbance such as fire may still dominate the upper canopy; snags and coarse woody debris in all stages of decomposition typical, as are patchy understories |

## DATA SOURCES

This mapping project is based on 1:35 000 black and white digital photography utilized in a PurView GIS environment.
Ecosystem linework derived from PGTSA VRI/PEM
Three hundred and thirty nine plots (81 GIFs and 127 Visuals) were established for the TEM project. Of these plots, a total of 134 plots (51 GIFs and 83 Visual inspections) fall within the current Lheidli T'enneh Community Forest boundary.

## CREDITS

The Project was coordinated by Jim Burbee, Venture Forestry Consulting Inc., and managed by Patience Rakochy of Timberline Natural Resource Group Ltd.
Ecosystem photo interpretation, digital data capture, and final report by Neil Tajcnar of Timberline Natural Resource Group.
Field Data Collection by Neil Lamont, Brent Thiessen, Kim Everett, Qinglin Li, and Ryan Zapisocki, of Timberline Natural Resource Group Ltd. Internal quality assurance conducted by Ksenia Konwicki, RPF and Frank Caffrey, RPF.
GIS personnel were David Mahoney and Dana Schwehr of Timberline Natural Resource Group Ltd.
MoE Project Correlation: Corey Erwin
The project was funded by Ainsworth Lumber Company Ltd., and the Forest Investment Account (FIA) Land Base Investment Program.

## CITATION

Resource Inventory Standards Committee. 2003. *Provincial Mapcodes List*. Prepared by the Ministry of Sustainable Resource Management, Terrestrial Information Branch, For the Resource Inventory Standards Committee, Victoria, B.C.

Resource Inventory Standards Committee. 2006. *Provincial Site Series List*. Prepared by the Ministry of Environment, Terrestrial Information Branch, For the Resource Inventory Standards Committee, Victoria, B.C.

# Appendix II – Expanded Legend

| ap Unit | Description |
|---|---|

| | |
|---|---|
| SB | Sxw - Black Huckleberry - Highbush-cranberry |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SB | Gentle slope; glacial till and glacial lacustrine deposits; deep medium- to fine-textured soil; nutrient reg |

| Map Symbol | SB6 | SB6 | Sl |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Pl, Sxw, black huckleberry, thimbleberry, highbush-cranberry, queens cup | Pl, Sxw, At, alder, black twinberry, thimbleberry, bunchberry, queens cup, red-stemmed feathermoss | Sxw, At, alder, thimbleberr highbush-cranberry, palma stalk, one-leaved foamflow |
| Associated Plant Species | Bl, birch-leaved spirea, black twinberry, prickly rose, black gooseberry, western mountain ash, bunchberry, false Soloman's seal, one-sided wintergreen, stiff clubmoss, twinflower, wild sarsaparilla, oak fern | Ep, Bl, prickly rose, birch-leaved spirea, black huckleberry, highbush-cranberry, wild sarsaparilla, heart-leaved arnica, blue wildrye, oak fern, twinflower, pink wintergreen, clasping twistedstalk, wavy-leaved moss, stepmoss | black twinberry, birch-leav twinflower, Hooker's fairy Indian hellebore, red-stem |
| Plots | Description based on Delong (1993) | AIN_51, AIN_53, SAL8, SAL11, SAL13, SAL16 | AIN_1, AIN_3 |

| Map Unit | Description |
|---|---|
| LM | Pl - Cladina - Step moss |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| LM | gentle slope; crest position; shallow soil over bedrock |

| Map Symbol | LM6 | LM6 | LM |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Pl, Sxw, soopolallie, showy aster, dwarf blueberry | | |
| Associated Plant Species | prickly rose, saskatoon, birch-leaved spirea, pin cherry, twinflower, dwarf blueberry, wild sarsaparilla, blue wildrye, northern bedstraw, rough-fruited fairybells, red-stemmed feathermoss, step moss, cladina lichens | | |
| Plots | Description based on Delong (1993) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| LC | Pl - Feathermoss - Cladina |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| LC | level site; deep, coarse-textured soils; common on upper coarse-textured (glacio)fluvial terraces of existi |

| Map Symbol | LC6 | LC6 | L |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Pl, velvet-leaved blueberry, kinnicknick, red-stemmed feathermoss, wavy-leaved moss, cladina lichens | | |
| Associated Plant Species | prickly rose, birch-leaved spirea, soopolallie, kinnikinnick, bunchberry, twinflower, ground-cedar, dwarf blueberry, bastard toad-flax, cow-wheat, rough-leaved ricegrass, peltigera lichens, wooly coral lichen | | |
| Plots | Description based on Delong (1993) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| DK | SxwFd - Knight's plume |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| DK | significant slope; warm aspect; deep, medium-textured soil |

| Map Symbol | DK6 | DK6 | D |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Fd, Pl, Sxw, knight's plume | Fd, At, Sxw, thimbleberry, wild sarsaparilla, clasping twisted stalk, red-stemmed feathermoss, knight's plume | |
| Associated Plant Species | black huckleberry, birch-leaved spirea, prickly rose, highbush-cranberry, saskatoon, bunchberry, one-sided wintergreen, rattlesnake-plantain, dwarf rattlesnake orchid, false Solomon's-seal, prince's pine,heart-leaved arnica, twinflower, red-stemmed feathermoss, step moss, electrified cat's-tail moss | saskatoon, tall Oregon-grape, queens cup, bunchberry, rattlesnake-plantain | |
| Plots | Description based on Delong (1993) | SAL5 | no plot data |

| Map Unit | Description |
|---|---|
| ST | SxwFd - Toad-flax |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| ST | Significant slope; warm aspect; deep medium-textured soil |

| Map Symbol | ST6 | ST6 | S |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Pl, Sxw, false toad-flax, red-stemmed feathermoss, kniht's plume | Pl, Sxw, At, soopolallie, black huckleberry, birch-leaved spirea, pink spirea, bunchberry, queens cup, twinflower, stiff club-moss, clasping twisted-stalk, red-stemmed feathermoss, wavy-leaved moss, step moss, electrified cat's tail moss | Sxw, Bl, Ep, At, prickly ros feathermoss, wavy-leaved electrified cat's tail moss |

| | | | |
|---|---|---|---|
| **Associated Plant Species** | Fd, black huckleberry, birch-leaved spirea, prickly rose, black twinberry, saskatoon, thimbleberry, bunchberry, queen's cup, twinflower, rattlesnake-plantain, rough-leaved ricegrass, fireweed, wavy-leaved moss, step moss, electrified cat's tail moss | saskatoon, black twinberry, tall Oregon-grape, prickly rose, wild sarsaparilla, showy aster, ground cedar, fireweed, false toad-flax, dwarf blueberry, step moss, common haircap moss | Fd, Pl, soopolallie, dogwoo Oregon-grape, step moss |
| **Plots** | Description based on Delong (1993) | AIN_57, AIN_58, AIN_55, G_53, G51, SAL1, SAL14 | AIN_5, AIN_7, AIN_8 |

