

**Beaver River wetlands:**  
Predictive wetland ecosystem mapping of the  
wetlands in the Beaver River Watershed

April 2025





# Beaver River wetlands: Predictive wetland ecosystem mapping of the wetlands in the Beaver River Watershed

Government of Yukon  
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## Introduction

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In January 2018, the Government of Yukon and First Nation of Nacho Nyak Dun signed an agreement to develop a sub-regional land use plan for the Beaver River watershed planning area (“the planning area”). In response to this agreement, a high-level information gap analysis identified a need to gain further information on wetland ecosystems and habitat within the planning area. As a result, a wetland inventory program and predictive wetland mapping program were developed to support the planning process. This technical report supplements the Beaver River predictive wetland map (“the map”), which identifies wetland areas at a regional scale for the planning area.

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## Study area

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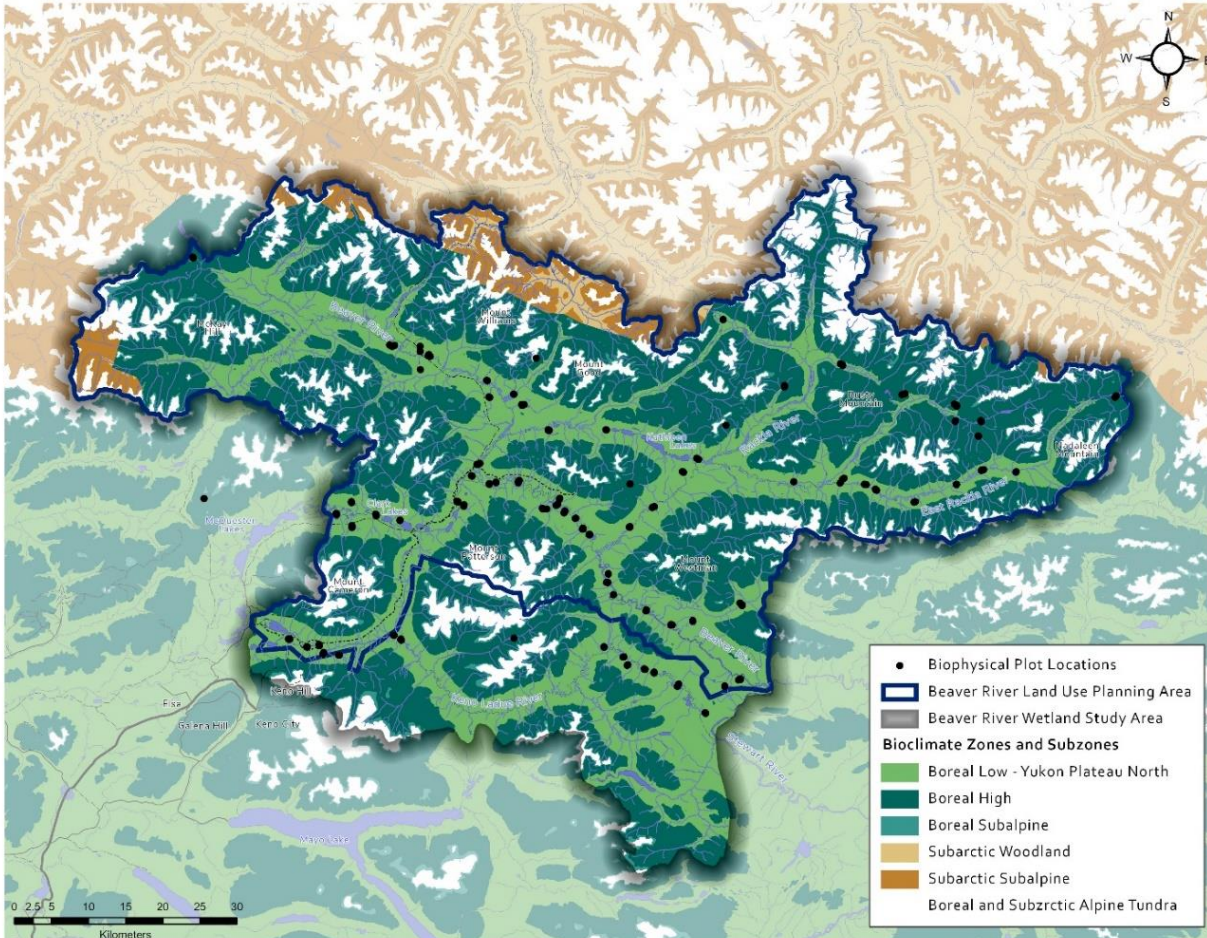
This study area in east central Yukon has a total area of 504,800 ha. The area consists of the Beaver River watershed, including the Rackla and East Rackla rivers, and a portion of the Keno Ladue watershed. The study area is mostly in the McQuesten Highlands Ecoregion with the Beaver and Keno Ladue rivers overlapping the Yukon Plateau-North Ecoregion, and the Rackla and North Rackla rivers overlapping the Mackenzie Mountains (GeoYukon December 2019).

The McQuesten Highlands, which include the Southern Wernecke Mountains from the Peel watershed divide in the north, to the Stewart River valley in the south is a glaciated landscape. This area was completely glaciated during the mid Pleistocene (approx. 200,000 yrs BP). During the later Pleistocene (22,000 yrs BP), the glaciers advanced from the west, covering all the valleys leaving only the highest peaks exposed in the east. In the western portion of the study area, near the glacial limits, the Davidson Range and the range between the Beaver River and McQuesten Lake were not glaciated. Glacial processes left broad u-shaped valleys with smaller streams, moraine, and at higher elevations, alpine cirques. The valleys in this glaciated landscape are filled by rolling to hummocky glacial till deposits, some lacustrine and glaciolacustrine deposits with numerous lakes, wetlands and some smaller peat deposits, and are dissected by rivers and creeks (Smith et al. 2004). The Beaver and Keno Ladue rivers and some upper reaches of the Rackla River are mostly meandering rivers with broad floodplains, local fine textured lacustrine and numerous wetlands.

The Wernecke Mountains are composed of variably deformed, mostly Paleozoic sedimentary rocks deposited on the outer continental shelf of North America. They consist of clastic sediments (sandstones, siltstones, shales, conglomerates) as well as limestone and dolostone, with some volcanics. These rocks became deformed and altered when associated with later granitic intrusions and hydrothermal fluids resulting in mineralization with economic potential (Smith et al. 2004).

The climate of this region is strongly continental with warm summers and very cold winters. Within the region, low-lying river valleys experience the warmest summer and the coldest winter temperatures and cold air ponding in the valleys, trapped by winter temperature inversions, can result in warmer temperatures at higher elevations (Bonnaventure et al. 2012).

The study area ranges from the Boreal Low Bioclimate zone (BOL) in the lower valleys (up to 950 masl), to Boreal High (BOH) between 950 masl and 1,150 masl, Boreal Subalpine (BOS) between 1,150 masl and 1,450 masl, to Boreal Alpine (BOA) above 1,450 masl. These bioclimate zone transitions were developed based on the draft report on the Boreal High Bioclimate Zone (BOH) in Yukon (Meidinger Ecological Consultants and EDI Environmental Dynamics 2018) which analyzed all available data to determine where bioclimate differences are occurring in the boreal bioclimate region. The report indicates that the valleys of the Beaver River planning region below 950m are BOL, which were previously understood to be BOH based on pre-existing mapping. Field work in summer 2019, investigating the Beaver River wetlands, confirms that the valleys where most wetlands occur should be mapped in the BOL. The Bioclimate limits shown in Figure 1 are those from Meidinger and EDI (2018). There are also small areas in the northern and western parts of the study area in the Subarctic Woodland and Subarctic Subalpine Bioclimate zones.

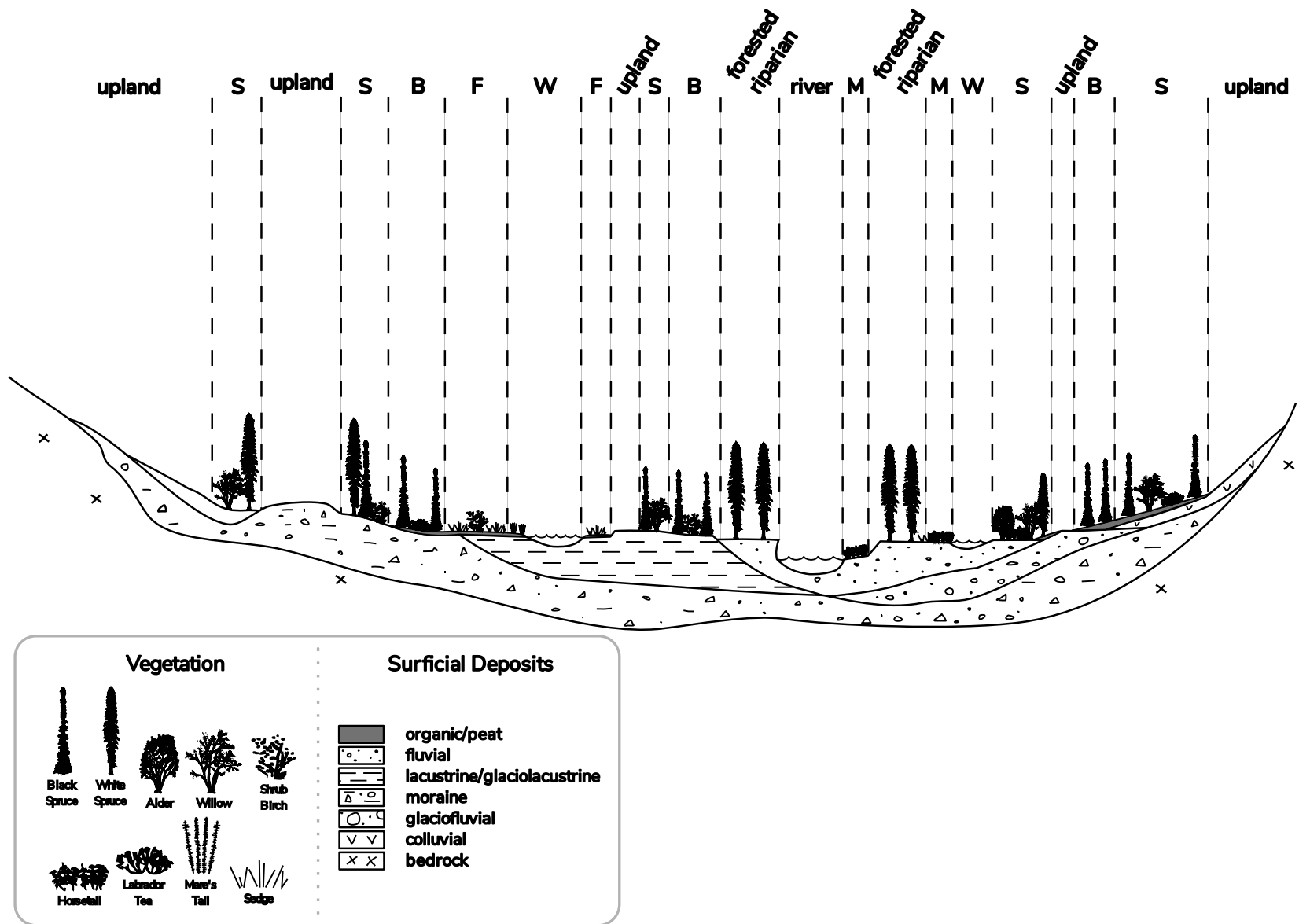


**Figure 1.** Beaver River wetland study area, including subregional planning area, Bioclimate Zones and subzones (Meidinger and EDI 2018), and 2019 plot locations.

The study area is within the extensive discontinuous permafrost zone. Permafrost underlies the higher elevations and much of the slopes and valleys. The hummocky to undulating surface of the glacial deposits and the permafrost distribution are both key factors influencing the type and distribution of wetlands and plant communities (Smith et al. 2004). Thermokarst is common.

Open to closed, black and white spruce (*Picea mariana*, and *Picea glauca*, respectively) forests dominate the area below 1,400 meters. Aspen (*Populus tremuloides*) and Alaska birch (*Betula papyrifera*), often occurring in mixed stands, are found on warmer sites and in successional forests. Balsam poplar (*Populus balsamifera*) is found on some fluvial floodplain sites. Subalpine fir (*Abies lasiocarpa*) may be present at higher elevations and on cooler sites. The shrub understory on circum-mesic sites typically consists of shrub birch (*Betula glandulosa*), common Labrador tea (*Rhododendron groenlandicum*), willows (*Salix* spp.) and soapberry (*Shepherdia canadensis*).

Wetlands in the Beaver River watershed are concentrated in the broader river valleys. They are located on the current and relic floodplains of rivers, on lacustrine and glaciolacustrine deposits underlying many river valleys and on the toe slopes where fine textured surficial deposits have accumulated from downslope permafrost movement covering the edges of the older fluvial deposits. Wetlands are also found along smaller tributary creeks on adjacent side slopes. A few wetlands are mapped occurring in small, isolated basins on side slopes and in higher elevation valleys of the BOH. Figure 2 illustrates the generalized landscape distribution and relationship of wetlands classes within the study area.



**Figure 2.** Landscape profile of wetland distribution and classes in the Beaver River Wetland study area, 2019. S= swamp, B= bog, F= fen, W= water.

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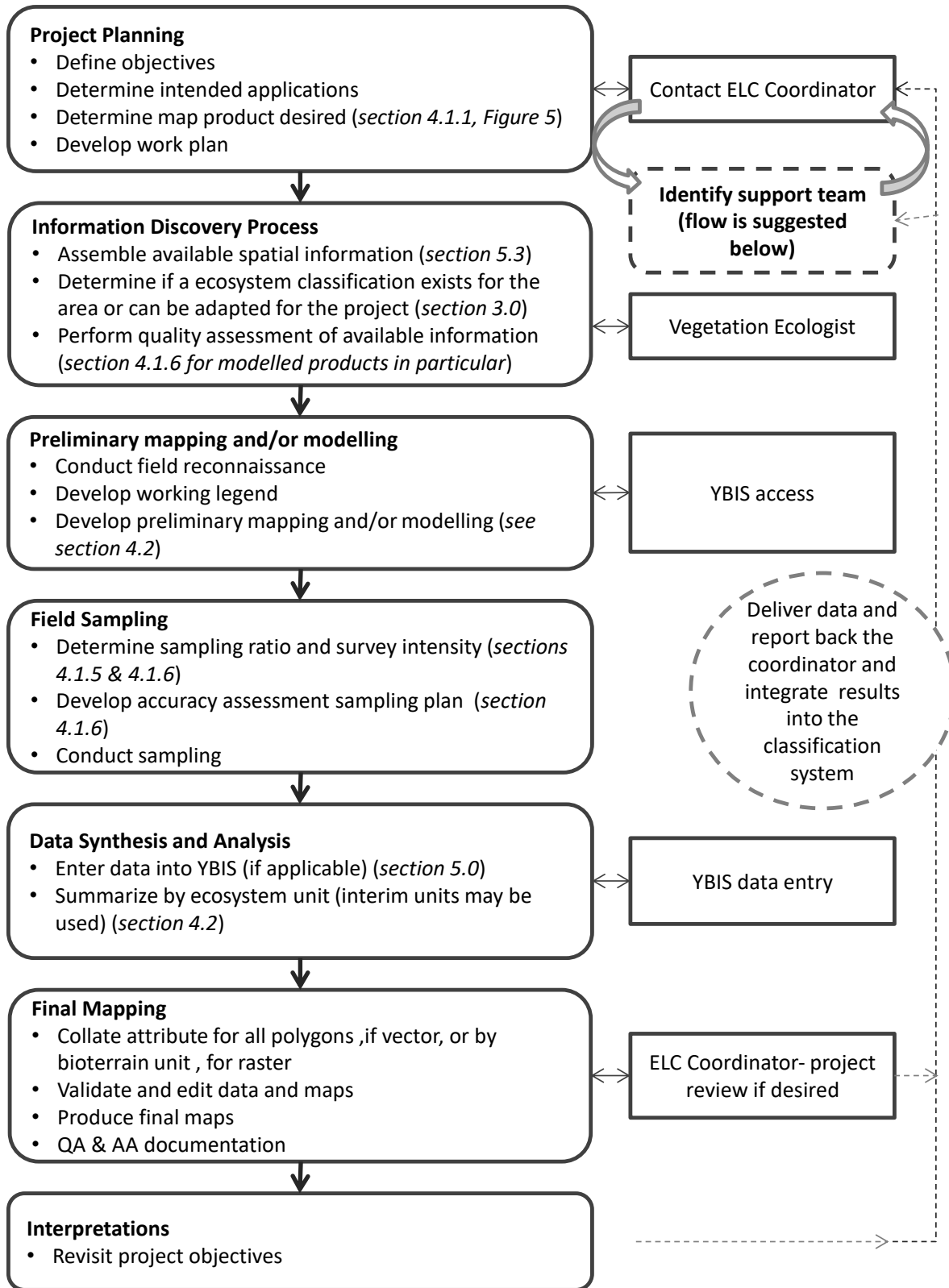
## Methods

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We developed the Beaver River wetland map using a Predictive Ecosystem Map (PEM) approach utilizing a random forest machine-learning model. The predictive model approach was selected as the most suitable method for regional planning purposes given the size of the study area and the availability of data. PEM products have consistently been the method of choice for previous land use planning processes in the Yukon. Alternatively, a Terrestrial Ecosystem Map (TEM) would be an appropriate product for site level classification and mapping and should be considered if a finer level of detail is required for environmental assessment or infrastructure planning (Environment Yukon 2016). The methods to develop the PEM generally followed the workflow for ecosystem mapping presented in the ELC mapping guidelines (Figure 3; Environment Yukon 2016). The workflow has been generalized into the five processes below and described in detail in the following sections:

- i. Create training polygons from high resolution imagery interpretation, existing ecological data and landscape variables.
- ii. Determine and develop predictor variables from literature utilizing satellite imagery, elevation models and additional geospatial data.
- iii. Develop and run the random forest classification model to develop a preliminary PEM.
- iv. Field test the preliminary PEM and collect on the ground data to validate the map.
- v. Develop the final PEM by analyzing field information, refining training data and validating the accuracy using data withheld from the modeling process.

To supplement the PEM, a wetland classification was developed using field data to provide detailed information about the ecotopes within the five mapped wetland classes.



**Figure 3.** Recommended workflow for conducting an ecosystem mapping project (Environment Yukon 2016).

## Creation of training polygons

A fundamental component to constructing a supervised classification is having a set of knowledge-based input training data to classify different land cover types and train the model to predict areas without existing information. Training data can be derived from ground data, existing ecosystem or land cover maps, and air photo or satellite imagery interpretation. In the case of the Beaver River study area, minimal ground data and no ecosystem maps were available, so training data were developed from satellite imagery interpretation using the following data sources (Table 1).

**Table 1.** Satellite imagery sources used to develop training data.

Source	Acquisition date	Coverage	Resolution (m)
Spot 6	September 8, 2018	Full	1.5
Pleiades 1	August 3, 2013	Partial	0.5
ESRI World Imagery	Multiyear (2013-2015)	Full	0.5 – 15
Sentinel-2	September 17, 2018	Full	10

Imagery interpretation was completed by ecologists with specialties in air photo interpretation at Palmer Environmental Consulting Group and Drosera Ecological Consulting. Contractors used multiple imagery datasets along with landscape variables to determine the classification of each polygon. A total of 1,621 polygons were delineated and classified by landcover type (Table 2).

**Table 2.** Training polygon classification and characteristics.

Landcover type	Number of polygons	Total area represented (ha)
Bog	99	10.7
Fen	178	21.8
Marsh	93	8.9
Swamp	380	54.7
Shallow Water	171	26.2
Exposed Fluvial	51	2.5
Forested Coniferous	337	78.8
Herbaceous / Barren	114	10.6
Shrub / Regenerating Forest	189	98.0

Training polygons were developed proportionally to reflect the extent and variability of each land cover class within the study area. In some instances, polygons were shifted slightly from their source imagery location to match up with the imagery and data inputs used for the model. Upland landcover classes were classified generally to assist the model in correctly separating

wetland and upland ecosystems. Upland landcover is not included in the final mapping product as minimal field effort was spent to verify these classes on the ground.

## Development of predictor variables

Predictor variables for the PEM model consist of multiple raster layers derived from remotely sensed satellite data and a digital elevation model (DEM) derivative. Criteria for developing and selecting the predictor variables were based on previous PEM products developed in the Yukon and British Columbia (Fraser et al. 2012, Merchant et al. 2019, Filatow et al. 2018).

Selection of predictor variables was based on spatial coverage, cost and availability within the constraints of the budget, appropriate resolution, and significance in characterizing wetland types. Predictor variables were derived from three primary sources (Table 3).

**Table 3.** Primary data sources used to develop Predicted Ecosystem Map (PEM).

Source	Description	Resolution
Sentinel-2 (13 band multispectral satellite imagery)	Sentinel-2 data was the primary satellite imagery data input into the predictive model. Raw imagery was downloaded from the European space agency, corrected to bottom of atmosphere radiance, and mosaiced for the study area. The satellite hosts 13 bands of optical data, which independently or jointly was used to create optical imagery, Near Infrared, Normalized Difference Vegetation Index (NDVI), and Enhanced Vegetation Index (EVI). These layers combined provided multiple inputs to the model. Bands utilized in the model were resampled to 10 m resolution. Image acquired (2018-09-17)	10 metre (Bands 2,3,4,8)
		20 metre (Bands 5,6,7,8A,11,12)
		60 metre (Bands 1,9, 10)
Sentinel 1 (c-band Synthetic-aperture Radar Satellite)	Sentinel-1 is a synthetic-aperture radar image, which was used to derive a cross-polarization image. Raw image files were resampled, terrain corrected with the 10 m Arctic DEM, speckle filtered and radiometrically corrected to reduce data skewness. Image acquired (2019-09-22)	10 metre
Arctic DEM	Captured from the DigitalGlobe constellation, a 2 m Digital Elevation Model (DEM). The Raw data was generalized to a 10 m working resolution and mosaiced for the study area to be consistent with the resolution of other data sources. This dataset was the primary source for developing wetland related landscape variables including (Topographic Wetness Index - TWI, Topographic Position Index - TPI, Curvature, etc.)	2 metre (Generalized to 10 metre)

The primary data sources were used to derive specific predictor variables to run the supervised classification (Table 4). The following predictor variables were developed as final inputs into the random forest model.

**Table 4.** Predictor variables inputs used in the Predictive Ecosystem Map (PEM) model.

<b>Variable</b>	<b>Source</b>	<b>Description</b>
<b>Derived from Sentinel imagery:</b>		
Vegetation Indices	Sentinel-2 (acquired September 2018)	Ratio Vegetation Index (Red/NIR), Enhanced Vegetation Index ( $2.5 * (NIR - Red) / (NIR + 6 * Red - 7.5 * Blue + 1)$ ), Normalized Difference Vegetation Index ( $(NIR - Red) / (NIR + Red)$ ).
Radiance	Sentinel-2 (acquired September 2018)	SWIR1 (B11), SWIR 2 (B12), Vegetation red edge (B06).
Principal Component Analysis	Sentinel-2 (acquired September 2018)	Principal component analysis on sentinel red, green and blue bands.
Cross polarization ratio (VH/VV)	Sentinel-1 (acquired September 2018)	Cross polarization ratio calculated from geometrically corrected vertically and horizontally received polarized bands.
<b>Derived from Digital Elevation Model (DEM):</b>		
Generalized elevation	Arctic DEM (10 metre)	10 metre DEM with holes and sinks filled, generalized from 2 metre DEM.
Diurnal anisotropic heat	Arctic DEM (10 metre)	DEM derived diurnal anisotropic heating.
Plan curvature	Arctic DEM (10 metre)	Derived from the DEM; is the measure of curvature perpendicular to the downward direction of slope.
Profile curvature	Arctic DEM (10 metre)	Derived from the DEM; is the measure of curvature parallel to the downward direction of slope.
Permafrost probability	Yukon DEM (30 metre)	Derived from the Yukon 30 metre DEM down-sampled to 10 metres. (Bonnaventure et al. 2012)
Vertical distance to channel network	Arctic DEM (10 metre)	Calculated vertical elevation from an interpolated channel network base level elevation.
Topographic position index	Arctic DEM (10 metre)	Index of landscape position relative to neighbouring cells. Positive values represent ridges and negative values represent valleys.

<b>Variable</b>	<b>Source</b>	<b>Description</b>
Topographic wetness index	Arctic DEM (10 metre)	Calculation of slope relative to catchment area to determine soil moisture relative to the catchment area.
Slope	Arctic DEM (10 metre)	Slope of each raster cell based on DEM.
Multiresolution index of valley bottom flatness	Arctic DEM (10 metre)	Function to calculate valley bottoms as flat low areas. Uses slope and elevation between neighbouring cells to establish the index.
Terrain classification index (lowlands)	Arctic DEM (10 metre)	Terrain Classification Index for lowlands based on DEM and Slope

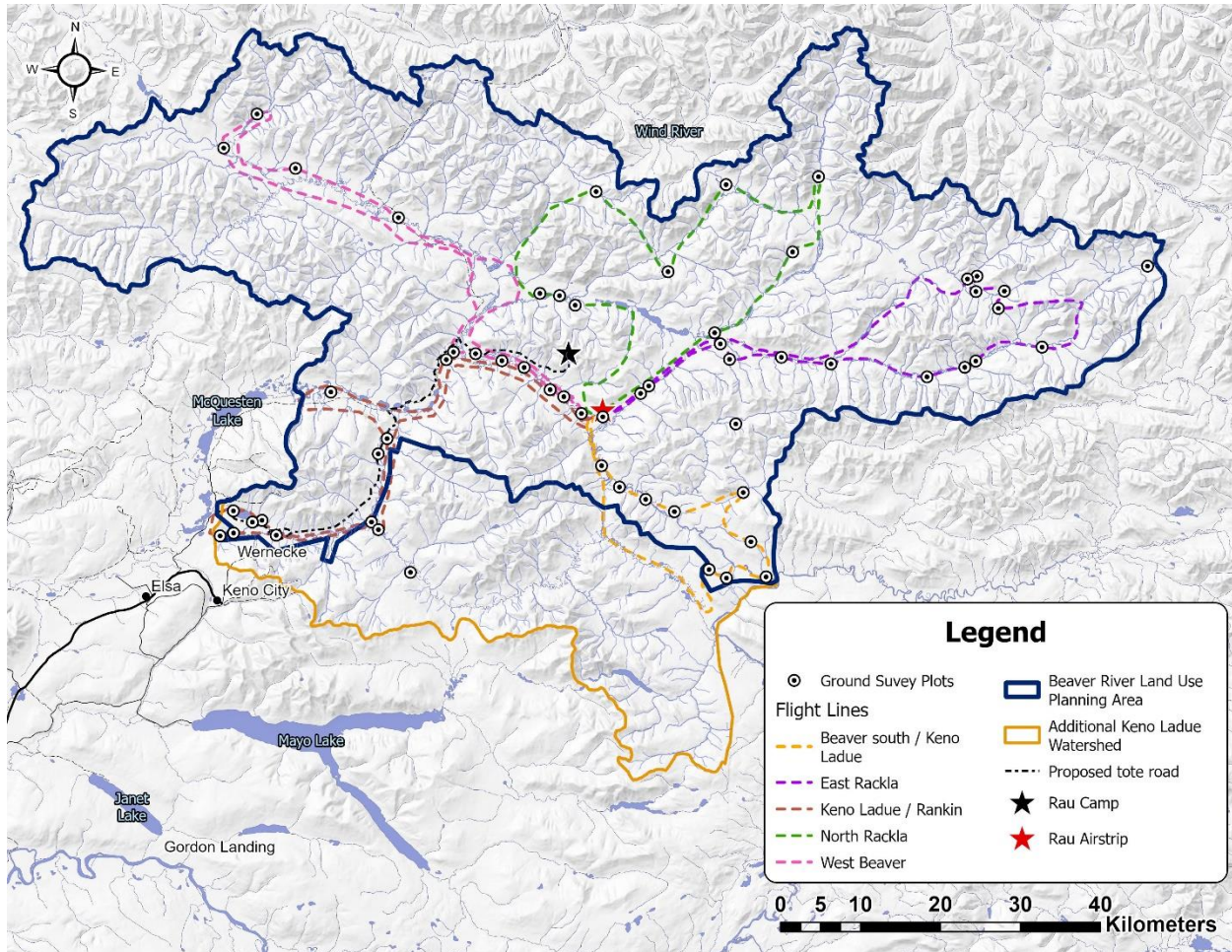
## Random forest classification model

Image-based predictive modeling is a common technique to develop ecosystem maps over a large area. There are two general approaches to image-based modeling: unsupervised and supervised classification. An unsupervised classification relies purely on the computer's interpretation of the input variables with no added knowledge about the area of interest. A supervised classification utilizes user input in the form of training data to help the computer train the model to classify areas based on the user's knowledge. The latter approach often combines imagery interpretation and field data as training data to support the model.

A supervised classification approach was selected and developed prior to the field inventory program to improve the understanding of the input data and model performance for the study area. Preliminary model results and maps were used to inform the field-sampling program and were tested for validity during the field campaign.

## Field test and validation

Fieldwork to check the preliminary supervised wetland classification and characterize wetlands in the study area, was undertaken from July 4<sup>th</sup> to July 13<sup>th</sup>, 2019. A sampling protocol for fieldwork was developed identifying aerial traverses, potential ground plot and aerial plot locations (Figure 4).



