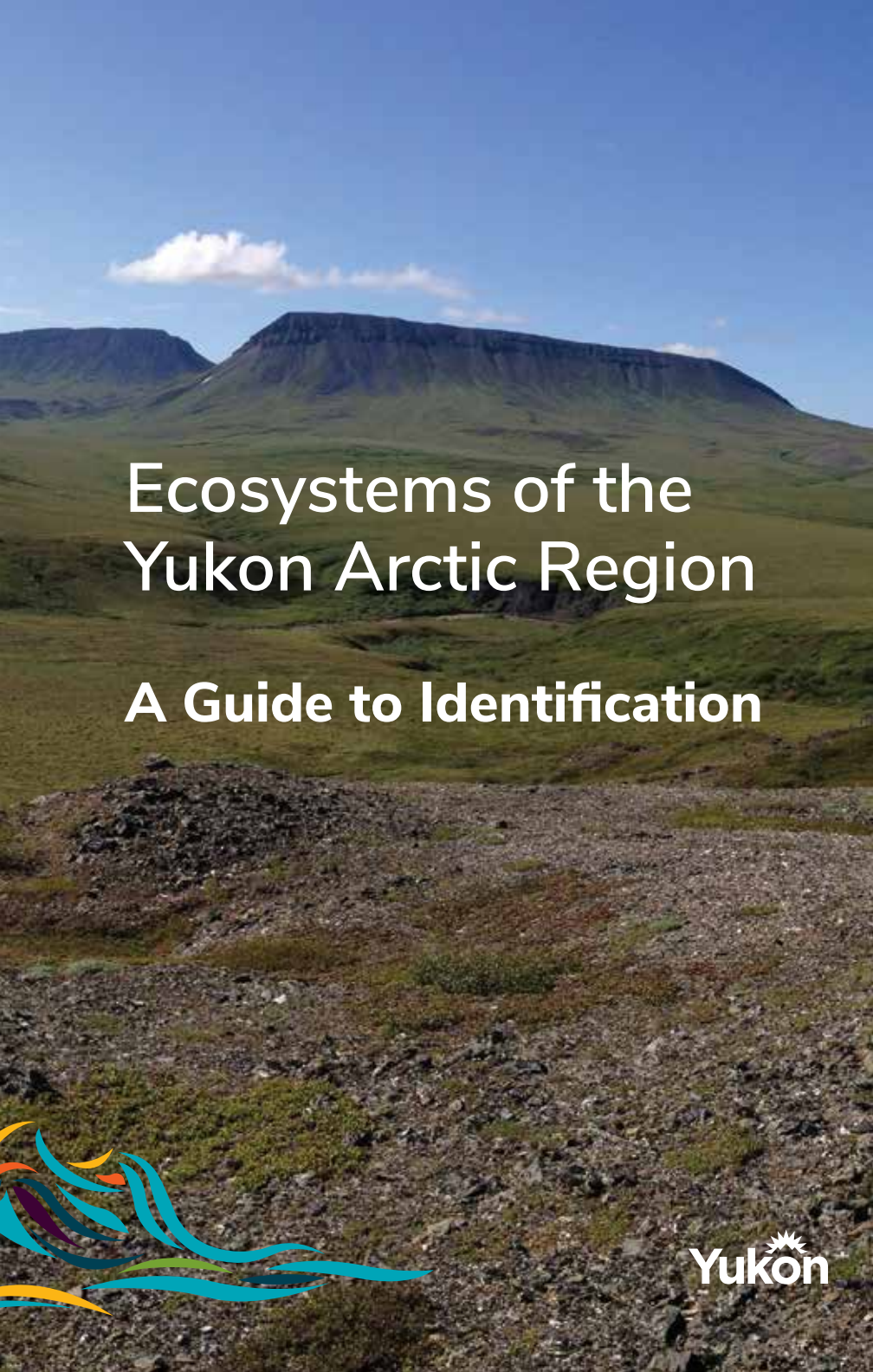


Ecosystems of the Yukon Arctic Region

A Guide to Identification

Yukon

Ecosystems of the Yukon Arctic Region

A Guide to Identification

Citation:

MacKenzie, W.H., C.E. Kennedy and N. Flynn. 2022. *Ecosystems of the Yukon Arctic Region: a guide to identification.* Department of Environment, Fish and Wildlife Branch, Government of Yukon, Whitehorse, Yukon. viii + 236 pp.

Author's Affiliation:
William H. MacKenzie, Vegetation Ecologist, Smithers, British Columbia
Catherine E. Kennedy, Vegetation Ecologist, Whitehorse, Yukon
Nadele Flynn, Coordinator, Ecological and Landscape Classification Program, Department of Environment, Government of Yukon, Whitehorse, Yukon.

ISBN: 978-1-55362-865-1

Front and back covers: A view across tundra to Welcome Mountain, Barnes Mountains. Photo: Will MacKenzie.

Back cover, top: Arctic-alpine tundra in the northern Richardson Mountains. Photo: Will MacKenzie. Centre: Tundra and wetlands of the Coastal Plain. Photo: Will MacKenzie. Bottom: Yukon Coastal Lowland, east of Sabine Point, showing coastal retrogression thaw slump (At$1) dominated by Mastodon flower. Photo: Hannah Gray.

Copies of this report, including a digital version, are available at: Ecological and Landscape Classification and Mapping, Fish and Wildlife Branch, Department of Environment, Government of Yukon, Box 2703 (V-5), Whitehorse, Yukon Y1A 2C6; 867-667-3081; elc@yukon.ca.

For more information on the ELC Program and other publications, visit: www.yukon.ca/elc.

Contents

Upland Ecosite Classes

List of figures

List of Tables

Acknowledgements

This guide is the result of the efforts of many individuals. Legions of field workers collected the data on which the guide is based, and many people helped with various aspects of the guide conceptualization, ecological analysis and production. The authors greatly appreciate the contributions of all these individuals.

The foundation of an ecological field guide is a database of field plot data. Data collectors included a large number of biologists, botanists, soil scientists and field technicians over the years from 1965 to 2015, supported by funds from Government of Yukon, Canadian Forest Service, Department of Indian Affairs and Northern Development, and Parks Canada. The assistance of numerous park rangers, biologists and the administrative staff of Herschel Island – Qikiqtaruk Territorial Park and Ivvavik National Park, in providing critical logistical and technical field support, is gratefully acknowledged. The contribution of the Dawson regional biologists on many north slope field projects is deeply appreciated. Government of Yukon and Agriculture Canada have provided invaluable technical soil science field support.

The Wildlife Management Advisory Council (North Slope) has been consistently supportive, contributing funding to numerous inventory projects. The logistical field support and warm hospitality provided by the community members of Aklavik is gratefully acknowledged.

The authors also thank the Polar Continental Shelf Program (NRCan) for providing helicopter support, supplementing other transportation resources, to provide access to field camps and sampling sites in remote locations throughout the region.

Accurate identification of plant species is critical for ecosystem analysis and description. Taxonomic verification by the following individuals is gratefully acknowledged — vascular plants: Bruce Bennett, W.J. (Bill) Cody and Jennifer Line; lichens: Trevor Goward and Irwin Brodo; bryophytes: Terry McIntosh and Robert Ireland.

The first database of Canadian Arctic ecological data and provisional list Arctic vegetation associations was developed in a joint project conducted by Government of Yukon and Natural Resources Canada (NRCan) under the auspices of International Polar Year (IPY), within the CiCAT group led by Greg Henry, UBC. Thanks are due to Ken Baldwin, Canadian Forest Service, for his leadership during IPY for supporting the inclusion of Arctic vegetation data, and Yukon data in particular, into the Canadian National Vegetation Classification (CNVC) database. Adrian DeGroot and Irene Ronalds acquired, evaluated and digitized unpublished Arctic ecological plot data. Russell Klassen conducted the challenging task of harmonizing and synthesizing the unpublished data with existing Yukon plot data and developing it into one composite database. Draft Arctic vegetation associations were developed from this database. Peer review meetings were led by Ken Baldwin. Thanks

to Tina Boucher, Serguei Ponomarenko and Del Meidinger for valuable comments during development of the associations.

Major funding support for the development of the field guide was provided by Government of Yukon. Mitch Heynen and Sandra Smith designed numerous graphics, tables and maps and helped finalize the guide. Val Loewen provided Yukon Biophysical Inventory System (YBIS) technical support. Thanks to Del Meidinger for sharing his wisdom throughout development of the guide. Paula Bartemucci provided valuable review of the guide.

1.0 Introduction

1.1 Vegetation Classification and Inventory in the Yukon Arctic

Botanical exploration of the far northern Yukon began in the 1890s, when whaling ships and scientific expeditions travelled along the Beaufort Sea. Many plant specimens collected from Alaska to Herschel Island well over a century ago remain preserved in herbaria around the world (Hulten 1968). However, ecological inventory of the soil and vegetation in the area did not begin until the 1960s. At that time a new age of scientific enquiry and momentum for land-use planning in Canada's far north was driven by increasing resource development and, in the following decade, by the settlement of aboriginal land claims.

In 1965, graduate student John Lambert began a doctoral study of the relationships of the ecology and successional trends of tundra plant communities in the Low Arctic Region of the Richardson and British mountains, under the guidance of Vladamir Krajina at the University of British Columbia. That study described and investigated vegetation communities in relation to elevation, exposure, soil moisture, permafrost, snow cover, cryoturbation and topography (Lambert 1968).