| Map Unit | Description |
|---|---|
| BH | Sb - Huckleberry - Spirea |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| BH | Gentle slope; deep, medium (to fine) textured soil; poor nutrient regime; common, especially on level c |

| | | | |
|---|---|---|---|
| **Map Symbol** | BH6 | BH6 | BI |
| **Structural Stage** | Mature Forest | Mature Forest | Young |
| **Dominant Plant Species** | Pl, Sb, Sxw, Labrador tea, bunchberry, step moss | Sxw, Pl, Sb, At, alder, soopolallie, bunchberry, red-stemmed feathermoss, step moss, knight's plume, curly heron's bill moss | Sxw, At, Sb, soopolallie, bu feathermoss, step moss, kn cat's tail moss, curly heron |
| **Associated Plant Species** | black huckleberry, black twinberry, prickly rose, birch-leaved spirea, saskatoon, western mountain ash, dwarf blueberry, false toad-flax, twinflower, fireweed, yarrow, palmate coltsfoot, rough-leaved ricegrass, one-sided wintergreen, red-stemmed feathermoss, knight's plume | black huckleberry, birch-leaved spirea, velvet-leaved blueberry, wild sarsaparilla, showy aster, prince's pine, queen's cup, false toad-flax, stiff club-moss, rough-leaved ricegrass, palmate coltsfoot, dwarf blueberry | Pl, saskatoon, black twinbe spirea, black huckleberry, aster, princes pine, false toa leaved ricegrass, palmate c |
| **Plots** | Description based on Delong (1993) | SAL12, SAL17 | SAL7, SAL9 |

| Map Unit | Description |
|---|---|
| SO | Sxw - Oak fern |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SO | gentle, lower slope, receiving sites; deep, medium-textured soil; common and found in association with SBSmk1/08 |

| Map Symbol | SO6 | SO6 | SC |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Sxw, prickly rose, black twinberry, bunchberry, oak fern, step moss | Sxw, At, alder, black twinberry, birch-leaved spirea, pink spirea, highbush cranberry, bunchberry, oak fern, red-stemmed feathermoss, knight's plume, leafy moss | Sxw, Ep, At, Act, alder, bla thimbleberry, common sno |
| Associated Plant Species | BL, clasping twisted stalk, one-sided wintergreen, one-leaved foamflower, three-leaved foamflower, false Solomon's-seal, queen's cup, knight's plume, red-stemmed feathermoss, electrified cat's-tail moss, leafy mosses | Bl, prickly rose, thimbleberry, lady fern, bluejoint reedgrass, blue wildrye, twinflower, horsetail, stiff club moss, false Solomon's seal, coltsfoot, pink wintergreen, dwarf red raspberry, one-leaved foamflower, three-leaved foamflower, dwarf blueberry, Indian hellebore, electrified cat's tail moss, wavy-leaved moss | Fd, prickly rose, oak fern, l stemmed feathermoss |
| Plots | Description based on Delong (1993) | AIN_52, AIN_54, AIN_56, AIN_58, SAL18, SAL4 | AIN_2, AIN_4 |

| Map Unit | Description |
|---|---|
| SD | Sxw - Devil's club |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SD | gentle, lower slope, receiving sites; deep medium textured soil; rich nutrient regime; commonly northw aspect |

| Map Symbol | SD6 | SD6 | SI |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Sxw, devil's club, black twinberry, bunchberry, horsetail, step moss, leafy moss | Sxw, At, devil's club, lady fern, oak fern, red-stemmed feathermoss, leafy moss, knight's plume, electrified cat's tail moss | |
| Associated Plant Species | Bl, black gooseberry, highbush-cranberry, thimbleberry, western mountain ash, lady fern, one-leaved foamflower, three-leaved foamflower, wild sarsaparilla, common mitrewort, knight's plume, red-stemmed feathermoss, electrified cat's-tail moss | Bl, Ep, alder, willow, black twinberry, black gooseberry, prickly rose, thimbleberry, elderberry, common snowberry, black huckleberry, wild sarsaparilla, goatsbeard, wild ginger, bluejoint reedgrass, bunchberry, spiny wood fern, false Solomon's seal, common mitrewort, palmate coltsfoot, dwarf red raspberry, clasping twisted stalk, one-leaved foamflower, step moss | |
| Plots | Description based on Delong (1993) | G52, SAL15, SAL2, SAL6 | no plot data |

| Map Unit | Description |
|---|---|
| SH | Sxw - Horsetail |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SH | gentle slope to level; deep, medium- to coarse-textured soil; common on edge of rivers/streams and in d |

| Map Symbol | SH6 | SH6 | SH |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |

| | | | |
|---|---|---|---|
| **Dominant Plant Species** | Sxw, meadow horsetail, common horsetail | Sxw, thimbleberry, lady fern, horsetail, red-stemmed feathermoss, leafy moss | Sxw, At, black twinberry, |
| **Associated Plant Species** | Act, Pl, Bl, black twinberry, red-osier dogwood, prickly rose, highbush cranberry, black gooseberry, red swamp currant, dwarf red raspberry, sweet-scented bedstraw, bunchberry, common mitrewort, twinflower, mountain sweet cicely, knight's plume, leafy mosses, red-stemmed feathermoss, step moss, electrified cat's-tail moss | Bl, At, Act, Ep, willow, alder, dogwood, black gooseberry, red swamp currant, prickly rose, elderberry, pink spirea, common snowberry, highbush cranberry, wild sarsaparilla, great northern aster, bluejoint reedgrass, large-leaved avens, oak fern | Pl, highbush cranberry, bu horsetail, common horseta feathermoss |
| **Plots** | Description based on Delong (1993) | G-54, SAL10, SAL3 | AIN6 |

| Map Unit | Description |
|---|---|
| BB | Sb - Scrub birch - sedge |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| BB | Treed, organic bog wetland |