**Figure 4.** Preliminary flight paths and ground sampling locations in the Beaver River Wetland Study Area.

Fieldwork was based at the ATAC Rau camp where Archer Cathro provided accommodation and meals for the field crew. Helicopter support was provided by Barry Guthrie and Capital Helicopters with a Bell 206L Long Ranger helicopter. The field team consisted of two 3-person field crews to enable detailed and quick plots to be completed in an efficient manner. Data was collected in transects at each landing site targeting multiple wetland and upland types. The field program resulted in a total of 250 ground plots, comprised of quick site visit and complete ecosystem plots.

At each ground plot site crews collected general location and site information, data on mineral soil, organic and peat layers, water table, permafrost, pH, vegetation species and cover, terrain and wetland classification. Data was recorded on field forms using standards from the Department of Environment's Field Manual for Describing Yukon Ecosystems (2017a). Detailed site, soil and vegetation field forms were completed for many plots, but some shorter site visit forms were used for quick plots. All ground plots were entered into the Yukon Biophysical Inventory System (YBIS) database where they can be used to develop further ecosystem products.

In addition to the ground plots, 265 aerial checks were conducted to validate the preliminary map polygons. Aerial checks were conducted from the helicopter and consisted of a waypoint, geotagged photos, wetland classification and any additional notes.

## Accuracy assessment and final map development

Field notes, ground plots and aerial checks were incorporated into the final mapping product. Initial training polygons were reclassified to reflect field observations and updated information obtained during the field campaign. Additional training polygons were derived to fill gaps in wetland representation. The random forest model was rerun using the updated training data consisting of 1,621 unique polygons distributed across the study area. The model results were cross-validated with the field ground plot and aerial check data. Training data accounted for 75% of the input polygons while the validation data made up the remaining 25%. The goal of the product was to achieve an accuracy of 70% or greater based on a survey level intensity of 4 which identified 15-25 percent of mapped polygons (Environment Yukon 2016). The model output was a 10 m resolution classified raster that contained nine landcover classes. The classified raster was generalized, and a speckle filter ran using nearest neighbor interpolation to remove and reclassify single pixels to their neighbouring pixel value. The generalized output was manually adjusted to reclassify shadow pixels as null. The open water class was manually adjusted, based on existing vector hydrology data, to separate out large lakes and rivers from this class to provide a more accurate representation of true shallow water wetlands.

## Wetland classification

Classification of the wetlands was completed using VENUS Professional (VPro) Software developed for the B.C. Biogeoclimatic Ecosystem Classification (BEC) Program (MacKenzie and Klassen 2004) to analyse detailed plot information. Plot data was classified to the class level and the ecosite level based on the analysis. Wetland ecosites found in the Beaver River watershed include many ecosites common to other subzones of the Boreal Low, the BOL Klondike Plateau (BOLkp), BOL Southern Lakes (BOLsl), BOL Yukon Plateau Central (BOLyc) and the BOL Liard Hyland (BOLlh). This report summarizes the data collected in the Beaver River Land Use Planning area which lies in the McQuesten Upland bioclimate zone (BOLmh). The data is not distributed throughout the whole subzone; however this report does provide a good representation of the wetlands of the subzone and can be considered as a draft guide for the subzone.

After the classification was finalized, reporting and description of the wetland classes was completed. Wetlands can be identified by class: bog, fen, swamp, marsh and shallow water as in Table 5. However, identifying wetlands to ecosite provides a lot more information about soil conditions, water, permafrost and the vegetation assemblage found on the site which help our understanding of the ecological functions and habitat that the different ecosites provide.

Many of the wetland ecosites described in this report are summarized from the ecosite descriptions in previous ecosite guides from BOLkp (Environment Yukon 2019a), BOLlh (Environment Yukon 2019b), BOLyc (Meidinger and EDI 2016) and BOLsl (Environment Yukon

2017b). The descriptions have been expanded and adapted to reflect the slightly different conditions and vegetation species present in the McQuesten Highlands Ecoregion and Bioclimate subzone.

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## Results and discussion

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The final PEM is produced at a map scale of 1:100,000 and is attached in Appendix A. As per ELC mapping guidelines, this product can be used at a scale of 1:50,000. The resulting geospatial data is a 10 m resolution GeoTIFF covering the extent of the study area. Wetlands were modelled and mapped to the five major class level described by *The Canadian Wetland Classification System* (National Wetlands Working Group, 1997). Wetlands were further classified and described to the ecosite level, based on ecosystem plot data but were not mapped to this level of detail due to data limitations and the output map scale.

The PEM results suggest that wetlands cover 68,440 ha (11%) of the study area. This area is further divided by wetland class to represent the relative composition of wetlands in the study area (Table 5).

**Table 5.** Wetland area and percentage by class within the Beaver River study area.

<b>Wetland Type</b>	<b>Bog</b>	<b>Swamp</b>	<b>Fen</b>	<b>Marsh</b>	<b>Shallow Water</b>
<b>Area</b>	4,916 ha	51,061 ha	4,376 ha	748 ha	2,278 ha
<b>Percent of total wetlands</b>	7%	82%	7%	1%	3%

There are 5 classes of wetlands in Canada — bogs, fens, swamps, marshes and shallow water; all of which are found within the study area. The definitions of wetland classes in the following paragraphs are simplified from those provided in *The Canadian Wetland Classification System*. The descriptions and discussion of the distribution of each class of wetland in the Beaver River study area are based on the data collected during fieldwork in July 2019 in the Beaver River and Keno Ladue River watersheds. The key factors that characterize the different wetland classes in the study area are summarized in Table 6.

**Table 6.** Wetland identification table for the Beaver River study area.

<b>Wetland Class</b>	<b>Moisture</b>	<b>Terrain, Soils</b>	<b>Vegetation (trees, shrubs)</b>	<b>Vegetation (groundcover)</b>
<b>Bog</b>	<b>SMR:</b> 6-7. <b>Drainage:</b> P-VP Stable water table; surface is usually fairly dry, raised above the water table	Level or depression sites; $\geq 40$ cm poorly decomposed peat; soils are Organic Cryosols; permafrost at about 35-55 cm	Open and sparse Sb; Labrador tea present; shrub birch common	Dominated by peat mosses, reindeer lichens and cloudberry; bog cranberry and low bush cranberry characteristic
<b>Fen</b>	<b>SMR:</b> 7-8 <b>Drainage:</b> P-VP Water table at or near surface, or seepage on top of permafrost	Mid to toe slopes, or level or depression sites; 20-40 cm or more of fibric or mesic peat; soils are Fibrisols, Mesisols or Cryosols; permafrost may be present	Mostly non-treed (trees $< 10\%$ cover); can be shrub dominated (shrub birch, willow, leatherleaf); sometimes sparse to open Sb or Sw.	Sedges; peat mosses and brown mosses
<b>Swamp</b>	<b>SMR:</b> 6-7 <b>Drainage:</b> I-P Fluctuating water table; seepage may be present; signs of gleying, distinct or prominent mottles or water table within 40 cm; subsurface water flow, flooding or winter aufeis common	Mid to toe slopes, or level floodplain sites; often along rivers, creeks, in valleys or draws; generally shallow layer (5-30 cm) of moderately decomposed peat over mineral soil; soils usually Gleysols. Permafrost may be present	Forest (Sw, SbSw,) or shrub dominated (willow, river alder, shrub birch).	Variable understory including reedgrass, sedges, horsetails, mosses and sometimes lichen; mosses may include brown, feather, peat and leafy mosses
<b>Marsh</b>	<b>SMR:</b> 7-8 <b>Drainage:</b> I-VP Fluctuating water table; water table may be present at surface	Sandy, silty or loamy mineral soils; Gleysols	Trees $< 10\%$ cover; shrubs $< 10\%$ cover.	Sedge (beaked, water, russet, spike-rush), water horsetail, reedgrass or mannagrass dominated
<b>Shallow Water</b>	<b>SMR:</b> 9 Aquatic Permanent water less than 2 m deep	Aquatic	Trees $< 10\%$ cover; shrubs $< 10\%$ cover.	Emergent and submergent aquatics, including pondweed, mare's tail, pond lily, bladderwort or milfoil and sedges. Variable moss

The wetland classes (by colour) and ecosites and are shown on the following edatopic grid which illustrates the relative moisture and nutrient status of the different ecosites (Figure 5).

### Beaver River Wetland Edatopic Grid

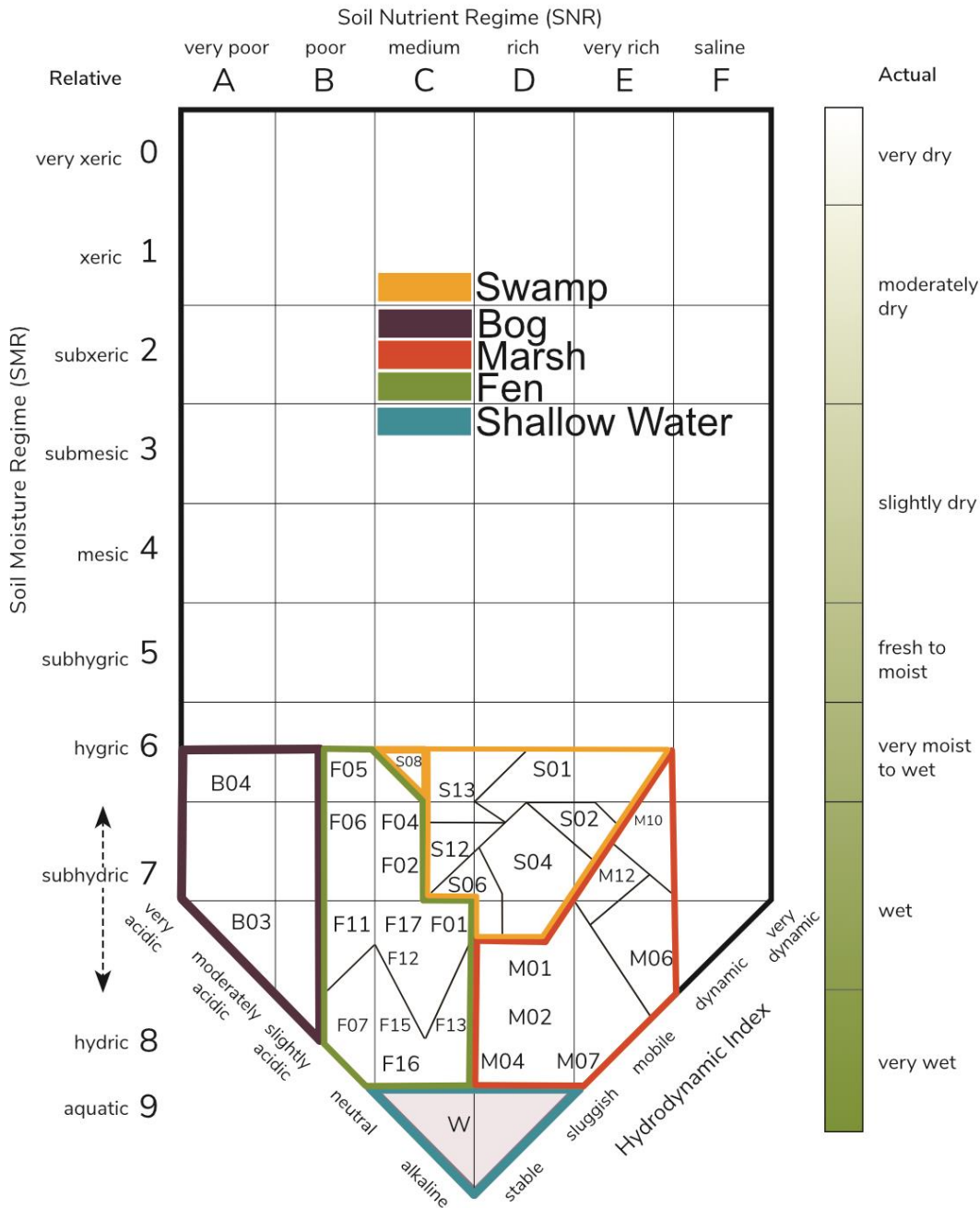


Figure 5. Wetland Edatopic Grid illustrating the relative moisture and nutrient status of the five different ecosites found in the Beaver River wetland study area, 2019.

## Bogs

Bogs are peat landforms characterized by a raised surface above the surrounding terrain, thus they receive water from precipitation but are virtually unaffected by any groundwater flow. The depth of peat is typically greater than 40 cm. Peat is poorly decomposed with a low soil and water pH; usually less than pH 4.8. Bogs in the Yukon are usually associated with permafrost.

In the study area, bogs are often mapped as part of wetland complexes found on toe slopes and on old floodplains along the Beaver, Keno-Ladue, and East Rackla rivers and the headwaters of Scougale Creek. Bogs within swamp complexes contain peat that is generally less than 45 cm. Bogs associated with fens and shallow water wetlands, infilling deeper depressions and old meander scars, may contain much deeper peat deposits. Soils are typically classified as Terric Fibric or Fibric Organic Cryosols or, when peat is close to but less than 40 cm, as Regosolic Turbic Cryosols. Surface peat is poorly decomposed peat moss with a low pH (between 4 and 5), often overlying a thin band of mesic peat close to the frozen surface or mineral contact. Soil frost in July is typically found between 30 and 45 cm from the surface in the peat but it is expected that the active layer is deeper later in the summer.

Bogs in the Beaver River watershed are characterized by open to sparse stunted black spruce, with a groundcover of peat moss. The driest undisturbed sites have a high cover of reindeer lichen. Pocket depressions within a drier bog may support sphagnum mosses, brown mosses, various sedges and cottongrass. Feathermosses and other mosses may occur on drier hummocks. We recognized four different bog ecosites and accompanying vegetation associations in the study area (Table 7). For more details see Appendix A – Wetland Ecosite Fact Sheets.

**Table 7.** Bog ecosite identification in the Beaver River wetland study area, 2019.

<b>Ecosite</b>	<b>Ecosite name: Vegetation Association</b>	<b>Moisture</b>	<b>Site/Soils</b>	<b>Overstory/Shrubs</b>	<b>Ground Cover</b>
<b>B02</b>	Sw – Labrador tea – Peat moss Bog	SMR: 5-7	>=40cm poorly decomposed peat; Organic Cryosols; permafrost	Open white spruce canopy; Labrador tea dominant shrub also shrub birch	Peat moss dominant; some feathermoss, brown mosses
<b>B03</b>	Sb – Labrador Tea – Peat Moss Bog	SMR: 5-7; SNR: A-B; stable water table	>=40 cm poorly decomposed peat; soils are Organic Cryosols; permafrost	Open to closed black spruce canopy; Labrador tea dominant in shrub layer	Peat mosses with some feathermosses, ground shrubs and lichens
<b>B04</b>	Sb – Lichen Bog	SMR: 5-7; SNR: A-B; stable water table	>=40 cm poorly decomposed peat; soils are Organic Cryosols; permafrost	Sparse to moderate cover canopy of black spruce; Labrador tea low to high cover; shrub birch sometimes moderate cover	High lichen cover with peat moss and some feathermoss

<b>B06</b>	Shrub birch – Lichen – Peat moss Bog	SMR: 5-7; SNR: A-B; stable water table	>=40 cm poorly decomposed peat; soils are Organic Cryosols; permafrost	Trees <5% cover; open cover of shrub birch	High lichen cover with some peat moss
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## Fens

Fens are peat landforms influenced by minerotrophic groundwater; rich in dissolved minerals, they have a higher pH and are more productive than bogs. Slow groundwater and sometimes surface water flow are characteristic. The water table is usually at or just below the surface, and the peat is composed of moderate to poorly decomposed sedge or brown moss peat. They range from rich fens with significant nutrient rich water flow and a neutral to high pH, to poor fens, with a lower pH, lower in nutrients, and with many species in common with bogs.

Fens are sparsely distributed throughout the valleys in the Beaver River watershed, usually occurring in association with other wetlands including bogs, shallow water ponds and swamps. The depth of peat in fens within the study area varies from about 20 cm to more than 2 meters. The pH is typically in the range of 5.5 to 7.5. Many fens do not contain permafrost, however poorer fens are commonly frozen at less than 50 cm from the surface. Soils are classified as Mesisols, Fibrisols and Cryosols. The Yukon Wetland Classification guide criteria specify peat depth at 30 cm as the lower threshold for organic (Department of Environment 2019), however we encountered ice at peat depths of less than 30 cm at several fen ecosites in the study area. When considering the vegetation, soils, and hydrology of these sites, we determined they fit the criteria for fen wetlands.

Like the soils, the vegetation of fens is diverse. Fens may be treed, dominated by shrubs or herbaceous vegetation. Treed fens tend to be drier, poorer in nutrients, with a lower pH and are associated with permafrost in this part of the Yukon. The ground vegetation in fens is typically dominated by a variety of sedges and mosses. We identified twelve fen ecosites in the data sampled (Table 8). For more details see Appendix A – Wetland Ecosite Fact Sheets.

**Table 8.** Fen ecosite identification within the Beaver River watershed study area, 2019.

<b>Ecosite</b>	<b>Ecosite Name</b>	<b>Moisture</b>	<b>Site/Soils</b>	<b>Overstory/Shrubs</b>	<b>Ground Cover</b>
<b>F01</b>	Water Sedge Fen	SMR: 7-8; water table at or near the surface	>=30 cm poorly to moderately decomposed peat; soils are Fibrisols, Mesisols, Organic Cryosols	Trees <10%; shrubs <10%	Water sedge or beaked sedge dominates cover; brown mosses usually present
<b>F02</b>	Shrub Birch Fen	SMR: 7-8; stable water table close to surface	Peat 20-105 cm or more; soils are Fibrisols or Mesisols; may have	Trees <10%; shrubs >10% dominated by shrub birch, often with Labrador tea	Water sedge and sometimes beaked sedge with brown, peat

			limnic, cumulic or hydric layers		or other wetland mosses
<b>F04</b>	SbSw – Water Sedge Fen	SMR: 7; moderately stable water table close to surface	Peat 20-45 cm or more, may have limnic, cumulic or hydric layers	Black or white spruce >= (7) 10%; low to high cover of willow often blueberry or grey-leaved willow	Water sedge usually dominant with minor cover of other sedges; mosses mix of step moss, brown mosses, and low cover of peat mosses
<b>F05</b>	Sb – Tussock Sedge Fen	SMR: 5–7; seepage on top of permafrost	Usually level to gently sloping lower or toe slopes; 20 to >40 cm fibric and mesic peat; soils are Turbic, Static and Organic Cryosols	Sparse to open stunted black or white spruce; shrubs may include shrub birch, Labrador tea, and willow	Tussock cottongrass and/or spruce muskeg sedge dominates
<b>F06</b>	Shrub birch –Tussock Sedge Fen	SMR: 5–7; seepage on top of permafrost	Usually level to gently sloping lower or toe slopes; 20 to >40 cm fibric or mesic peat; soils are Turbic, Static or Organic Cryosols	Trees <10%; tall to medium shrub cover dominated by shrub birch	Tussock cottongrass and/or spruce muskeg sedge dominates
<b>F07</b>	Leatherleaf – Peat Moss Fen	SMR: 7-8; water table at or near the surface	70-100 +cm fibric or mesic peat; soils are Organic. Soils may have hydric layers	Trees < 10%; leatherleaf and or bog rosemary dominate a low shrub layer	Water sedge usually dominant with minor others (e.g., mud or lesser panicked); peat moss dominates moss layer
<b>F11</b>	Clubrush – Sedge Fen	SMR: 7-8; water table at or near the surface	40-125 +cm fibric or mesic peat; soils are Organic. Soils may have hydric layers	Trees < 10%; shrubs usually < 10%;	Alpine or tufted clubrush has moderate to high cover; tufted clubrush sometimes present with high cover; sedges common; peat moss and or brown moss also present
<b>F12</b>	Lesser Panicked Sedge Fen	SMR: 8; water table at or near the surface	>40cm fibric or mesic peat; soils are Organic	Trees < 10%; shrubs < 10%	Lesser panicked sedge dominates with bog buckbean; brown mosses characterize moss layer (common hook, giant water, and others)

<b>F15</b>	Mud Sedge – Bog Buckbean Fen	SMR: 7-8; water table at or near the surface	70-200 cm fibric or mesic peat; soils are Organic	Trees < 10%; shrubs < 10%	Bog buckbean and mud sedge dominate herb layer; brown or peat moss often abundant
<b>F16</b>	Shrub birch - Clubrush	SMR: 6-8; water table close to the surface	35->140cm fibric to mesic peat. Soils are Organic or Cryosols	Trees <10% - some Sb, Sw may be present; shrubs >10% dominated by shrub birch	Alpine or tufted clubrush present with high cover; sedges common; peat moss usually present
<b>F17</b>	Silvery sedge Fen	SMR: 7-8; water table at or near the surface	20-160cm fibric and mesic peat. Soils usually Organic	Trees < 10%; shrubs < 10%	Silvery sedge has a medium cover, other sedges common. Brown mosses typical
<b>F18</b>	Carex aquatilis – Peat moss Fen	SMR: 7-8; water table close to the surface	> 80cm peat; soils Fibrisol or Organic Cryosol	Trees < 10%; shrubs < 10%	Water sedge and sometimes other sedges with peat mosses
<b>F19</b>	Sweet Gale - Peat moss Fen	SMR: 6-7; SNR: C-D variable water table	>40cm peat; soils are Cryosols	Trees <10%; shrubs >=15% with low to high cover of sweet gale	High cover of peat moss

## Swamps

A swamp is defined as a tall shrub or tree dominated wetland (usually >25% cover of woody species) that is influenced by minerotrophic groundwater. Swamps usually have a well decomposed woody peat horizon that is not thick enough to make them peatlands, though occasionally they have a thick peat layer. They typically have a fluctuating water table and may be subject to flooding. Unlike swamps characteristic of more southern places, shrubs in the north are often medium height shrubs, not always tall.

Swamps constitute the most common wetland class in the Beaver River watershed study area. Soils may be Gleysols, Regosols or Cryosols, and may have permafrost. They include both tree and shrub dominated wetlands. Treed swamps have an open to closed white, black spruce or mixed canopy with a mixed groundcover. Shrub swamps are usually dominated by various willow species, but alder, shrub birch and shrubby cinquefoil are also common. The understory of sedges and reedgrass often characterizes the ecosite. Mosses are variable and diverse.

Swamps are also present on toe slopes along the edge of the river valleys where they are interspersed with bogs. Many of these black spruce swamps are transitional between bogs and uplands. The soils have a peaty surface horizon, a shallow depth to permafrost, indicators of prolonged water saturation and a significant cover of wetland species but are not classified as bogs. We identified seven swamp ecosites in the Beaver River watershed (Table 9). For more details see Appendix A – Wetland Ecosite Fact Sheets.

**Table 9.** Swamp ecosite identification in the Beaver River wetland study area, 2019.

<b>Ecosite</b>	<b>Ecosite Name</b>	<b>Moisture</b>	<b>Site/Soils</b>	<b>Overstory/Shrubs</b>	<b>Ground Cover</b>
<b>S01</b>	Willow – Bluejoint Swamp	SMR: 5-7; SNR: C-D fluctuating water table	20-40+ cm LFH or peat; soils commonly Orthic Gleysols, sometimes Humisols	Trees < 10%; tall to medium willow shrubs >= 10% usually > 25%	Reedgrass moderately abundant, usually bluejoint, but may be slim-stemmed or Lapland reedgrass; russet sedge or tufted hairgrass can also occur; moss cover low
<b>S02</b>	River Alder Swamp	SMR: 5-6; SNR: D-E; fluctuating water table, flooding common	Fluvial deposit, soils are Cumulic or Gleyed Regosols or Brunisols; usually < 10 cm organic layer	Trees < 10%; shrubs are dominated by tall to medium height alder, usually with willow	Horsetails usually abundant; bluejoint reedgrass may be abundant; mosses have low to sparse cover
<b>S04</b>	Willow – Horsetail Swamp	SMR: 5-7; SNR: C-E fluctuating water table	Soils are usually Gleysols or Gleyed Regosols	Trees <= 10%; tall or medium height willow >= 15% cover	Moderate to high cover of horsetail (usually common but also variegated scouring-rush or water or meadow horsetail)
<b>S06</b>	Willow – Water Sedge – Peat moss Swamp	SMR: 5-7; SNR: C-D fluctuating water table	Soils are usually Gleysols, or Gleyed Regosols or Brunisols; usually < 15 cm organic layer	Trees <= 10%; tea-leaved or other willows >= 15%	Large water sedges dominate; marsh cinquefoil and horsetail usually present; moss cover sparse to abundant
<b>S07</b>	Sb – Labrador Tea Swamp	SMR: 5-7; SNR B-C Fluctuating water table	Soils are peat over mineral; Cryosols, (Gleysols); seepage within 50cm	Black spruce > 10%; Labrador tea low to moderate cover	Peat moss with feathermosses and reindeer lichen
<b>S08</b>	SbSw – Red Bearberry – Brown Moss Swamp	SMR: 5-7; SNR: C-E	Peaty with 10-40 cm organic layer of LFH, Of, Om or Oh; soils are Gleysols or Turbic Cryosols; may have permafrost	Sb >10%; Sw often present; shrub cover usually moderate to high cover of Labrador tea, shrub birch and/or willow	Red bearberry characteristic; horsetails usually present; moss cover high, usually dominated by feathermosses but characterized by presence of brown mosses
<b>S13</b>	Sw – Blueberry Willow –	SMR: 5-7; SNR: C-D	Peaty with 10-30 cm LFH, Of, Om or Oh; soils are Gleysols,	Sw or B >10%; moderate cover of willow shrubs;	Low to high cover of horsetail; mosses are usually brown mosses and step moss

Horsetail Swamp	Brunisols or Turbic Cryosols	characterized by blueberry willow
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## Marshes

A marsh is a minerotrophic wetland with a near-surface water table that fluctuates daily, seasonally, or annually. Marshes are frequently subject to flooding with high water levels that can vary from year to year. Marshes are characterized by sedges, grasses or forbs. Moss cover is usually low.

Marshes in the Beaver River study area occur in recently abandoned meander channels of the Beaver River, and other larger creeks and rivers. Soils can be variable in texture and are classified as Regosols or Gleysols. Permafrost is absent. We identified seven marsh ecosites for the Beaver River watershed (Table 10). For more details see Appendix A – Wetland Ecosite Fact Sheets.

**Table 10.** Marsh ecosite identification in the Beaver River wetland study area, 2019.

Ecosite	Ecosite name	Moisture	Site/Soils	Overstory/Shrubs	Ground Cover
<b>M01</b>	Beaked – Water Sedge Marsh	SMR: 6-8; SNR: C-E; fluctuating water table at or close to surface	Usually less than 10 cm organic; soils are Gleysols	Trees <=10%; tall or medium shrubs <=10%	Dominated by beaked or water sedge; low to sparse moss cover
<b>M02</b>	Water Horsetail Marsh	SMR: 7-8; SNR: C-E; fluctuating water table at or close to the surface	Mineral soil at the surface; soils are Gleysols	Trees <= 10%; tall and medium shrubs <= 10%	Dominated by horsetail (usually water horsetail, sometimes marsh horsetail); sedges sometimes moderately abundant; wetland herbs common
<b>M04</b>	Alopecurus Marsh	SMR 6-7; SNR C	Soils are Gleysols or Gleyed Regosols	Trees <= 10%; tall and medium shrubs <= 10%	Dominated by <i>Alopecurus aequalis</i> ; other sedges and brown moss present
<b>M06</b>	Mannagrass Marsh	SMR: 6-8; SNR: C-E; fluctuating water table at or close to the surface	Gleysolic soils	Trees <= 10%; tall and medium shrubs <= 10%	Moderate to high cover of mannagrass (boreal or fowl) is characteristic; may occur with sedge, grass, or horsetail
<b>M07</b>	Least Spike- rush Marsh	SMR: 6-8; SNR: D-E; fluctuating water table	Gleysolic soils	Trees <= 10%; tall and medium shrubs <= 10%	Moderate to high cover of least spike-rush; creeping spike-rush, alpine bluegrass, bur-reed or northern arrowhead are sometimes of moderate to high cover

<b>M10</b>	Bluejoint Marsh	SMR: 6-7; SNR: D-E	Gleysolic soils	Trees <= 10%; tall and medium shrubs <= 10%	Moderate to high cover of bluejoint reedgrass is characteristic; sedges and sometimes other grass species are common
<b>M12</b>	Russet Sedge – Water Horsetail Marsh	SMR: 7; SNR: C-D; fluctuating water table	Gleysolic soils	Trees <= 10%; tall and medium shrubs <= 10%	Characterized by russet sedge with low to high cover; other sedges, grass, and water horsetail may also be present with variable cover

### Shallow Water

Shallow water wetlands have standing or flowing water less than 2 m deep in mid-summer. Shallow water wetlands are transitional between seasonally wet (i.e. bog, fen, marsh or swamp) and permanent, deep waterbodies. Water levels are seasonally stable, permanently flooded, or intermittently exposed during droughts, low flows or in coastal areas, intertidal periods. Shallow waters are subject to aquatic processes typical of upper limnetic or infralittoral lake zones, such as nutrient and gaseous exchange, oxidation and decomposition. The shallow water wetland class excludes artificial water bodies such as reservoirs, impoundments and dugouts where water regimes have been manipulated. Shallow water wetlands are variously called ponds, pools, shallow lakes, oxbows, sloughs, reaches or channels and they may occupy portions of larger wetlands or bays and margins of lakes.

In the Beaver River watershed, the shallow water wetlands are most common on the wide floodplains of the Beaver and Keno Ladue rivers marking old river meanders. There are usually surrounded by fens, marshes, swamps and/or riparian forest. Other shallow water ponds are found in hummocky glacial deposits in higher elevation valleys. We documented five shallow water ecosites in the Beaver River watershed (Table 11). For more details see Appendix A – Wetland Ecosite Fact Sheets.