In 1972, Charles D. Bird, an ecologist with the University of Calgary, conducted ecological studies in the Richardson Mountains, in conjunction with the Geological Survey of Canada. Sites were selected on both glaciated and unglaciated landforms. Bird (1974) investigated the relationship between vascular and non-vascular flora and carbonate and silicate rocks, and compared the flora of alpine calcareous and acidic soils.

The first reconnaissance-level biophysical survey of the Yukon was conducted in 1975 by Ed Oswald, ecologist, and John Senyk, surficial geologist, of the Pacific Forest Research Centre, Forestry Canada. Field data was collected from all regions of the territory (including the North Slope) to supplement a literature review. The survey described 22 ecoregions — based on vegetation, physiography, regional climate and permafrost — and mapped at a scale of 1:2,500,000 (Oswald and Senyk 1977).

With an interest in the establishment of national parks in the northern Yukon, Parks Canada and the Department of Indian and Northern Affairs (now Crown-Indigenous Relations and Northern Affairs Canada) engaged the Lands Directorate, Environment Canada, to collect baseline ecological land survey data in northern Yukon, including the Old Crow basin, the British and Richardson Mountains and the coastal plain, and to produce 1:500,000-scale ecodistrict maps (Wiken et al. 1981).

Herschel Island (Qikiqtaruk), a 116-square-kilometre island situated five km off the north Yukon coast in the Beaufort Sea, was established as a Yukon territorial park through the Inuvialuit Final Agreement. A detailed ecological and archaeological survey of Herschel Island - Qikiqtaruk Territorial Park was undertaken in 1985, which included an inventory of historic and prehistoric

sites, fisheries, wildlife, birds, terrain and vegetation. Detailed site sampling of soils, terrain and vegetation was conducted throughout the island; ecological units were mapped at a scale of 1:20,000 (Smith et al. 1989). Herschel Island continues to draw scientists from around the world; they study climate change, terrain, permafrost, vegetation, birds and mammals (Burn 2012).

In the mid 1980s, Parks Canada directed a comprehensive resource description and analysis of the new North Yukon National Park (later known as Ivvavik). This park encompasses 10,000 square km in the northwestern corner of the Yukon, and includes the western portion of the British Mountains and the coastal plain. Descriptions and assessments of natural and cultural resources of Ivvavik involved extensive research, field work and mapping. Ecological surveys included geology, geomorphology, hydrology, soils, vegetation, fisheries and wildlife. This work contributed greatly to the understanding of ecological relationships in the far northern Yukon (Karasiuk 1993; Kennedy 1993; Welch and Smith 1993; Welch 1993a; Welch 1993b).

From 1986 to 1989 the Canadian Wildlife Service, Environment Canada, conducted field work in conjunction with Environment Yukon on the coastal plain in support of remote sensing (Landsat) image analysis, used to develop a land cover map. In this project, CWS biologist Jim Hawkings mapped the vegetation and habitat of migratory waterfowl, supported through the Northern Oil and Gas Program.

A similar land cover mapping project using Landsat image analysis was undertaken in the North Richardson Mountains by Government of Yukon, supported by the Canadian Centre for Remote Sensing (CCRS) Wildlife Management Advisory Council (North Slope) (WMAC-NS). Between 1991 and 1993, ecological sampling (soil and vegetation plots) was conducted out of field camps in the vicinity of Canoe Lake, Summit Lake, Bonnet Lake and Big Fish Lake (Loewen et al. 1991; 1992; 1993).

A study of grizzly bear habitat use in the Firth River corridor was conducted in Ivvavik National Park from 1994 to 1996. Soil and vegetation plot sampling and analysis informed a bear habitat map and ecosystem descriptions (MacKenzie and MacHutchon 1996), in the mountains, the foothills and the coastal plain.

During International Polar Year, Parks Canada, in conjunction with CCRS, conducted an ecosystem mapping project of Ivvavik National Park. The analysis was based on remotely sensed imagery and soil and vegetation plot sampling in the park from 2009 to 2011 (Ponomarenko 2010).

In an effort to extend ecosystem mapping across the entire Yukon North Slope and the western Inuvialuit Settlement Region, Government of Yukon identified a data gap between Ivvavik and the North Richardson Mountains. In 2015, a field camp was based at the Blow River airstrip to collect soil, terrain and vegetation data throughout the Barn and Richardson Mountains and the eastern half of the coastal plain, extending to the westernmost part of the Mackenzie River delta. This work was supported in part by WMAC(NS).

Plot data was collected to supplement data previously collected throughout the region for analysis and ecological description of vegetation associations described in this field guide.

This field guide to ecosystems of the Yukon Arctic Region represents a consolidation of this historic and contemporary work into a harmonized classification standard.

1.2 Objectives/scope

This guide presents classification and identification information for ecosystems of the Yukon Arctic Region (Figure 1-1). The guide organizes our current understanding of the ecological relationships among vegetation communities, landscape position, soil and climate in the region.

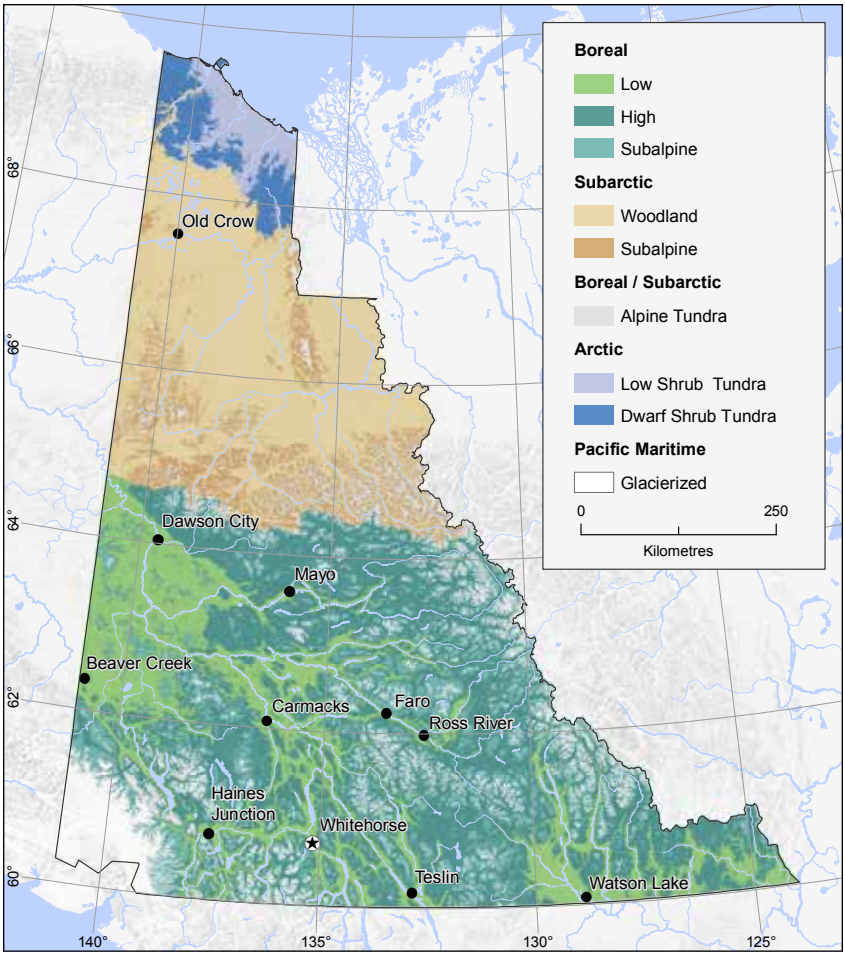


Figure 1-1. Bioclimate zones of Yukon

These are the objectives of the guide:

- to consolidate knowledge of Yukon Arctic Region ecosystem diversity, characteristics and distribution;
- to promote a better understanding of arctic ecosystems and their inter-relationships;
- to provide a framework for organizing ecological information and management experience in arctic ecosystems;
- to provide resource managers with a common language to describe arctic ecosystems;
- to provide an ecological baseline for monitoring change; and
- to create "natural" ecosystem units for mapping and management initiatives such as wildlife habitat assessment and site-specific development reviews.

This guide uses the Yukon Bioclimate Ecosystem Classification (YBEC) system, which is the foundation of the Yukon Ecological and Landscape Classification (ELC) Program. Information relating to this program, including bioclimatic zone mapping, links to reports, and background information on the ELC Program, is here: https://yukon.ca/ecological-landscape-classification#what-is-ecological-and-landscape-classification-elc.

1.3 Regulatory and standards context

Ecosystem classification is an important part of shaping regulations and best practices in management, policy, land-use planning and environmental assessment in Yukon. However, management interpretations are not included in this guide. YBEC provides the classification units used in ecological mapping. For guidelines on ecological mapping, contact the ELC Program.

1.4 Taxonomic and data standards

In order to use this guide to identify ecosystem units, some field data is generally required. This particularly includes data on vegetation composition; it also includes some site and soil information. The *Field Manual for Describing Yukon Ecosystems* (Department of Environment 2017) or the *Field Manual for Describing Terrestrial Ecosystems* (B.C. Ministry of Environment and B.C. Ministry of Forests and Range 2010) can assist with the collection of this data.