| | | | |
|---|---|---|---|
| **Map Symbol** | BB6 | BB6 | Bl |
| **Structural Stage** | Mature Forest | Mature Forest | Young |
| **Dominant Plant Species** | Sb, scrub birch, sedges, sphagnum mosses | | |
| **Associated Plant Species** | Labrador tea, willows, alder, black twinberry, common horsetail, swamp horsetail, bluejoint reedgrass, bog cranberry, white bog-orchid, marsh cinquefoil, creeping snowberry, nodding wood-reed, red-stemmed feathermoss, step moss, knight's plume, glow moss, golden fuzzy fen moss, leafy mosses | | |
| **Plots** | Description based on Delong (1993) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| Wb13 | Shore sedge - Buckbean - Peat moss bog |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| Wb13 | Acidic peatland; either grounded, highly saturated peat blankets, or floating mats; soils are deep sedge-d |

| Map Symbol | Wb13 | Wb13 | |
|---|---|---|---|
| Structural Stage | Herb (2, 3a) | Herb (2, 3a) | |
| Dominant Plant Species | *Carex limnosa, Drosera anglica, Eriophorum angustifolium, Kalmia microphylla, Menyanthes trifoliata, Trientalis europa ssp. arctic, Sphagnum spp.* | | |
| Associated Plant Species | | | |
| Plots | Mackenzie and Moran (2004) | no plot data | |

| Map Unit | Description |
|---|---|
| Wf05 | Slender sedge - Common hook moss fen |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| Wf05 | Common throughout the BC Interior at elevations below 1400m; deep peat deposits common but some organic veneers |

| | | | |
|---|---|---|---|
| **Map Symbol** | Wf05 | Wf05 | |
| **Structural Stage** | Herb (2) | Herb (2) | |
| **Dominant Plant Species** | *Carex aquatillis, Carex lasiocarpa, Carex utriculata, Drepanocladus aduncus* | | |
| **Associated Plant Species** | | | |
| **Plots** | Mackenzie and Moran (2004) | no plot data | |

| Map Unit | Description |
|---|---|
| Wm01 | Beaked sedge - Water sedge marsh |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| Wm01 | Most common marsh site association in province; wide range of site conditions on mineral substrates w |

| | | | |
|---|---|---|---|
| **Map Symbol** | Wm01 | Wm01 | |
| **Structural Stage** | Herb (2) | Herb (2) | |
| **Dominant Plant Species** | *Carex utriculata, Carex aquatilis* | | |
| **Associated Plant Species** | | | |
| **Plots** | Mackenzie and Moran (2004) | no plot data | |

| **Map Unit** | **Description** |
|---|---|
| Ws04 | Drummond's willow - Beaked sedge swamp/fen |

| **Map Unit** | **Ecosystem Site and Soil** |
|---|---|
| Ws04 | Sedge peat veneers or blankets over fine- to medium-textured fluvial or lacustrine materials |

| | | | |
|---|---|---|---|
| **Map Symbol** | Ws04 | Ws04 | |
| **Structural Stage** | Shrub (3a, 3b) | Shrub (3a, 3b) | |
| **Dominant Plant Species** | *Salix drummondiana, Lonicera involucrata, Spirea douglasii, Calamagrostis canadensis, Carex aquatillis, Carex sitchensis, Carex utriculata, Mnium spp.* | | |

| | | | |
|---|---|---|---|
| **Associated Plant Species** | | | |
| **Plots** | Mackenzie and Moran (2004) | no plot data | |

| Map Unit | Description |
|---|---|
| Ws50 | Pink spirea - Sitka sedge swamp |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| Ws50 | Located in basins, gullies, and margins of waterbodies and peatlands; sites with prolonged saturation; so Humisols and Gleysols; organic veneers may be present |

| | | | |
|---|---|---|---|
| **Map Symbol** | Ws50 | Ws50 | |
| **Structural Stage** | Low shrub (3a) | Low shrub (3a) | |
| **Dominant Plant Species** | *Spirea douglasii, Carex sitchensis, Aulacomnium palustre, Sphagnum spp.* | | |
| **Associated Plant Species** | | | |
| **Plots** | Mackenzie and Moran (2004) | no plot data | |

| Map Unit | Description |
|---|---|
| SP | SxwFd - Pinegrass |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SP | gentle slope; deep, medium textured soils; |

| Map Symbol | SP6 | SP6 | SI |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Sxw, bunchberry, pinegrass | Sxw, At, Ep, Fd, alder, thimbleberry, queen's cup, bunchberry, step moss, red-stemmed feathermoss, knight's plume, electrified cat's tail moss | Pl, At, Ep, alder, thimblebe stemmed feathermoss, knig tail moss |
| Associated Plant Species | Fd, birch-leaved spirea , prickly rose, highbush cranberry, black twinberry, thimbleberry, alder, queen's cup, showy aster, twinflower, heart-leaved arnica, false Solomon's seal, red-stemmed feathermoss, knight's plume | Pl, dogwood, black twinberry, prickly rose, soopolallie, highbush cranberry, wild sarsaparilla, showy aster | Fd, Bl, highbush cranberry huckleberry, soopolallie, d wild sarsaparilla, bunchber moss |
| Plots | Description based on Delong (1993) | FN3, FS2, FS5 | AIN_13, AIN_14, AIN_20, AIN_32, AIN_33, AIN_34, |

| Map Unit | Description |
|---|---|

| | |
|---|---|
| DC | FdPl - Cladonia |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| DC | Warm aspect; medium- to coarse-textured soil; often shallow to bedrock |

| Map Symbol | DC6 | DC6 | D |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Fd, Pl, birch-leaved spirea, twinflower, kinnikinnick, black-foot cladonia, orange-foot cladonia, grey reindeer lichen | | |
| Associated Plant Species | Soopolallie, rough-fruited fairybells, dwarf blueberry, rough-leaved ricegrass, bunchberry, field pussytoes, apple pelt, red-stemmed feathermoss, wavy-leaved moss | | |
| Plots | Description based on Delong (1993) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| LC | Pl - Feathermoss - Cladina |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| | Level sites; deep, coarse-textured (glacio fluvial) terraces; |

| Map Symbol | LC6 | LC6 | L |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **Structural Stage** | Mature Forest | Mature Forest | Young |
| **Dominant Plant Species** | Pl, bunchberry, twinflower, kinnikinnick, dwarf blueberry | | |
| **Associated Plant Species** | Soopolallie, birch-leaved spirea, prickly rose, willows, velvet leaved blueberry, cow-wheat, pink wintergreen, green wintergreen, fireweed, northern bedstraw, rattlesnake plantain, ground cedar, red-stemmed feathermoss, wavy-leaved moss, grey reindeer lichen, orange-foot lichen | | |
| **Plots** | Description based on Delong (1993) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| SR | SxwFd - Ricegrass |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SR | gentle slope; deep, coarse textured soil; |