**Table 11.** Shallow water ecosite identification

<b>Ecosite</b>	<b>Ecosite Name</b>	<b>Moisture</b>	<b>Site/Soils</b>	<b>Overstory/Shrubs</b>	<b>Ground Cover</b>
<b>W04</b>	Mare's-tail Shallow Water	SMR: 8-9; SNR: D	Mud flats of larger rivers	Trees <= 10%; tall and medium shrubs <= 10%	Common mare's-tail with moderate to high cover
<b>W06</b>	Pondweed Shallow Water	SMR: 9; SNR: D-E	Margins of ponds and abandoned meanders	Trees <= 10%; tall and medium shrubs <= 10%	Pondweeds dominate, usually Richardson's, but also sago, flat-stemmed, or others
<b>W09</b>	Rocky Mountain Pond-lily Shallow Water	SMR: 9; SNR: D	Still shallow water of ponds and lakeshores	Trees <= 10%; tall and medium shrubs <= 10%	Moderate to high cover of Rocky Mountain pond-lily

<b>W10</b>	Water-milfoil – Bladderwort Shallow Water	SMR: 9; SNR: E	Ponds on old floodplains	Trees <= 10%; tall and medium shrubs <= 10%	High cover of water- milfoil
<b>W13</b>	Macroalgae Shallow Water	SMR: 9; SNR: C-D	Shallow water in fens; flarks in string fens	Trees <= 10%; tall and medium shrubs <= 10%	Macroalgae dominates; no other species

## Model classification and accuracy

We completed multiple iterations of the random forest model to refine and improve the input data and resulting map accuracy and evaluated the final PEM using a cross-validation accuracy assessment between training and validation datasets. The final classification accuracy of the PEM is 81% with a kappa of 0.77 across all wetland and upland classes (Table 12). Isolating specifically the wetland classes, the map classification accuracy is 78% (kapa 0.69). The resulting map accuracy meets the project goal of greater than 70% accuracy for a PEM produced at a survey level intensity 4 as per the ELC Mapping guideline (Environment Yukon 2016).

**Table 12.** Predictive Ecosystem Mapping (PEM) cross-validation confusion matrix. Producer accuracy is an indication of how often real features on the ground were classified accurately in the map. User's accuracy represents how frequently a mapped class will be correctly classified when ground-truthed.

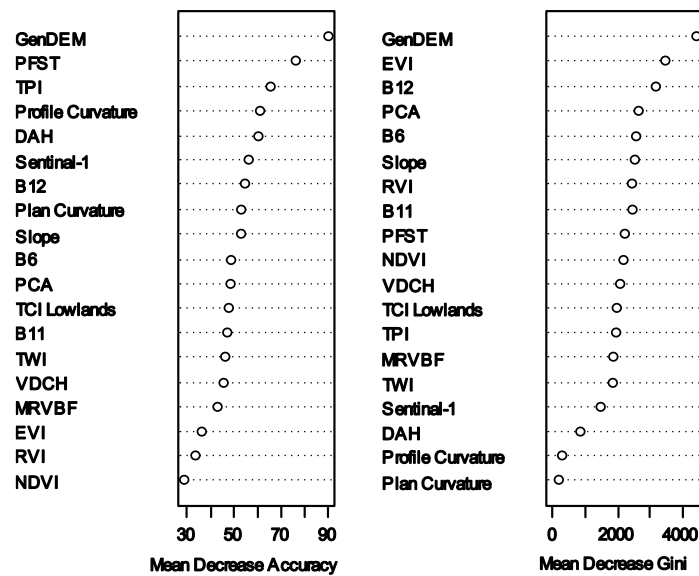
	Bog	Exposed Fluvial	Fen	Marsh	Exposed herb bryoid	Swamp	Shrub and Regenerating Forest	Coniferous Forest	Shallow Water / Isolated Pond	Total	User's Accuracy
Bog	21	0	2	0	0	5	1	1	0	30	0.70
Exposed Fluvial	0	9	0	0	0	0	0	0	0	9	1.00
Fen	3	0	61	7	0	8	1	0	0	80	0.76
Marsh	0	0	0	21	0	2	1	0	1	25	0.84
Exposed herb bryoid	0	0	0	0	20	0	0	0	0	20	1.00
Swamp	5	0	17	3	0	114	3	12	0	154	0.74
Shrub and Regenerating forest	1	0	2	1	0	2	39	0	0	45	0.87
Coniferous Forest	3	0	4	0	0	8	0	89	0	104	0.86
Shallow Water / Isolated Pond	0	0	0	1	0	1	0	0	34	36	0.94
Total	33	9	86	33	20	140	45	102	35	503	
Producer's Accuracy	0.64	1.00	0.71	0.64	1.00	0.81	0.87	0.87	0.97		0.81

The confusion matrix provides information on the model performance and the wetland classes which were most often misclassified. Two indicators that are used to present this information are producer's and user's accuracy.

Producer's accuracy represents the number of times a wetland was classified correctly divided by the total number of accuracy points for that wetland class. Producer accuracy is an indication of how often real features on the ground were classified accurately in the map. All wetland classes, except for bogs, were classified correctly greater than 70% of the time. Misclassification occurred mostly between fens and bogs being classified as swamps and alternatively swamps being classified as fens.

User's accuracy represents the map reliability in describing how frequently a mapped class will be correctly classified when ground-truthed. All wetland classes had a user accuracy equal to or greater than 70%. Fens and bogs were most commonly misclassified as swamps and swamps were most commonly misclassified as fens or coniferous forests.

The random forest model can derive a table of variable importance to examine how frequently a decision tree within the model used a specific variable when making a decision. Figure 6, presents the order of variable importance based on the mean decrease in accuracy (left) and mean decrease in Gini (right) derived for the PEM. The mean decrease in Gini coefficient is a measure of how each variable contributes to the homogeneity of the nodes and leaves in the resulting random forest. The higher the value of mean decrease accuracy or mean decrease Gini score, the higher the importance of the variable in the model (Martinez-Taboada et al. 2020).



**Figure 6.** Variable of importance for random forest model. (Diurnal Anisotropic Heat [DAH], Enhanced Vegetation Index [EVI], Generalized DEM [GenDEM], Multiresolution Index of Valley Bottom Flatness [MIVBF], Normalized Difference Vegetation Index [NDVI], Permafrost Probability [PFST], Principal Component Analysis [PCA], Ratio Vegetation Index [RVI], Terrain Classification Index [TCI] Lowlands, Topographic Position Index [TPI], Topographic Wetness Index [TWI], Vertical Distance to Channel Network [VDCH]). For details on the variables used see Table 4.

The variable of importance chart shows that the elevation derived variables were the most utilized in the decision-making process of the model. This outcome is consistent with other wetland PEMs (Filatow et al. 2018) utilizing a similar model approach.

## Limitations

The main limitation of the modelled wetland accuracy lies with limitations associated with the input data. Data limitations for this project exist in three areas: spatial inputs, training data, and field data for accuracy assessment. Spatial inputs were restricted based on costs and availability, as well as coarseness of scale for some inputs. Spatial inputs were primarily obtained from free and open sources relying on the off-the-shelf accuracy of the product with minimal additional accuracy assessment done on the data itself. The resulting map was derived from a modelled approach and relies heavily on input data. Most training data was collected from one field campaign over a single year. There may be seasonal or temporal variations in wetland structure that were not captured during the field campaign, and all variations in wetland ecotypes and vegetation associations may not be accurately captured as a result. Attributing all wetlands to a discrete wetland type or ecotype in the field proved challenging at some sample sites. Wetlands often occur as complex mosaics in the landscape (Department of Environment 2024), and delineating transitions between wetland types often prove challenging.

Accuracy assessment was conducted based off a single season a field data. A more robust accuracy assessment should involve a third party who conducts a specific field program for accuracy assessment. Due to the high cost of this undertaking and remoteness of the area third party accuracy assessment has not been completed for this map at the time of publication.

The results presented represent predicted wetland areas, however results on the ground may differ. As such, the map should be used as a planning tool rather than a site-specific wetland map of the ground.

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## Conclusion

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The Beaver River wetland map and subsequent inventory was developed to support the Beaver River Land Use Plan. For this project, we chose to develop the map using a Predictive Ecosystem Map (PEM) approach. By creating a PEM, we were able to classify wetlands at a scale that accurately captured land use planning requirements of the project, while working within cost restraints.

Our analysis shows that wetlands make up approximately 11% of the study area, with swamps being the most common wetland class. Wetlands were accurately assessed 78% of the time, exceeding Yukon ELC accuracy assessment standards of 70%. Producer's accuracy was greater than 70% overall, while user's accuracy was greater or equal to 70%. Misclassification most often occurred between fens and bogs being classified as swamps and alternatively swamps being classified as fens. Moving forward, we suggest future work to refine this PEM or other broadscale wetland mapping

efforts across the Yukon should place a higher priority on improving accuracy of swamp classifications. Since production of this map, additional data within the study area have been collected by both the Government of Yukon and the private sector. Including these data into the modelling as training or validation points would help to increase overall map accuracy. If future field campaigns are initiated, data collection should focus on the delineation of transitional zones between swamps and bogs, and the transition from swamp to fen ecosites.

This inventory will provide valuable information for future land use planning processes. Results from this model can be used to inform other important biophysical topics such as carbon capture and storage, biodiversity potential, rare species inventory, wildlife habitat, and transportation planning.

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## Appendix A – Wetland Ecosite Fact Sheets

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The following Ecosite fact sheets for the wetlands identified in the Beaver River LUP area provide information needed for users to identify different ecosites on the ground. This information includes a general description, a table of site and soil characteristics, a vegetation summary, a vegetation association table and photos. The user can identify an ecosite and describe the vegetation community by identifying the vegetation association.

Many of the wetland ecosites occur in different regions of the Yukon and have been described for these areas. Guides have been completed for the Boreal Low Southern lakes (BOLsl) and Klondike Plateau (BOLkp) bioclimate subzones. Draft guides are completed for the Boreal Low Yukon Plateau Central (BOLyc) and the Boreal Low Liard Hyland (BOLlh) subzones. A preliminary analysis has also been completed for the Boreal High (BOH) zone.

The general descriptions for each ecosite in this report generally apply to the ecosite as described throughout its range. The descriptions may vary slightly from the description in the initial published guides as more data has been collected and is therefore used to further expand the description. The vegetation tables refer only to the plot data found in the Beaver River study area and some species found may differ slightly from the more general description of the ecosite.

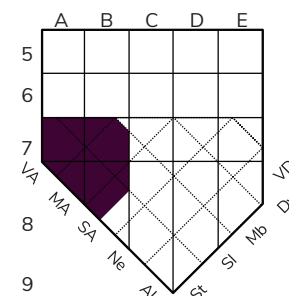
### BOLmh/B02 Sw – Labrador Tea – Peat Moss Bog

#### General description

The White spruce / Shrub birch – Labrador tea / Crowberry / Peat moss Bog is an open canopied treed bog generally found on peaty hygric to subhygric sites. The sparse to open tree canopy is dominated by white spruce (*Picea glauca*).

The characteristic shrub understory species are Labrador tea (*Rhododendron groenlandicum*), shrub birch (*Betula glandulosa*) and willows (*Salix* spp.). Crowberry (*Empetrum nigrum*), cloudberry (*Rubus chamaemorus*), blueberry (*Vaccinium uliginosum*), lowbush cranberry (*Vaccinium vitis-idaea*) and bog cranberry (*V. oxycoccus*) are associated species found with low to moderate abundance. Grasses (*Poaceae*) or sedges (*Carex* spp.) may also be present with low to moderate abundance. Peat moss (*Sphagnum* spp.) is present with usually a moderate cover. Other mosses including step moss (*Hylocomium splendens*), glow moss (*Aulacomnium palustre*) and golden fuzzy fen moss (*Tomentypnum nitens*) are commonly present. Cetraria lichens frequently occur at moderate cover, with reindeer lichens occasionally having moderate cover.

Soils are classified as Organic Cryosols though sometimes Turbic Cryosols are found where the poorly decomposed organic layer is thinner than 40 cm.



#### Comments

Beaver River wetlands

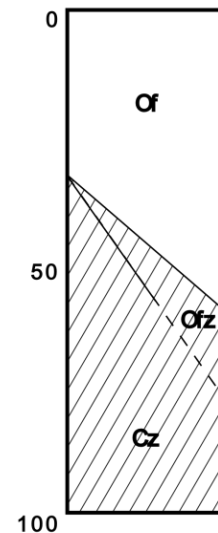
Ecosite B02 is differentiated from other similar bog ecosites, as follows:

- B03 is dominated by black spruce with peat moss.
- B04 has black spruce and a significant lichen cover.

Ecosite B02 also occurs in the BOLyc and BOLsl.

**Table B1.** B02 site and soil characteristics.

Plots in unit:	2
Moisture Regime	Hygic to subhydryc (6-7)
Nutrient Regime	very poor to poor (A-B)
Meso slope position	mid, lower and toe slope, level or depression
Aspect	n/a
Slope Gradient	level
Surficial material	organic
Soil texture	fibric
Soil drainage	poor
Humus form	Fibrimor
Humus depth	> 40 cm
Soil classification	Terric Fibric or Fibric Organic Cryosol (Turbic Cryosol)
Seepage/water table	frozen
Permafrost	Usually frozen at less than 45 cm



### Vegetation summary

The following vegetation associations characterize the variation in species composition for Ecosite B02.

**Sw40** White spruce / Shrub birch / Labrador tea / Peat moss

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B2.** B02 vegetation table.

Stratum	Species	Common Name	B02-Sw40
		no. of plots	2
T	<i>Picea glauca</i>	white spruce	■■■
S	<i>Picea glauca</i>	white spruce	■■
S	<i>Betula glandulosa</i>	shrub birch	■■■
S	<i>Rhododendron</i> spp.	Labrador tea	■■■■

GS	<i>Empetrum nigrum</i>	crowberry	
GS	<i>Rubus chamaemorus</i>	cloudberry	
GS	<i>Vaccinium vitis-idaea</i>	low bush cranberry	
GS	<i>Vaccinium oxycoccus</i>	bog cranberry	
GR	<i>Carex aquatilis</i>	water sedge	
BR	<i>Hylocomium/Pleurozium</i>	feathermosses	
BR	<i>Sphagnum</i> spp.	peat mosses	
LN	<i>Cetraria</i> spp.		
LN	<i>Cladina</i> spp.	reindeer lichens	

Frequency (percent of plots)    |    70-100%    |    50-70%    |    25-50%

Abundance (average percent cover)    |||||    >25%    ||||    10-25%    |||    3-10%    ||    1-3%    |    <1%



Figure B1. B02-Sw40 (19MH04)

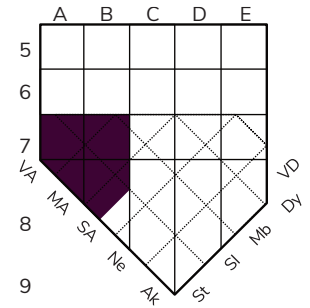
## BOLmh/B03 Sb – Labrador Tea – Peat Moss Bog

### General description

The Sb – Labrador Tea – Peat Moss Bog ecosite occurs on poorly drained sites with a subhydryc or hygric soil moisture regime. B03 bogs are often found associated with other wetlands in wetland complexes, raised slightly above the rest of the wetland.

These bogs have a sparse to open black spruce (*Picea mariana*) tree or shrub cover with a groundcover dominated by peat mosses (*Sphagnum* spp.) or feathermosses (*Hylocomium splendens*, *Pleurozium schreberi*) with peat moss. A Labrador tea (*Rhododendron groenlandicum*) shrub layer is also characteristic. Cloudberry (*Rubus chamaemorus*), bog cranberry (*Vaccinium oxycoccus*), and lowbush cranberry (*Vaccinium vitis-idaea*) are common associates.

The sites have organic soils (>30 cm fibric peat) and a poor to very poor nutrient status associated with a low pH. These bogs usually have frozen soils and are commonly classified as Fibric or Terric Fibric Organic Cryosols.



### Comments

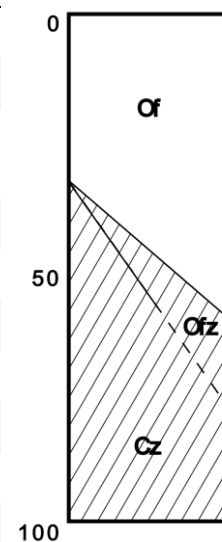
Ecosite B03 is differentiated from other similar black spruce bog ecosites, as follows:

- B02 is dominated by white spruce not black spruce.
- B04 also have black spruce but have a significant lichen cover.

Ecosite B03 also occurs in BOLkp, BOLyc and BOLlh.

**Table B3.** B03 site and soil characteristics.

Plots in unit:	7
Moisture Regime	hygric to subhydryc (6-7)
Nutrient Regime	very poor to poor (A-B)
Meso slope position	mid, lower and toe slope, level or depression
Aspect	n/a
Slope Gradient	level
Surficial material	organic
Soil texture	fibric
Soil drainage	poor
Humus form	Fibrimor
Humus depth	> 40 cm
Soil classification	Terric Fibric or Fibric Organic Cryosol



Seepage/water table	frozen
Permafrost	Usually frozen at less than 45 cm

### Vegetation summary

The following vegetation associations characterize the variation in species composition for Ecosite B03.

**Sb44** Black spruce / Labrador tea / Cloudberry – Lowbush cranberry / Peat moss

The frequency and abundance of species for these associations are shown in the following vegetation table.

**Table B4.** B03 vegetation table.

Stratum	Species	Common Name	B03-Sb44
		no. of plots	7
T	<i>Picea mariana</i>	black spruce	
S	<i>Picea mariana</i>	black spruce	
S	<i>Rhododendron groenlandicum</i>	Labrador tea	
S	<i>Rhododendron tomentosum</i>	northern Labrador tea	
GS	<i>Rubus chamaemorus</i>	cloudberry	
GS	<i>Vaccinium vitis-idaea</i>	lowbush cranberry	
GS	<i>Vaccinium oxycoccus</i>	bog cranberry	
BR	<i>Hylocomium/Pleurozium</i>	feathermosses	
BR	<i>Polytrichum</i> spp.	haircap mosses	
BR	<i>Sphagnum</i> spp.	peat mosses	
BR	<i>Sphagnum capillifolium</i>	common red peat-moss	**
LN	<i>Cladina</i> spp.	reindeer lichens	

Frequency (percent of plots)      |      70-100%      |      50-70%      |      25-50%

Abundance (average percent cover)      |||||      >25%      ||||      10-25%      |||      3-10%      ||      1-3%      |      <1%



Figure B2. B03-Sb44 (19KM40)

## BOLmh/B04 Sb – Lichen Bog

### General description

The Sb – Lichen Bog ecosite represents hygric or subhydric black spruce wetlands with a very poor to poor nutrient regime dominated by a lichen groundcover.

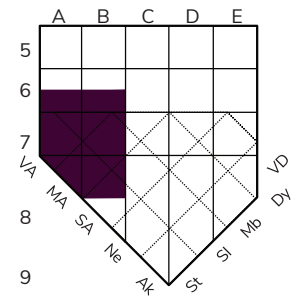
B04 bogs have a sparse to open black spruce (*Picea mariana*) tree or shrub cover and a groundcover dominated by reindeer lichens (*Cladina stellaris*, *C. mitis*, *C. rangiferina*, *C. spp.*) sometimes with *Cetraria* or *Cladonia* lichens. Labrador tea (*Rhododendron groenlandicum*, or *R. tomentosum*) is characteristic; shrub birch (*Betula glandulosa*) may or may not be present. Ground shrubs such as cloudberry (*Rubus chamaemorus*), bog cranberry (*Vaccinium oxycoccus*), lowbush cranberry (*Vaccinium vitis-idaea*) and crowberry (*Empetrum nigrum*) are common associates. The bryophyte layer consists most commonly of peat mosses (*Sphagnum spp.*), but feathermosses (*Pleurozium schreberi*, *Hylocomium splendens*) may also occur with moderate cover.

Soils are organic with 30-40 cm or more of fibric peat. Permafrost is present and soils are classified as Fibric or Terric Fibric Organic Cryosols and occasionally Turbic Cryosols, peaty phase.

### Comments

Ecosite B04 is differentiated from other similar bog ecosites, as follows:

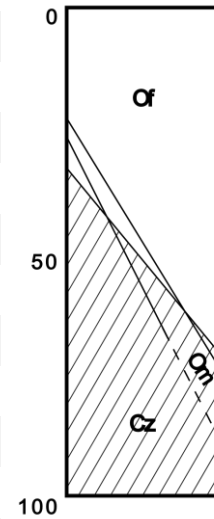
- B02 has a white spruce overstory.
- B03 has a black spruce overstory but groundcover is dominated by peat moss without significant lichen cover.



Ecosite B04 also occurs in BOLyc and BOLlh.

**Table B5.** B04 site and soil characteristics.

<b>Plots in unit:</b>	<b>15</b>
Moisture Regime	hygric to subhydric (6-7)
Nutrient Regime	very poor to poor (A-B)
Meso slope position	level, lower slope
Aspect	n/a
Slope Gradient	0
Surficial material	organic
Soil texture	fibric
Soil drainage	poor
Humus form	Fibrimor
Humus depth	>30cm
Soil classification	Fibric Organic Cryosol, Turbic Cryosol
Seepage/water table	frozen about 20-45 cm
Permafrost	yes



**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite B06.

**Sb42** Black Spruce / Labrador tea/ Lichen – Peat moss

The frequency and abundance of species for this association are shown in the following vegetation table.

**Table B6.** B04 vegetation table.

Stratum	Species	Common Name	B04-Sb42
		no. of plots	15
T	<i>Picea mariana</i>	black spruce	
S	<i>Picea mariana</i>	black spruce	
S	<i>Betula glandulosa</i>	shrub birch	
S	<i>Rhododendron groenlandicum</i>	Labrador tea	
S	<i>Rhododendron tomentosum</i>	northern Labrador tea	
GS	<i>Rubus chamaemorus</i>	cloudberry	
GS	<i>Vaccinium vitis-idaea</i>	lowbush cranberry	
BR	<i>Hylocomium/Pleurozium</i>	feathermosses	***
BR	<i>Sphagnum</i> spp.	peat mosses	
LN	<i>Cetraria</i> spp.		

LN	<i>Cladina</i> spp.	reindeer lichens								
Frequency (percent of plots)	█	70-100%	█	50-70%	█	25-50%				
Abundance (average percent cover)	██████	>25%	██████	10-25%	███	3-10%	██	1-3%	█	<1%



Figure B3. B04-Sb42 (19KM12)

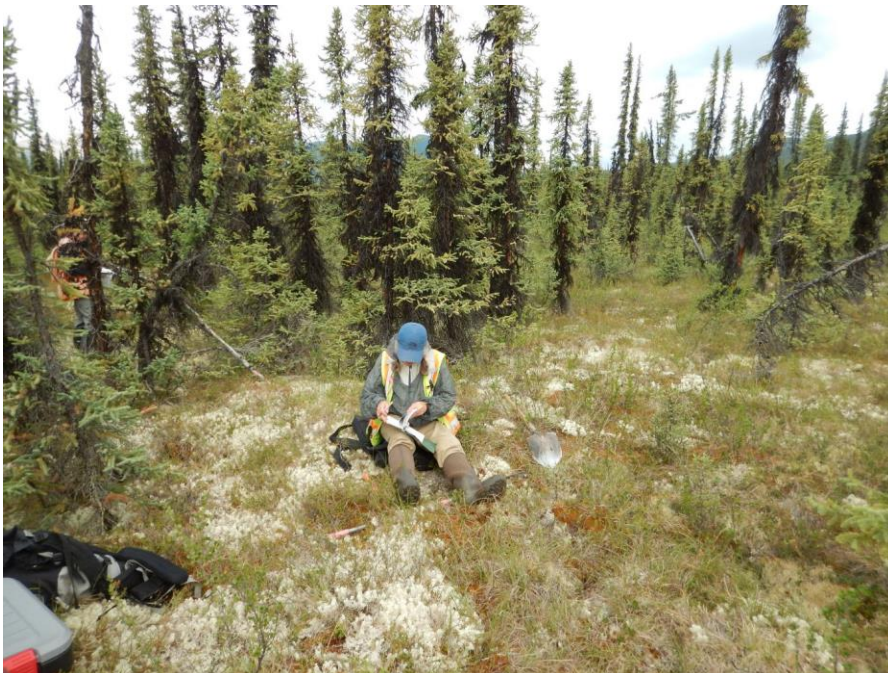


Figure B4. B04-Sb42 (19KM05)

## BOLmh/B06 Shrub birch – Reindeer lichen Bog

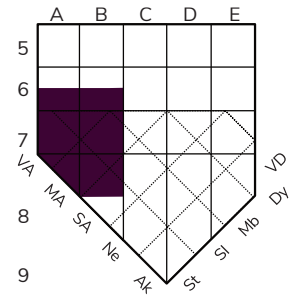
Beaver River wetlands

**General description**

Shrub birch – Reindeer lichen bogs occur on shrubby, level to lower slope sites with a very poor to poor nutrient regime with a lichen-dominated ground cover.

B06 bogs have an open shrub birch (*Betula glandulosa*) shrub cover and a groundcover dominated by reindeer lichens (*Cladina stellaris* with *Cladina mitis*, *Cladina rangiferina*, *Cladina* spp. and sometimes *Cladonia*). Northern Labrador tea (*Rhododendron tomentosum*) and cloudberry (*Rubus chamaemorus*) are common associates. The bryophyte layer is commonly dominated by peat mosses (*Sphagnum* spp.).

Soils are organic with greater than 40 cm or more of fibric peat. Permafrost is present and soils are classified as Fibric or Terric Fibric Organic Cryosols.



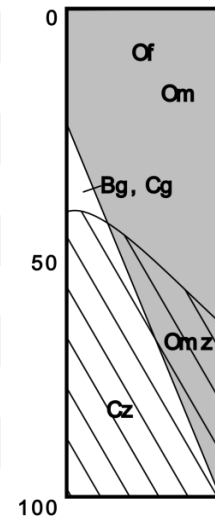
**Comments**

Ecosite B06 is differentiated from other similar bog ecosites, as follows:

- B02 has a white spruce overstory.
- B03 has a black spruce overstory but groundcover is dominated by peat moss without significant lichen cover.
- B04 has a black spruce overstory with peat moss and lichen groundcover.

**Table B7.** B06 site and soil characteristics.

Plots in unit:	1
Moisture Regime	hygric to subhydric (6-7)
Nutrient Regime	very poor to poor (A-B)
Meso slope position	level, lower slope
Aspect	n/a
Slope Gradient	0
Surficial material	organic
Soil texture	fibric
Soil drainage	poor
Humus form	Fibrimor
Humus depth	>40 cm
Soil classification	Fibric Organic Cryosol, Turbic Cryosol
Seepage/water table	Usually frozen at less than 50cm
Permafrost	yes



**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite B06.

Beaver River wetlands

**Begl40**

Shrub birch / northern Labrador tea/ Lichen – Peat moss

The frequency and abundance of species for this association are shown in the following vegetation table.

**Table B8.** B06 vegetation table.

Stratum	Species	Common Name	B06-Begl40
		no. of plots	1
S	<i>Betula glandulosa</i>	shrub birch	
S	<i>Rhododendron tomentosum</i>	northern Labrador tea	
GS	<i>Rubus chamaemorus</i>	cloudberry	
GS	<i>Vaccinium vitis-idaea</i>	lowbush cranberry	
BR	<i>Polytrichum</i> spp.	haircap mosses	
BR	<i>Sphagnum</i> spp.	peat mosses	
BR	<i>Sphagnum capillifolium</i>	common red peat moss	
LN	<i>Cetraria</i> spp.		
LN	<i>Cladina</i> spp.	reindeer lichens	
LN	<i>Icmadophila ericetorum</i>	spraypaint	

Frequency (percent of plots)                    |                    70-100%                    |                    50-70%                    |                    25-50%

Abundance (average percent cover)                    |||||                    >25%                    ||||                    10-25%                    |||                    3-10%                    ||                    1-3%                    |                    < 1%



**Figure B5.** B06-Begl40 (19AD61)

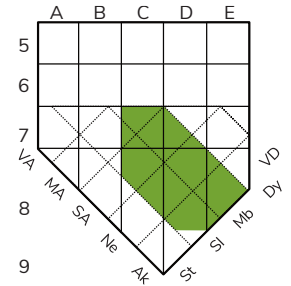
**BOLmh/F01      Water Sedge Fen**

### General description

The Water Sedge Fen ecosite occurs on peaty, hydric or subhydric sites, dominated by water sedge (*Carex aquatilis*) and/or beaked sedge (*Carex utriculata*). It is the most common fen ecosite in the region. In the Liard Hyland region. The F01 occurs in some large wetlands but it is also very common along the margins of lakes and ponds. The water table is at or very close to the surface.

A high to moderate cover of water sedge or beaked is diagnostic. Other sedges, including mud sedge (*C. limosa*), few-flowered sedge (*C. pauciflora*), and silvery sedge (*C. canescens*) may occur with trace to moderate cover. Marsh cinquefoil (*Comarum palustre*) is a common associate. The significant bryophyte layer is variable and may be dominated by glow moss (*Aulacomnium palustre*), golden fuzzy fen moss (*Tomentypnum nitens*), or hook mosses (*Drepanocladus* spp., *Scorpidium revolvens*).

Soils are very poor to poorly drained, peaty, with more than 30-40 cm of peat. They are usually classified as Terric, Typic or Hydric Mesisols and Fibrisols.



### Comments

Ecosite F01 can be differentiated from other graminoid wetland ecosites, as follows:

- F02, F03, F07, F16 are fens with willow, shrub birch, or leatherleaf shrub overstories.
- F11, F12, F17 may have some water or beaked sedge but are dominated by other sedges.
- F18 is dominated by water sedge but has a moderate to high cover of peat moss.
- M01 may be dominated by water or beaked sedge but does not have organic soils and moss cover is usually low or other species are not fen species.
- M02 is dominated by horsetail and beaked or water sedge but does not have organic soils and moss cover is usually low.
- Other marshes are dominated by other species.