Cody's *Flora of the Yukon Territory* (1996) is a comprehensive reference for identifying vascular plants although it is not up to date with current taxonomy and nomenclature. For vascular plants and bryophytes, the taxonomy in this guide is generally consistent with the Flora of North America project (FNA 1993+). For common species, English names of typical usage in the Yukon are applied. For less common species, contemporary nomenclature is applied from the *Database of Vascular Plants of Canada* (Brouillet et al. 2018). Useful field guides for plant identification include *Alpine Plants of the Northwest: Wyoming to Alaska* (Pojar and MacKinnon 2013); *Mosses, Lichens and Ferns of Northwest North America* (Vitt et al. 2007); and *Plants of the Western Boreal Forest and Aspen Parkland* (Johnson et al. 1995).

Readers interested in delving deeper into soils and terrain classification can refer to *The Canadian System of Soil Classification* (Soil Classification Working Group 1998) and *Terrain Classification System for British Columbia* (Howes and Kenk 1997). *The Canadian Wetland Classification System* (NWWG 1997) and the site classification of MacKenzie (2012) are useful references to the broader ecosite classes applied in this guide.

1.5 Guide content

The guide is organized as follows:

- Section 1. Introduction.
- Section 2. Yukon Bioclimate Ecosystem Classification (YBEC) System: an overview.
- Section 3. Yukon Arctic Region: general description of the climate, physiography, glacial history, geology, permafrost, soils and vegetation.
- Section 4. How to use the guide presents the steps required to identify bioclimate and ecosite units.
- Section 5. Yukon Arctic Region ecosites provides a general description of classification units in the Yukon Arctic Region.
- Section 6. Yukon Arctic Region ecosites provides a detailed description of all classification units of the Yukon Arctic Region, grouped by ecosite class. This is the core of the guide: two-page individual ecosite descriptions outlining the environmental and vegetation characteristics of each unit.
- Section 7. Yukon Arctic Region bioclimatic units: a description of the landscape and the distribution of associated ecosites.
- Literature cited.
- Appendices: Description of data sources and methods; List of ecosites and vegetation associations; Crosswalk to other classifications; Species applied in the guide; and Keys and codes.

1.6 Limitations of the guide

The ecological plot data used to develop the classification and description of the units are described in Appendix 1. Most ecosite descriptions are based on a fairly large set of plot data, but some are supported by only limited data. For some ecosites, soils data are very limited and certain plant groups (e.g., bryophytes and willows) were sometimes not identified to species. This limits the information presented for these units.

Additionally, the guide describes commonly occurring units in the landscape, which in most cases will define much of the landscape. However, users may find undocumented types that represent less common or more localized units in the landscape not yet sampled. Over time and where necessary, these gaps will be filled.

2.0 Yukon Bioclimate Ecosystem Classification (YBEC) System

2.1 Overview of the YBEC system

An ecosystem results from the complex interactions of plants, animals and micro-organisms with the physical environment. Ecosystems can be described at various scales, from local to regional. The Yukon Bioclimate Ecosystem Classification (YBEC) system groups similar segments of the landscape — ecosystems — to form ecosites. Ecosite units are classified by combining components of the classification system at the local scale. A Dwarf birch / Lowbush cranberry – Tussock cotton-grass bog is an example of a local-scale ecosystem. A regional ecosystem is broader, encompassing many local-scale ecosystems.

For practical purposes in YBEC, an ecosystem is generally characterized as a particular plant community and its associated topography, soil and climate. Transitions from one ecosystem to another can be abrupt or gradual, depending on the environmental factors that influence the ecosystem. Although animals, fungi and microorganisms are not specifically considered during classification, they are recognized as important components of the ecosystem.

Climate is the most important factor that influences the development of terrestrial ecosystems. Within areas of similar climate, ecosystems vary because of differences in topography and soil. For example, grasslands occur on steep, warm aspects; bogs and fens occur in sites with impeded drainage.

The vegetation that develops on these local-scale sites reflects differences in topography and soil. Vegetation is important when developing an ecological classification because it is readily visible and it reflects the environment, biology and history of a site. Vegetation changes over time in a process called succession. In boreal regions such as the Boreal Low Zone, disturbance is common and many successional vegetation communities may occur on the same ecosite. In the Yukon Arctic Region, however, landscape-level disturbances generally do not occur and ecosites are commonly represented by a single mature plant association. Localized permafrost failures occur commonly in the arctic. These temporarily support distinct successional ecosystems that lead to new site conditions, which support vegetation often unrelated to the previous community.

YBEC organizes local-scale and regional ecosystems, as well as vegetation communities, in three hierarchical classifications, each with different primary contributing factors (Figure 2-1). This guide presents a classification of bioclimate subzones (subdivisions of bioclimate zones) and ecosites.

2.2 Bioclimate classification

Bioclimate classification categorizes broad areas that are influenced by similar regional climates in a hierarchy of bioclimate units. The highest level of the hierarchy is the bioclimate region, and the lowest level is the bioclimate subzone. In the YBEC system, bioclimate units follow elevationally and geographically controlled climatic gradients. Mature vegetation communities on reference or zonal sites (sites with well-drained, circum-mesic, nutrient-medium soils and average snow accumulations), as well as ecosystems on drier, wetter, poorer and richer sites, are used to differentiate bioclimate units.

The Yukon Arctic Region is divided into two zones based on zonal vegetation change with increasing elevation and latitude; the Arctic Low Shrub Tundra and Arctic Dwarf Shrub Tundra. YBEC differentiates subzones within zones in order to describe units with different zonal vegetation and arrangements of ecosystems on azonal sites. The Arctic Dwarf Shrub Tundra is further subdivided into the lowland, montane and alpine subzones based on less significant vegetation differences in zonal association composition.

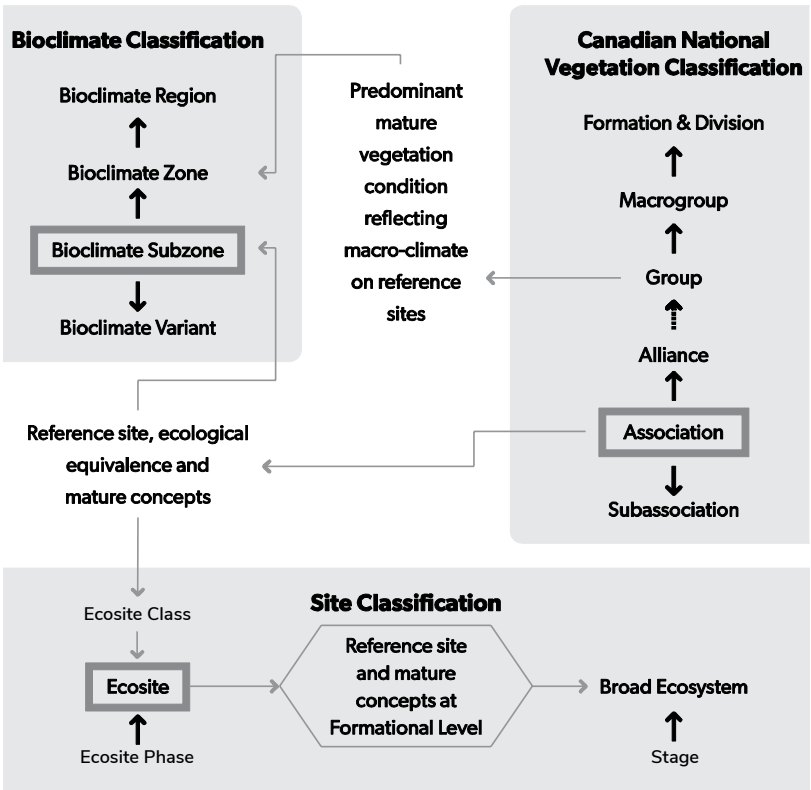


Figure 2-1. Structure of the YBEC system of ecological classification

Note: primary units for each level are shown with thick grey borders

Significant regional differences in vegetation do occur; they reflect the contrasting geology, largely calcareous substrates versus non-calcareous rock types. These are treated at the site level in the classification as they do not represent climatic variation.

2.2.1 Bioclimate unit names and codes

Zone names combine bioclimate regions (Boreal, Subarctic, Arctic), elevational position (low, high, subalpine, alpine), and/or physiognomy (woodland, low shrub, dwarf shrub). The codes for these zones comprise three or four letters using components of the descriptive terms. For example, the Arctic Low Shrub Tundra is coded ARLS; the Arctic Dwarf Shrub Tundra Zone, elevationally above or latitudinally north of the ARLS, is coded ARDS.

2.3 Vegetation and site classification

2.3.1 Vegetation classification

YBEC classifies plant communities according to vegetation associations (also called plant associations). The association is the basic unit of a hierarchy of vegetation units (Figure 2-1). In YBEC it characterizes the vegetation of an ecosite, or the variations within an ecosite that has more than one type of vegetation. An association is a vegetation classification unit "defined on the basis of a characteristic range of species composition, diagnostic species occurrence, habitat conditions, and physiognomy" (Faber-Langendoen et al. 2014).

A subassociation is a division of the association. It is generally used for characterizing variation in species composition that is not considered significant enough to be an association.

2.3.2 Site classification

Site classification in YBEC characterizes landscape components with similar topography and soil conditions. The fundamental unit is the ecosite. Ecosites are ecological units with uniformity in site conditions as expressed by similarity in plant community composition. In the arctic, features that affect active layer depth — such as snow accumulation, stream irrigation, soil moisture regime and soil pH — have a strong influence on ecosites.

Arctic ecosites are generally represented by a single plant association. Some ecosites include several plant subassociations, which describe minor vegetation variation on generally similar site conditions, often intergrading in some locales. In a few cases, the vegetation variation described in a single ecosite represents two or more plant associations. Often, limited data is available for environmental differentiation but field observations by the authors suggest that conditions are similar.