| | | | |
|---|---|---|---|
| **Map Symbol** | SR6 | SR6 | SI |
| **Structural Stage** | Mature Forest | Mature Forest | Young |
| **Dominant Plant Species** | Fd, Pl, Sxw, prickly rose, alder, rough-leaved ricegrass | | Pl, Fd, At, Sxw, soopolallie kinnikinnick, showy aster, moss, red-stemmed feather |
| **Associated Plant Species** | birch-leaved spirea, saskatoon, soopolallie, highbush cranberry, twinflower, wild sarsaparilla, one-sided wintergreen, false Solomon's seal, bunchberry, prince's pine, heart-leaved arnica, red-stemmed feathermoss, wavy-leaved moss, knight's plume, step moss | | saskatoon, prickly rose, thi spirea, velvet leaved blueb rough-leaved ricegrass |

| | | | |
|---|---|---|---|
| **Plots** | Description based on Delong (1993) | no plot data | SF6 |

| Map Unit | Description |
|---|---|
| BF | PlSb - Feathermoss |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| BF | gentle slope to level; deep, medium textured soil; nutrient poor |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| BF | gentle slope to level; deep, medium-textured soil; nutrient poor |

| | | | |
|---|---|---|---|
| **Plots** | Description based on Delong (1993) | AIN_29 | AIN_28 |

| Map Unit | Description |
|---|---|
| SS | Sxw - Pink spirea - Prickly rose |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SS | gentle slope to level; deep, fine-textured soil (lacustrine) |

| Map Symbol | SS6 | SS6 | SS |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Sxw, prickly rose, pink spirea, bunchberry | | Sxw, At, alder, black twinb soopolallie, bunchberry, re knight's plume, electrified |
| Associated Plant Species | Pl, At, (Sb), highbush cranberry, black twinberry, soopolallie, saskatoon, dwarf red raspberry, twinflower, palmate coltsfoot, creamy peavine, bluejoint reedgrass, wild strawberry, dwarf blueberry, fringed aster, fireweed, rosy wintergreen, red-stemmed feathermoss, knight's plume, freckle lichen | | Pl, Fd, Ep, Sb, thimbleberr spirea, velvet leaved blueb showy aster, queen's cup, r twinflower, wavy-leaved n |
| Plots | Description based on Delong (1993) | no plot data | AIN_37, FN2, FN4, FN5, F |

| Map Unit | Description |
|---|---|
| ST | Sxw - Twinberry |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| ST | gentle slope; lower receiving moisture position; deep fine-textured soil |

| Map Symbol | ST6 | ST6 | ST |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Sxw, prickly rose, black twinberry, bunchberry, twinflower, palmate coltsfoot | Sxw, At, willow, alder, black twinberry, pink spirea, bluejoint reedgrass, bunchberry, oak fern, step moss, leafy mosses, red-stemmed feathermoss, electrified cat's tail moss | Ep, At, Sxw, Bl, Fd, Act, al thimbleberry, red-stemme cat's tail moss |
| Associated Plant Species | At, highbush cranberry, black gooseberry, red-osier dogwood, dwarf red raspberry, false Solomon's seal, fringed aster, common mitrewort, step moss, knight's plume, red-stemmed feathermoss, leafy mosses | red-osier dogwood, common snowberry, highbush cranberry, fringed aster, common mitrewort, palmate coltsfoot, dwarf red raspberry | Douglas maple, devil's club common snowberry, queer |
| Plots | Description based on Delong (1993) | FS3 | AIN10, AIN_11, AIN_15, A AIN_23, AIN_35 |

| Map Unit | Description |
|---|---|
| SO | Sxw - Oak fern |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SO | gentle, lower slope receiving positions; deep, coarse-textured soils |

| Map Symbol | SO6 | SO6 | SO |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Sxw, black twinberry, oak fern | Sxw, Pl, At, Ep, alder, black twinberry, thimbleberry, oak fern, red-stemmed feathermoss, knight's plume, electrified cat's tail moss, leafy mosses | Sxw, Ep, At, alder, oak fern feathermoss |

| | | | |
|---|---|---|---|
| **Associated Plant Species** | Fd, Pl, Bl, highbush cranberry, prickly rose, birch-leaved spirea, bunchberry, wild sarsaparilla, common mitrewort, dwarf red raspberry, one-sided wintergreen, red-stemmed feathermoss, knight's plume, electrified cat's tail moss, leafy mosses | Sb, Fd, birch-leaved spirea, prickly rose, highbush cranberry, wild sarsaparilla, fringed aster, bunchberry, dwarf red raspberry, step moss | Pl, Fd, thimbleberry, Doug leafy mosses, knight's plum |
| **Plots** | Description based on Delong (1993) | AIN_24, FS4 | AIN_12, AIN_17, AIN_19, AIN_9 |

| Map Unit | Description |
|---|---|
| SH | Sxw - Horsetail - Glow moss |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SH | toe slope to depression; deep, medium-textured soils (and organic veneers); fluctuating water table |

| | | | |
|---|---|---|---|
| **Map Symbol** | SH6 | SH6 | SH |
| **Structural Stage** | Mature Forest | Mature Forest | Young |
| **Dominant Plant Species** | Sxw, bunchberry, common horsetail | Ep, At, alder, black twinberry, prickly rose, willow | |
| **Associated Plant Species** | black twinberry, prickly rose, black gooseberry, black huckleberry, wood horsetail, dwarf red raspberry, twinflower, common mitrewort, sweet-scented bedstraw, oak fern, red-stemmed feathermoss, step moss, knight's plume, leafy mosses | Sxw, Act, red-osier dogwood, highbush cranberry, horsetail, red-stemmed feathermoss | |
| **Plots** | Description based on Delong (1993) | AIN_27 | no plot data |

| Map Unit | Description |
|---|---|
| BS | Sb - Soft-leaved sedge - Sphagnum |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| BS | organic bog wetland |

| Map Symbol | BS6 | BS6 | BS |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Sb, sedges, sphagnum mosses | | |
| Associated Plant Species | labrador tea, black twinberry, northern black current, common horsetail, marsh cinquefoil, common mitrewort, bunchberry, red-stemmed feathermoss, leafy mosses, knight's plume, step moss | | |
| Plots | Description based on Delong (1993) | no plot data | no plot data |

| Map Unit | Description |
|---|---|

| | |
|---|---|
| Fl05 | Drummond's willow - Bluejoint |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| Fl05 | Flood plain ecosystem; soils silty to fine-sandy texture |

| Map Symbol | Fl05 | Fl05 | |
|---|---|---|---|
| Structural Stage | Shrub (3a, 3b) | Shrub (3a, 3b) | |
| Dominant Plant Species | Black twinberry, willow (*Salix drummondiana),* pink spirea | | |
| Associated Plant Species | bluejoint reedgrass | | |
| Plots | Mackenzie and Moran (2004) | no plot data | |

| Map Unit | Description |
|---|---|
| Wb12** | Scheucheria - Peat-moss bog |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| Wb12 | peat moss bog; very poorly drained, fibric sphagnum peat, and can be floating mats; uncommon at eleva 1000m** |

| Map Symbol | Wb12 | Wb12 | |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **Structural Stage** | Herb, Low Shrub (2, 3a) | | |
| **Dominant Plant Species** | willow (*Salix pedicellaris*), Andromeda polifolia, Carex limosa, Eriophorum chamissonis, Kalmia microphylla, Oxycoccus oxycoccos, Scheuchzeria pallustris, sphagnum spp. | | |
| **Associated Plant Species** | | | |
| **Plots** | Mackenzie and Moran (2004) | no plot data | |