Ecosite F01 also occurs in BOLsl, BOLyc, BOLkp and BOLlh.

Ecosite F01 is equivalent to Wf01 in British Columbia (MacKenzie and Moran 2004).

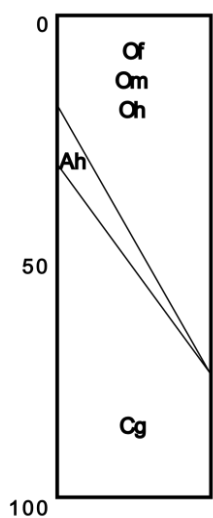
**Table B9.** F01 site and soil characteristics.

<b>Plots in unit:</b>	<b>10</b>
Moisture Regime	subhydric to hydric (7-8)
Nutrient Regime	mesic to rich (C-D)
Meso slope position	level
Aspect	none
Slope Gradient	level
Surficial material	organic over fluvial or lacustrine
Soil texture	fibric, mesic, (humic)

Soil drainage	very poor to poor
Humus form	fibrimor, mesimor
Humus depth	30-125 cm
Soil classification	Terric or Typic Mesisols, Fibrisols
Seepage/water table	at or near surface

Permafrost	absent
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**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite F01.

**Caaq55** Water sedge / Beaked sedge

**Caut55** Beaked sedge / Marsh cinquefoil

The frequency and abundance of species for these associations are shown in the following vegetation table.

**Table B10.** F01 vegetation table.

Stratum	Species	Common Name	F01-Caaq55	F01-Caut55
		no. of plots	7	3
GR	<i>Carex aquatilis</i>	water sedge		
GR	<i>Carex utriculata</i>	beaked sedge		
FB	<i>Comarum palustre</i>	marsh cinquefoil	*	
FB	<i>Menyanthes trifoliata</i>	buckbean		****
BR	<i>Drepanocladus</i> spp.	hook mosses		
BR	Bryophytes	Other mosses		***

Frequency (percent of plots)    |    70-100%    |    50-70%    |    25-50%

Abundance (average percent cover)    |||||    >25%    ||||    10-25%    |||    3-10%    ||    1-3%    |    < 1%



Figure B6. F01-Caaq55 (19AD03)



Figure B7. F01-Caaq55 (19KM23)

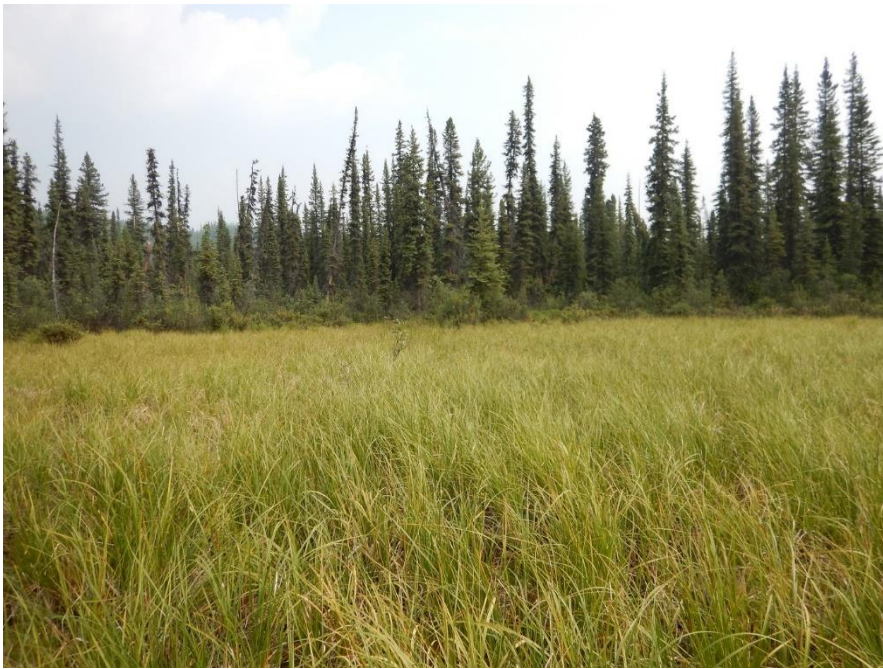


Figure B8. F01-Caut55 (19KM61)

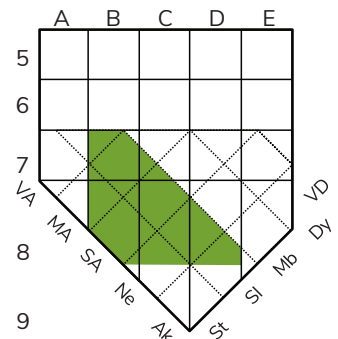
## BOLmh/F02 Shrub Birch – Willow – Water sedge Fen

### General description

The Shrub Birch – Willow – Water Sedge Fen ecosite occurs on cool valley bottom sites from low to higher elevations. The moisture regime ranges from subhygric to hydric and the nutrient regime is poor to medium.

Shrub birch (*Betula glandulosa*) dominates the shrub layer. Willows (*Salix* spp.) are usually present with a low cover but may be codominant on some sites. A significant cover of Labrador tea (*Rhododendron groenlandicum*) is characteristic in BOLlh. Water sedge (*Carex aquatilis*) cover is variable ranging from traces to greater than 50%. It may occur with or occasionally be replaced by other sedges or common horsetail (*Equisetum arvense*) on some sites. A high moss cover of brown moss (glow moss (*Aulacomnium palustre*), golden fuzzy fen moss (*Tomentypnum nitens*) and/or hook moss (*Drepanocladus* spp.)) is characteristic. Peat mosses (*Sphagnum* spp.) may also be present.

The poor to very poorly drained soils are likely frozen within 2 meters. The fibric and mesic peat is greater than 30 cm and soils are classified as Organic or Turbic Cryosols with peaty surface horizons.



### Comments

Ecosite F02 can be differentiated from other shrub wetlands, as follows:

- F03 has organic soils but has a willow overstory, and not shrub birch, or shrub birch with willow.
- F04 and F14 have organic soils but have a tree cover > (7-)10%.
- F07 has organic soils but is characterized by a shrub layer of leatherleaf and bog rosemary.

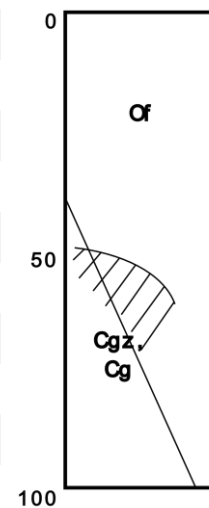
- F06 may have a shrub birch overstory but the sedge groundcover is dominated by spruce muskeg sedge or tussock cottongrass.
- F16 has shrub birch but also a clubrush understory.
- S01, S03 and S04 have a willow shrub overstory and do not have organic soils.

Ecosite F02 also occurs in BOLsl and BOLlh and at higher elevations of the BOH.

Ecosite F02 is similar to Wf02 in British Columbia (MacKenzie and Moran 2004).

**Table B11.** F02 site and soil characteristics.

<b>Plots in unit: 6</b>	
Moisture Regime	hygic to hydric (6-8)
Nutrient Regime	poor to rich (B-D)
Meso slope position	level and toe
Aspect	none
Slope Gradient	level
Surficial material	organic / organic over fluvial
Soil texture	fibric
Soil drainage	poor to very poor
Humus form	fibric
Humus depth	30-105+ cm
Soil classification	Typic & Terric Fibrisols, Turbic Cryosols
Seepage/water table	at or near surface
Permafrost	Often present in this region



### Vegetation summary

The following vegetation association characterizes the species composition for Ecosite F02.

**BegI50** Shrub birch – Willow / Water sedge

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B12.** F02 vegetation table.

Stratum	Species	Common Name	F02-BegI50
		no. of plots	6
S	<i>Betula glandulosa</i>	shrub birch	
S	<i>Salix</i> spp.	willows	
GR	<i>Carex aquatilis</i>	water sedge	

FB	<i>Rubus arcticus</i>	arctic raspberry	
BR	<i>Sphagnum</i> spp.	peat mosses	
BR	<i>Drepanocladus</i> spp.	hook mosses	
BR	<i>Tomentypnum nitens</i>	golden fuzzy fen moss	
BR	Bryophytes	other mosses	

**Frequency (percent of plots)**    |    70-100%    |    50-70%    |    25-50%  
**Abundance (average percent cover)**    ||||| >25%    |||| 10-25%    ||| 3-10%    || 1-3%    | < 1%



Figure B9. F02-Beg150 (19AD108)



Figure B10. F02-Beg150 (19AD120)

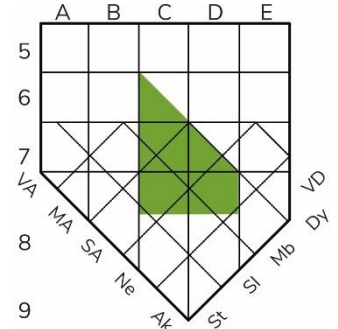
## BOLmh/F04      SbSw – Water Sedge Fen

### General description

The SbSw – Water Sedge Fen ecosite may occur in channels between uplands and along the margins of larger wetland complexes where it is found on hygric to subhydric sites with a medium to rich nutrient regime.

Sparse to open white or black spruce (*Picea glauca*, *P. mariana*) composes the overstory. A low to high cover of shrubs with willows (*Salix myrtilifolia*, *S. glauca*, *S. arbusculoides*, *S. bebbiana*, *S. planifolia*) and shrub birch (*Betula glandulosa*) is typical. The ground shrub layer often contains a moderate cover of net-veined willow (*Salix reticulata*), crowberry (*Empetrum nigrum*) or red bearberry (*Arctous rubra*). A moderate to high cover of sedges, typically dominated by water sedge (*Carex aquatilis*), is characteristic, often with some sparse cover of other sedges (e.g., *C. capillaris*, *C. capitata*, *C. gynocrates*). Brown mosses (*Tomentypnum nitens*, *Aulacomnium palustre*, *Sanionia uncinata*) usually dominate the bryophyte layer, but step moss (*Hylocomium splendens*), red-stemmed feathermoss (*Pleurozium schreberi*) and peat mosses (*Sphagnum* spp.) are common associates.

These fens are on poor to very poorly drained soils. Soils are organic with greater than 30 cm of peat and are classified as Organic soils or Cryosols.



### Comments

Ecosite F04 can be differentiated from other wetlands, as follows:

- F01, F02, F06, F07, F11, F12, F15, F18, F19 have organic soils but lack tree cover greater than 10% and are dominated by shrubs or graminoids.

- F05 has a black or white spruce overstory but the sedge groundcover is dominated by spruce muskeg sedge or tussock cottongrass.
- S08 lacks sedge cover greater than about 10% and soils are usually mineral with less than 30 cm of surface peat.

Ecosite F04 also occurs in BOLsl, BOLyc and BOLlh.

**Table B13.** F04 site and soil characteristics.

<b>Plots in unit:</b>	<b>2</b>
Moisture Regime	hygric to subhydric (6-7)
Nutrient Regime	medium – rich (C-D)
Meso slope position	toe and lower slope, level, depression
Aspect	none
Slope Gradient	0-3%
Surficial material	organic or organic over fluvial
Soil texture	fibric, mesic, humic, silty
Soil drainage	poor to very poor
Humus form	mesimor, fibrimor
Humus depth	30->90 cm
Soil classification	Mesisols, Fibrisols
Seepage/water table	usually at or within 50 cm of the surface
Permafrost	absent

### Vegetation summary

The following vegetation association characterizes the species composition for Ecosite F04.

**Sw50** White spruce / Labrador tea / Water sedge

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B14.** F04 vegetation table.

Stratum	Species	Common Name	F04-Sw50
		no. of plots	2
T	<i>Picea glauca</i>	white spruce	
S	<i>Rhododendron tomentosum</i>	northern Labrador tea	
S	<i>Salix</i> spp.	willows	
S	<i>Vaccinium uliginosum</i>	bog blueberry	
GS	<i>Arctous rubra</i>	red bearberry	

GS	<i>Empetrum nigrum</i>	crowberry	
GS	<i>Salix reticulata</i>	net-veined willow	
GR	<i>Carex aquatilis</i>	water sedge	
BR	<i>Aulacomnium palustre</i>	glow moss	
BR	<i>Drepanocladus</i> spp.	hook mosses	
BR	<i>Hylocomium, Pleurozium</i>	feathermosses	
BR	<i>Sphagnum</i> spp.	peat-mosses	
BR	<i>Tomentypnum nitens</i>	golden fuzzy fen moss	
LI	<i>Cladina</i> spp.	reindeer lichens	

Frequency (percent of plots)    ||    70-100%    ||    50-70%    ||    25-50%

Abundance (average percent cover)    |||||    >25%    |||||    10-25%    ||||    3-10%    ||    1-3%    ||    <1%



Figure B11. F04-Sw50 (19AD97)

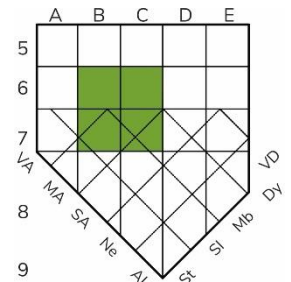
## BOLmh/F05      Sb - Tussock Sedge Fen

### General description

The Sb – Tussock Sedge Fen ecosite is a treed fen that occurs primarily on level to gently sloping hygric to subhydric sites underlain by shallow permafrost.

The F05 ecosite consists of an open canopy of stunted black spruce (*Picea mariana*) with tussock cottongrass (*Eriophorum vaginatum*) and/or spruce muskeg sedge (*Carex lugens*) dominating the herb layer. Both species are tussock sedges, giving the wetland a “tussocky” microtopography. The tussocks create microsites with varying moisture and nutrient conditions favourable for a wide variety of species. Sometimes stunted white spruce (*P. glauca*) replaces the black spruce or is co-dominant. Some stands are dominated by Alaska paper birch (*Betula nealaskana*). The shrub layer is characterized by shrub birch

Beaver River wetlands



(*Betula glandulosa*. Leatherleaf (*Chamaedaphne calyculata*) is common in the. Other common shrubs are willows (*Salix* spp.), Labrador teas (*Rhododendron tomentosum*, *R. groenlandicum*) and blueberry (*Vaccinium uliginosum*), in varying amounts. Other sedges can be present with low to moderate cover. Lowbush cranberry (*Vaccinium vitis-idaea*) and cloudberry (*Rubus chamaemorus*) often occur with low cover. The moss layer is variable, comprised of peat mosses (*Sphagnum* spp.), feathermosses (mostly *Hylocomium splendens*), glow moss (*Aulacomnium palustre*) and golden fuzzy fen moss (*Tomentypnum nitens*).

Permafrost is present: soils are classified as Gleysolic Static Cryosols, Turbic Cryosols or Organic Cryosols. The soils typically consist of a 20-35 cm thick organic surface horizon over reworked silty loess, although deeper peat is also found. The active layer is usually between about 25 and 35 cm, with seepage often present on top of the active layer, sometimes right to the surface. In the BOLkp, F05 sometimes occurs on moderate to steep slopes on cool aspects or in narrower draws with deep reworked loess sediments and subhygric to hygric moisture conditions.

### Comments

Ecosite F05 can be differentiated from other wetland ecosites as follows:

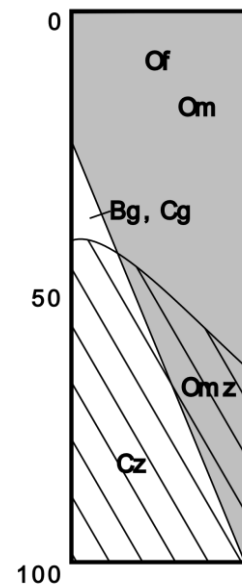
- B03 includes peaty sites but with less water movement. It has greater peat moss cover and lacks the F05 indicators such as leatherleaf, spruce muskeg sedge or tussock cottongrass.
- F06 also has spruce muskeg sedge or tussock cottongrass but has less than 10% tree cover and is dominated by shrub birch.
- S07 can have similar vegetation to some sites in F05, but if spruce muskeg sedge or tussock cottongrass occur in S07, they are of low cover. Peat moss is more characteristic of S07; brown mosses are more characteristic of F05. S07 does not have more than 40 cm of peat; F05 may.
- S08 is a swampy ecosite and either lacks or has low cover of peat mosses. It is characterized by glow moss and golden fuzzy fen moss. S08 sites may have spruce muskeg sedge and/or shrub birch, but if so, they are of low cover. The S08 lacks leatherleaf and can have high bluejoint reedgrass cover.

F05 is common in BOLkp and BOLyc.

**Table B15.** F05 site and soil characteristics.

Plots in unit:	8
Moisture Regime	hygric to subhydric (6-7)
Nutrient Regime	poor to medium [B-C]
Meso slope position	level, toe slope, lower slope
Aspect	variable
Slope Gradient	Level to gentle
Surficial material	organic over fine textured sediments
Soil texture	fibric, mesic over silty

Soil drainage	poor
Humus form	mor
Humus depth	Usually 20-30 cm, sometimes less
Soil classification	Organic and Turbic Cryosols
Seepage/water table	usually at or within 50 cm of the surface
Permafrost	present



### Vegetation summary

The following vegetation associations characterize the species composition for Ecosite F05.

**F05-Sb50**                    Black spruce / Spruce muskeg sedge

**F05-Sb55**                    Black spruce / Tussock cotton-grass

**F05-SbSw55**                Black spruce (White spruce) / Leatherleaf / Spruce muskeg sedge

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B16.** F05 vegetation table.

Stratum	Species	Common Name	F05-Sb50	F05-Sb55	F05-SbSw56
		no. of plots	3	1	4
T	<i>Picea glauca</i>	white spruce	**		
T	<i>Picea mariana</i>	black spruce			
S	<i>Rhododendron groenlandicum</i>	Labrador tea			
S	<i>Betula glandulosa</i>	shrub birch			
S	<i>Dasiphora fruticosa</i>	shrubby cinquefoil			*
S	<i>Salix glauca</i>	grey-leaved willow			*
S	<i>Salix planifolia</i>	plane-leaved willow	*		
S	<i>Vaccinium uliginosum</i>	bog blueberry			
GS	<i>Arctous rubra</i>	red bearberry			
GS	<i>Vaccinium oxycoccus</i>	bog cranberry	*		
GS	<i>Rubus chamaemorus</i>	cloudberry			
GS	<i>Salix reticulata</i>	net-veined willow			
GR	<i>Carex lugens</i>	spruce muskeg sedge		***	
GR	<i>Carex aquatilis</i>	water sedge			***
GR	<i>Eriophorum vaginatum</i>	tussock cotton-grass			
BR	<i>Aulacomnium palustre</i>	glow moss			
BR	<i>Hylocomium, Pleurozium</i>	feathermosses			
BR	<i>Sphagnum</i> spp.	peat mosses			
BR	<i>Tomentypnum nitens</i>	golden fuzzy fen moss	****		**
LI	<i>Cladina</i> spp.	reindeer lichens			

Frequency (percent of plots)	█	70-100%	█	50-70%	█	25-50%			
Abundance (average percent cover)	██████	>25%	████	10-25%	███	3-10%	██	1-3%	█ < 1%



Figure B12. F05-Sb55 (19KM26)



Figure B13. F05-Sb50 (19KM41)

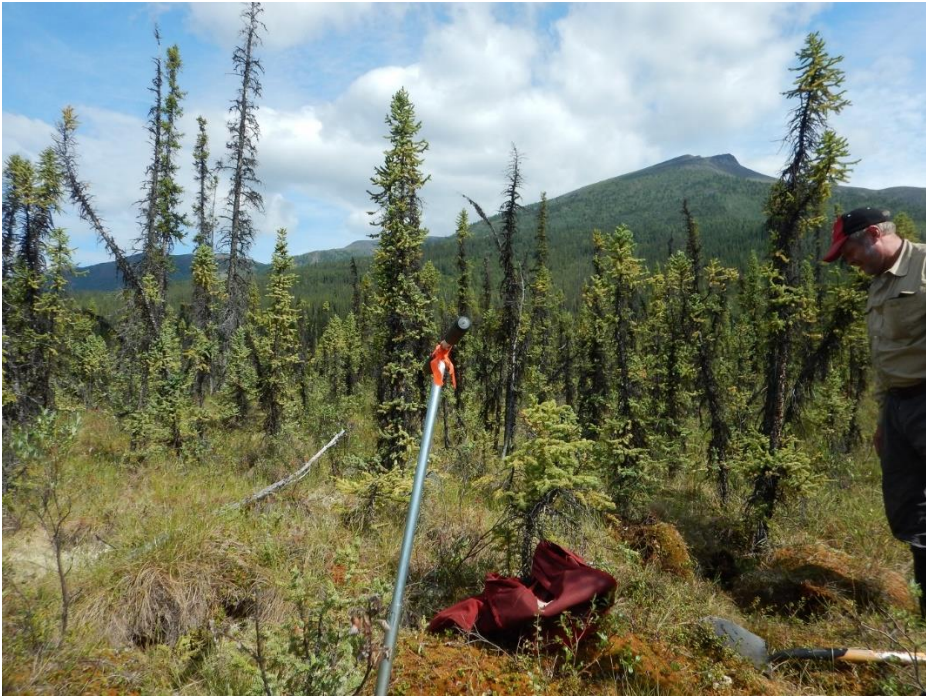


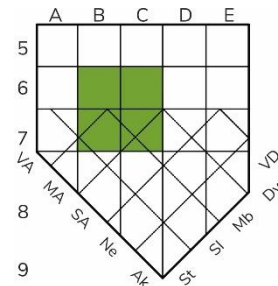
Figure B14. F05-SbSw55 (19AD31)

## BOLmh/F06 Shrub Birch – Tussock Sedge Fen

### General description

The Shrub Birch – Tussock Sedge Fen ecosite is a shrub fen that occurs mostly on hygric – subhydryc sites. The sites are level or gently to moderately sloped with imperfect to very poor drainage on permafrost.

Shrub birch (*Betula glandulosa*) is generally the most conspicuous shrub of the F06 ecosite, although willows (*Salix* spp.) occasionally dominate. Sheathed cottongrass (*Eriophorum vaginatum*) and/or spruce muskeg sedge (*Carex lugens*) dominate the herb layer. Both of these are tussock sedges, giving the wetland a “tussocky” microtopography. The tussocks create microsites with varying moisture and nutrient conditions favourable for a wide variety of species. Other common shrubs are Labrador teas (*Rhododendron tomentosum*, *R. groenlandicum*) and blueberry (*Vaccinium uliginosum*) and sometimes leatherleaf (*Chamaedaphne calyculata*). Scattered spruce (*Picea mariana*, *P. glauca*) may be present. Lowbush cranberry (*Vaccinium vitis-idaea*), bog blueberry (*V. uliginosum*) and cloudberry (*Rubus chamaemorus*) often occur. The moss layer is variable, comprised of peat mosses (*Sphagnum* spp.), feathermosses (mostly *Hylocomium splendens*), glow moss (*Aulacomnium palustre*), golden fuzzy fen moss (*Tomentypnum nitens*) and/or hook-mosses (*Drepanocladus* spp.)



This ecosite may occupy the centre of a wetland surrounded by a F05 ecosite with a higher cover of spruce. Permafrost is always present, usually within 20 to 45 cm of the ground surface. Soils are Gleysolic Static or Turbic Cryosols or Organic Cryosols with shallow to moderate depths of peat (usually 20–60 cm, overlying fine textured deposits. Seepage may be present on top of the permafrost table.

### Comments

Ecosite F06 can be differentiated from other wetland shrub ecosites as follows:

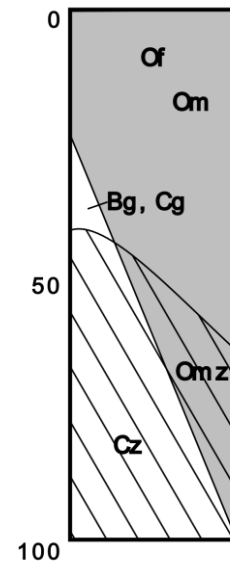
- F07 is dominated by leatherleaf instead of shrub birch or willow.
- S01 is characterized by bluejoint reedgrass under a willow overstory, rather than spruce muskeg sedge or tussock cottongrass of F06.
- S02 occurs on swampy soils dominated by river alder.
- S06 is a swampy ecosite dominated by willows with either water sedge or peat moss dominating, rather than spruce muskeg sedge or tussock cottongrass of F06.

F06 is also common in the BOLkp and BOLyc.

**Table B17.** F06 site and soil characteristics.

<b>Plots in unit:</b>	<b>2</b>
Moisture Regime	hygric to subhydryc (6-7)
Nutrient Regime	poor to medium (B-C)
Meso slope position	level, toe slope, lower slope and mid slope

Aspect	variable
Slope Gradient	Level to gentle
Surficial material	organic over fine textured deposits
Soil texture	fibric, mesic over silty
Soil drainage	imperfect to very poor
Humus form	mor
Humus depth	20-60 cm
Soil classification	Static, Turbic or Organic Cryosols
Seepage/water table	usually at or within 50 cm of the surface
Permafrost	present



**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite F06.

**Beg152** Shrub birch / Spruce muskeg sedge

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B18.** F06 vegetation table.

Stratum	Species	Common Name	F06-Beg152
		no. of plots	2
S	<i>Betula glandulosa</i>	shrub birch	
S	<i>Chamaedaphne calyculata</i>	leatherleaf	
S	<i>Picea mariana</i>	black spruce	
S	<i>Rhododendron groenlandicum</i>	Labrador tea	
S	<i>Rhododendron tomentosum</i>	northern Labrador tea	
S	<i>Salix</i> spp.	willows	
S	<i>Vaccinium uliginosum</i>	bog blueberry	
GS	<i>Rubus chamaemorus</i>	cloudberry	
GS	<i>Vaccinium vitis-idaea</i>	lowbush cranberry	
GR	<i>Carex lugens</i>	spruce muskeg sedge	
GR	<i>Carex</i> spp.	other sedges	
GR	<i>Eriophorum vaginatum</i>	tussock cotton-grass	
BR	<i>Sphagnum</i> spp.	peat mosses	
LN	<i>Cladina</i> spp.	reindeer lichens	

Frequency (percent of plots)      |      70-100%      |      50-70%      |      25-50%

Abundance (average percent cover)      |||||      >25%      ||||      10-25%      |||      3-10%      ||      1-3%      |      < 1%



Figure B14. F06-Beg152 (19AD108)

## BOLmh/F07 Leatherleaf – Peat Moss Fen

### General description

The Leatherleaf – Peat Moss Fen ecosite is found on subhydric to hydric sites characterized by leatherleaf (*Chamaedaphne calyculata*) and/or bog rosemary (*Andromeda polifolia*) shrubs. The ecosite has a generally poor nutrient regime.

A low to high cover of leatherleaf and or bog rosemary is diagnostic. A moderate to high cover of sedges, most commonly water sedge (*Carex aquatilis*) but also mud sedge (*C. limosa*), or others, is characteristic. Bog buckbean (*Menyanthes trifoliata*) and three-leaved Solomon’s-seal (*Maianthemum trifolium*) are common in BOLlh. The moss layer is usually dominated by a high cover of peat moss (*Sphagnum* spp.), but may occasionally be of low cover or be dominated by a variety of other species.

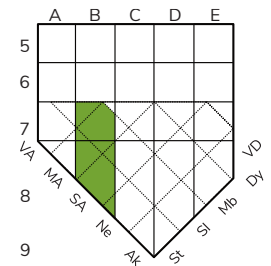
Water table is at the surface. Soils are organic, usually classified as Fibrisols or Mesisols.

### Comments

Ecosite F07 can be differentiated from other wetlands, as follows:

- F07 is differentiated from other shrub or treed fen ecosites by the presence of leatherleaf and/or bog rosemary and lack of a tree cover of more than 10 % total and a significant cover of taller shrubs.
- F11 may have a low cover of bog rosemary but there is a high cover of clubrush.

Ecosite F07 also occurs in BOLyc, BOLkp and BOLlh.



**Table B19.** F07 site and soil characteristics.

<b>Plots in unit:</b>	<b>6</b>	
Moisture Regime	subhydryc to hydric (7-8)	
Nutrient Regime	Poor (B)	
Meso slope position	level, lower slope, depression	
Aspect	none	
Slope Gradient	level	
Surficial material	organic	
Soil texture	fibric, may be mesic	
Soil drainage	very poor, poor	
Humus form	fibrimor	
Humus depth	120+ cm	
Soil classification	Typic or Hydric Fibrisols	
Seepage/water table	at or near the surface	
Permafrost	absent	

**Vegetation summary**

The following vegetation associations characterize the species composition for Ecosite F07.

**Anpo55** Bog rosemary / Mud sedge / Peat moss

**Chca51** Leatherleaf / Bog rosemary / Mud sedge

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B20.** F07 vegetation table.