This guide applies an ecosite class concept to group, organize and code ecosites, based on the wetland class of the Canadian Wetland Classification System (National Wetlands Working Group 1997) and the site class of

MacKenzie (2012). The ecosite class groups ecosites with similar basic underlying environmental attributes. These attributes support similar characteristic vegetation physiognomy and species adaptation guilds in communities representing mature (non-seral) vegetation. The ecosite class is functionally broader than the ecosite, but ecologically consistent. For example, the Arctic Meadow Class occurs on warm-aspect, snow-accumulation sites that produce soils with deep active layers and improved soil moisture and that support lush forb and graminoid dominated vegetation.

This broader ecosystem component is useful in several ways:

- it facilitates an understanding of broader ecological relationships between ecosites;
- it provides broad ecosystem units for applications not requiring species–level detail;
- it provides a classification unit in cases where more specific information required for ecosite designation is not available;
- it assists in communicating ecological and ecological management principles to non-technical users; and
- it provideds a framework and coding system for organizing and presenting ecosite information.

Ecosite phases are occasionally designated for an ecosite. Ecosite phases differentiate site or soil conditions that are ecologically equivalent (i.e., they support the same mature vegetation association), but describe physical properties of sites that have important interpretative value. For example, tall-shrub ecosystems dominated by *Alnus viridus* and *Calamagrostis canadensis* are commonly associated with floodplains where active subirrigation has led to a deep active layer and productive ecosystems (alluvial phase). However, these vegetation communities are also found on upland sites' snow accumulation hollows and thaw slumps. In such cases warmer soils and continuous seepage from snowmelt and permafrost thawing provide ecologically equivalent environmental conditions (snowbed phase).

2.4 YBEC and climate change

Even though the effects of climate change are starting to be seen in northern ecosystems, the classification presented here will reflect what is seen on the landscape for many years. Short-term change will be expressed in growth release of shrub species or a differential change in cover of species already on the site. Migration of newly suitable species to a site is generally a longer-term process.

The ecosites presented in this guide represent repeating patterns of vegetation on the landscape that reflect climate- and site-level environmental conditions. These units represent the baseline from which climate change impacts can be assessed. However, the relative abiotic differences between ecosites will endure and can allow for a nuanced assessment of site-level ecological change for various habitats over time.

3.0 The Yukon Arctic Region

3.1 Location and distribution

The Yukon Arctic Region is generally defined as the land north of the treeline, which is broadly where the mean July temperature is less than 10–12°C (Jonasson et al. 2000). The treeless arctic landscape in Yukon occupies 2.2 million ha (Figure 3-1). It extends south from the Beaufort Sea to approximately the height of land in the British and Richardson mountains at the point where these mountain ranges block warmer southern air masses. Subarctic climates persist through the British Mountains along the Firth River Valley, allowing the most northerly occurrence of trees in Canada. Similarly, the treeline is extended north along the Mackenzie river, where the effects of the warm mass of river water and the low terrain allow trees to establish much farther north than usual.

Arctic and alpine ecosystems have similar environmental characteristics and species compositions. In the Yukon classification, the mountain regions

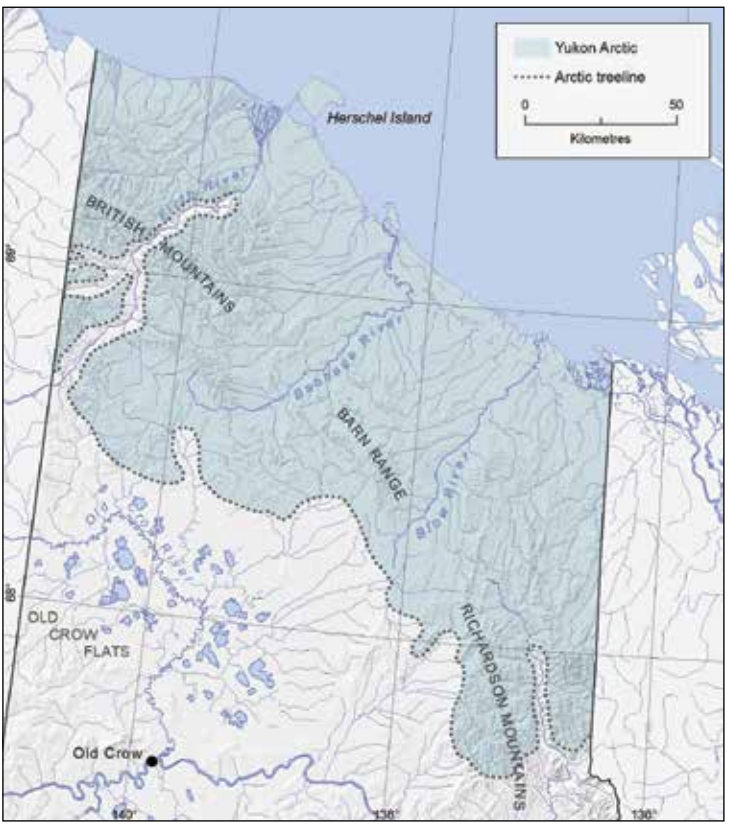


Figure 3-1. The Yukon Arctic Region north of treeline (Jorgensen and Meidinger 2015)

occurring in the Yukon Arctic Region are treated as Arctic bioclimates, while high-elevation tundra ecosystems to the south are considered to be part of the Alpine zone. This distinction is made for consistency, but the division between Arctic and Alpine zones is arbitrary and the two zones have many floristic and ecological similarities.

3.2 Climate

The distribution of the Arctic Region in the Yukon is largely driven by the interplay of the cold Beaufort Sea and warmer southern air masses. Prevailing northwesterly winds bring cold air and fog off the ocean and ice pack, which depresses spring and summer temperatures. This influence is generally strongest near the coast; warmer summer climates and deeper active layers occur inland. Summer temperatures are cooler in areas away from the warm waters of the Mackenzie River Delta.

This cold oceanic air penetrates inland, but is blocked from moving south by the Richardson and British mountains. Cold air has little capacity to hold moisture, so the coastal lowland receives low precipitation in all seasons. Although this region receives almost four months of continuous daylight, much of the sun and heat energy is blocked during extended periods of sea fog. Inland mountains of the Yukon Arctic Region are influenced less by these coastal conditions, but experience cooler temperatures due to higher elevations.

The winter climate conditions north and south of the Richardson and British mountains are similar, but, in contrast, there is a sharp demarcation in summer climate conditions between the Yukon Arctic Region and the adjacent Subarctic Region (Ritchie 1984). The divide of the northern mountains blocks the cold ocean-influenced air masses from moving south and prevents warmer southern systems from moving north. A common feature of summer climates is cumulus and convective storms; these form along the southern edge of the mountains where the two air masses meet. These storm systems rarely move north into the coastal lowland. The warm southern air masses and associated convective storm precipitation provide much more favourable growing season conditions in the Subarctic Region.

There are limited long-term weather stations in the Yukon Arctic Region, but climate normals for the 1971–2000 period published by Environment Canada (2020) show the contrast between Arctic and Subarctic climate regimes (Table 3-1).

Table 3-1. Comparison of selected climate variables between arctic and subarctic locations

Climate Station (Region)	Days with minimum temperature >0°C	Mean July temperature (°C)	Annual precipitation (mm)	Mean annual temperature (°C)
Komakuk Beach (Arctic)	75.6	6.0	161.3	–11.0
Shingle Point (Arctic)	89.7	8.7	253.9	–9.9
Inuvik (Subarctic)	106.7	12.2	248.4	–8.8
Old Crow (Subarctic)	104.3	12.6	265.5	–9.0

Winter snow cover is one of the primary influences on the distribution of arctic vegetation. The wind redistributes snow from exposed sites into protected gullies and lee slopes in the same place each year and can be considered a permanent site characteristic. Snow cover protects vegetation from the erosive effects of blowing snow, insulates soils (if deep enough) and provides early growing season moisture. Snow cover also shortens the growing season if it persists. The arctic tundra snowpack is consolidated into dense windslab by strong and persistent winds. This snowpack is slower to melt in spring than the soft, un-redeposited snow of treed environments; this can further delay the start of the growing season.

3.3 Physiography of the Yukon Arctic Region

The Yukon Arctic Region can be divided into three principal physiographic regions: the Northern Mountains (comprised of the Richardson, Barn and British mountains); the Coastal Lowland; and a small portion of the Mackenzie Delta (Figure 3-2).

3.3.1 Northern mountains

The southern boundary of the Yukon Arctic Region is dominated by two mountain ranges: the British Mountains in the west, oriented northwest-southeast; and the Richardson Mountains in the east, oriented north-south. The small Barn Range is located between these two ranges.

British Mountains

The British Mountains are part of the Cordillera of western Canada. This is a series of northwesterly trending mountain ranges consisting mostly of folded and thrust-faulted sedimentary rocks dominated by sandstone, shale, limestone and dolomite. The limestones represent an accumulation of shallow-water sediments and carbonate debris on a former continental shelf (Wiken et al. 1981).

The British Mountains are an eastern extension of the Brooks Range in Alaska, and extend from the Yukon-Alaska border to the Babbage River. The terrain of the British Mountains is rugged and the slopes are steep, with closely spaced angular ridges. The highest peak, near the Yukon-Alaska border, is 1,655

metres ASL, with lower summits ranging from 1,100 to 1,600 metres ASL The relief of the British Mountains ranges from 460 to 600 metres (Welsh and Rigby 1971a; Welch 1993a).