**unit not mapped in project area

| Map Unit | Description |
|---|---|
| Wm01 | Beaked sedge - Water sedge marsh |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| Wm01 | Most common marsh site association in province; wide range of site conditions on mineral substrates w |

| | | | |
|---|---|---|---|
| **Map Symbol** | Wm01 | Wm01 | |
| **Structural Stage** | Herb (2) | Herb (2) | |
| **Dominant Plant Species** | *Carex utriculata, Carex aquatilis* | | |
| **Associated Plant Species** | | | |
| **Plots** | Mackenzie and Moran (2004) | no plot data | |

| Map Unit | Description |
|---|---|
| Wm02 | Swamp Horsetail - Beaked sedge |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| Wm02 | uncommon at lower elevations throughout the BC Interior; silty or fine-sandy fluvium, deep limnic dep margins of lakes, or recently flooded peat |

| | | | |
|---|---|---|---|
| **Map Symbol** | Wm02 | Wm02 | |
| **Structural Stage** | Herb (2) | Herb (2) | |
| **Dominant Plant Species** | *Carex utriculata, Equisetum fluviatile* | | |
| **Associated Plant Species** | | | |
| **Plots** | Mackenzie and Moran (2004) | no plot data | |

| Map Unit | Description |
|---|---|
| SN | SxwFd - Hazelnut |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SN | gentle slope; deep, medium-textured soils |

| Map Symbol | SN6 | SN6 | SN |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Fd, Sxw, prickly rose, thimbleberry, beaked hazelnut, electrified cat's tail moss | | |
| Associated Plant Species | Ep, red-osier dogwood, highbush cranberry, black gooseberry, birch-leaved spirea, saskatoon, tall Oregon grape, black twinberry, Douglas maple, soopolallie, wild sarsaparilla, bunchberry, creamy peavine, rough-leaved ricegrass, twinflower, Hooker's fairybells, common mitrewort, sweet-scented bedstraw, showy aster, dwarf red raspberry, red-stemmed feathermoss | | |
| Plots | Description based on Delong (2003) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| DC | FdPl - Cladonia |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| DC | gentle slope; crest position; shallow soil over bedrock |

| Map Symbol | DC6 | DC6 | D |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Fd, wavy-leaved moss | | |
| Associated Plant Species | Bl, Ep, falsebox, soopolallie, Douglas maple, saskatoon, common juniper, tall Oregon-grape, northern gooseberry, prickly rose, birch-leaved spirea, wild sarsaparilla, twinflower, rough-leaved ricegrass, kinnikinnick, heart-leaved arnica, red-stemmed feathermoss, cladina lichen, step moss, freckle lichen, toad lichen, cladonia lichens | | |
| Plots | Description based on Delong (2003) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| LV | FdPl - Velvet-leaved blueberry - Cladonia |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| LV | gentle slope to level; coarse-textured soils (fluvial and glaciofluvial); poor nutrient regime |

| Map Symbol | LV6 | LV6 | L |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Pl, soopolallie, prickly rose, kinnikinnick | | |

| | | | |
|---|---|---|---|
| **Associated Plant Species** | Fd, Ep, velvet-leaved blueberry, birch-leaved spirea, twinflower, dwarf blueberry, prince's pine, wild strawberry, wild lily-of-the-valley, rough-leaved ricegrass, pinegrass, bunchberry, red-stemmed feathermoss, wavy-leaved moss, grey reindeer lichen, knight's plume, electrified cat's tail moss, cladonia lichens | | |
| **Plots** | Description based on Delong (2003) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| DD | Fd - Douglas maple - Step moss |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| DD | significant slope; warm aspect; deep, medium-textured soil |

| | | | |
|---|---|---|---|
| **Map Symbol** | DD6 | DD6 | D |
| **Structural Stage** | Mature Forest | Mature Forest | Young |
| **Dominant Plant Species** | Fd, Douglas maple, step moss | | |
| **Associated Plant Species** | Bl, prickly rose, birch-leaved spirea, soopolallie saskatoon, tall Oregon-grape, red-osier dogwood, choke cherry, rough-fruited fairybells, creamy peavine, showy aster, wild sarsaparilla, twinflower, wild strawberry, fringed aster, red-stemmed feathermoss, electrified cat's-tail moss, wavy-leaved moss | | |
| **Plots** | Description based on Delong (2003) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| SF | SxwFd - Feathermoss |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SF | gentle slope; deep, medium-textured soils |

| Map Symbol | SF6 | SF6 | S |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Fd, Sxw, step moss, electrified cat's tail moss | | |
| Associated Plant Species | Ep, Bl, prickly rose, birch-leaved spirea, thimbleberry, Douglas maple, saskatoon, black gooseberry, western mountain ash, twinflower, bunchberry, wild sarsaparilla, wild lily-of-the-valley, prince's pine, common mitrewort, false Solomon's-seal, rough-leaved ricegrass, oak fern, Hooker's fairybells, red-stemmed feathermoss, wavy-leaved moss, knight's plume | | |
| Plots | Description based on Delong (2003) | no plot data | no plot data |

| Map Unit | Description |
|---|---|

| | |
|---|---|
| SC | SxwFd - Coltsfoot |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SC | gentle, lower slope receiving sites; deep, medium-textured soils |

| Map Symbol | SC6 | SC6 | SC |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Sxw, Fd, coltsfoot, | | |
| Associated Plant Species | Ep, Pl, highbush cranberry, soopolallie, saskatoon, red-osier dogwood, thimbleberry, birch-leaved spirea, black twinberry, prickly rose, beaked hazelnut, bunchberry, wild sarsaparilla, showy aster, twinflower, one-sided wintergreen, heart-leaved arnica, queen's cup, Hooker's fairybells, western meadowrue, electrified cat's tail moss, red-stemmed feathermoss, step moss | | |
| Plots | Description based on Delong (2003) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| SD | SxwEp - Devil's club |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SD | gentle, lower slope receiving sites; deep, medium-textured soils; rich nutrient regime |