Stratum	Species	Common Name	F07-Anpo55	F07-Chca51
		no. of plots	2	4
S	<i>Chamaedaphne calyculata</i>	leatherleaf		
GS	<i>Vaccinium oxycoccus</i>	bog cranberry		
GS	<i>Andromeda polifolia</i>	bog-rosemary		***
GS	<i>Rubus chamaemorus</i>	cloudberry		
GR	<i>Carex limosa</i>	shore sedge		
GR	<i>Carex aquatilis</i>	water sedge		
GR	<i>Trichophorum cespitosum</i>	tufted clubrush		
FB	<i>Comarum palustre</i>	marsh cinquefoil		
FB	<i>Drosera rotundifolia</i>	round-leaved sundew		
BR	<i>Sphagnum</i> spp.	peat mosses		
BR	Bryophytes	Other mosses		

Frequency (percent of plots)	█	70-100%	█	50-70%	█	25-50%			
Abundance (average percent cover)	██████	>25%	████	10-25%	███	3-10%	██	1-3%	█ < 1%



Figure B15. F07-Chca51 (19MH01)



Figure B16. F07-Anpo55 (19KM108)

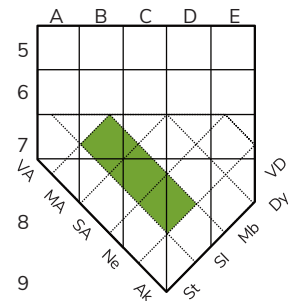
**BOLmh/F11      Clubrush – Sedge Fen**

### General description

The Clubrush – Sedge Fen ecosite is characterized by a significant cover of alpine clubrush (*Trichophorum alpinum*) or tufted clubrush (*T. caespitosum*). It occurs on subhydryc to hydric sites associated with deep peat and a nutrient regime which ranges from poor to rich. This ecosite may form string or ladder fens.

Clubrush (*Trichophorum alpinum*, *T. caespitosum*) is diagnostic of F11 although cover is variable—usually moderately high to high but can be low. White or black spruce may be present with a sparse or low cover. Shrubby cinquefoil (*Dasiphora fruticosa*) may be found with low to moderate cover. Water sedge (*Carex aquatilis*) is a common associate with a moderate cover; other sedges can also occur with low cover. Sundews (*Drosera rotundifolia*, *D. anglica*) and crowberry (*Empetrum nigrum*) are sometimes present. Brown mosses (*Drepanocladus spp.*, *Scorpidium spp.*) and peat mosses (*Sphagnum spp.*) usually dominate the moss cover, but other wetland mosses can also occur.

The poor and very poorly drained soils are organic and usually classified as Typic Fibrisols or Mesisols occasionally Cryosols. Peat is usually greater than 120 cm deep and pH can range from 4.5-7.



### Comments

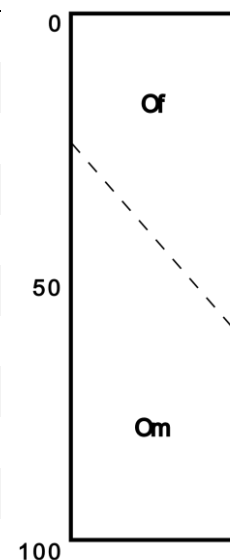
Ecosite F11 can be differentiated from other graminoid wetlands, as follows:

- Other graminoid fen ecosites F01, F12, F13 and F15 do not have clubrush except in trace to low amounts.
- Marsh ecosites M01, M02, M05, M06, M07, M09, M10, M11 and M12 do not have clubrush.

Ecosite F11 also occurs in BOLkp and BOLlh.

**Table B21.** F11 site and soil characteristics.

Plots in unit:	11
Moisture Regime	subhydryc to hydric (7-8)
Nutrient Regime	Poor to rich (B-D)
Meso slope position	level, lower slope
Aspect	none
Slope Gradient	level
Surficial material	organic, organic over fluvial
Soil texture	fibric
Soil drainage	very poor
Humus form	fibrimor
Humus depth	120 + cm
Soil classification	Typic Fibrisols and Mesisols
Seepage/water table	at or near the surface



Permafrost	Usually absent
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**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite F11.

**Tra151** Tufted clubrush

**Trce51** Alpine clubrush

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B22.** F11 vegetation table

Stratum	Species	Common Name	F11-Tra151	F11-Trce51
		no. of plots	5	6
GS	<i>Andromeda polifolia</i>	bog-rosemary	█	███
GR	<i>Carex limosa</i>	shore sedge	***	████
GR	<i>Carex aquatilis</i>	water sedge		███
GR	<i>Trichophorum alpinum</i>	alpine clubrush	██████	
GR	<i>Trichophorum cespitosum</i>	tufted clubrush		██████
HE	<i>Drosera</i> spp.	sundews	██	**
BR	<i>Aulacomnium</i> spp.	groove-mosses	████	
BR	<i>Drepanocladus</i> spp.	hook mosses	████	***
BR	<i>Sphagnum</i> spp.	peat mosses	████	█
BR	Bryophytes	other mosses		████

**Frequency (percent of plots)** █ 70-100% █ 50-70% █ 25-50%

**Abundance (average percent cover)** █████ >25% █████ 10-25% ███ 3-10% ██ 1-3% █ < 1%



Figure B17. F11-Trce51 (19MH02)



Figure B18. F11-Tra151 (19MH14)

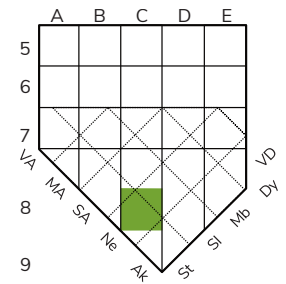
## BOLmh/F12 Lesser-Panicled Sedge Fen

### General description

The Lesser-Panicled Sedge Fen ecosite is uncommon and is located on level sites or in depressions with a hydric to subhydric moisture regime. The nutrient regime ranges from poor to medium. The ecosite is characterized by a moderate cover of lesser-panicled sedge (*Carex diandra*).

In addition to lesser-panicled sedge, water sedge (*Carex aquatilis*) or sometimes beaked sedge (*Carex utriculata*) can occur with moderate cover. In the forb layer bog buckbean (*Menyanthes trifoliata*) occurs with moderate to high cover, along with spring water-starwort (*Callitriche palustris*) and marsh cinquefoil (*Comarum palustre*). Wetland mosses such as hooked scorpion moss (*Scorpidium scorpioides*), common hook moss (*Drepanocladus aduncus*) and giant water moss (*Calliergon giganteum*) are typical of the moss layer.

This fen ecosite occurs on deeper peat deposits associated with larger wetlands with a water table at or above the surface. Soils are likely classified as Typic Mesisols and Fibrisols.



### Comments

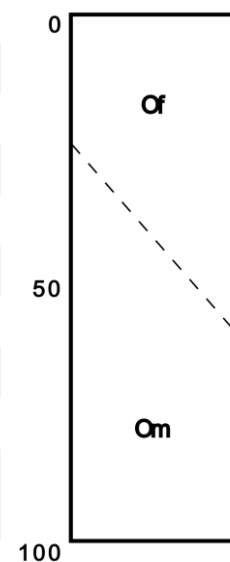
Ecosite F12 can be differentiated from other sedge wetlands, as follows:

- The graminoid fens F01, F11, F15 do not have moderate cover of lesser-panicled sedge.
- Marshes M01, M02, do not have organic soils and do not have lesser-panicled sedge.

Ecosite F12 is also found in the BOLkp and BOLlh.

**Table B23.** F12 site and soil characteristics.

Plots in unit:	1
Moisture Regime	subhydric to hydric (7-8)
Nutrient Regime	poor to medium (B-C)
Meso slope position	level and depression
Aspect	none
Slope Gradient	level
Surficial material	organic
Soil texture	fibric, mesic
Soil drainage	poor
Humus form	fibrimor
Humus depth	usually greater than 100 cm, may be 200 cm
Soil classification	usually Fibrisols
Seepage/water table	near surface



Permafrost	absent
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**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite F11.

**Cadi55** Lesser-panicled sedge

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B24.** F12 vegetation table.

Stratum	Species	Common Name	F12-Cadi50
		no. of plots	1
S	<i>Rhododendron groenlandicum</i>	Labrador tea	██
GR	<i>Carex canescens</i>	silvery sedge	██
GR	<i>Carex diandra</i>	lesser-panicled sedge	████
GR	<i>Carex limosa</i>	shore sedge	███
GR	<i>Carex aquatilis</i>	water sedge	████
FB	<i>Callitriche palustris</i>	spring water-starwort	████
FB	<i>Comarum palustre</i>	marsh cinquefoil	███
FB	<i>Menyanthes trifoliata</i>	buckbean	███
FB	<i>Sparganium</i> spp.	bur-reeds	██
BR	<i>Scorpidium scorpioides</i>	hooked scorpion-moss	████
BR	<i>Sphagnum</i> spp.	peat mosses	██

**Frequency (percent of plots)**      █      70-100%      █      50-70%      █      25-50%

**Abundance (average percent cover)**      █████ >25%      ███ 10-25%      ██ 3-10%      █ 1-3%      █ <1%



Figure B19. F12-Cadi50 (19AD37)

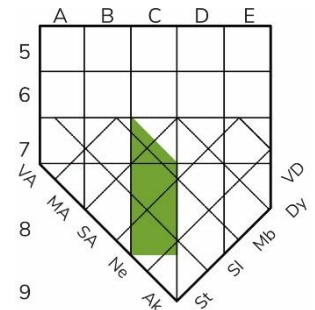
## BOLmh/ F15 Mud Sedge Fen

### General description

The Mud sedge Fen is a subhydic to hydric fen dominated by mud sedge (*Carex limosa*). Nutrient status is generally medium. The water table is usually at or close to the surface.

Mud sedge is diagnostic, but the cover is highly variable. Bog buckbean (*Menyanthes trifoliata*) is a common associate with low to high cover. Marsh scheuchzeria (*Scheuchzeria palustris*) is common in BOLlh. Other sedges (*Carex* spp.) may be present in low, trace and sometimes moderate amounts. A high cover of wetland mosses such as hook mosses (*Scorpidium revolvens*, *Drepanocladus* spp.), yellow starry fen moss (*Campylium stellatum*), peat moss (*Sphagnum* spp.), felted leafy moss (*Rhizomnium pseudopunctatum*) and golden fuzzy fen moss (*Tomentypnum nitens*) or glow moss (*Aulacomnium palustre*) is characteristic.

Soils are very poor to poorly drained Fibrisols, Mesisols or Organic Cryosols.



### Comments

Ecosite F15 can be differentiated from other sedge wetlands, as follows:

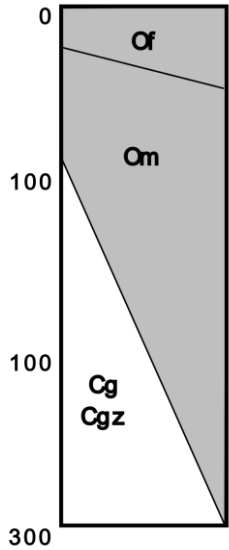
- F10 has mud sedge and livid sedge.
- F11 may have mud sedge but tufted clubrush is dominant.
- F01 may have mud sedge but water or beaked sedge has a much higher cover.
- F02, F03 may have trace or low cover of mud sedge but they have greater than 15% shrub cover.

Ecosite F15 is also found in BOLLh.

Ecosite F15 is similar to Wf08 in British Columbia (MacKenzie and Moran 2004).

**Table B24.** F15 site and soil characteristics.

<b>Plots in unit:</b>	<b>5</b>	
Moisture Regime	subhydryc to hydric (7-8)	
Nutrient Regime	medium (C)	
Meso slope position	level, lower slope, depression	
Aspect	none	
Slope Gradient	level	
Surficial material	organic	
Soil texture	fibric, mesic	
Soil drainage	very poor, poor	
Humus form	fibrimor	
Humus depth	70-100+ cm	
Soil classification	Fibrisols, Mesisols, Organic Cryosols	
Seepage/water table	at or close to the surface	
Permafrost	absent	



**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite F15:

**Cali58** Mud Sedge

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B25.** F15 vegetation table.

Stratum	Species	Common Name	F15-Cali58
		no. of plots	5
GS	<i>Vaccinium oxycoccus</i>	bog cranberry	
GR	<i>Carex limosa</i>	mud sedge	
GR	<i>Carex aquatilis</i>	water sedge	
GR	<i>Carex</i> spp.	other sedges	
FB	<i>Comarum palustre</i>	marsh cinquefoil	**
FB	<i>Menyanthes trifoliata</i>	bog buckbean	***
BR	<i>Calliergon, Drepanocladus, Tomentypnum nitens</i>	brown mosses	
BR	<i>Sphagnum</i> spp.	peat mosses	

Frequency (percent of plots)	█	70-100%	█	50-70%	█	25-50%			
Abundance (average percent cover)	██████	>25%	████	10-25%	███	3-10%	██	1-3%	█ < 1%



Figure B20. F15-Cali58 (19AD81)

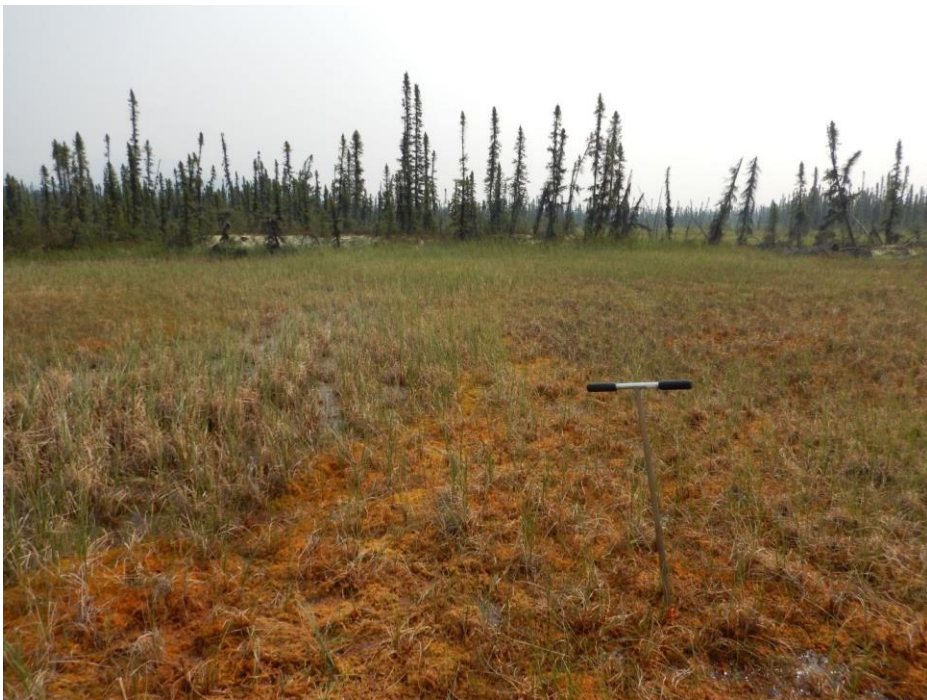


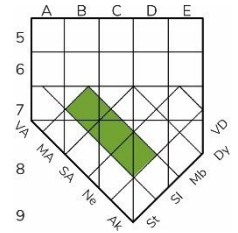
Figure B21. F15-Cali58 (19AD85)

**BOLmh/F16      Shrub Birch – Clubrush Fen**

Beaver River wetlands

### General description

The Shrub Birch – Clubrush Fen ecosite is characterized by a shrub birch (*Betula glandulosa*) cover with significant cover of alpine clubrush (*Trichophorum alpinum*) or tufted clubrush (*T. caespitosum*). It occurs on subhydryc to hydric sites with the nutrient regime ranging from poor to rich.



Clubrush (*Trichophorum alpinum*, *T. caespitosum*) is diagnostic of F11 although cover is variable—usually moderately high to high but can be low. White or black spruce or larch (in BOLLh) may be present with a sparse or low cover. Water sedge (*Carex aquatilis*) is a common associate with a moderate cover; other sedges can also occur with low cover. Sundews (*Drosera rotundifolia*, *D. anglica*) and crowberry (*Empetrum nigrum*) are sometimes present. Brown mosses (*Drepanocladus* spp., *Scorpidium* spp., *Tomentypnum nitens*.) and peat mosses (*Sphagnum* spp.) usually dominate the moss cover but other wetland mosses can also occur.

The poor and very poorly drained soils are organic and usually classified as Typic Fibrisols or Mesisols occasionally Cryosols.

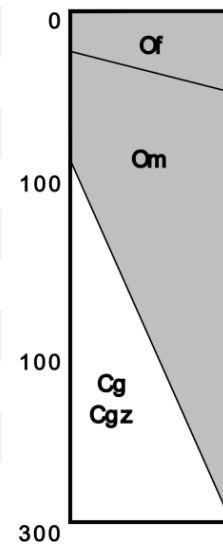
### Comments

Ecosite F16 can be differentiated from other graminoid wetlands, as follows:

- The graminoid fen ecosites F01, F12, F13 and F15 do not have clubrush except in trace to low amounts.
- Marsh ecosites M01, M02, M05, M06, M07, M09, M10, M11 and M12 do not have clubrush.

**Table B26.** F16 site and soil characteristics.

Plots in unit:	3
Moisture Regime	subhydryc to hydric (7-8)
Nutrient Regime	poor to medium (B-C)
Meso slope position	level, lower slope
Aspect	none
Slope Gradient	level
Surficial material	organic, organic over fluvial
Soil texture	fibric
Soil drainage	very poor
Humus form	fibrimor
Humus depth	35-190 cm
Soil classification	Typic Fibrisols and Mesisols, sometimes Cryosols
Seepage/water table	at or near the surface
Permafrost	Usually absent



## Vegetation summary

The following vegetation association characterizes the species composition for Ecosite F16.

### Beglxx Shrub birch / Clubrush

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B27. F16 vegetation table.

Stratum	Species	Common Name	F16-Beglxx
		no. of plots	3
T	<i>Picea</i> spp.	spruces	■■■
S	<i>Betula glandulosa</i>	shrub birch	■■■■
GR	<i>Carex aquatilis</i>	water sedge	■■■
GR	<i>Trichophorum</i> spp.	clubrushes	■■■■■
FB	<i>Tofieldia pusilla</i>	common false asphodel	■
BR	<i>Drepanocladus</i> , <i>Scorpidium</i> , <i>Tomentypnum</i>	brown mosses	■■■■■
BR	<i>Sphagnum</i> spp.	peat mosses	■■■

Frequency (percent of plots)	■	70-100%	■	50-70%	■	25-50%				
Abundance (average percent cover)	■■■■■	>25%	■■■■	10-25%	■■■	3-10%	■■	1-3%	■	<1%



Figure B22. F16-Beglxx (19AD99)

## BOLmh/F17 Silvery Sedge Fen

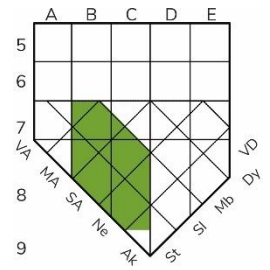
### General description

Beaver River wetlands

The Silvery Sedge Fen is a subhydic to hydric fen that occurs on very poorly drained, level sites with fluvial parent materials that is characterized by a moderate to high cover of silvery sedge (*Carex canescens*). Nutrient regime varies from poor to medium.

Other sedges (*C. aquatilis*, *C. utriculata*) are common associates. In BOLLh, reedgrass (*Calamagrostis canadensis*, *C. stricta*) are also common. The composition of the moss layer is variable, composed of brown (*Calliergon* spp., *Aulacomnium palustre*) or peat (*Sphagnum* spp.) mosses.

Soils are usually organic with >40 cm fibric or mesic peat but occasionally peat may only be 25-40cm. Soils are classified as Fibrisols, Mesisols, Cryosols or Gleysols. Soils may be subject to flooding.



**Comments**

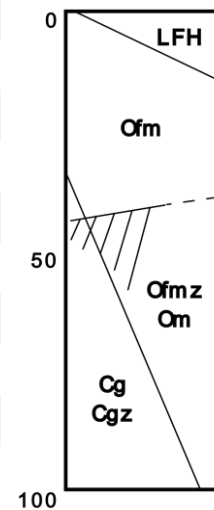
Ecosite F17 can be differentiated from other graminoid wetlands, as follows:

- The graminoid fen ecosites F01, F12, F13 and F15 do not have silvery sedge except in trace to low amounts. Other species dominate.
- Marsh ecosites M01, M02, M05, M06, M07, M09, M10, M11 and M12 also do not have silvery sedge except in low or trace amounts. Other species dominate.

Ecosite F17 also occurs BOLLh.

**Table B28.** F17 site and soil characteristics.

<b>Plots in unit:</b>	<b>5</b>
Moisture Regime	subhydic to hydric (7-8)
Nutrient Regime	poor to medium (B-C)
Meso slope position	level
Aspect	none
Slope Gradient	level
Surficial material	organic, organic over fluvial
Soil texture	fibric, mesic
Soil drainage	very poor
Humus form	fibrimor, mesimor
Humus depth	35-190 cm
Soil classification	Fibrisols and Mesisols, sometimes Organic Cryosols, Gleysols
Seepage/water table	at or near the surface
Permafrost	sometimes present



**Vegetation summary**

Beaver River wetlands

The following vegetation association characterizes the species composition for Ecosite F17

**Cacn50** Silvery Sedge – Water sedge – Brown moss

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B29.** F17 vegetation table.

Stratum	Species	Common Name	F17-Cacn50
		no. of plots	5
GR	<i>Carex canescens</i>	silvery sedge	
GR	<i>Carex aquatilis</i>	water sedge	
FB	<i>Comarum palustre</i>	marsh cinquefoil	
BR	Bryophytes	mosses	

**Frequency (percent of plots)**    |    70-100%    |    50-70%    |    25-50%

**Abundance (average percent cover)**    ||||| >25%    |||| 10-25%    ||| 3-10%    || 1-3%    | < 1%



**Figure B23.** F17-Cacn50 (19MH16)

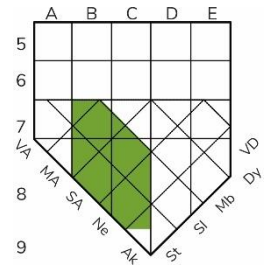
**BOLmh/F18** Water Sedge – Peat moss Fen

### General description

The Water Sedge - Peat moss Fen ecosite occurs on peaty, hydric or subhydric sites, dominated by water sedge (*Carex aquatilis*) with a peat moss (*Sphagnum* spp.) moss layer. The water table is at or very close to the surface.

A high to moderate cover of water sedge is diagnostic. Other sedges, including mud sedge (*C. limosa*), few-flowered sedge (*C. pauciflora*), and silvery sedge (*C. canescens*) may occur with trace to moderate cover. Marsh cinquefoil (*Comarum palustre*) is a common associate. The significant bryophyte layer is variable and may be dominated by glow moss (*Aulacomnium palustre*), golden fuzzy fen moss (*Tomentypnum nitens*), or hook mosses (*Drepanocladus* spp., *Scorpidium revolvens*).

Soils are very poor to poorly drained, peaty, with more than 30 cm of peat. They are usually classified as Typic, Terric or Hydric Fibrisols or Organic Cryosols.



### Comments

Ecosite F016 can be differentiated from other graminoid wetland ecosites, as follows:

- F01 may have a moderate to high cover of water sedge but mosses are dominated by brown mosses.
- F02, F03, F07 are fens with willow, shrub birch, or leatherleaf shrub overstories.
- F11, F12, F17 may have some water or beaked sedge but are dominated by other sedges.
- M01 may be dominated by water or beaked sedge but does not have organic soils and moss cover is usually low or other species are not fen species.
- M02 is dominated by horsetail and beaked or water sedge but does not have organic soils and moss cover is usually low.
- Other marshes are dominated by other species.

Ecosite F18 also occurs in BOLLh.

**Table B30.** F18 site and soil characteristics.

<b>Plots in unit:</b>	<b>5</b>
Moisture Regime	subhydric to hydric (7-8)
Nutrient Regime	poor to mesic (B-C)
Meso slope position	level
Aspect	none
Slope Gradient	level
Surficial material	organic
Soil texture	fibric, mesic
Soil drainage	very poor to poor
Humus form	fibrimor

Humus depth	30-228 cm	
Soil classification	Typic, Hydric, Terric Fibrisols, Organic Cryosols	
Seepage/water table	at or near surface	
Permafrost	absent	

### Vegetation summary

The following vegetation association characterizes the species composition for Ecosite F18.

**Caaqxx** Water sedge – Peat moss

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B31.** F18 vegetation table.

Stratum	Species	Common Name	F18-Caaqxx
		no. of plots	5
GS	<i>Vaccinium oxycoccus</i>	bog cranberry	
GS	<i>Andromeda polifolia</i>	bog-rosemary	
GR	<i>Carex limosa</i>	shore sedge	
GR	<i>Carex aquatilis</i>	water sedge	
FB	<i>Comarum palustre</i>	marsh cinquefoil	**
FB	<i>Drosera anglica</i>	great sundew	**
FB	<i>Menyanthes trifoliata</i>	buckbean	****
BR	<i>Sphagnum</i> spp.	peat mosses	

Frequency (percent of plots)    ||    70-100%    ||    50-70%    ||    25-50%

Abundance (average percent cover)    |||||    >25%    ||||    10-25%    |||    3-10%    ||    1-3%    |    <1%



Figure B24. F18-Caaqxx (19KM27)

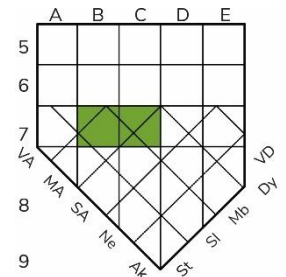
## BOLmh/F19 Sweet Gale – Peat Moss Fen

### General description

The Sweet Gale – Peat moss fen is an uncommon fen characterized by a moderate cover of sweet gale (*Myrica gale*) which dominates the shrub layer. It is a poorly to very poorly drained subhydic ecosite with a medium to poor nutrient regime.

Other shrubs may include shrub birch (*Betula glandulosa*), Labrador tea (*Rhododendron tomentosum*) and leatherleaf (*Chamaedaphne calyculata*) with a trace to low cover. Ground shrubs and graminoids are usually low. Moss layer is dominated by peat mosses (*Sphagnum fuscum*, *Sphagnum capillifolium*).

Soils consist of poorly decomposed peat and are permanently frozen. Soil is classified as a Terric Fibric Organic Cryosol. The pH of the soil and the water is moderately acidic.



### Comments

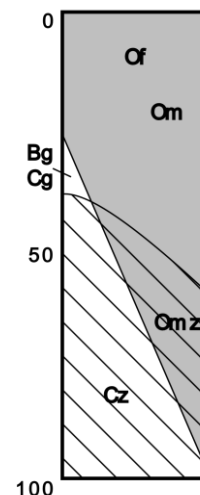
Ecosite F19 can be differentiated from other graminoid wetland ecosites, as follows:

- F02, F03, F07 are shrub fens dominated by willow, shrub birch, or leatherleaf shrub overstories not sweet gale.

Ecosite F19 was also found in BOLLh with a high cover of sweet gale and a clubrush and peat moss groundcover.

Table B32. F19 site and soil characteristics.

<b>Plots in unit:</b>	<b>1</b>
Moisture Regime	subhydric (7)
Nutrient Regime	poor to medium (B-C)
Meso slope position	depression
Aspect	N/A
Slope Gradient	level
Surficial material	organic over fluvial
Soil texture	fibric
Soil drainage	poor to very poor
Humus form	fibric
Humus depth	>40cm
Soil classification	Terric Fibric Organic Cryosol
Seepage/water table	10cm
Permafrost	yes



### Vegetation summary

The following vegetation association characterizes the species composition for Ecosite F19.

**Mygaxx** Myrica gale / Peat moss

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B33. F19 vegetation table.

Stratum	Species	Common Name	F-Mygaxx
		no. of plots	1
S	<i>Betula glandulosa</i>	shrub birch	■■■
S	<i>Chamaedaphne calyculata</i>	leatherleaf	■■■
S	<i>Myrica gale</i>	sweet gale	■■■■■
S	<i>Rhododendron tomentosum</i>	northern Labrador tea	■■■
GS	<i>Empetrum nigrum</i>	crowberry	■
GS	<i>Vaccinium oxycoccus</i>	bog cranberry	■
GR	<i>Carex</i> spp.	sedges	■■■
FB	<i>Menyanthes trifoliata</i>	buckbean	■
BR	<i>Aulacomnium</i> spp.	groove-mosses	■■■
BR	<i>Sphagnum</i> spp.	peat mosses	■■■■■
BR	<i>Sphagnum capillifolium</i>	common red peat moss	■■■■■
LI	<i>Cladina</i> spp.	reindeer lichens	■■■

Frequency (percent of plots) ■ 70-100% ■ 50-70% ■ 25-50%

Abundance (average percent cover)



>25%



10-25%



3-10%



1-3%



<1%



Figure B25. F19-Mygaxx (19KM59)

## BOLmh/S01 Willow – Bluejoint Swamp

### General description

The Willow – Bluejoint Swamp ecosite is found along rivers, smaller creeks and at the edge of ponds that flood less frequently than some other swamps. Soils are usually found on subhygric to subhydic sites, either level or depression.

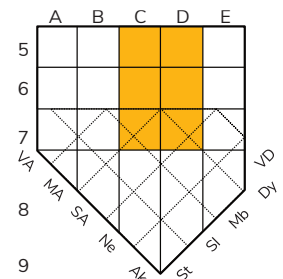
Willows (*Salix planifolia*, *S. alaxensis*, *S. pseudomonticola*, *S. barclayi*, *S. glauca*, *S. pulchra* and others) characterize these swamps, along with moderate to high cover of bluejoint reedgrass (*Calamagrostis canadensis*) or other reedgrasses (*C. stricta*, *C. lapponica*). Tufted hairgrass (*Deschampsia caespitosa*) can occur with moderate to low cover. Various sedges (*Carex saxatilis*, *C. aquatilis*, *C. utriculata*) can also occur in low to trace amounts. Various other grasses and forbs are often present, but usually occur with low to sparse cover. The variable moss cover is generally moderately high and may be comprised of glow moss (*Aulacomnium palustre*), golden fuzzy fen moss (*Tomentypnum nitens*), hook-mosses (*Drepanocladus* spp.), tree moss (*Climacium dendroides*), thread-mosses (*Bryum* spp.), peat mosses (*Sphagnum* spp.) or leafy mosses (*Rhizomnium* spp.).