Local topography is more precipitous in the western part of the British Mountains, where sharp ridges and cliffs are common. East of the Firth River slopes and summits are more gentle and rounded, except where harder rocks like chert and quartzite form ridgelines.

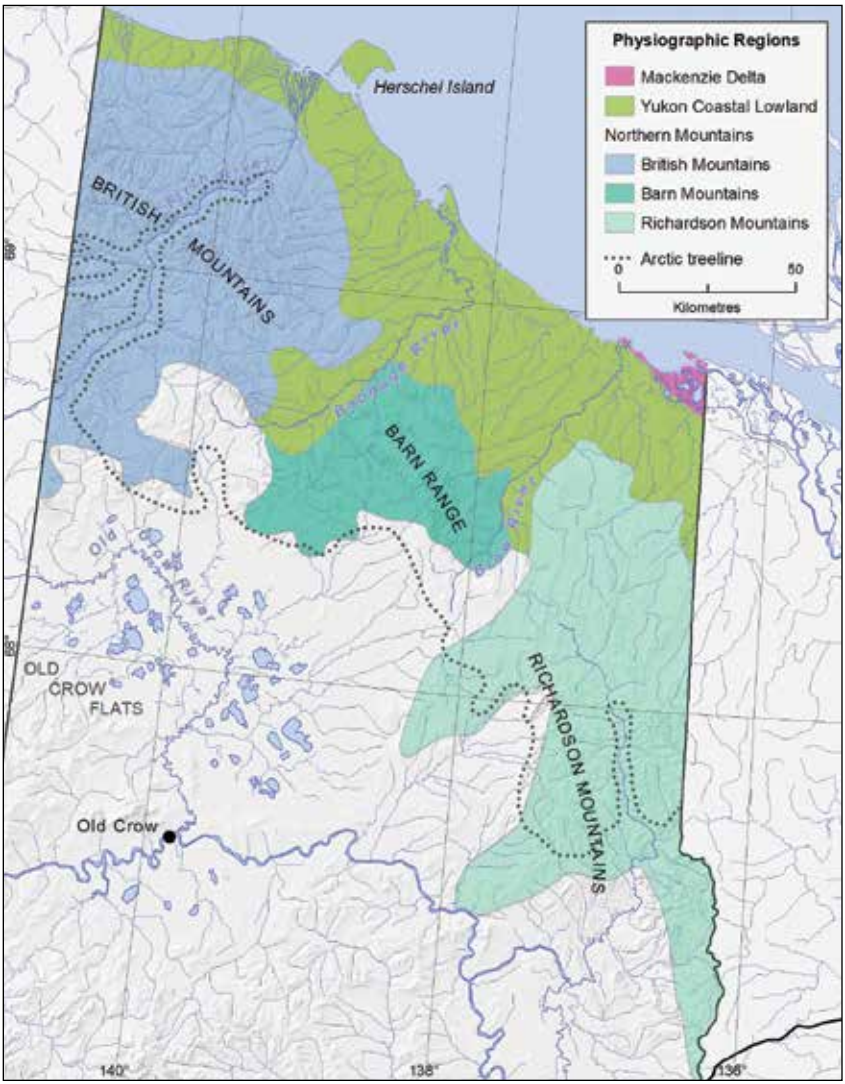


Figure 3-2. Main physiographic regions in the Yukon Arctic Region (Gordey and Makepeace 1999)

The northern foothills of the British Mountains, known as the Buckland Hills, extend from the Alaska border to the Babbage River. These hills generally define the limits of the Buckland Glaciation (the localized name for the northwestern surge of the Laurentide Ice), as it expanded northward out of the Mackenzie River valley.

Richardson Mountains

The Richardson Mountains are situated east of the Blow River and west of the Mackenzie River, and are oriented in a north-south direction. These mountains are uplifted offshore sediments from the late Cretaceous or early Tertiary (Ecoregions Working Group 2004). Sedimentary rocks such as shales and cherts predominate, suggesting uplift from deeper ocean basin deposits than those from which the British Mountains originate (Welch 1993a).

Barn Range

Between the British Mountains and the Richardson Mountains is the small Barn Range. This is comprised of relatively low mountains and angular or rolling hills, rising to approximately 1,070 metres ASL.

Sleepy Mountain, at the centre of the Barn Mountain Range, is an inselberg ("island mountain") that rises abruptly from a gently sloping plain.

3.3.2 Yukon Coastal Lowland

The Yukon Coastal Lowland is predominantly a gentle plain of low relief that rises gently from sea level to an elevation of about 150 metres at the base of the British, Barn and Richardson mountains. It extends across the northern Yukon from the Alaska-Yukon border to the Mackenzie River Delta, a distance of approximately 275 km. The Yukon Coastal Lowland is narrowest west of the Malcolm River and broadest west of the Blow River, where it widens to 20 to 35 km. It then narrows again towards the Mackenzie River Delta.

The glaciated terrain of the Yukon Coastal Lowland east of the Firth River is comprised of rolling glacial moraine interspersed with nearly flat areas of lacustrine deposits, in the topographical lows. Deep, medium-textured morainal material is extensive along the coast, and extends along the eastern slopes of the Richardson Mountains.

3.3.3 Mackenzie Delta

The Yukon Arctic Region includes a small portion of the 12,000-square-km Mackenzie River Delta. This delta region is a young landscape, composed of an intricate pattern of fluvial channels, lakes and flats.

Topographic relief is minimal, extending only a few metres above sea level. Deep annual flooding during the spring freshet is typical. Permanent ponds and shallow lakes are common and soils are poorly drained. Some organic soils have developed, including peat development on the outer delta. Despite annual flooding of the Mackenzie River, vegetation cover is nearly complete.

3.4 Glacial history

Unlike the rest of Canada, much of the Yukon Arctic Region was not glaciated during the Quaternary period (Figure 3-3). Over the past two million years, there were several glacial periods in North America. The most recent was during the Late Pleistocene when the Laurentide ice sheet covered most of Canada, an epoch that ended only 11,700 years ago. The most northwesterly advance of this continental ice sheet was across the eastern Yukon Coastal Lowland, where its movement to the southwest was constrained by the northern mountains. This local Late Pleistocene advance is referred to as the Buckland Glaciation.

Only the Coastal Lowland east of the Firth River experienced light glaciation. The mountains and hilly terrain are largely comprised of extensive erosional landscapes that have evolved slowly over millions of years. The Mackenzie River Delta was completely covered during the Buckland Glaciation. Ice advanced west along the coastal lowland, pushing moraine, lacustrine and marine sediments as far as the Firth River. Herschel Island, at the terminus of the Buckland Glaciation, is an ice-thrust moraine, associated with uplifted

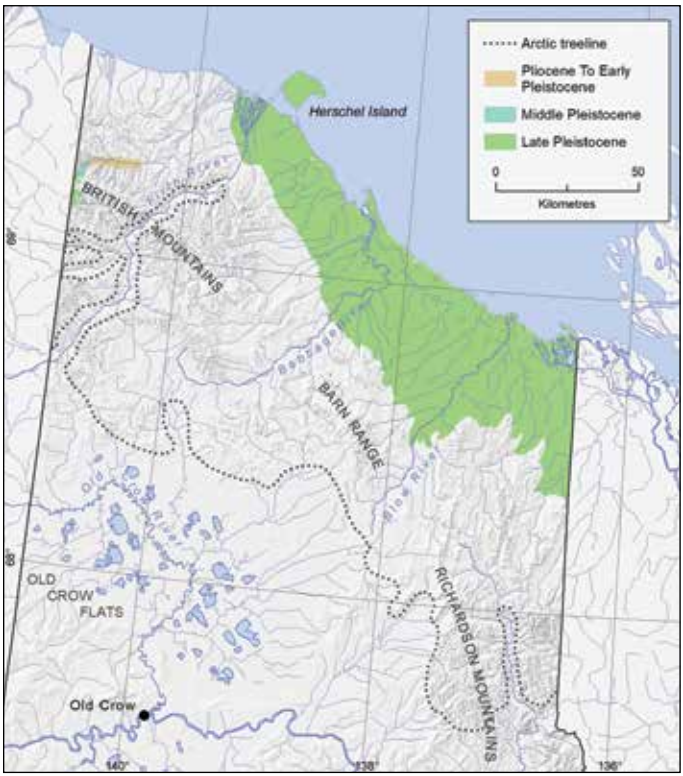


Figure 3-3. Extent of glaciation in the Yukon Arctic Region (Duk-Rodkin 1999)

marine sediments. Other evidence of glacial flows are the ridges on the northern flanks of the Buckland Hills.

The higher ground in the mountain ranges has remained almost entirely unglaciated during all glacial periods, except for some minor alpine glaciation in the British Mountains and continental glaciation on the eastern flank of the Richardson Mountains.

3.5 Landforms and terrain

The Yukon Arctic Region has landscape features that in part reflect the area's glacial history. Bedrock weathering has taken place over a very long period of time in the non-glaciated portion of the region, and the areas covered by ice in the Buckland Glaciation have glacial features. Periglacial processes of intense frost action affect most of the Arctic landscape. Landforms developed from such processes can occur in both glaciated and non-glaciated areas.

3.5.1 Periglacial processes and landforms

The term periglacial was introduced to describe the climatic and geomorphic conditions adjacent to the ice sheets of the Late Pleistocene. The definition has since been expanded to include those environments where climatic conditions result in severe frost action that dominates geomorphic processes (Rains 2002). All of the Yukon Arctic Region, both glaciated and non-glaciated, is considered a periglacial environment. Permafrost is not a prerequisite for periglacial landscapes, but it is nearly ubiquitous in Arctic environments. A cold arctic environment continues to foster the development of periglacial features throughout the Yukon Arctic Region.