| Map Symbol | SD6 | SD6 | SD |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |

| | | | |
|---|---|---|---|
| **Dominant Plant Species** | Sxw, thimbleberry, beaked hazelnut, devil's club, oak fern, electrified cat's tail moss, leafy mosses | | |
| **Associated Plant Species** | Fd, Ep, Douglas maple, black gooseberry, red-osier dogwood, highbush cranberry, black twinberry, spiny wood fern, one-leaved foamflower, common mitrewort, clasping twistedstalk, sweet-scented bedstraw, wild sarsaparilla, bunchberry, Hooker's fairybells, ragged mosses, red-stemmed feathermoss | | |
| **Plots** | Description based on Delong (2003) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| OF | Sxw - Ostrich fern |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| OF | gentle slope; deep medium-textured soils; rich nutrient regime; floodplain or toe slope |

| | | | |
|---|---|---|---|
| **Map Symbol** | OF6 | OF6 | O |
| **Structural Stage** | Mature Forest | Mature Forest | Young |
| **Dominant Plant Species** | Sxw, Act, alder, ostrich fern | | |
| **Associated Plant Species** | Bl, devil's club, red elderberry, red-osier dogwood, black twinberry, stinging nettle, enchanter's nightshade, oak fern, sweet-scented bedstraw, large-leaved avens, one-leaved foamflower, meadow horsetail, common horsetail, leafy mosses, ragged mosses, green-tongue liverwort | | |
| **Plots** | Description based on Delong (2003) | no plot data | no plot data |

| Map Unit | Description |
|---|---|
| SH | Sxw - Horsetail -Glow moss |

| Map Unit | Ecosystem Site and Soil |
|---|---|
| SH | gentle slope to level sites and depressions; deep medium- to fine-textured soils |

| Map Symbol | SH6 | SH6 | SH |
|---|---|---|---|
| Structural Stage | Mature Forest | Mature Forest | Young |
| Dominant Plant Species | Sxw, common horsetail, electrified cat's tail moss | | |
| Associated Plant Species | At, Ep, Act, black twinberry, devil's club, red-osier dogwood, black gooseberry, saskatoon, prickly rose, dwarf scouring-rush, bunchberry, twinflower, common mitrewort, prince's pine, oak fern, dwarf red raspberry, red-stemmed feathermoss, knight's plume, ragged mosses, leafy mosses | | |
| Plots | Description based on Delong (2003) | no plot data | no plot data |

# Appendix III – Field Sampling Species List

| Species Code | LatinName | CommonName |
|---|---|---|
| ABIELAS | Abies lasiocarpa | subalpine fir |
| ACERGLA | Acer glabrum | Douglas maple |
| ACERGLA1 | Acer glabrum var. douglasii | Douglas maple |
| ACHIMIL | Achillea millefolium | yarrow |
| ACTARUB | Actaea rubra | baneberry |
| ALNUINC | Alnus incana | mountain alder |
| ALNUS | Alnus sp. | alder |
| ALNUVIR | Alnus viridis | green alder |
| AMELALN | Amelanchier alnifolia | saskatoon |
| ANAPMAR | Anaphalis margaritacea | pearly everlasting |
| AQUIFOR | Aquilegia formosa | Sitka columbine |
| ARALNUD | Aralia nudicaulis | wild sarsaparilla |
| ARCTUVA | Arctostaphylos uva-ursi | kinnikinnick |
| ARNICOR | Arnica cordifolia | heart-leaved arnica |
| ARUNDIO | Aruncus dioicus | goatsbeard |
| ASARCAU | Asarum caudatum | wild ginger |
| ASTECIL | Aster ciliolatus | Lindley's aster |
| ASTECON | Aster conspicuus | showy aster |
| ASTEFOL | Aster foliaceus | leafy aster |
| ASTEMOD | Aster modestus | great northern aster |
| ATHYFIL | Athyrium filix-femina | lady fern |
| BETUNAN | Betula nana | scrub birch |
| BETUPAP | Betula papyrifera | paper birch |
| BRACHYT | Brachythecium sp. | ragged-moss |
| CALACAN | Calamagrostis canadensis | bluejoint reedgrass |
| CALAMAG | Calamagrostis sp. | reedgrass |
| CALARUB | Calamagrostis rubescens | pinegrass |
| CAREX | Carex sp. | sedge |
| CHIMUMB | Chimaphila umbellata | prince's pine |
| CLADINA | Cladina sp. | reindeer lichens |
| CLADONI | Cladonia sp. | clad lichens |
| CLADRAN | Cladina rangiferina | grey reindeer |
| CLINUNI | Clintonia uniflora | queen's cup |
| CORNCAN | Cornus canadensis | bunchberry |
| CORNSTO | Cornus stolonifera | red-osier dogwood |

| Species Code | LatinName | CommonName |
|---|---|---|
| CORYCOR | Corylus cornuta | beaked hazelnut |
| DICRANU | Dicranum sp. | heron's-bill moss |
| DICRFUS | Dicranum fuscescens | curly heron's-bill moss |
| DICRPOL | Dicranum polysetum | wavy-leaved moss |
| DIPHCOM | Diphasiastrum complanatum | ground-cedar |
| DRYOEXP | Dryopteris expansa | spiny wood fern |
| ELYMGLA | Elymus glaucus | blue wildrye |
| EPILANG | Epilobium angustifolium | fireweed |
| EQUIARV | Equisetum arvense | common horsetail |
| EQUIPRA | Equisetum pratense | meadow horsetail |
| EQUISET | Equisetum sp. | horsetail |
| EQUISYL | Equisetum sylvaticum | wood horsetail |
| FRAGVIR | Fragaria virginiana | wild strawberry |
| GALIBOR | Galium boreale | northern bedstraw |
| GALITRF | Galium triflorum | sweet-scented bedstraw |
| GAULHIS | Gaultheria hispidula | creeping-snowberry |
| GEOCLIV | Geocaulon lividum | false toad-flax |
| GEUMMAC | Geum macrophyllum | large-leaved avens |
| GOODOBL | Goodyera oblongifolia | rattlesnake-plantain |
| GYMNDRY | Gymnocarpium dryopteris | oak fern |
| HERACLE | Heracleum sp. | cow-parsnip |
| HIERAUR | Hieracium aurantiacum | orange-red king devil |
| HYLOSPL | Hylocomium splendens | step moss |
| JUNICOM | Juniperus communis | common juniper |
| LATHOCH | Lathyrus ochroleucus | creamy peavine |
| LINNBOR | Linnaea borealis | twinflower |
| LONIINV | Lonicera involucrata | black twinberry |
| LUPINUS | Lupinus sp. | lupine |
| LYCOANN | Lycopodium annotinum | stiff club-moss |
| LYCOCLA | Lycopodium clavatum | running club-moss |
| LYCODEN | Lycopodium dendroideum | ground-pine |
| LYSIAME | Lysichiton americanus | skunk cabbage |
| MAHOAQU | Mahonia aquifolium | tall Oregon-grape |
| MAHONER | Mahonia nervosa | dull Oregon-grape |
| MAIARAC | Maianthemum racemosum | false Solomon's-seal |
| MITENUD | Mitella nuda | common mitrewort |
| MNIUM | Mnium sp. | leafy moss |
| OPLOHOR | Oplopanax horridus | devil's club |
| ORTHSEC | Orthilia secunda | one-sided wintergreen |
| ORYZASP | Oryzopsis asperifolia | rough-leaved ricegrass |