Parent materials are fluvial and sometimes lacustrine. The imperfect to poorly drained soils are usually classified as Gleysols though organic soils can also occur. Permafrost may be present at depth.

### Comments

Ecosite S01 can be differentiated from other shrub swamps, as follows:

Beaver River wetlands



- S02 may have high willow cover but is characterized by high river alder cover.
- S03 has a willow overstory but the groundcover is dominated by sedges and moss, and not reedgrass.
- S04 has a willow overstory and may have some reedgrass in the groundcover but it also has a moderate to high cover of meadow horsetail.

Ecosite S01 also occurs in BOLsl, BOLyc, BOLkp and BOLlh.

**Table B34.** S01 site and soil characteristics.

<b>Plots in unit:</b>	<b>9</b>	
Moisture Regime	subhygric to subhydric (5-7)	
Nutrient Regime	medium to rich (C-D)	
Meso slope position	level, depression, gully, toe slope	
Aspect	none	
Slope Gradient	0-3 %	
Surficial material	fluvial, sometimes lacustrine	
Soil texture	fine loamy, fine sandy	
Soil drainage	imperfect to poor	
Humus form	fibrimor, saprimoder	
Humus depth	0-48 cm	
Soil classification	Gleysols, Cryosols	
Seepage/water table	Fluctuating, usually near surface	
Permafrost	may have permafrost	

**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite S01.

**Sasp50** Willow / Bluejoint Reedgrass

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B35.** S01 vegetation table.

Stratum	Species	Common Name	S01-Sasp50
		no. of plots	9
S	<i>Betula glandulosa</i>	shrub birch	***
S	<i>Dasiphora fruticosa</i>	shrubby cinquefoil	
S	<i>Salix myrtilifolia</i>	bilberry willow	***
S	<i>Salix</i> spp.	willows	

S	<i>Vaccinium uliginosum</i>	bog blueberry	**
GR	<i>Carex aquatilis</i>	water sedge	**
GR	<i>Calamagrostis canadensis</i>	bluejoint reedgrass	
GR	<i>Calamagrostis stricta</i>	slimstem reedgrass	**
BR	<i>Rubus arcticus</i>	nagoonberry	
BR	<i>Drepanocladus</i> spp.	hook mosses	****
BR	Bryophytes	other mosses	

Frequency (percent of plots)      |      70-100%      |      50-70%      |      25-50%

Abundance (average percent cover)      |||||      >25%      |||||      10-25%      ||||      3-10%      ||      1-3%      |      <1%



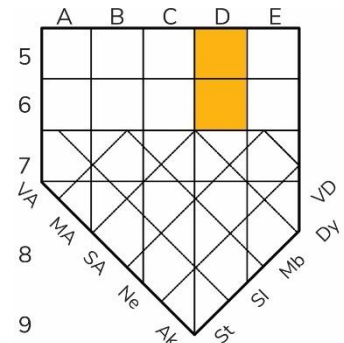
Figure B26. S01-Sasp50 (19KM06)

## BOLmh/S02 River Alder – Willow Swamp

### General description

The River Alder Swamp ecosite occurs on hygric to subhydryc sites on low bench floodplains of major rivers and along some smaller creeks.

A moderate to high cover of river alder (*Alnus incana*) usually occurring with willows (*Salix planifolia*, *S. pseudomonticola*, *S. alaxensis*, *S. pulchra*, *S. lasiandra*, and others) characterize these swamps. Common understory species include bluejoint reedgrass (*Calamagrostis canadensis*) and common horsetail (*Equisetum arvense*), but a wide range of forbs and graminoids may be found on these variable sites. Mosses are generally present and can include peat mosses (*Sphagnum* spp.), feathermosses (*Hylocomium splendens*, *Pleurozium schreberi*), brown mosses (*Aulacomnium palustre*, *Tomentypnum nitens*) and leafy mosses (*Mnium* spp., *Plagiomnium* spp.).



Parent material is typically sandy to loamy fluvial soils on level to gentle slopes. The unfrozen soils are classified as Gleysols or Gleyed or Cumulic Regosols. Moderate slopes may be typical of the ecosite on smaller tributary creeks. Flooding is common.

**Comments**

- S02 can be differentiated from other shrubby wetland ecosites by the moderate to high cover of river alder.
- Frequent flooding, poor and very poorly drained soils and or the presence of wetland species differentiate this swamp ecosite from a non-wetland low bench floodplain.

Ecosite S02 also occurs in BOLsl, BOLyc, BOLkp and BOLlh.

**Table B36.** S02 site and soil characteristics.

<b>Plots in unit:</b>	<b>3</b>	
Moisture Regime	subhygic to hygic (5-6)	
Nutrient Regime	rich (D)	
Meso slope position	level, lower slope, toe slope	
Aspect	none	
Slope Gradient	0-3%	
Surficial material	fluvial	
Soil texture	silt and fine sand, loams	
Soil drainage	imperfect to poor	
Humus form	hydromull	
Humus depth	0-11 cm	
Soil classification	Gleyed or Cumulic Regosols, Gleysols	
Seepage/water table	fluctuating water table, flooding	
Permafrost	absent	

**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite S02.

**Alin50** River alder / Willow

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B37.** S02 vegetation table.

Stratum	Species	Common Name	S02-Alin55
		no. of plots	3
T	<i>Picea glauca</i>	white spruce	1

T	<i>Populus balsamifera</i>	balsam poplar	***
S	<i>Alnus incana</i>	mountain alder	
S	<i>Salix alaxensis</i>	Alaska willow	
S	<i>Salix barclayi</i>	Barclay's willow	***
S	<i>Salix planifolia</i>	plane-leaved willow	
S	<i>Salix pseudomonticola</i>	serviceberry willow	***
S	<i>Salix</i> spp.	other willows	***
S	<i>Vaccinium uliginosum</i>	bog blueberry	***
GR	<i>Carex</i> spp.	sedges	
GR	Poaceae	grasses	
FB	<i>Achillea millefolium</i>	yarrow	
FB	<i>Artemisia tilesii</i>	Aleutian mugwort	
FB	<i>Equisetum arvense</i>	common horsetail	
FB	<i>Parnassia palustris</i>	northern grass-of-Parnassus	
FB	<i>Rubus arcticus</i>	nagoonberry	
BR	<i>Tomentypnum, Aulacomnium</i>	brown mosses	***
BR	<i>Pleurozium schreberi</i>	red-stem moss	**
BR	<i>Sphagnum</i> spp.	peat mosses	**
BR	Bryophytes	other mosses	

**Frequency (percent of plots)**      |      70-100%      |      50-70%      |      25-50%  
**Abundance (average percent cover)**      ||||| >25%      |||| 10-25%      ||| 3-10%      || 1-3%      | <1%



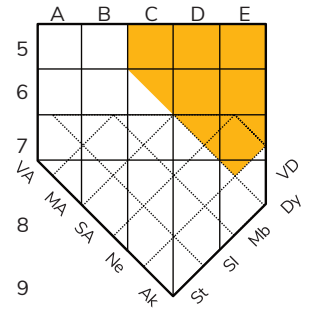
Figure B27. S02-Alin55 (19AD117)

**BOLmh/S04      Willow – Horsetail Swamp**

### General description

The Willow – Horsetail Swamp ecosite occurs along rivers and smaller creeks and at the edges of lakes and ponds. The S04 occurs on subhygric to hygric sites with a medium to rich nutrient regime which experience subsurface seepage and occasional flooding.

A high cover of willows (*Salix glauca*, *S. pseudomonticola*, *S. alaskensis*, *S. barclayi*, *S. lasiandra*, *S. planifolia* among others) and a moderate to high cover of common horsetail (*Equisetum arvense*) characterize these swamps. Occasionally other horsetail species may occur, sometimes replacing common horsetail, including water horsetail (*E. fluviatile*), marsh horsetail (*E. palustre*), meadow horsetail (*E. pratense*), or variegated scouring-rush (*E. variegatum*). Grasses including reedgrass (*Calamagrostis stricta*, *C. canadensis*), bluegrasses (*Poa* spp.), or hair bentgrass (*Agrostis scabra*) are usually present, with trace or low cover. Mosses including hook mosses (*Drepanocladus* spp.), glow mosses (*Aulacomnium* spp.), tree moss (*Climacium dendroides*) or other bryophytes are usually present with low to high cover.



The imperfectly to poorly drained soils are Gleysols or Gleyed Regosols.

### Comments

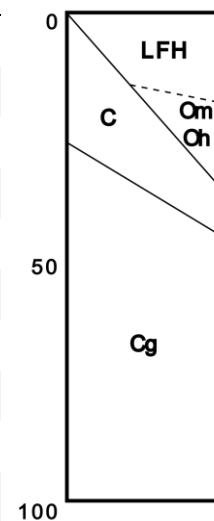
Ecosite S04 can be differentiated from other willow-dominated, shrub wetlands, as follows:

- F03 has a high cover of water sedges; and
- S01 has moderate to high cover of bluejoint reedgrass, and horsetails, if present, are of low cover.
- F06 moss layer is dominated by peat mosses, and horsetails, if present, are of low cover.

Ecosite S04 is also found in BOLsl, BOLkp and BOLlh.

Table B38. S04 site and soil characteristics.

<b>Plots in unit:</b>	<b>4</b>
Moisture Regime	hygric to subhygric (6-7)
Nutrient Regime	Medium to very rich (C-E)
Meso slope position	level, depression
Aspect	none
Slope Gradient	level
Surficial material	fluvial, could be lacustrine
Soil texture	variable
Soil drainage	imperfect to poor
Humus form	mor
Humus depth	thin humus
Soil classification	Gleysols, Gleyed Regosols



Seepage/water table	fluctuating water table close to the surface
Permafrost	absent

### Vegetation summary

The following vegetation association characterizes the species composition for Ecosite S04.

#### Sasp56 Willow /Horsetail

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B39. S04 vegetation table.

Stratum	Species	Common Name	S04-Sasp56
		no. of plots	4
S	<i>Salix barclayi</i>	Barclay's willow	**
S	<i>Salix glauca</i>	grey-leaved willow	
S	<i>Salix</i> spp.	willows	
S	<i>Salix pseudomonticola</i>	serviceberry willow	
S	<i>Salix pulchra</i>	diamond-leaved willow	***
S	<i>Vaccinium uliginosum</i>	bog blueberry	
GR	<i>Carex</i> spp.	sedges	
GR	Poaceae	grasses	
FB	<i>Juncus castaneus</i>	chestnut rush	
FB	<i>Equisetum arvense</i>	common horsetail	
FB	<i>Equisetum scirpoides</i>	dwarf scouring-rush	
FB	<i>Rubus arcticus</i>	nagoonberry	
BR	<i>Aulacomnium</i> spp.	glow mosses	
BR	<i>Drepanocladus</i> spp.	hook mosses	***
BR	<i>Sphagnum</i> spp.	peat mosses	***
BR	Bryophytes	other mosses	***

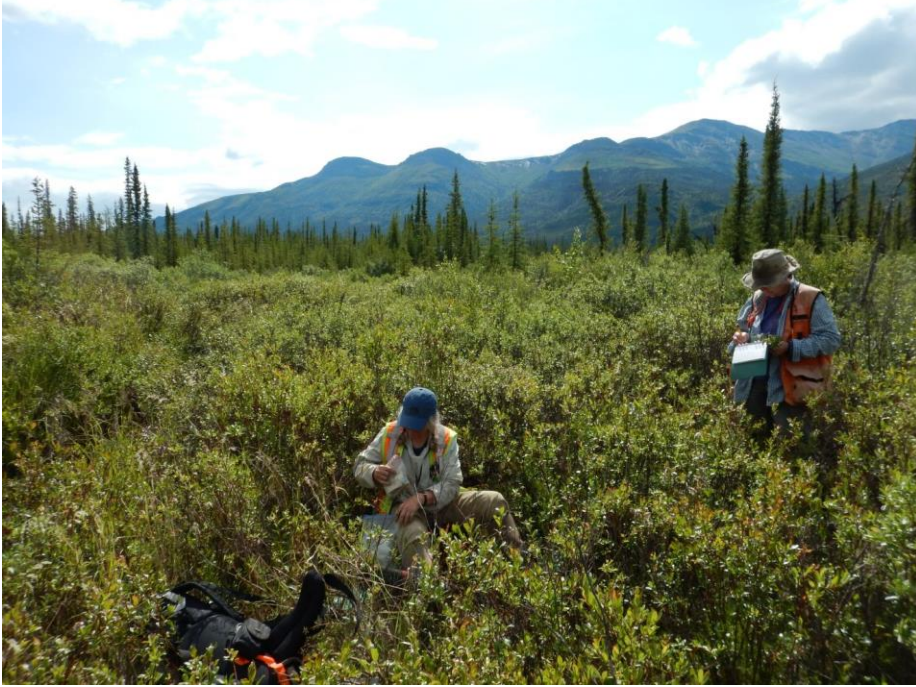


Figure B28. S04-Sasp56 (19KM22)

## BOLmh/S06 Willow – Sedge – Peat moss Swamp

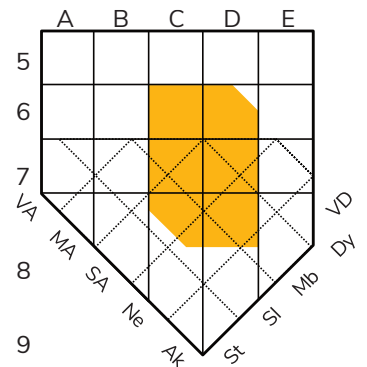
### General description

The Willow – Sedge – Peat Moss Swamp ecosite is a willow swamp that occurs mostly on subhygric to subhydric sites with a medium to rich nutrient regime. The sites are level to gently sloping and poor to very poorly drained with underlying permafrost.

S06 is characterized by various willows and either an understory dominated by sedges or a peat moss bryophyte layer; white spruce (*Picea glauca*) may be present with trace to low cover. Multiple willow species are generally found on a site and can include tea-leaved willow (*Salix planifolia*), diamond-leaved willow (*S. pulchra*), Alaska willow (*S. alaxensis*), little-tree willow (*S. arbusculoides*), Barclay’s willow (*S. barclayi*), grey-leaved willow (*S. glauca*), blueberry willow (*S. myrtilifolia*), or others. In the Beaver River watershed, *S. pulchra* and *S. barclayi* are the most common. Shrubby cinquefoil (*Dasiphora fruticosa*), blueberry (*Vaccinium uliginosum*), sedges (*Carex aquatilis*, *C. spp.*) and horsetails (*Equisetum arvense*, *E. pratense*) frequently occur, but vary considerably in cover. The moss layer is sometimes dominated by peat mosses (*Sphagnum spp.*) with other mosses, but on other sites the wet mosses which include hookmosses (*Drepanocladus spp.*), glow moss (*Aulacomnium palustre*), golden fuzzy fen moss (*Tomentypnum nitens*) and some leafy mosses (*Mnium spp.*, *Rhizomnium spp.*) are dominant.

Parent materials are usually fluvial with an organic veneer that varies considerably in thickness. Although a surface organic mat may be present, it is usually less than 20 cm thick. Permafrost is often present, especially in narrower valleys along smaller creeks. Soils are usually classified as Cryosols, Gleysols or Regosols. Flooding and winter auefs formation are common.

Beaver River wetlands



**Comments**

Ecosite S06 can be differentiated from other shrub wetlands with water sedges, as follows:

- F02 has high cover of shrub birch, though S06 may also have shrub birch, soils are not organic.
- F03 also has high cover of willows and water sedges; however, F03 sites have 40 cm or more of fibric or mesic peat.

Ecosite S06 also occurs in BOLkp.

**Table B40.** S06 site and soil characteristics.

<b>Plots in unit:</b>	<b>19</b>	
Moisture Regime	subhygic to subhydic (5-7)	
Nutrient Regime	medium to rich (C-D)	
Meso slope position	level, toe slope, lower slope, depression	
Aspect	none	
Slope Gradient	0-5 %	
Surficial material	fluvial, sometimes lacustrine	
Soil texture	fine loamy	
Soil drainage	poor to very poor	
Humus form	mor, moder	
Humus depth	1-20 cm	
Soil classification	Cryosols, Gleysols, Cumulic Regosols	
Seepage/water table	fluctuating water table; flooding	
Permafrost	often present	

**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite S06.

**Sasp55** Willow / Sedge

**Sasp57** Willow / Peat moss

The frequency and abundance of species for these associations is shown in the following vegetation table.

**Table B41.** S06 vegetation table.

Stratum	Species	Common Name	S06-Sasp55	S06-Sasp57
		no. of plots	16	3
T	<i>Picea glauca</i>	white spruce		
S	<i>Betula glandulosa</i>	shrubs birch		

S	<i>Dasiphora fruticosa</i>	shrubby cinquefoil	**	
S	<i>Salix</i> spp.	willows		
S	<i>Vaccinium uliginosum</i>	bog blueberry		
GR	<i>Carex canescens</i>	silvery sedge		
GR	<i>Carex aquatilis</i>	water sedge		
GR	<i>Carex</i> spp.	sedges	***	
GR	<i>Calamagrostis</i> spp.	reedgrasses	*	
FB	<i>Comarum palustre</i>	marsh cinquefoil	*	
FB	<i>Parnassia palustris</i>	northern grass-of-Parnassus		
FB	<i>Rubus arcticus</i>	nagoonberry		
BR	<i>Aulacomnium palustre</i>	glow moss	***	
BR	<i>Bryum</i> spp.	thread-mosses	****	
BR	<i>Drepanocladus</i> spp.	hook mosses		**
BR	<i>Sphagnum</i> spp.	peat mosses		
BR	<i>Tomentypnum nitens</i>	golden fuzzy fen moss	****	****

**Frequency (percent of plots)**    |    70-100%    |    50-70%    |    25-50%

**Abundance (average percent cover)**    |||||    >25%    |||||    10-25%    |||    3-10%    ||    1-3%    |    < 1%



Figure B29. S06-Sasp55 (19AD09)



Figure B30. S06-Sasp57 (19AD83)

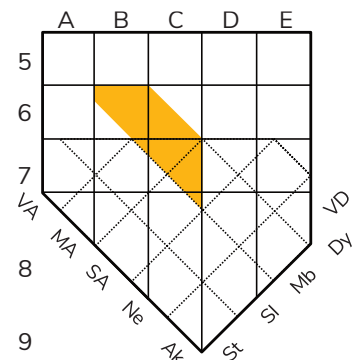
## BOLmh/S07 Sb – Labrador Tea – Peat moss Swamp

### General description

The Sb – Labrador Tea Swamp ecosite is usually associated with gentle and sometimes steep slopes on cool to neutral aspects. S07 sites have a subhygric to hygric moisture regime and a medium to poor nutrient regime.

Black spruce (*Picea mariana*) and Labrador teas (*Rhododendron groenlandicum*, *R. tomentosum*) characterize the ecosite, with a mixed groundcover that includes peat mosses (*Sphagnum* spp.). White spruce (*P. glauca*) may also occur with low cover. Associated species include willows (*Salix* spp.), shrub birch (*Betula glandulosa*), lowbush cranberry (*Vaccinium vitis-idaea*), spruce muskeg sedge (*Carex lugens*), cloudberry (*Rubus chamaemorus*), arctic sweet coltsfoot (*Petasites frigidus*) and horsetails (*Equisetum arvense*, *E. sylvaticum*). The moss layer is usually dominated by peat mosses (*Sphagnum fuscum*, *S. capillifolium*, *S. spp.*) though feathermosses (*Hylocomium splendens*, *Pleurozium schreberi*), haircap mosses (*Polytrichum* spp.) or brown mosses (*Aulacomnium palustre*, *Tomentypnum nitens*) are usually present. Reindeer lichens (*Cladina stellaris*, *C. rangiferina*, *C. mitis*) may have a moderate cover on some sites. Following disturbance such as fire, a frequent occurrence in the BOLkp subzone, the cover of Alaska paper birch (*Betula neoalaskana*) and green alder (*Alnus viridis*) may increase (see vegetation association SbW35).

Soils have peaty surface horizons 15–30 cm thick overlying medium textured mineral soil. They usually have a shallow active layer (<70cm) over permafrost and are usually classified as Cryosols. Some are Gleysols.



## Comments

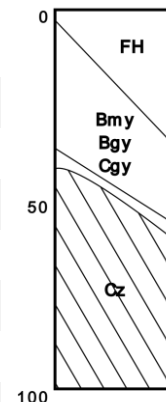
Ecosite S07 can be differentiated from other black spruce treed wetland ecosites as follows:

- B03 has similar vegetation to S07, but differs ecologically sites have a more stagnant water source and soils are organic, with a lower pH in the rooting zone. B03 sites generally have a higher cover of peat moss.
- F05 has similar vegetation to some sites in S07, but if spruce muskeg sedge or tussock cottongrass occur in S07, they are of low cover. Peat moss is more characteristic of S07 but may also occur in F05.
- S08 has similar vegetation to S07, but either lacks or has low cover of peat mosses. It is characterized by glow moss and golden fuzzy fen moss. Labrador tea on S08 sites is of lower cover than S07. The S08 can have high bluejoint reedgrass cover.

Ecosite S07 is also found in BOLkp.

**Table B42.** S07 site and soil characteristics.

Plots in unit:	19
Moisture Regime	mostly subhygric to hygric [5-6,7]
Nutrient Regime	poor to medium (B-C)
Meso slope position	mostly mid to lower slope, sometimes toe or level
Aspect	cool, sometimes neutral or none
Slope Gradient	gentle to steep
Surficial material	organic, fluvial
Soil texture	peaty over loamy
Soil drainage	imperfect to poor
Humus form	mor
Humus depth	5-35 cm
Soil classification	Cryosols, sometimes Gleysols
Seepage/water table	seepage within 50cm, over permafrost
Permafrost	usually present



## Vegetation summary

The following vegetation associations characterize the species composition for Ecosite S07.

**S07-Sb34** Black spruce / Labrador tea/ Lowbush cranberry / Feathermoss - Peat moss

**S07-Sb36** Black spruce / Northern Labrador tea/ Lowbush cranberry / Lichen - Peat moss

The frequency and abundance of species for these associations is shown in the following vegetation table.

Table B43. S07 vegetation table.

Stratum	Species	Common Name	S07-Sb34	S07-Sb36
		no. of plots	6	12
T	<i>Picea mariana</i>	black spruce		
S	<i>Rhododendron groenlandicum</i>	Labrador tea		
S	<i>Betula glandulosa</i>	shrub birch		
S	<i>Salix</i> spp.	willows		
S	<i>Vaccinium uliginosum</i>	bog blueberry		
GS	<i>Vaccinium vitis idaea</i>	low bush cranberry		
GS	<i>Empetrum nigrum</i>	crowberry		
GS	<i>Rubus chamaemorus</i>	cloudberry		***
GR	<i>Carex lugens</i>	spruce muskeg sedge		
FB	<i>Arctous rubra</i>	red bearberry		
BR	<i>Hylocomium / Pleurozium</i>	feathermosses		
BR	<i>Sphagnum</i> spp.	peat mosses		
BR	<i>Tomentypnum nitens / Aulacomnium</i>	golden fuzzy fen moss		
BR	Bryophytes	other mosses		***
LI	<i>Cladina</i> spp.	reindeer lichens		

Frequency (percent of plots)    |    70-100%    |    50-70%    |    25-50%

Abundance (average percent cover)    |||||    >25%    ||||    10-25%    |||    3-10%    ||    1-3%    |    < 1%



Figure B31. S07-Sb34 (19KM28)



Figure B32. S07-Sb36 (19KM02)



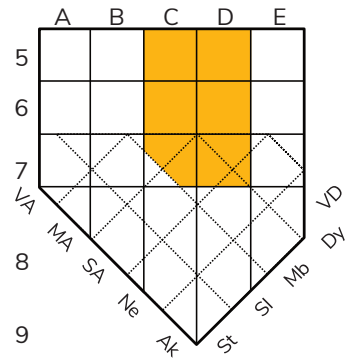
Figure B33. S07-Sb36 (19KM44)

## BOLmh/S08 SbSw – Red Bearberry – Brown Moss Swamp

### General description

The SbSw – Red Bearberry – Brown Moss Swamp ecosite occurs on subhygric to subhydric sites that are found on level terraces, and on cooler-aspect lower and toe slopes. These sites can be poor to rich and can have a fluctuating water table.

S08 is comprised of relatively open stands of black spruce (*Picea mariana*) or white spruce (*Picea glauca*), or both. Red bearberry (*Arctous rubra*), glow moss (*Aulacomnium palustre*) and golden fuzzy fen moss (*Tomentypnum nitens*) are key indicator species. Common associated species are willows (*S. myrtillifolia*, *S. glauca*, *Salix* spp.), Labrador tea (*Rhododendron groenlandicum*), sedges (*Carex* spp.) and low cover of horsetails (*Equisetum arvense*, *E. sylvaticum*, *E. fluviatile*, *E. scirpoides*). Crowberry (*Empetrum nigrum*), lowbush cranberry (*Vaccinium vitis-idaea*) are common in BOLkp.



The S08 ecosite occurs on imperfect to poorly drained sites that commonly have permafrost. A peaty surface horizon over mineral soil is typical. Soils are usually Turbic Cryosols or sometimes Gleysols.

### Comments

Ecosite S08 can be differentiated from other black spruce treed wetland ecosites as follows:

- B03, B04 occur on peaty sites with organic soils, with a more stagnant water source and a low pH in the rooting zone; they have high cover of peat moss.
- F04 may have a mixed spruce overstory but it has a moderate to high cover of sedges and organic soils; if sedges are present in S08 they usually occur in low to trace amounts and soils are not organic.
- S13 may also have a black and white spruce overstory but is characterized by high horsetail cover and blueberry willow and a lack of Labrador tea.

**Table B44.** S08 site and soil characteristics.

Plots in unit:	15
Moisture Regime	subhygric to subhydric (5-7)
Nutrient Regime	medium (poor to rich) (C-D)
Meso slope position	Mid, lower and toe slope, depression
Aspect	north and east, level most common
Slope Gradient	0-18 cm
Surficial material	morainal, lacustrine, fluvial
Soil texture	sandy, loamy, loamy skeletal
Soil drainage	imperfect to poor
Humus form	moder, mor

Humus depth	9-25 cm	
Soil classification	Cryosols, Gleysols	
Seepage/water table	close to surface, fluctuating	
Permafrost	may have permafrost	100

**Vegetation summary**

The following vegetation associations characterize the species composition for Ecosite S08.

**S08-SbSw32**            Black spruce (White spruce) / Labrador tea / Feathermoss – Brown moss

**S08-Sw32**             White spruce / Willow / Red bearberry / Brown moss

The frequency and abundance of species for these associations is shown in the following vegetation table.

**Table B45.** S08 vegetation table.

Stratum	Species	Common Name	S08-SbSw32	S08-Sw32
		no. of plots	7	9
T	<i>Picea glauca</i>	white spruce		
T	<i>Picea mariana</i>	black spruce		
S	<i>Rhododendron groenlandicum</i>	Labrador tea		
S	<i>Betula glandulosa</i>	shrub birch		
S	<i>Dasiphora fruticosa</i>	shrubby cinquefoil		
S	<i>Salix</i> spp.	willows	**	
S	<i>Vaccinium uliginosum</i>	bog blueberry		
GR	<i>Carex capillaris</i>	hairlike sedge	*	
GR	<i>Carex</i> spp.	other sedges		
FB	<i>Arctous rubra</i>	red bearberry		
FB	<i>Equisetum arvense</i>	common horsetail		
FB	<i>Equisetum scirpoides</i>	dwarf scouring-rush		
BR	<i>Aulacomnium palustre</i>	glow moss		***
BR	<i>Hylocomium / Pleurozium</i>	feathermosses		
BR	<i>Sphagnum</i> spp.	peat mosses		
BR	<i>Tomentypnum nitens</i>	golden fuzzy fen moss		
BR	Bryophytes	other mosses		
LI	<i>Cladina</i> spp.	reindeer lichens		***

Frequency (percent of plots)	█	70-100%	█	50-70%	█	25-50%			
Abundance (average percent cover)	██████	>25%	████	10-25%	███	3-10%	██	1-3%	█ < 1%



Figure B34. S08-SbSw32 (19KM17)



Figure B35. S08-Sw32 (19KM48)

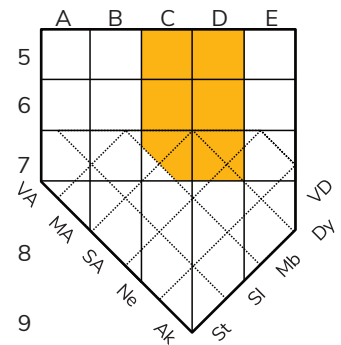
## BOLmh/S13 Sw – Blueberry Willow – Horsetail Swamp

### General description

The Sw – Blueberry Willow – Horsetail Swamp ecosite occurs on subhydryc to subhygric sites and is characterized by white spruce (*Picea glauca*), or sometimes balsam poplar (*Populus balsamifera*), with willows (*Salix* spp.), horsetails (*Equisetum* spp.) and brown mosses (*Tomentypnum* spp., *Aulacomnium* spp., *Drepanocladus* spp.). This ecosite usually occupies level or gently sloping sites where there is subsurface seepage. Drainage is imperfect to poor.