Most arctic (and alpine) periglacial environments are characterized by large seasonal temperature variations, which promote severe frost action. Repeated freeze-thaw cycles in fine-grained sediments promotes mechanical weathering, sorting of fine and coarse-grained deposits, and mass movement. This leads to the widespread redistribution of fine-grained materials on slopes, the formation of patterned ground features, low permeability and saturation of soils, and mass movements downslope.

A characteristic feature of the unglaciated landscape, particularly in the mountains, is the extensive mantle of regolith which has developed through periglacial weathering of bedrock over the past 40 to 60 million years (Welch 1993b). The mechanical weathering of bedrock into regolith is the result of intense frost action due to diurnal and seasonal temperature change, whereby rock is shattered into fragments. By contrast, most of the landforms of the rest of Canada have resulted from two million years of periodic glacial erosion and deposition, with as little as 10,000 to 15,000 years of subsequent weathering since the last glaciation (Welch 1993b).

Periglacial landforms can be divided into two main groups: slope landforms and patterned ground landforms.

Periglacial slope landforms

Slope landforms are widespread in the Yukon Arctic Region and include solifluction lobes, cryoplanation terraces, cryopediments, fellfield, felsenmeer and tors.

Solifluction and cryoplanation

Solifluction lobes and terraces form on steep slopes (between 15 and 35 percent). Solifluction lobes form where permafrost restricts drainage; surface soils become saturated during seasonal melt and gradually flow downslope. Solifluction features typically have buried soil horizons.

Cryoplanation is a type of frost weathering that modifies the landscape into terraces. Through a long geologic period of freeze-thaw activity under periglacial conditions, cryoplanation terraces can develop. At high elevations in the Richardson Mountains there are well-developed sequences of up to 15 cryoplanation terraces (Lauriol 1990). These terraces have risers (vertical surfaces) and treads (horizontal surfaces). The risers may be bare of vegetation; soils and vegetation are increasingly more well developed from the outer toe to the inner reaches of the treads.

Cryopediments

Pediments are very gently sloping (8 to 12 percent) landforms comprised of fine sediments washed down from steeper upslope terrain. Long-term weathering and downslope erosion lead to the removal of fine materials on the steeper slopes and accumulation in the pediments. Often there is a marked slope transition between these two landforms. Pediment landforms in Yukon are unique in Canada, but are comparable to other arid, non-glaciated, erosional landscapes in the world, such as the southwestern deserts of United States and southern Africa (Welch 1993b). In periglacial environments such as those in Yukon, pediments are referred to as cryopediments (Rains 2002).

Extensive pediments occur throughout the British, Barn and Richardson mountains, and where the foothills slope down to the Coastal Lowland. Pediments are typically poorly drained in this region and are blanketed with tussock cottongrass *(Eriophorum vaginatum)* ecosystems. Pediments that merge or coalesce over a large area are referred to as a pediplain.

Fellfield and felsenmeer

Extensive surfaces throughout the British and Richardson mountains are covered in boulder-sized angular rocks, referred to as fellfield, felsenmeer or blockfields. Felsenmeer or “sea of rocks” develops under periglacial conditions, and the associated frequent freeze-thaw cycles. Water infiltrates rock cracks and expands as it freezes, shattering rock into smaller fragments. Fellfield differs from talus in that it does not originate from mass movement; it typically develops on plateaus or mountain surfaces with less than 45 percent slope. Basalt and sedimentary rocks produce larger, more numerous fellfields than other types of rock. Fellfields often have limited cover of vascular plants due to

lack of soil; however, stable sites can support well-developed communities of saxicolous lichens and mosses.

Tors

Tors are highly visible rock towers on mountain slopes and ridges throughout the non-glaciated British and Richardson mountains. They are most commonly the result of differential weathering between erosion-resistant rock and a more erodible matrix. Tors are often composed of granites, but they can also be weathered from schist, sandstone and other rock types. Over long periods of weathering, granite minerals such as feldspar and mica are transformed into clay minerals, which are gradually dissolved and transported away by meltwater. The weather-resistant quartz minerals are left behind, remaining as residual deposits on summits, ridgelines and valley walls. The presence of tors is generally considered evidence of the absence of glaciation in the region, since their formation takes many millenia and they would be destroyed by any glacial advance.

Periglacial patterned ground landforms

Most of the patterned ground landforms are unique to the periglacial environment (Rains 2002). High- and low-centred polygon wetlands are numerous in the glaciated portion of the coastal lowlands. Netted vegetation is very common in the northern mountains.

Polygons

Low-centre and high-centre frost-wedge polygons are a prominent landscape feature in the level terrain of the Yukon Arctic Region. These geometric landforms occur in waterlogged, ice-rich mineral soils. Soils are generally fine-textured, mottled or gleyed, often with thin, weakly decomposed peat layers. Soils are mostly classified as Cryosols. Vegetation cover on low-centre polygons is dominated by cottongrass sedge tussocks and ericaceous low shrubs. Wetlands and ice-wedge channels are dominated by sedges and willows.

Nets and stripes

On mountain saddles and summits, unsorted or sorted circles of varying diameter often develop at the surface. The centre of the circles is comprised of fine or coarse unconsolidated material that remains unvegetated due to active cryoturbation or frost churning. Vegetation is able to establish in the more stable soil that surrounds the circles, creating a pattern known as a vegetation net. On steeper slopes, gravity pulls the substrate and the vegetation downslope, and vegetation nets can become elongated into vegetation stripes.

3.5.2 Active landforms

Active landforms occur on river floodplains and deltas, beaches and dunes at the marine interface, and in thaw slumps common on the coastal lowland.

Alluvial landforms

Low-gradient reaches of larger rivers typically have floodplains that accumulate alluvium during the spring freshet. Major active drainages such as the Firth, Malcolm, Blow, Babbage and Rapid rivers have deep active layers and warmer soils that can support medium to tall shrubs in localized areas. Many smaller creek systems, such as those of Running Creek, will have narrow alluvial deposits with deep active layers. The size of alluvial coarse fragments is a function of the velocity and power of the freshet; fine sands are deposited in slower-moving floodwaters and larger gravels or cobbles in steeper reaches.

The Mackenzie River Delta has widespread zones of active deposition of fine-textured fluvial sediments. Other major rivers have delta landforms where they enter the marine environment.

Coastal shore zone landforms

Pebble beaches occur extensively along the coastal shoreline. They are formed and maintained by wave and wind erosion in a nearly continuous process of accumulation and erosion. Dunes are maintained by wind deposition of marine sand in inland areas, but are generally uncommon in the region.

Thaw failure landforms

Active failures from heavy rainfall events and permafrost thaw are common on gradual slopes and bluffs on the coastal lowland. These slumps have semicircular scarp failures up to 5 metres in height and several hundreds of metres long, with hummocky mudflows spreading downslope from the failure face.

3.6 Permafrost and soils

3.6.1 Permafrost

Soils of the Yukon Arctic Region have developed under cold climatic conditions where permafrost and cryoturbation are the dominant influence. Permafrost is nearly continuous throughout the region. The depth of the active layer (i.e., the depth to which the soil surface is unfrozen at the time of greatest seasonal thaw in the summer) is related to climate, aspect, soil characteristics, groundwater effects and vegetation cover. The depth of the active layer varies from shallow (e.g., 30 cm) in poorly drained, fine-textured soils with an insulating cover of moss and vegetation to deep (>100 cm) in well-drained upland soils. The active layer can even be absent in gravelly alluvial sites with active groundwater movement.

The coastal lowland is characterized by shallow active layers and the accompanying impeded drainage. This is due in part to extensive fine-textured soils, the insulating effects of vegetation and accumulated organic surface horizons, and low heat accumulation due to cool coastal influences. For these reasons many coastal soils are wet, though precipitation is low, and soils have limited oxygen supply, expressed in gleyed or strongly mottled horizons.

Farther inland and in the mountains, permafrost is still almost continuous, but soils tend to be better drained. Warmer summer temperatures and less insulation from vegetation cover and accumulations of organic matter generally lead to ground thaw that is deeper than on the coast even at high elevations.

3.6.2 Soils

Soil formation in the region is dominated by freeze-thaw processes. Soils that develop through other non-cryogenic processes occur only under special and generally very localized conditions, such as river floodplains and well-drained, insolated slopes.

Cryosols

Soils that have permafrost are classified as Cryosols (CSSC 1998). The most common Cryosol group in the Yukon Arctic Region is Turbic Cryosols: resorting of materials through frost heaving are displayed in convoluted cryoturbation horizons. Orthic Turbic Cryosols are common on drier, low-elevation sites and are typical soils in mountain landscapes. Gleysolic or Histic Turbic Cryosols are typical on sites with poorly drained silty or clay-textured soils, such as pediment slopes.

Soils with permafrost within 2 m of the soil surface that do not have cryoturbation features are less common, but do occur on older, well-drained alluvial terraces. In these non-cryoturbated sites, Regosolic Static Cryosols are typical.

Non-Cryosol soils

There are localized occurrences where permafrost is lacking or very deep in the soil (more than two metres below the surface).

In major active drainages such as the Blow, Babbage and Rapid rivers and in smaller stream courses, coarse-textured soils and active groundwater flow deepen the active layer. These recent depositions of alluvial sands and gravels show little sign of weathering or cryoturbation and they develop Orthic or Cumulic Regosols. Orthic Eutric Regosols may occur on well-drained fluvial terraces above the valley floor.