| Species Code | LatinName | CommonName |
|---|---|---|
| OSMOBER | Osmorhiza berteroi | mountain sweet-cicely |
| PAXIMYR | Paxistima myrsinites | falsebox |
| PELTAPH | Peltigera aphthosa | freckle pelt |
| PELTIGE | Peltigera sp. | pelt lichens |
| PELTSCA | Peltigera scabrosa | toad pelt |
| PETAFRI3 | Petasites frigidus var. palmatus | palmate coltsfoot |
| PHLEPRA | Phleum pratense | common timothy |
| PICEENE | Picea engelmannii x glauca | hybrid white spruce |
| PICEGLA | Picea glauca | white spruce |
| PICEMAR | Picea mariana | black spruce |
| PINUCON2 | Pinus contorta var. latifolia | lodgepole pine |
| PLATORB | Platanthera orbiculata | large round-leaved rein orchid |
| PLEUSCH | Pleurozium schreberi | red-stemmed feathermoss |
| POLYCOM | Polytrichum commune | common haircap moss |
| POPUBAL | Populus balsamifera | balsam poplar |
| POPUTRE | Populus tremuloides | trembling aspen |
| PROSHOO | Prosartes hookeri | Hooker's fairybells |
| PSEUMEN | Pseudotsuga menziesii | Douglas-fir |
| PTILCRI | Ptilium crista-castrensis | knight's plume |
| PYROASA | Pyrola asarifolia | pink wintergreen |
| RHYTTRI | Rhytidiadelphus triquetrus | electrified cat's-tail moss |
| RIBELAC | Ribes lacustre | black gooseberry |
| RIBETRI | Ribes triste | red swamp currant |
| ROSAACI | Rosa acicularis | prickly rose |
| RUBUIDA | Rubus idaeus | red raspberry |
| RUBUPAR | Rubus parviflorus | thimbleberry |
| RUBUPED | Rubus pedatus | five-leaved bramble |
| RUBUPUB | Rubus pubescens | dwarf red raspberry |
| SALIX | Salix sp. | willow |
| SAMBRAC | Sambucus racemosa | red elderberry |
| SHEPCAN | Shepherdia canadensis | soopolallie |
| SORBSCO | Sorbus scopulina | western mountain-ash |
| SORBSIT | Sorbus sitchensis | Sitka mountain-ash |
| SPHAGNU | Sphagnum sp. | peat-moss |
| SPIRBET | Spiraea betulifolia | birch-leaved spirea |
| SPIRDOU | Spiraea douglasii | hardhack |
| STREAMP | Streptopus amplexifolius | clasping twistedstalk |
| STRELAN | Streptopus lanceolatus | rosy twisted stalk |
| SYMPALB | Symphoricarpos albus | common snowberry |
| THALOCC | Thalictrum occidentale | western meadowrue |

| Species Code | LatinName | CommonName |
|---|---|---|
| TIARTRI | Tiarella trifoliata | three-leaved foamflower |
| TIARTRI1 | Tiarella trifoliata var. trifoliata | three-leaved foamflower |
| TIARTRI2 | Tiarella trifoliata var. unifoliata | one-leaved foamflower |
| TRIFPRA | Trifolium pratense | red clover |
| URTIDIO | Urtica dioica | stinging nettle |
| VACCCAE | Vaccinium caespitosum | dwarf blueberry |
| VACCMEM | Vaccinium membranaceum | black huckleberry |
| VACCMYL | Vaccinium myrtilloides | velvet-leaved blueberry |
| VALEDIO | Valeriana dioica | marsh valerian |
| VALERIA | Valeriana sp. | valerian |
| VERAVIR | Veratrum viride | Indian hellebore |
| VIBUEDU | Viburnum edule | highbush-cranberry |
| VIOLA | Viola sp. | violet |
| VIOLADU | Viola adunca | early blue violet |

# Appendix IV – Lheidli T'enneh Community Forest Terrestrial Ecosystem Maps

# Lheidli T'enneh Community Forest Terrestrial Ecosystem Maps

The terrestrial ecosystem maps on the following pages provide an overview of the dominant site series classified for each polygon in the Lheidli T'enneh Community Forest (site series component 1, database field name is 'Site_S1'). The ecosystem map of the Salmon Unit is illustrated in Figure 1, and the ecosystem map of the Fyfe Unit follows in Figure 2.