White spruce dominates the moderate to high tree cover, although balsam poplar may occasionally dominate. A low to high cover of willows, particularly blueberry willow (*Salix myrtilifolia*), is characteristic. Other indicator species include horsetails (*Equisetum arvense*, *E. pratense*, *E. fluviatile*), brown mosses (*Tomentypnum nitens* or *Aulacomnium palustre*) and feathermosses (*Hylocomium splendens* and *Pleurozium schreberi*). Common associates occurring with sparse to low cover, include sedges (*Carex capillaris*, *C. scirpoidea*, *C. spp.*), alpine hedysarum (*Hedysarum alpinum*), red bearberry (*Arctous rubra*) and twinflower (*Linnea borealis*). Various forbs including pussytoes (*Antennaria* spp.), bistort (*Bistorta* spp.), common bedstraw (*Gallium boreale*), louseworts (*Pedicularis* spp.) and orchids (*Platanthera* spp.) are also commonly found with sparse to low cover.

Soils may be fine to medium textured fluvial, lacustrine or colluvial and are classified as gleyed subgroups of Brunisols, Gleysols or Cryosols.



### Comments

Ecosite S13 occurs occasionally in the Beaver River watershed. It can be differentiated from other treed wetland ecosites as follows:

- S08 is dominated by black and white spruce with a brown moss bryophyte layer but does not have a significant horsetail cover.
- F04 has a black and white spruce cover and may have high to moderate willow cover but also has a high to moderate cover of sedges.
- The moss layer of ecosites S07, B03, B04 is dominated by peat mosses.

Ecosite 13 also occurs in BOLsl, BOLyc and BOLlh.

**Table B46.** S13 site and soil characteristics.

<b>Plots in unit:</b>	<b>6</b>
Moisture Regime	subhygric to subhydryc (5-7)
Nutrient Regime	medium to rich (C-D)
Meso slope position	level, lower slope, mid slope
Aspect	none

Slope Gradient	0-3 %	
Surficial material	fluvial, may also be lacustrine, colluvial	
Soil texture	fine loamy	
Soil drainage	imperfect to poor	
Humus form	mor, moder	
Humus depth	< 20 cm	
Soil classification	Gleyed Regosols, Gleysols, Cryosols	
Seepage/water table	Fluctuating, may be close to the surface	
Permafrost	may have permafrost	100

### Vegetation summary

The following vegetation associations characterize the species composition for Ecosite S13.

**B52** Balsam poplar / Willow / Water sedge – Horsetail

**Sw39** White spruce / Willow / Horsetail / Brown moss

The frequency and abundance of species for these associations is shown in the following vegetation table.

**Table B47.** S13 vegetation table.

Stratum	Species	Common Name	S13-B52	S13-Sw39
		no. of plots	1	5
T	<i>Picea glauca</i>	white spruce	██	████
T	<i>Populus balsamifera</i>	balsam poplar	████	
S	<i>Alnus incana</i>	mountain alder	███	
S	<i>Betula glandulosa</i>	shrub birch		███
S	<i>Dasiphora fruticosa</i>	shrubby cinquefoil	████	██
S	<i>Salix myrtilifolia</i>	bilberry willow		██
S	<i>Salix</i> spp.	willows	███	███
S	<i>Shepherdia canadensis</i>	soopolallie	██████	*
S	<i>Vaccinium uliginosum</i>	bog blueberry		███
GR	<i>Carex</i> spp.	sedges	██	███
GR	Poaceae	grasses	██████	
FB	<i>Antennaria microphylla</i>	white pussytoes	██	
FB	<i>Arctous rubra</i>	red bearberry		███
FB	<i>Platanthera</i> spp.	rein orchids	██	
FB	<i>Cypripedium passerinum</i>	sparrow's-egg lady's-slipper	███	
FB	<i>Equisetum arvense</i>	common horsetail		███
FB	<i>Galium boreale</i>	northern bedstraw	██	

FB	<i>Hedysarum alpinum</i>	alpine hedysarum		
FB	<i>Rubus arcticus</i>	nagoonberry		**
BR	<i>Tomentypnum / Aulacomnium / Drepanocladus</i>	brown mosses		
BR	<i>Hylocomium splendens / Pleurozium schreberi</i>	feathermosses		

<b>Frequency (percent of plots)</b>		70-100%		50-70%		25-50%				
<b>Abundance (average percent cover)</b>		>25%		10-25%		3-10%		1-3%		< 1%



Figure B36. S13-Sw39 (19KM50)

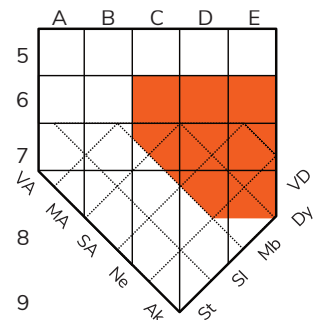
## BOLmh/M01 Beaked – Water Sedge Marsh

### General description

The Beaked – Water Sedge Marsh ecosite is a common marsh ecosite dominated by beaked sedge (*Carex utriculata*) or water sedge (*Carex aquatilis*) or both. The ecosite is usually subject to fluctuating water levels and frequent flooding.

Though water sedge and beaked sedge dominate the ecosite, other sedges may be common and other species such as water horsetail (*Equisetum fluviatile*), creeping spike-rush (*Eleocharis palustris*), marsh cinquefoil (*Comarum palustre*) or reedgrasses (*Calamagrostis* spp.) may be present with low cover. A low to trace amounts of shrubs, e.g., willows (*Salix* spp.) is frequent. Mosses are sometimes present but usually have a low cover due to the frequent flood regime causing regular deposition.

Soils are poor or very poorly drained on fluvial and sometimes lacustrine parent materials. Soils are classified as Gleysols or Gleyed Regosols.



## Comments

Ecosite M01 can be differentiated from similar ecosites as follows:

- F01 has similar sedges but has organic soils and a continuous moss layer.
- Other marsh ecosites may have water and beaked sedge but their cover is lower and the ecosites are characterized by other species.

Equivalent to Wm01 in B.C. (MacKenzie and Moran 2004).

**Table B48.** M01 site and soil characteristics.

<b>Plots in unit:</b>	<b>28</b>	
Moisture Regime	hygric to hydric (6-8)	
Nutrient Regime	medium to very rich (C-E)	
Meso slope position	level	
Aspect	none	
Slope Gradient	0-2 %	
Surficial material	fluvial	
Soil texture	loamy, silty	
Soil drainage	poor to very poor	
Humus form	mor	
Humus depth	0-10 cm	
Soil classification	Gleysols	
Seepage/water table	at or within 50 cm of the surface	
Permafrost	absent	

## Vegetation summary

The following vegetation association characterizes the species composition for Ecosite M01.

**M01-Caut56** Beaked Sedge / Water Sedge

**M01-Caut57** Beaked sedge

The frequency and abundance of species for these associations is shown in the following vegetation table.

**Table B49.** M01 vegetation table.

Stratum	Species	Common Name	M01-Caut56	M01-Caut57
		no. of plots	15	4
S	Salix pulchra	diamond-leaved willow	***	*

Beaver River wetlands

GR	Carex aquatilis	water sedge		
GR	Carex utriculata	beaked sedge		
BR	Drepanocladus spp.	hook mosses	***	****
BR	Mniums	leafy mosses	**	
BR	Bryophytes	other mosses		

Frequency (percent of plots)    |    70-100%    |    50-70%    |    25-50%

Abundance (average percent cover)    ||||| >25%    |||| 10-25%    ||| 3-10%    || 1-3%    | < 1%



Figure B37. M01-Caut56 (19KM08)



Beaver River wetlands

Figure B38. M01-Caut57 (19AD64)

## BOLmh/M02 Water Horsetail Marsh

### General description

The Water Horsetail Marsh ecosite is characterized by a significant cover of water horsetail (*Equisetum fluviatile*) which is replaced in some cases by marsh horsetail (*Equisetum palustre*). Frequent flooding, erosion and deposition are characteristic. This ecosite is usually found slightly lower than the 01 ecosite, with a slightly higher water table and is flooded for slightly longer.

Water horsetail (*Equisetum fluviatile*) generally dominates the groundcover, however, sometimes sedge cover can equal or slightly exceed that of the horsetail. Beaked sedge (*Carex utriculata*) is the most common associate, but occasionally water sedge (*C. aquatilis*) or russet sedge (*C. saxatilis*) may occur. Marsh horsetail (*E. palustre*) can occur and sometimes dominates. Moss cover is variable.

The very poorly drained soils are likely classified as Rego Gleysols.

### Comments

Ecosite M02 can be differentiated from similar ecosites as follows:

- M01 may have traces to low cover of water horsetail but is strongly dominated by sedges.
- Other marshes may also have low cover of water horsetail but are characterized by other species.

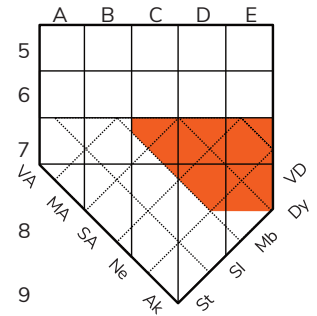
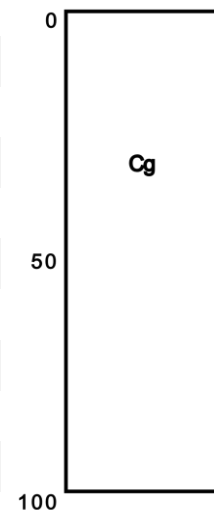


Table B50. M02 site and soil characteristics.

Plots in unit:	3
Moisture Regime	subhydic to hydric (7-8)
Nutrient Regime	medium to very rich (C-E)
Meso slope position	level, toe slope, depression
Aspect	none
Slope Gradient	0-20%
Surficial material	usually fluvial
Soil texture	often fine loamy
Soil drainage	poor to very poor
Humus form	mor
Humus depth	usually 0
Soil classification	Gleysols
Seepage/water table	at or near surface, flooding



Permafrost	absent
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**Vegetation summary**

The following vegetation associations characterize the species composition for Ecosite M02.

**M02-Eqfl55** Water Horsetail – Water sedge

**M02-Eqfl56** Water horsetail – Beaked sedge marsh

The frequency and abundance of species for these associations is shown in the following vegetation table.

**Table B51.** M02 vegetation table.

Stratum	Species	Common Name	M02-Eqfl55	M02-Eqfl56
		no. of plots	2	1
FB	<i>Equisetum fluviatile</i>	water horsetail		
FB	<i>Equisetum palustre</i>	marsh horsetail		
FB	<i>Equisetum scirpoides</i>	dwarf scouring-rush		
GR	<i>Carex aquatilis</i>	water sedge		
GR	<i>Carex utriculata</i>	beaked sedge		
FB	<i>Rorippa palustris</i>	marsh yellowcress		
BR	Bryophytes	mosses		

**Frequency (percent of plots)**      |      70-100%      |      50-70%      |      25-50%

**Abundance (average percent cover)**      |||||      >25%      ||||      10-25%      |||      3-10%      ||      1-3%      |      < 1%



**Figure B39.** M02-Eqfl55 (19AD113)

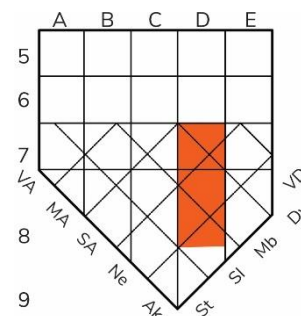
## BOLmh/M04 Short-awn foxtail Marsh

### General description

The Short-awn Foxtail Marsh is dominated by short-awn foxtail (*Alopecurus aequalis*). This rich subhydic ecosite occurs rarely in the subzone and in the Yukon. It has been found in old, abandoned river channels.

The vegetation is dominated by short-awn foxtail sometimes with a high hook moss (*Drepanocladus* spp.) bryophyte layer. Other species including sedges or grasses may occur in trace to moderate amounts.

The very poorly drained soils are likely classified as Gleysols.



### Comments

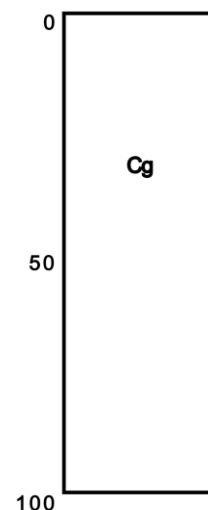
Ecosite M04 can be differentiated from similar ecosites as follows:

- Other marshes do not contain short-awn foxtail

Ecosite M04 also occurs in BOLsl.

**Table B52.** M04 site and soil characteristics.

Plots in unit:	1
Moisture Regime	Subhydic to hydric (7-8)
Nutrient Regime	rich (D)
Meso slope position	level
Aspect	none
Slope Gradient	0%
Surficial material	usually fluvial
Soil texture	mud
Soil drainage	very poor
Humus form	mor
Humus depth	usually 0
Soil classification	Gleysols
Seepage/water table	at or close to surface; subject to flooding
Permafrost	absent



### Vegetation summary

The following vegetation associations characterize the species composition for Ecosite M02.

**M04-Alaq55** Short-awn Foxtail

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B53. M04 vegetation table.

Stratum	Species	Common Name	M04-Alae55
		no. of plots	1
GR	<i>Alopecurus aequalis</i>	little meadow-foxtail	
GR	<i>Carex canescens</i>	silvery sedge	
GR	<i>Carex utriculata</i>	beaked sedge	
BR	<i>Bryum</i> spp.	thread-mosses	
BR	<i>Drepanocladus</i> spp	hook mosses	

Frequency (percent of plots)    |    70-100%    |    50-70%    |    25-50%

Abundance (average percent cover)    |||||    >25%    ||||    10-25%    |||    3-10%    ||    1-3%    |    <1%



Figure B40. M04-Alae55 (19MH07)

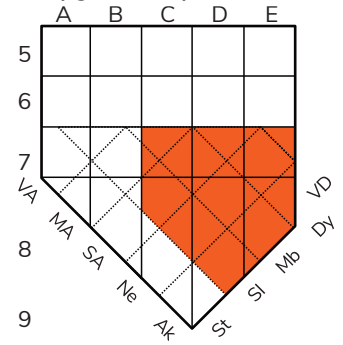
## BOLmh/M06    Mannagrass Marsh

### General description

The Mannagrass Marsh ecosite occurs on level floodplain sites and depressions with a hygric to hydric moisture regime. The water table is often near the surface. It is characterized by a significant moderate to high cover of mannagrass. This is an uncommon ecosite that occurs on sites with a medium to rich nutrient regime.

Boreal mannagrass (*Glyceria borealis*) usually dominates the vegetation cover. In some areas, fowl mannagrass (*G. striata*) or tall Mannagrass (*G. grandis*) may dominate. Other species that may be moderately abundant include bluejoint reedgrass (*Calamagrostis canadensis*), sedges (*Carex utriculata*, *C. canescens*), spikerushes (*Eleocharis* spp.), spring water starwort (*Callitriche palustris*) or marsh cinquefoil (*Comarum palustre*). Moss cover is usually low or absent.

The poor to very poorly drained soils are of fluvial or lacustrine parent material and are classified as Gleysols.



### Comments

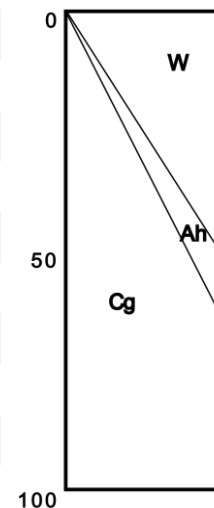
Ecosite M06 can be differentiated from other graminoid ecosites as follows:

- Marshes ecosites M01, M02, M07, M09, & M10 do not have moderate to high cover of mannagrass.
- Graminoid fens have organic soils and do not have mannagrass.

Ecosite M06 is a rarely occurring ecosite which is also found in BOLsl, BOLkp and BOLlh.

**Table B54.** M06 site and soil characteristics.

Plots in unit:	1
Moisture Regime	hygric to hydric (6-8)
Nutrient Regime	medium to rich (C-D)
Meso slope position	depression, level
Aspect	none
Slope Gradient	level
Surficial material	fluvial, lacustrine
Soil texture	often fine loamy
Soil drainage	poor to very poor
Humus form	hydromull
Humus depth	0-20 cm
Soil classification	Gleysols
Seepage/water table	at or near the surface, flooding
Permafrost	absent



## Vegetation summary

The following vegetation association characterizes the species composition for Ecosite M02.

### M06-Glsp56 Mannagrass

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B55. M06 vegetation table.

Stratum	Species	Common Name	M06-Glsp56
		no. of plots	1
GR	<i>Alopecurus aequalis</i>	little meadow-foxtail	■■■
GR	<i>Carex canescens</i>	silvery sedge	■■■
GR	<i>Carex utriculata</i>	beaked sedge	■■■
GR	<i>Eleocharis palustris</i>	common spike-rush	■■■
GR	<i>Glyceria borealis</i>	northern mannagrass	■■■■
FB	<i>Callitriche palustris</i>	spring water-starwort	■■■

Frequency (percent of plots)      ■ 70-100%      ■ 50-70%      ■ 25-50%

Abundance (average percent cover)      ■■■■■ >25%      ■■■■ 10-25%      ■■■ 3-10%      ■■ 1-3%      ■ <1%



Figure B41. M06-Glsp56 (19MH10)

## BOLmh/M07 Least Spike-rush Marsh

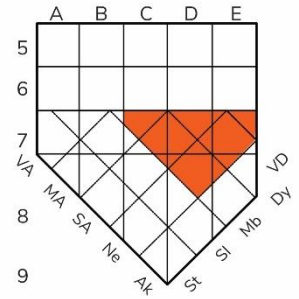
### General description

Beaver River wetlands

The Least Spike-rush Marsh ecosite is characterized by the presence of least spike-rush (*Eleocharis acicularis*). The M07 occurs on nutrient rich to very rich sites with a high water table, subject to periodic flooding, such as abandoned meander channels.

Least spike-rush is a major component of the herbaceous layer, usually with a moderate to high cover. Water sedge (*Carex aquatilis*) and beaked sedge (*C. utriculata*) are common associates. Common mare's-tail (*Hippuris vulgaris*) is a common associate. Northern arrowhead (*Sagittaria cuneata*), creeping spike-rush (*Eleocharis palustris*) or white water-crowfoot (*Ranunculus aquatilis*) are common associated species in BOLlh. Other species may also occur with low cover: grasses, other sedges and horsetails including alpine bluegrass (*Poa alpina*), Kentucky bluegrass (*P. pratensis*) or bluejoint reedgrass (*Calamagrostis canadensis*), and water horsetail (*Equisetum fluviatile*). The moss layer is usually absent or of low cover.

The poor to very poorly drained, usually saturated soils, are classified as Gleysols.



**Comments**

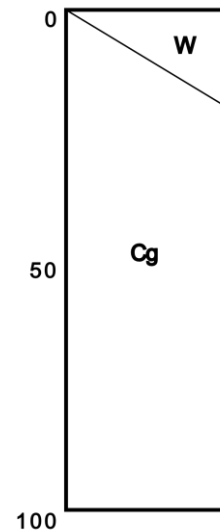
Ecosite M07 can be differentiated from similar ecosites as follows:

- Other marsh ecosites do not have a moderate to high cover of least spike-rush.
- Swamp ecosites may have some spike-rush but have greater than 20% tall shrubs.

Ecosite M07 also occurs in BOLsl and BOLlh.

**Table B56.** M07 site and soil characteristics.

Plots in unit:	1
Moisture Regime	usually hydric (8)
Nutrient Regime	rich to very rich (C-E)
Meso slope position	level and depression
Aspect	none
Slope Gradient	level
Surficial material	fluvial
Soil texture	usually fine loamy
Soil drainage	very poor, poor
Humus form	mor
Humus depth	0-1 cm
Soil classification	Gleysols
Seepage/water table	at or near surface, flooding
Permafrost	absent



## Vegetation summary

The following vegetation association characterizes the species composition for Ecosite M07.

### M07-Elac57 *Eleocharis acicularis*

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B57. M07 vegetation table.

Stratum	Species	Common Name	M07-Elac57
		no. of plots	1
GR	<i>Carex utriculata</i>	beaked sedge	■■■
GR	<i>Eleocharis acicularis</i>	needle spike-rush	■■■■■
FB	<i>Equisetum fluviatile</i>	swamp horsetail	■■■
FB	<i>Hippuris vulgaris</i>	common mare's-tail	■■■■■

<b>Frequency (percent of plots)</b>	■	70-100%	■	50-70%	■	25-50%				
<b>Abundance (average percent cover)</b>	■■■■■	>25%	■■■■	10-25%	■■■	3-10%	■■	1-3%	■	<1%



Figure B42. M07-Elac57 (19AD02)

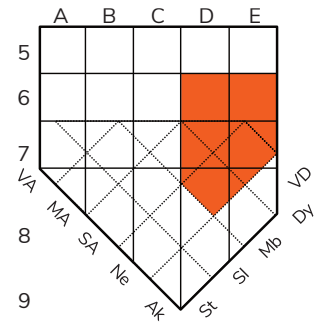
## BOLmh/M10 Bluejoint Marsh

### General description

The Bluejoint Marsh ecosite develops on hygric to subhydryc sites with a rich to very rich nutrient regime.

Bluejoint reedgrass (*Calamagrostis canadensis*) dominates the ecosite, although a significant cover of sedges (*Carex aquatilis*, *C. utriculata*, *C. spp.*) may also occur. A minor cover of other grasses and herbs is possible including hairgrass (*Deschampsia cespitosa*), large-leaved avens (*Geum macrophyllum*) or dwarf scouring rush (*Equisetum scirpoides*). Moss cover is generally low.

Soils are poorly drained loamy and sandy fluvial deposits and are usually classified as Gleysols. These wetlands typically have a fluctuating water table but are slightly drier on average than most other marshes.



### Comments

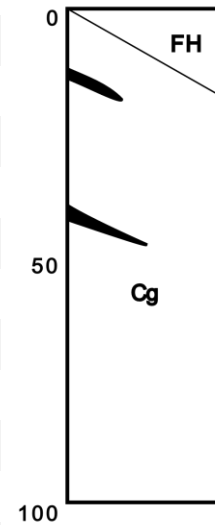
Ecosite M10 can be differentiated from similar ecosites as follows:

- Other marsh ecosites may have some bluejoint reedgrass but the cover is less than the cover of sedges or other characteristic species.

Ecosite M10 also occurs in BOLkp and BOLlh.

Table B58. M10 site and soil characteristics.

<b>Plots in unit:</b>	<b>2</b>
Moisture Regime	hygric to subhygric (6-7)
Nutrient Regime	rich to very rich (D-E)
Meso slope position	level, toe slope
Aspect	none
Slope Gradient	level
Surficial material	fluvial
Soil texture	loamy, sandy
Soil drainage	poor
Humus form	no data
Humus depth	no data
Soil classification	Gleysols, Gleyed Regosols
Seepage/water table	water near surface
Permafrost	absent



**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite M10.

**M10-Caca54** Bluejoint reedgrass

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B58. M10 vegetation table.

Stratum	Species	Common Name	M10-Caca54
		no. of plots	2
S	<i>Salix barclayi</i>	Barclay's willow	██
GR	<i>Carex gynocrates</i>	yellow bog sedge	██████
GR	<i>Deschampsia caespitosa</i>	tufted hairgrass	██
GR	<i>Calamagrostis canadensis</i>	bluejoint reedgrass	██████
FB	<i>Equisetum arvense</i>	common horsetail	██
FB	<i>Equisetum scirpoides</i>	dwarf scouring-rush	██
FB	<i>Epilobium angustifolium</i>	fireweed	██
FB	<i>Geum macrophyllum</i>	large-leaved avens	████
BR	Bryophytes	other mosses	██

**Frequency (percent of plots)** █ 70-100% █ 50-70% █ 25-50%

**Abundance (average percent cover)** █████ >25% ████ 10-25% ███ 3-10% ██ 1-3% █ < 1%



Figure B43. M10-Caca54 (19MH07)

## BOLmh/M12 Russet Sedge Marsh

### General description

The Russet Sedge Marsh ecosite occurs on imperfect to very poorly drained floodplain sites with a fluctuating water table. Sites have a hygric to hydric moisture regime and are nutrient rich. Frequent flooding is common.

Russet sedge (*Carex saxatilis*) characterizes the vegetation of this ecosite with a moderate to high cover. Common associates include beaked sedge (*Carex utriculata*) or water sedge (*C. aquatilis*) and water horsetail (*Equisetum fluviatile*) with trace to moderate cover. A low to moderate cover of grasses (*Calamagrostis* spp., *Poa* spp.), nagoonberry (*Rubus arcticus*) and water buttercup (*Ranunculus* spp.) may occur. Creeping spike-rush (*Eleocharis palustris*), arctic sweet coltsfoot (*Petasites frigida*), common water-parsnip (*Sium suave*) and western dock (*Rumex occidentalis*) were common in the BOLlh. Moss cover is often very low to absent, but hook mosses (*Drepanocladus* spp.) may occasionally be of high cover.

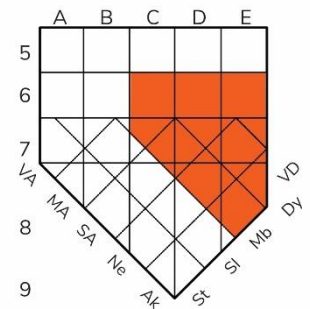
The imperfect to very poorly drained soils are classified as Regosols or Gleysols.

### Comments

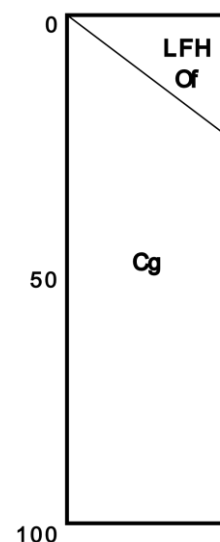
Ecosite M12 can be differentiated from other marsh ecosites based on its moderate to high cover of russet sedge. Other ecosites may have very low or trace amounts of russet sedge.

Ecosite M12 is also found in BOLlh.

[Table B59](#). M12 site and soil characteristics.



<b>Plots in unit:</b>	<b>3</b>
Moisture Regime	hygric to subhygric (6-8)
Nutrient Regime	medium to rich (D-E)
Meso slope position	level
Aspect	none
Slope Gradient	level
Surficial material	fluvial
Soil texture	fine loamy
Soil drainage	poor
Humus form	no data
Humus depth	no data
Soil classification	Gleysols
Seepage/water table	near surface
Permafrost	absent



### Vegetation summary

The following vegetation association characterizes the species composition for Ecosite M12.

#### M12-Casa54 Russet Sedge

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B60. M12 vegetation table.

Stratum	Species	Common Name	M12-Casaxx
		no. of plots	3
GR	<i>Carex saxatilis</i>	russet sedge	
GR	<i>Carex</i> spp.	other sedges	
GR	Poaceae	grasses	
FB	<i>Equisetum fluviatile</i>	water horsetail	
FB	<i>Geum macrophyllum</i>	large-leaved avens	***
FB	<i>Ranunculus</i> spp.	water-buttercups	
FB	<i>Rubus arcticus</i>	nagoonberry	
BR	Bryophytes	other mosses	

Frequency (percent of plots)      |      70-100%      |      50-70%      |      25-50%

Abundance (average percent cover)      |||||      >25%      ||||      10-25%      |||      3-10%      ||      1-3%      |      <1%



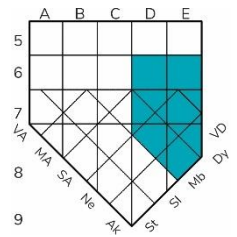
Figure B44. M12-Casa (19AD89)

## BOLmh/W04 Mare's-tail Shallow Water

### General Description

The dominance of common mare's-tail (*Hippuris vulgaris*) characterizes the W04 shallow water ecosite. It is common on mud flats of larger rivers. A high cover of open water may be present.

Pondweeds (*Potamogeton* spp., *Stuckenia* spp.) are common associates with a low to moderate cover. Water crowfoot (*Ranunculus* spp.), water-milfoil (*Myriophyllum* spp.) and wetland mosses (*Drepanocladus aduncus*, *Calliergon giganteum*) are common on some sites. Other aquatic species may occur with trace to moderate cover but do not dominate.



### Vegetation summary

The following vegetation associations characterize the species composition for Ecosite W04.

**Hivu70** Mare's tail – Brown mosses

**Hivu71** Mare's-tail – Pondweed

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B61. W04 vegetation table.

Stratum	Species	Common Name	W04-Hivu70	W04-Hivu71
		no. of plots	1	1
GR	<i>Carex utriculata</i>	beaked sedge		
FB	<i>Hippuris vulgaris</i>	common mare's-tail		
FB	<i>Myriophyllum</i> spp.	water-milfoils		
FB	<i>Potamogeton praelongus</i>	long-stalked pondweed		
FB	<i>Ranunculus hyperboreus</i>	far-northern buttercup		
FB	<i>Sparganium</i> spp.	bur-reeds		
FB	<i>Stuckenia pectinata</i>	fennel-leaved pondweed		
FB	<i>Stuckenia vaginata</i>	sheathing pondweed		
BR	Bryophytes	other moss		

**Frequency (percent of plots)**    |    70-100%    |    50-70%    |    25-50%  
**Abundance (average percent cover)**    ||||| >25%    |||| 10-25%    ||| 3-10%    || 1-3%    | < 1%



Figure B45. W04-Hivu70 (19KM14)

## BOLmh/W06 Pondweed Shallow Water

### General Description

Pondweeds (*Potamogeton* spp.) dominate the W06 ecosite. Ecosite W06 sometimes occurs on the margins of ponds in peatlands as well as in abandoned river meander channels.

In this subzone, Richardson's pondweed (*P. richardsonii*) is the most frequent pondweed and often has the highest cover, but other pondweeds (*P. alpinus*, *P. obtusifolius*, *P. friesii*, *P. zosteriformis*) are common associates. Other species on W06 can include water-milfoil (*Myriophyllum* spp.), white water

crowfoot (*Ranunculus aquatilis*), northern arrowhead (*Sagittaria cuneata*), sago pondweed (*Stuckenia pectinata*), bur-reeds (*Sparganium spp.*) and bladderworts (*Utricularia spp.*).