Brunisolic soils show some soil weathering and develop on warmer or rapidly drained sites which have been undisturbed for some time. This includes some larger alluvial floodplains (e.g., Babbage River); coarse-textured glaciofluvial terraces (e.g., east of the Richardson Mountains); or well-drained south-facing slopes (e.g., Firth River valley). Brunisols rarely occur in the region.

An unusual soil described as Rendzina occurs in the weathered regolith of the non-glaciated British Mountains (Welch and Smith 1993). The Rendzina soil profile is characterized by a calcareous humus layer developed over a shallow, dark-brown mineral soil that is underlain by limestone bedrock. Rendzina soils can be associated with distinctive plant communities that may include rare or unusual species.

3.7 Vegetation of the Yukon Arctic Region

The vegetation of the Yukon Arctic Region is broadly the result of the cold high latitude climates and short growing seasons, as described in Section 3.2. Variations in this climate regime within the region are related to distance from the cold Arctic Ocean and to altitude and aspect. In the most benign climates of the region, a continuous cover of vegetation and the presence of tall shrubs in protected locations are typical. As conditions become increasingly harsh, shrub height and cover decline and vegetation cover becomes increasingly sparse. This distribution of vegetation is described in detail in Section 5.1.

Several other non-climatic factors influence regional distribution and occurrence of vegetation species within the region.

3.7.1 Biogeography

The vascular flora of the Yukon Arctic Region is comprised of 43% circumpolar, 38% North American and 19% amphiberingian species (Ritchie 1984). The amphiberingian element of the Yukon flora aligns with Alaskan flora and separates this region from the Canadian Arctic regions east of the Mackenzie River Delta. Some of the amphiberingian species that occur as diagnostic species in Yukon ecosystems include *Astragalus umbellatus, Boykinia richardsonii, Carex lugens, Dryas alaskensis*, *Oxytropis nigrescens, Salix chamissonis, S. ovalifolia, S. phlebophylla* and *S. pulchra.* Other amphiberingian species such as *Saxifraga hieraciifolia, Spiraea stevenii, Tofieldia coccinea, Viola epipsila* ssp. *repens* and *Wilhelmsia physodes* are common in some ecosystems, but rarely abundant. Many others occur, but with less frequency. Amphiberingian vascular plants are identified in Appendix 4.

The bryophyte flora of the Yukon Arctic Region is more cosmopolitan than the vascular flora, and is comprised of 94% circumpolar, 4% amphiberingian and 3% North American species (Ritchie 1984).

3.7.2 Geology

Much of the Yukon Arctic Region is comprised of soils derived from local bedrock that have developed over a long period of weathering. In these circumstances, the effects of geology on vegetation may be pronounced. Only the eastern coastal lowland is blanketed with soils derived of mixed parent source from glacial commingling. Accumulations of organic matter are common in the low arctic and they may mask the effects mineral soil composition. The floristic-geology relationship is often most clearly observed on rock outcrops, ridge crests and mountain summits or at higher latitudes with very thin soils directly derived from the local geology.

The most common and pronounced geological effect on vegetation in tundra environments is from calcareous and non-calcareous substrates. In the Yukon Arctic Region, a mix of calcareous and non-calcareous geology is found (Figure 3-4).

Some of the common species affiliations to calcareous and non-calcareous soils are listed in Table 3-2.

Table 3-2. Species with general preference for calcareous versus non-calcareous substrates

Geology	Common species
Calcareous	*Carex scirpoidea*, *Dasiphora fruticosa*, *Dryas integrifolia*, Leguminous forbs *(Hedysarum alpinum, Oxytropis maydelliana, O. nigrescens)*, *Rhododendron lapponicum*, *Salix alaxensis, S. glauca, S. richardsonii*, *Tofieldia coccinea*, *Zigadenus elegans*
Non-calcareous	*Alnus viridus*, *Anthoxanthum monticola*, *Carex bigelowii, C. microchaeta*, Ericaceous ground shrubs *(Empetrum nigrum, Rhododendron groenlandicum, Vaccinium vitis-idaea)*, *Festuca altaica*, *Rubus chamaemorus*, *Salix phlebophylla, S. pulchra*

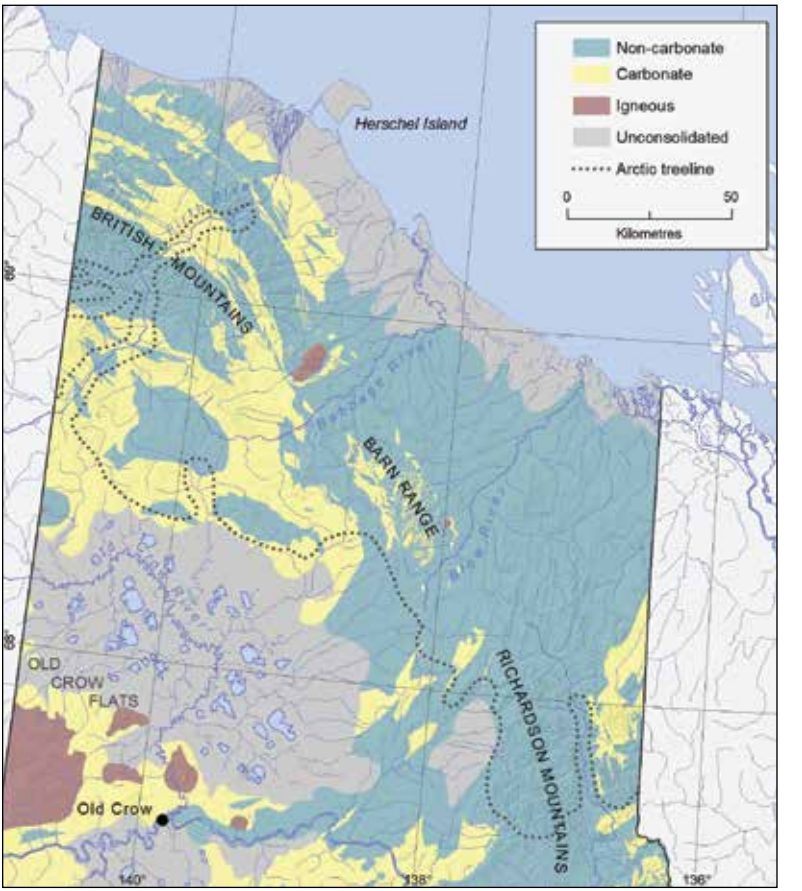


Figure 3-4. Surficial geology in the Yukon Arctic Region (Yukon Geological Survey 2018)

Investigators in the British and Richardson mountains reported a strong geological control over the distribution of some species (Welsh and Rigby 1971b). Soils developed directly from bedrock have specific chemical and textural characteristics that often support species that are uncommon elsewhere. These characteristics include physical (absolute amount of fine-fraction versus coarse fragment, soil texture) and chemical (pH, micro-nutrients, toxicity) differences. Species-bedrock relations are often not obligate; however, many species will occur more frequently and at higher abundance on preferred substrates and less frequently on non-preferred soil types. The vegetation on silicious rocks, such as chert, tends to have lower species diversity than that on limestone and shale (Table 3-3).

Table 3-3. Species with restricted preference for bedrock geology

Substrate	Species
Limestone	*Alyssum americanum, Braya purpurascens, Melandrium apetala, Minuartia rossii* var. *elegans, Saxifraga caespitosa, Silene involucrata*
Slate and schists	*Douglasia arctica, Minuartia macrocarpa, Minuartia rubella, Saxifraga eschscholtzii, Tephroseris lindstroemii*
Silicious conglomerates and sandstone	*Loiseleuria procumbens, Potentilla elegans, Saussurea angustifolia*
Shale	*Saxifraga exilis, Saxifraga serpyllifolia*

Source: Welsh and Rigby (1971b)

4.0 How to use the guide

Site units are comprised of ecosites. Ecosite phases are also described for some units.

Ecosite identification involves two steps:

- accurate description (determination and recording) of site, soil and vegetation characteristics; and
- use of the various aids and descriptive materials in this guide to determine the ecosite that best matches these characteristics.

4.1 Description of ecosites

In most cases, a field visit is necessary to confirm an ecosite identification. A vegetation assessment often provides sufficient information for identification of an ecosite, but for a full ecosystem description it is necessary to collect site and soils information (Table 4-1) . Data should be collected using field forms and methods described in the Field Manual for Describing Yukon Ecosystems (Environment Yukon 2017), or the Field Manual for Describing Terrestrial Ecosystems. 2nd Edition (B.C. Ministry of Environment and B.C. Ministry of Forests and Range 2010). Several keys to assist in the identification of ecosite characteristics are provided in Appendix 5 and Appendix 6.

Table 4-1. Site and soil features that are important in characterizing arctic ecosites

Site features	Soil features	
• Elevation	• Soil texture/coarse fragment %	• Humus thickness
• Slope position	• Active layer thickness	• Humus form
• Slope gradient	• Soil depth	• Type of A horizon
• Aspect	• Rooting depth	• Presence of gleying
• Floodplain	• Depth to root-restricting layer	• Bedrock geology
• Exposure	• Depth to water table	• Soil drainage
• Disturbance	• pH	• Degree of cryoturbation

In most situations, the observer would carry out the following steps.