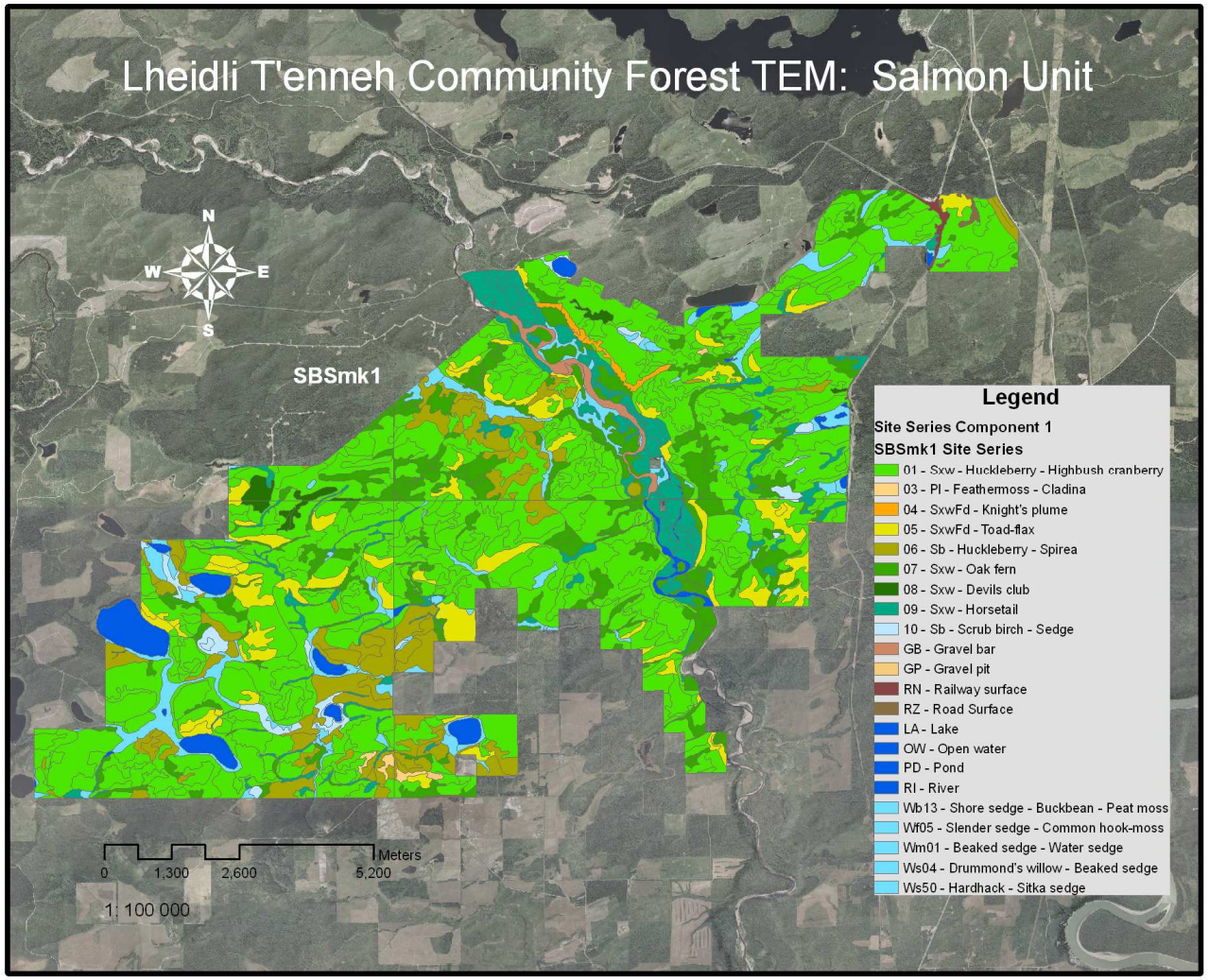


Figure 1. Lheidli T'enneh Community Forest terrestrial ecosystem map of site series component 1 (Site_S1) in the Salmon Unit.

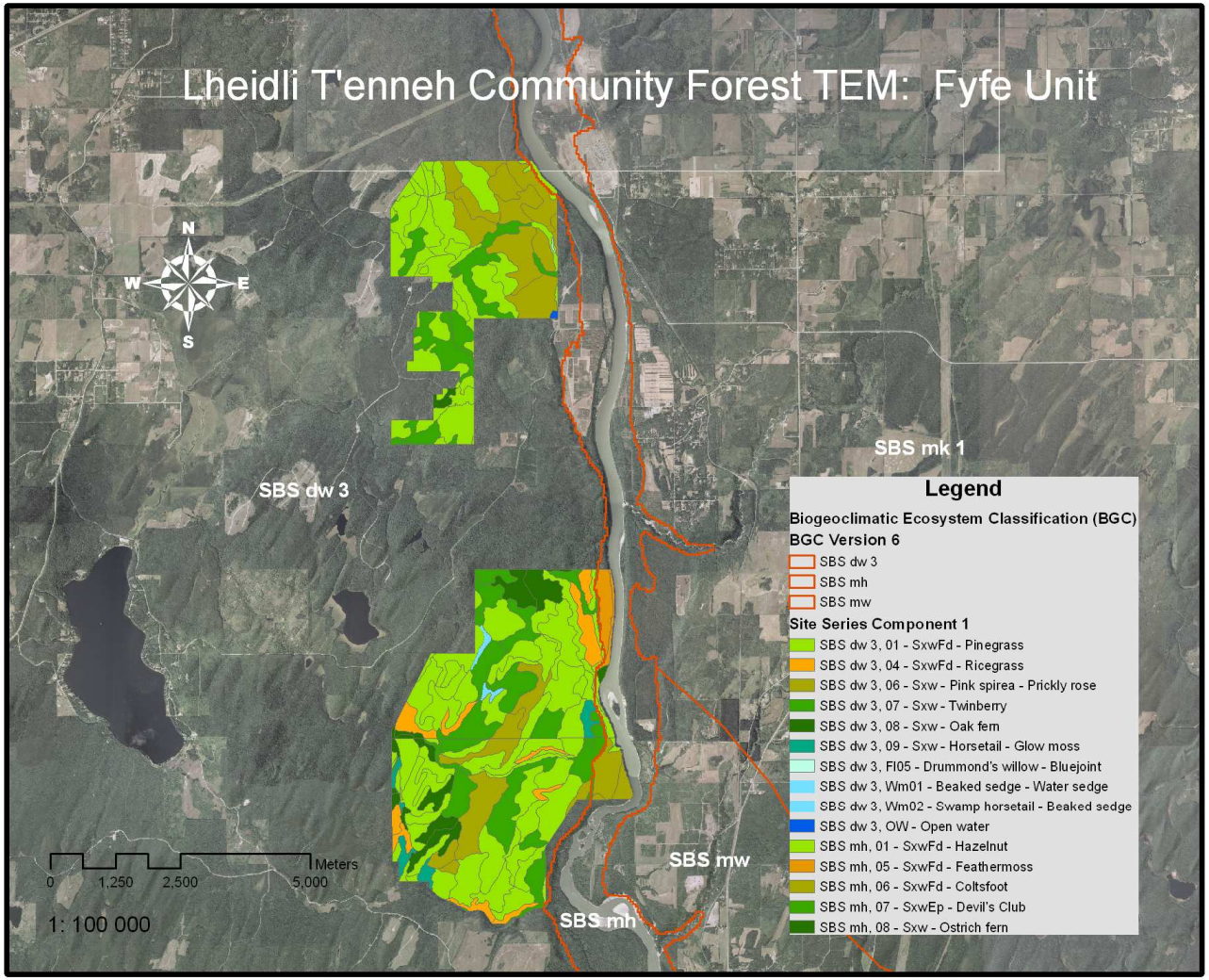


**Figure 2. Lheidli T'enneh Community Forest terrestrial ecosystem map of site series Component 1 (Site_S1) in the Fyfe Unit.**