**Vegetation summary**

The following vegetation association characterizes the species composition for Ecosite W06.

**Posp70 Pondweed**

The frequency and abundance of species for this association is shown in the following vegetation table.

**Table B62.** W06 vegetation table.

Stratum	Species	Common Name	W06-Posp70
		no. of plots	3
FB	<i>Myriophyllum verticillatum</i>	verticillate water-milfoil	▣▣▣
FB	<i>Potamogeton richardsonii</i>	Richardson's pondweed	▣▣▣▣
FB	<i>Potamogeton spp.</i>	pondweeds	▣▣▣▣
FB	<i>Sparganium spp.</i>	bur-reeds	▣▣
FB	<i>Utricularia spp.</i>	bladderworts	▣▣▣
BR	<i>Drepanocladus spp.</i>	hook mosses	***

Frequency (percent of plots)      ▣      70-100%      ▣      50-70%      ▣      25-50%

Abundance (average percent cover)      ▣▣▣▣      >25%      ▣▣▣▣      10-25%      ▣▣▣      3-10%      ▣▣      1-3%      ▣      <1%



**Figure B46.** W06-Posp70 (19KM16)

## BOLmh/W09 Rocky Mountain Pond-lily Shallow Water

### General Description

The W09 ecosite is dominated by Rocky Mountain pond-lily (*Nuphar polysepala*), which has moderate to high cover. W09 occurs in relatively still, shallow open water ponds and along lakeshores.

Bog buckbean (*Menyanthes trifoliata*), bur-reeds (*Sparganium* spp.) and horsetails (*Equisetum* spp.) may be present on some sites.

### Vegetation summary

The following vegetation association characterizes the species composition for Ecosite W09.

#### Nupo70 Rocky mountain pond-lily

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B63. W09 Vegetation Table

Stratum	Species	Common Name	W09-Nupo70
		no. of plots	3
FB	<i>Myriophyllum</i> spp.	water-milfoils	
FB	<i>Nuphar polysepala</i>	Rocky Mountain pond-lily	
FB	<i>Nuphar</i> spp.	pond lilies	**
FB	<i>Sparganium</i> spp.	bur-reeds	

Frequency (percent of plots)      |      70-100%      |      50-70%      |      25-50%

Abundance (average percent cover)      |||||      >25%      |||||      10-25%      |||      3-10%      ||      1-3%      |      <1%



Figure B47. W09-Nupo70 (19AD73)

## BOLmh/W10 Water-milfoil – Bladderwort Shallow Water

### General Description

The W10 is characterized by a high cover of water-milfoil (*Myriophyllum* spp.). This shallow water ecosite sometimes occurs in ponds on old river floodplains.

Other species found with a lower cover than water-milfoil may include pondweeds (*Potamogeton* spp, *Stuckenia pectinata*), bladderworts (*Utricularia* spp.), duckweed (*Lemna* spp.), bur-reeds (*Sparganium* spp.) and least-spike rush (*Eleocharis palustris*).

### Vegetation summary

The following vegetation association characterizes the species composition for Ecosite W10.

#### Mysp70 Water-milfoil / Bladderwort

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B64. W10 vegetation table.

Stratum	Species	Common Name	W10-Mysp70
		no. of plots	1
GR	<i>Eleocharis palustris</i>	common spike-rush	■■■
FB	<i>Equisetum fluviatile</i>	swamp horsetail	■■
FB	<i>Myriophyllum sibiricum</i>	Siberian water-milfoil	■■■■
FB	<i>Sparganium angustifolium</i>	narrow-leaved bur-reed	■■■

BR	<i>Drepanocladus</i> spp.	hook mosses	
BR	Bryophytes	other moss	
<b>Frequency (percent of plots)</b>		70-100%	
<b>Abundance (average percent cover)</b>		>25%	
		10-25%	
		3-10%	
		1-3%	
		<1%	



Figure B48. W10-Mysp70 (19AD110)

## BOLmh/W13 Macroalgae Shallow Water

### General Description

The W13 macro algae shallow water is a shallow water ecosite characterized by a moderate to high cover of macroalgae. This alga appears as a brownish floating algal mass. The W13 is typical of some shallow water pools in peaty fen wetlands such as flarks in string fens. Few other species are present and if present occur with trace to low cover.

### Vegetation summary

The following vegetation association characterizes the species composition for Ecosite W13.

#### W13-macroalgae Macroalgae

The frequency and abundance of species for this association is shown in the following vegetation table.

Table B65. W13 Vegetation Table

Stratum	Species	Common Name	W13-macroalgae
		no. of plots	5
	macroalgae		


Frequency (percent of plots)      |      70-100%      |      50-70%      |      25-50%

Abundance (average percent cover)      |||||      >25%      ||||      10-25%      |||      3-10%      ||      1-3%      |      <1%



Figure B49. W13-macroalgae (19AD96)

# Appendix B - Field Data Collection Forms

		<b>ECOSYSTEM SITE FORM</b>						
Project						Plot No.		
Plot Type <input type="checkbox"/> Standard <input type="checkbox"/> Novveg <input type="checkbox"/> Irreg		Date: YYYY-MM-DD		Observer(s)		Ecoregion	Airphoto	NTS Map
YBEC		Location						
Lat N			Long W		Source NGPS <input type="checkbox"/>		Accur (m)	Datum WGS84 <input type="checkbox"/>
UTM Zone		Northing		Easting				Site Diagram
Elev (m)	Source NGPS <input type="checkbox"/>	Aspect (°)		Slope %	Surface Shape			
Microtopography Type:		Intensity:	Meso Position	Structure		Stand Age		
Flood Regime	SMR		SNR	Disturbance None _____				
Plot Representing				Exposure Type				
Ecosite		Veg Association		Complex No.	Component:			
Class	Form	Wetland (CWCS) Subform	Type	Subtype				
Comments							Photos	

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# SITE VISIT FORM

Project		Plot Level: <input type="checkbox"/> G <input type="checkbox"/> V		Plot No.	
Date: YYYY-MM-DD		Plot Type: <input type="checkbox"/> Standard <input type="checkbox"/> Observer(s)		NTS map	
Location		<input type="checkbox"/> Noveg <input type="checkbox"/> Ireg			
Lat N		Long W		Accur (m) WGS84 <input type="checkbox"/>	
Northing		Easting		UTM Zone	
Site Features		Aspect (°)		Slope %	
Site Disturb.		Elev (m)		Surface Shape	
Expose. Type		<input type="checkbox"/> Crest <input type="checkbox"/> Upper <input type="checkbox"/> Mid <input type="checkbox"/> Lower <input type="checkbox"/> Flood plain? <input type="checkbox"/> <input type="checkbox"/> Toe <input type="checkbox"/> Level <input type="checkbox"/> Dep. <input type="checkbox"/> Gully <input type="checkbox"/> plain? <input type="checkbox"/> <input type="checkbox"/> None <input type="checkbox"/> Veg. Removal <input type="checkbox"/> Soil Dist. <input type="checkbox"/> Terrain <input type="checkbox"/> SNR <input type="checkbox"/> Fire <input type="checkbox"/> Ebiotic <input type="checkbox"/> Wind <input type="checkbox"/> Snow <input type="checkbox"/> Water Spray <input type="checkbox"/> Other <input type="checkbox"/> Frost <input type="checkbox"/> Cold Air <input type="checkbox"/> Aufeis <input type="checkbox"/> Rain Shadow <input type="checkbox"/> Other		<input type="checkbox"/> CV <input type="checkbox"/> CX <input type="checkbox"/> ST <input type="checkbox"/> UN	
Stand Attributes		Stand Age _____		Canopy Composition	
Plot Representing		Stand Ht. _____		Structure	
Wetland Class		<input type="checkbox"/> 1 <input type="checkbox"/> 2a <input type="checkbox"/> 2b <input type="checkbox"/> 2c <input type="checkbox"/> 2d <input type="checkbox"/> 3a <input type="checkbox"/> 3b <input type="checkbox"/> 3c <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7a <input type="checkbox"/> 7b <input type="checkbox"/> 8		Veg Assoc.	
Ecosite		Map Label			
Terrain		Surface Expression		Geo. Process	
1.				Rock Types	
2.				1.	
Rooting Zone		<input type="checkbox"/> VR <input type="checkbox"/> R <input type="checkbox"/> W <input type="checkbox"/> MW <input type="checkbox"/> I <input type="checkbox"/> P <input type="checkbox"/> VP			
Humus/Organic Form		<input type="checkbox"/> Mor <input type="checkbox"/> Moder <input type="checkbox"/> Mull <input type="checkbox"/> Fibric <input type="checkbox"/> Mesic <input type="checkbox"/> Humic			
Humus thickness _____ cm		<input type="checkbox"/> Ah? <input type="checkbox"/> Ae? _____ cm   Est. soil depth _____ cm			
Depth to: Min Soil _____ cm		<input type="checkbox"/> Wat. table <input type="checkbox"/> Seepage <input type="checkbox"/> Mottlie/gley <input type="checkbox"/> Restrict. <input type="checkbox"/> None			
Rest. Type		<input type="checkbox"/> Pan <input type="checkbox"/> Compact <input type="checkbox"/> Water <input type="checkbox"/> Lithic <input type="checkbox"/> CaCO3 <input type="checkbox"/> Frost			
R.Z. Particle Size		<input type="checkbox"/> R.Z. Coarse Fragment % <input type="checkbox"/> Estimated Rooting Depth _____ cm			
Comments					

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## Appendix C – Species List

Scientific name	Common Name
<i>Achillea millefolium</i>	Common yarrow
<i>Aconitum delphiniifolium</i>	Monkshood
<i>Agropyron</i> sp.	Wheat grass
<i>Agrostis scabra</i>	Rough bentgrass
<i>Agrostis</i> sp.	Bentgrass
Algae spp.	Algae
<i>Alnus incana</i>	River alder
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	Mountain alder
<i>Alnus viridis</i>	Green alder
<i>Alopecurus aequalis</i>	Short-awned foxtail
<i>Amblystegium serpens</i>	Creeping feather moss
<i>Andromeda polifolia</i>	Bog rosemary
<i>Anemone parviflora</i>	Northern anemone
<i>Anemone richardsonii</i>	Yellow anemone
<i>Anemone</i> sp.	Anemone
<i>Antennaria microphylla</i>	Little-leaved pussytoes
<i>Antennaria monocephala</i>	Single headed pussytoes
<i>Antennaria pulcherrima</i>	Showy pussytoes
<i>Anthoxanthum hirtum</i>	Northern sweetgrass
<i>Anticlea elegans</i>	Death camas
<i>Arctophila fulva</i>	Pendant grass
<i>Arctostaphylos uva-ursi</i>	Kinnikinnick
<i>Arctous rubra</i>	Red bearberry
<i>Arnica angustifolia</i>	Narrowleaf arnica
<i>Arnica</i> sp.	Arnica
<i>Artemisia norvegica</i> ssp. <i>saxatilis</i>	Mountain sagewort
<i>Artemisia rupestris</i>	Rock wormwood
<i>Artemisia tilesii</i>	Tilesius wormwood
<i>Astragalus</i> sp.	Milk-vetch
<i>Aulacomnium palustre</i>	Ribbed bog moss
<i>Aulacomnium</i> sp.	Bog moss
<i>Aulacomnium turgidum</i>	Mountain groove moss
<i>Betula glandulosa</i>	Glandular shrub birch
<i>Betula neoalaskana</i>	Alaska paper birch
<i>Betula occidentalis</i>	Water birch
<i>Bistorta vivipara</i>	Alpine bistort
<i>Brachythecium</i> sp.	Ragged moss

<i>Bromus pumpellianus</i>	Pumpelly brome
Bryophyte sp.	Bryophyte
<i>Bryum</i> sp.	Bryum
<i>Calamagrostis canadensis</i>	Bluejoint reedgrass
<i>Calamagrostis purpurascens</i>	Purple reedgrass
<i>Calamagrostis</i> sp.	Reedgrass
<i>Calamagrostis stricta</i>	Slim-stemmed reedgrass
<i>Calliergon cordifolium</i>	Heart-leaved sparmoss
<i>Calliergon giganteum</i>	Giant sparmoss
<i>Calliergon</i> sp.	Spear moss
<i>Callitriche palustris</i>	Spring water-starwort
<i>Caltha palustris</i>	Marsh Marigold
<i>Campylium stellatum</i>	Yellow starry fen moss
<i>Cardamine nymanii</i>	Northern field bittercress
<i>Carex aquatilis</i>	Water sedge
<i>Carex aurea</i>	Golden sedge
<i>Carex bigelowii</i> ssp. <i>Lugens</i>	Bigelow's sedge
<i>Carex canescens</i>	Hoary sedge
<i>Carex canescens</i> ssp. <i>canescens</i>	Hoary sedge
<i>Carex capillaris</i>	Hairlike sedge
<i>Carex capitata</i>	Capitate Sedge
<i>Carex diandra</i>	Lesser paniced sedge
<i>Carex gynocrates</i>	Northern bog sedge
<i>Carex lachenalii</i>	Lachenal's sedge
<i>Carex leptalea</i>	Bristle-stalked sedge
<i>Carex limosa</i>	Mud sedge
<i>Carex loliacea</i>	Ryegrass sedge
<i>Carex magellanica</i>	Boreal bog-sedge
<i>Carex magellanica</i> ssp. <i>irrigua</i>	Boreal bog-sedge
<i>Carex saxatilis</i>	Russet sedge
<i>Carex scirpoidea</i>	Single-spike sedge
<i>Carex</i> sp.	Sedge
<i>Carex tenuiflora</i>	Sparse-flowered sedge
<i>Carex utriculata</i>	Beaked sedge
<i>Carex vaginata</i>	Sheathed sedge
<i>Castilleja yukonis</i>	Yukon indian paintbrush
<i>Cerastium beeringianum</i>	Mouse-ear chickweed
<i>Ceratodon purpureus</i>	Red roof moss
<i>Cetraria</i> sp.	Iceland lichen
<i>Chamaedaphne calyculata</i>	Leatherleaf
<i>Chamerion angustifolium</i>	Fireweed
<i>Chamerion latifolium</i>	River beauty
<i>Chrysosplenium tetrandrum</i>	Golden saxifrage

<i>Cinclidium arcticum</i>	Arctic cinclidium moss
<i>Cinclidium stygium</i>	Sooty cupola moss
<i>Cladonia arbuscula</i> ssp. <i>mitis</i>	Green reindeer lichen
<i>Cladonia borealis</i>	Boreal cup lichen
<i>Cladonia crispata</i> var. <i>cetrariiformis</i>	Organ-pipe lichen
<i>Cladonia rangiferina</i>	Gray reindeer lichen
<i>Cladonia</i> sp.	Reindeer lichen
<i>Cladonia stellaris</i>	Star-tipped reindeer lichen
<i>Comarum palustre</i>	Marsh cinquefoil
<i>Cypripedium passerinum</i>	Northern lady's slipper
<i>Dasiphora fruticosa</i>	Shrubby cinquefoil
<i>Delphinium glaucum</i>	Tall delphinium
<i>Deschampsia cespitosa</i>	Tufted hairgrass
<i>Deschampsia cespitosa</i> ssp. <i>cespitosa</i>	Tufted hairgrass
<i>Dicranum fuscescens</i>	Dusky fork moss
<i>Dicranum</i> sp.	Fork moss
<i>Drepanocladus aduncus</i>	Knieff's hook moss
<i>Drepanocladus longifolius</i>	Longleaf hook moss
<i>Drepanocladus polygamus</i>	Fertile feather-moss
<i>Drepanocladus</i> sp.	Hook moss
<i>Drosera anglica</i>	English sundew
<i>Drosera rotundifolia</i>	Round leaved sundew
<i>Dryas ajanensis</i>	Ajan mountain-avens
<i>Dryas drummondii</i>	Yellow dryas
<i>Dryas incisa</i>	Crenulate-leaved mountain avens
<i>Dryas integrifolia</i>	Entire-leaved mountain-avens
<i>Eleocharis palustris</i>	Creeping spike-rush
<i>Eleocharis</i> sp.	Spikerush
<i>Elymus lanceolatus</i> ssp. <i>psammophilus</i>	Sanddune wildrye
<i>Elymus</i> sp.	Wheatgrass
<i>Elymus trachycaulus</i>	Slender wheatgrass
<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>	One-sided wheatgrass
<i>Empetrum nigrum</i>	Crowberry
<i>Epilobium ciliatum</i>	Fringed willowherb
<i>Epilobium hornemannii</i>	Hornemann's willowherb
<i>Epilobium palustre</i>	Marsh willowherb
<i>Epilobium</i> sp.	Willowherb
<i>Equisetum arvense</i>	Common horsetail
<i>Equisetum fluviatile</i>	Water horsetail

<i>Equisetum palustre</i>	Marsh horsetail
<i>Equisetum pratense</i>	Meadow horsetail
<i>Equisetum scirpoides</i>	Dwarf scouring-rush
<i>Equisetum</i> sp.	Horsetail
<i>Equisetum sylvaticum</i>	Wood Horsetail
<i>Equisetum variegatum</i>	Variegated scouring-rush
<i>Erigeron acris</i>	Fleabane daisy
<i>Erigeron caespitosus</i>	Tufted fleabane
<i>Erigeron hyssopifolius</i>	Hyssop-leaved fleabane
<i>Erigeron</i> sp.	Fleabane
<i>Eriophorum angustifolium</i>	Narrow-leaved cottongrass
<i>Eriophorum brachyantherum</i>	Closed-sheathed cottongrass
<i>Eriophorum</i> sp.	Cottongrass
<i>Eriophorum vaginatum</i>	Tussock cottongrass
<i>Eurybia sibirica</i>	Siberian aster
<i>Festuca altaica</i>	Altai fescue
<i>Flavocetraria cucullata</i>	Curled snow lichen
<i>Flavocetraria nivalis</i>	Crinkled snow lichen
<i>Flavocetraria</i> spp.	Snow lichen
<i>Galium boreale</i>	Northern bedstraw
<i>Galium</i> sp.	Bedstraw
<i>Galium trifidum</i>	Three-petalled bedstraw
<i>Gentiana glauca</i>	Glaucous gentian
<i>Gentianella propinqua</i>	Four-parted gentian
<i>Geocaulon lividum</i>	Bastard toadflax
<i>Geum macrophyllum</i>	Large-leaved avens
<i>Glyceria borealis</i>	Boreal mannagrass
<i>Glyceria pulchella</i>	Graceful mannagrass
<i>Goodyera repens</i>	Dwarf rattlesnake-plantain
<i>Hedysarum alpinum</i>	Alpine hedysarum
<i>Hedysarum boreale</i>	Northern hedysarum
<i>Hippuris vulgaris</i>	Common mare's-tail
<i>Hylocomium splendens</i>	Stairstep moss
<i>Hypnum lindbergii</i>	Lindberg's plait moss
<i>Icmadophila ericetorum</i>	Candy lichen
<i>Juncus castaneus</i>	Chestnut rush
<i>Juncus castaneus</i> ssp. <i>castaneus</i>	Chestnut rush
<i>Juncus</i> sp.	Rush
<i>Juniperus communis</i>	Common juniper
<i>Juniperus horizontalis</i>	Creeping juniper
<i>Kalmia microphylla</i>	Western bog laurel
<i>Leptobryum pyriforme</i>	Golden thread-moss
<i>Leymus innovatus</i>	Northwestern wildrye

<i>Lichen crustose</i> spp.	Crustose lichen
<i>Lichen</i> sp.	Lichen
<i>Linnaea borealis</i>	Twinflower
<i>Liverwort</i> sp.	Liverwort
<i>Lupinus arcticus</i>	Arctic lupine
<i>Luzula</i> sp.	Wood rush
<i>Lycopodium dendroideum</i>	Treelike clubmoss
<i>Malaxis paludosa</i>	Bog adder's-mouth
<i>Marchantia polymorpha</i>	Green-tongue liverwort
<i>Masonhalea richardsonii</i>	Richardson's masonhalea lichen
<i>Mentha arvensis</i>	Canadian mint
<i>Menyanthes trifoliata</i>	Bog buckbean
<i>Mertensia paniculata</i>	Tall bluebells
<i>Mnium</i> sp.	Leafy moss
<i>Moehringia lateriflora</i>	Grove sandwort
<i>Moneses uniflora</i>	Single delight
<i>Mylia anomala</i>	Anomalous flapwort
<i>Myrica gale</i>	Sweet gale
<i>Myriophyllum sibiricum</i>	Siberian water-milfoil
<i>Myriophyllum</i> sp.	Water-milfoil
<i>Myriophyllum verticillatum</i>	Whorled water-milfoil
<i>Nephroma</i> sp.	Kidney lichen
<i>Nuphar polysepala</i>	Western yellow pond-lily
<i>Nuphar</i> sp.	Pond-lily
<i>Orthilia secunda</i>	One-sided wintergreen
<i>Oxytropis deflexa</i>	Nodding locoweed
<i>Oxytropis deflexa</i> ssp. <i>foliolosa</i>	Nodding locoweed
<i>Oxytropis splendens</i>	Showy crazyweed
<i>Packera indecora</i>	Rayless mountain ragwort
<i>Paludella squarrosa</i>	Tufted fen-moss
<i>Parnassia kotzebuei</i>	Kotzebue's grass-of-Parnassus
<i>Parnassia palustris</i>	Northern grass-of-Parnassus
<i>Parnassia</i> sp.	Grass of Parnassus
<i>Pedicularis labradorica</i>	Labrador lousewort
<i>Pedicularis parviflora</i>	Small flowered lousewort
<i>Pedicularis</i> spp.	Lousewort
<i>Pedicularis sudetica</i>	Sudeten lousewort
<i>Pedicularis verticillata</i>	Whorled lousewort
<i>Peltigera aphthosa</i>	Common freckle pelt lichen
<i>Peltigera neopolydactyla</i>	Carpet pelt lichen
<i>Peltigera</i> sp.	Pelt lichen

<i>Petasites frigidus</i>	Arctic sweet coltsfoot
<i>Philonotis fontana</i>	Fountain apple moss
<i>Picea glauca</i>	White spruce
<i>Picea mariana</i>	Black spruce
<i>Picea</i> sp.	Spruce
<i>Pinguicula villosa</i>	Hairy butterwort
<i>Pinguicula vulgaris</i>	Common butterwort
<i>Plagiomnium ellipticum</i>	Marsh leafy moss
<i>Platanthera hyperborea</i>	Northern green orchid
<i>Platanthera obtusata</i>	Small northern bog orchid
<i>Pleurozium schreberi</i>	Red-stemmed feather moss
<i>Poa alpina</i>	Alpine bluegrass
<i>Poa pratensis</i>	Kentucky bluegrass
<i>Poa</i> sp.	Bluegrass
Poaceae	Grass
<i>Pohlia</i> sp.	Nodding moss
<i>Polytrichum juniperinum</i>	Juniper haircap moss
<i>Polytrichum</i> sp.	Haircap moss
<i>Populus balsamifera</i>	Balsam poplar
<i>Potamogeton alpinus</i>	Northern pondweed
<i>Potamogeton friesii</i>	Fries' pondweed
<i>Potamogeton gramineus</i>	Grassy pondweed
<i>Potamogeton obtusifolius</i>	Blunt-leaved pondweed
<i>Potamogeton praelongus</i>	White-stemmed pondweed
<i>Potamogeton richardsonii</i>	Richardson's pondweed
<i>Potamogeton</i> sp.	Pondweed
<i>Potentilla</i> sp.	Cinquefoil
<i>Pseudocalliergon brevifolium</i>	Shortleaf spear moss
<i>Ptilidium pulcherrimum</i>	Tree fringewort
<i>Ptilium crista-castrensis</i>	Knight's plume moss
<i>Ptychostomum weigeli</i>	Weigel's bryum moss
<i>Pyrola asarifolia</i>	Pink wintergreen
<i>Pyrola</i> sp.	Wintergreen
<i>Ranunculus aquatilis</i>	White water crowfoot
<i>Ranunculus flammula</i>	Lesser spearwort
<i>Ranunculus gmelinii</i>	Yellow water crowfoot
<i>Ranunculus hyperboreus</i>	Arctic buttercup
<i>Ranunculus occidentalis</i>	Western buttercup
<i>Ranunculus</i> sp.	Buttercup
<i>Rhododendron groenlandicum</i>	Common Labrador tea
<i>Rhododendron tomentosum</i>	Northern Labrador tea
<i>Ribes hudsonianum</i>	Black currant
<i>Ribes</i> sp.	Currant

<i>Rorippa palustris</i>	Bog yellowcress
<i>Rorippa palustris</i> ssp. <i>palustris</i>	Bog yellowcress
<i>Rosa acicularis</i>	Prickly rose
<i>Rubus arcticus</i>	Arctic raspberry
<i>Rubus arcticus</i> ssp. <i>arcticus</i>	Dwarf raspberry
<i>Rubus chamaemorus</i>	Cloudberry
<i>Rumex arcticus</i>	Arctic dock
<i>Rumex occidentalis</i>	Western dock
<i>Salix alaxensis</i>	Felt-leaf willow
<i>Salix alaxensis</i> var. <i>alaxensis</i>	Felt-leaf willow
<i>Salix arbusculoides</i>	Little-tree willow
<i>Salix arctica</i>	Arctic willow
<i>Salix athabascensis</i>	Athabasca willow
<i>Salix barclayi</i>	Barclay's willow
<i>Salix bebbiana</i>	Bebb's willow
<i>Salix brachycarpa</i>	Short-fruited willow
<i>Salix glauca</i>	Grey-leaved willow
<i>Salix myrtilifolia</i>	Blueberry willow
<i>Salix planifolia</i>	Tea-leaved willow
<i>Salix polaris</i>	Polar willow
<i>Salix pseudomonticola</i>	Mountain willow
<i>Salix pseudomyrsinites</i>	Tall blueberry willow
<i>Salix pulchra</i>	Tealeaf willow
<i>Salix reticulata</i>	Net-veined willow
<i>Salix scouleriana</i>	Scouler's willow
<i>Salix</i> sp.	Willow
<i>Sanionia uncinata</i>	Sickleleaf hook moss
<i>Sarmentypnum exannulatum</i>	Warnstorfia moss
<i>Saxifraga serpyllifolia</i>	Thyme leaved saxifrage
<i>Saxifraga tricuspidata</i>	Prickly saxifrage
<i>Scapania</i> spp.	Earwort
<i>Scheuchzeria palustris</i>	Marsh scheuchzeria
<i>Scorpidium cossonii</i>	Cosson's hook moss
<i>Scorpidium revolvens</i>	Rusty hook moss
<i>Scorpidium scorpioides</i>	Hooked scorpion moss
<i>Selaginella selaginoides</i>	Northern spikemoss
<i>Senecio lugens</i>	Black-tipped groundsel
<i>Shepherdia canadensis</i>	Soapberry
<i>Solidago lepida</i>	Elegant goldenrod
<i>Solidago lepida</i> var. <i>salebrosa</i>	Rocky Mountains Canada goldenrod
<i>Solidago multiradiata</i>	Northern goldenrod
<i>Solidago</i> sp.	Goldenrod

<i>Sparganium angustifolium</i>	Narrow-leaved burreed
<i>Sparganium</i> sp.	Burreed
<i>Sphagnum angustifolium</i>	Narrowleaf peatmoss
<i>Sphagnum balticum</i>	Baltic sphagnum
<i>Sphagnum capillifolium</i>	Northern peatmoss
<i>Sphagnum fuscum</i>	Brown peatmoss
<i>Sphagnum girgensohnii</i>	Girgensohn's peatmoss
<i>Sphagnum magellanicum</i>	Magellanic peatmoss
<i>Sphagnum</i> sp.	Peatmoss
<i>Sphagnum squarrosum</i>	Crome sphagnum
<i>Sphagnum teres</i>	Rigid peatmoss
<i>Sphagnum warnstorffii</i>	fen peatmoss
<i>Spiraea stevenii</i>	Steven's spiraea
<i>Spiranthes romanzoffiana</i>	Hooded ladies'-tresses
<i>Splachnum luteum</i>	Yellow collar moss
<i>Stellaria crassifolia</i>	Fleshy starwort
<i>Stellaria longipes</i>	Long-leaved starwort
<i>Stellaria</i> sp.	Chickweed
<i>Straminergon stramineum</i>	Straw spear moss
<i>Stuckenia pectinata</i>	Sago pondweed
<i>Stuckenia vaginata</i>	Sheathed pondweed
<i>Thalictrum alpinum</i>	Arctic meadowrue
<i>Thalictrum</i> sp.	Meadowrue
<i>Tofieldia pusilla</i>	False asphodel
<i>Tomentypnum nitens</i>	Golden fuzzy fen moss
<i>Tomentypnum</i> sp.	Fen moss
<i>Tortella fragilis</i>	Fragile twisted moss
<i>Trichophorum alpinum</i>	Alpine clubrush
<i>Trichophorum cespitosum</i>	Tufted clubrush
<i>Trisetum spicatum</i>	Spike trisetum
<i>Utricularia</i> sp.	Bladderwort
<i>Utricularia vulgaris</i> ssp. <i>macrorhiza</i>	Greater bladderwort
<i>Vaccinium oxycoccos</i>	Bog cranberry
<i>Vaccinium uliginosum</i>	Bog blueberry
<i>Vaccinium vitis-idaea</i>	Lowbush cranberry
<i>Valeriana capitata</i>	Capitate valerian
<i>Veronica scutellata</i>	Marsh speedwell
<i>Viburnum edule</i>	Highbush cranberry
<i>Viola epipsila</i>	Marsh violet
<i>Viola</i> spp.	Violets
<i>Warnstorfia fluitans</i>	Floating hook moss