Step 1: Select sample area. Locate an area for assessment that appears to be representative of the site being sampled, and is as homogeneous in plant cover and overstorey canopy condition as possible. The area should not have pronounced differences in site, soil or vegetation that may indicate another ecosite, and should exclude edge effects and disturbances such as roads or paths. The assessment area should ideally be at least 100 sq. m for tundra ecosystems, although a smaller plot size may be required for some sites to maintain homogeneity.

Step 2: Describe vegetation. Record as many of the plant species in the plot as possible. Estimate the percent cover of each species. Appendix 5, Figures A5.9 and A5.10 provide comparison charts for visual estimating foliage cover.

Step 3: Describe site and soil characteristics. Determine and record the site and soil information important for site identification. The keys and codes in Appendix 5 outline some of the more important site and soil features to be recorded. More detailed site and soil information may be required for certain purposes.

Step 4: Determine soil moisture and relative snow cover regime. Using the site and soil factors recorded, determine the relative soil moisture regime and relative snow cover regime, using the keys provided in Appendix 5.

4.2 Identifying ecosystem units

Once information about the site, soil and vegetation has been recorded for a given area, the ecosite unit can be identified and named. Several aids are presented in this field guide to assist in identifying ecosystem units:

- two-page ecosite descriptions of the concept, vegetation and typical environment for ecosystems;
- comparative vegetation summary tables, which are used in this guide to compare floristic features between ecosites within ecosite classes (Section 5.1);
- chionoedaphic grids showing the site relationship between ecosites on relative soil moisture and snow cover regime gradients within each arctic bioclimate;
- landscape profiles depicting the typical ecosystem position and the underlying parent materials and permafrost depths. The profiles also show ecosystems that commonly occur adjacent to each other.
- keys to ecosites and vegetation association. A key using distinctive site features and diagnostic species is provided as aid to identification of ecosites.

It should not be expected that a field site will perfectly match all the details in the description of an ecosite unit in this guide. Sites that are classified within an ecosite comprise a set of floristic and site conditions that describe a conceptual unit of classification. The site should reasonably match the concept and principal features of an ecosite.

Although the ecosite classification represents most of the variability in a subzone, some ecosystems will likely not appear to fit any of the described ecosites. This may be because the ecosystem is located in a geographically transitional area between two or more bioclimate subzones and so reflects the transitional climate.

Alternatively, an ecosite may be located on a transitional site that has features of two ecosites. In the latter case, the assessment plot might be relocated to more accurately represent one ecosite or the other. If this is not possible,

then the characteristics of the site as compared to both site units should be considered.

A "poor fit" could also be due to site disturbance (see Section 5.0) or to encountering an ecosystem that has not yet been described. If this is the case, it should be brought to the attention of the ELC Program.

4.3 Unit names and codes

Ecosite names use common English plant names that are important indicators of the vegetation found on the ecosite. Shortened English names are used for many ecosite names to reduce the label size for units. For example, the zonal ecosite in the Arctic Low Shrub Tundra Zone area is named Dwarf birch – Labrador tea – Crowberry. The full common name for this unit would be Arctic dwarf birch – Northern Labrador tea – crowberry. Sometimes, species names are combined to reflect similar ecological indicator value, or where the taxonomic detail in the plot data precludes the use of specifics. These are represented in labelling by a generic common name (e.g., "peat moss" to represent multiple species of sphagnum.

This field guide assigns each ecosite a two-letter ecosite group code (see Section 5.1), followed by a two-digit association code. The example in the previous paragraph is coded as a member of the Shrub tundra group (St01).

Each ecosite is defined by a vegetation association and has a unique scientific name. Vegetation units are named using scientific names for species. In the association name, species within the same physiognomic layer (shrub, herb, moss/lichen) are separated by an en dash with a space before and after (–). Species of different strata are separated by a forward slash with a space before and after (/). For example, in the *Betula nana – Rhododendron tomentosum / Rubus chamaemorus / Sphagnum* association the two shrub species are separated by the dash, and the shrub, herb and moss layers are separated by the slash. Shortened association codes are assigned to these units in Appendix 2.

Some ecosites in this guide have several ecosite subassociations. These subassociations share similar indicator species groups that reflect equivalent site conditions, but the prominence of a single species differentiates between ecosite subassociations. Ecosite subassociations are coded with a number that following the ecosite label, separated by a period. Subassociates are presented in individual ecosite descriptions (Section 6). Subassociations are named using a single species indicative of the sub-unit; the terms typic or sparse indicate a typical or species-depauperate condition, respectively: Wb01.1 (typic subassociation) and Wb01.2 (willow subassociation).

4.4 Organization of ecosite descriptions

The core of this guide is the description of each ecosite presented in Section 6 (see example in Figure 4-1). Each ecosite description includes the following information:

1. a concept statement outlines the general ecological conditions and distribution for the unit;
2. a description of vegetation outlines the dominant, characteristic and common associates, along with comments on vegetation structure and variability;
3. the environmental conditions include the dominant and characteristic site and soil conditions (see Table 4-2);
4. a photo of a selected plot is a representative example of the ecosite;
5. a range map shows the locations of plots assigned to the unit;
6. an environment table lists the specific values for selected environmental attributes;
7. a vegetation summary table lists species, ordered by life form (stratum), that occur with high freqency within the ecosite (see Table 4-3); and
8. comments include observations about similarity to other ecosystems or other specific values.

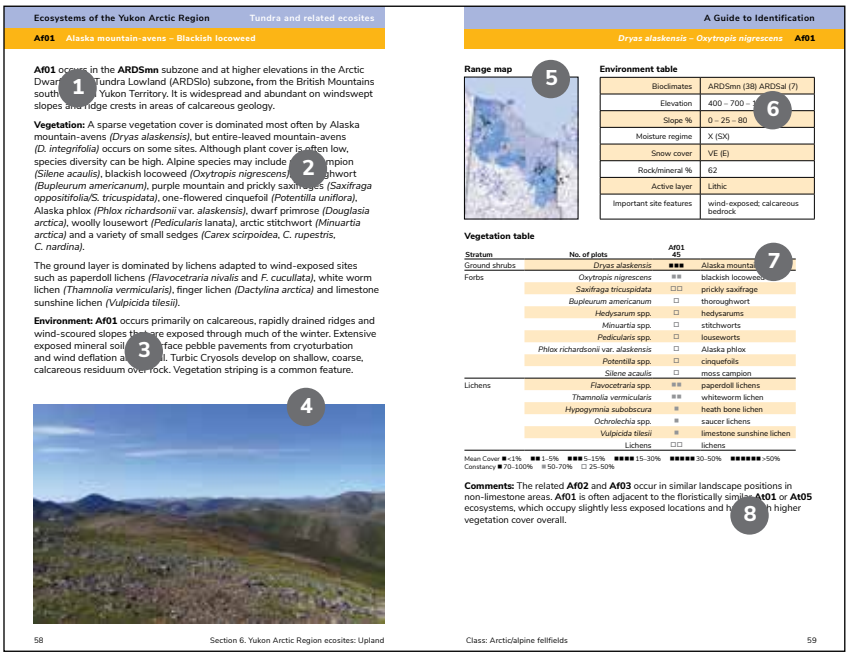


Figure 4-1. Sample of ecosite description in Section 6

Table 4-2. Environment table information

Bioclimates	Occurrence by arctic zone/subzone (plot count per unit)
Elevation	Range and mean elevations of plots
Slope %	Range and mean slope grade
Moisture regime	Soil moisture regime category (plot count per category)
Soil class	CSSC Soil great group (plot count); subgroup in select cases
Rock/mineral %	Mean cover of unvegetated surface rock, bedrock, or raw mineral soil
Active layer	General depth of active layer: shallow <30 cm; medium 30–60 cm; deep >60 cm
Important site features	Distinctive and typical site, soil or other factors

4.4.1 Vegetation tables

The vegetation tables provide a summary of the important and common species for specific ecosites and for comparisons of vegetation between classification units. The tables show constancy and mean cover for classes of species (or groups of species; see Table 4-3). The species are organized by life form; e.g., trees, shrubs, ground shrubs, etc. Scientific names are displayed on the left side of the table (except in the case of groupings of species, which may only have a common name), and common English names, on the right side.

Table 4-3. Symbols used to denote cover and constancy in the vegetation tables

Constancy	Mean cover					
	<1%	1–5%	5–15%	15–30%	30–50%	>50%
70–100%	■	■■	■■■	■■■■	■■■■■	■■■■■■
50–70%	■	■■	■■■	■■■■	■■■■■	■■■■■■
25–50%	□	□□	□□□	□□□□	□□□□□	□□□□□□

Mean Cover ■ < 1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

The vegetation tables are general guides to the dominant and indicator species that best characterize each unit (Table 4-4). The actual abundance of plant species on any given site will depend on site, seasonal and stochastic variability. The vegetation tables are derived from data collected in the sample plots that were used to classify and describe the ecosites. Some plants may be unique to a particular unit; this usually occurs at the extremes of the environmental gradient (e.g., in the driest or wettest units). Most sites, however, do not have exclusive plant species, and it is usually the relative abundance as well as the presence or absence of a group of plants that distinguishes one vegetation unit from another.

Table 4-4. Example of a vegetation table (At02)

Stratum	no. of plots	At02 88	At02.1 56	At02.2 32	
Ground shrubs	*Salix arctica*	■■■■	■■■■	■■■■	arctic willow
	Dryas integrifolia	■■■■■	■■■■■	■■■■■	entire-leaved mountain-avens
	Salix reticulata	■■■	■■■	■■■	net-veined willow
Graminoids	*Arctagrostis latifolia*	■■■	■■■	■■■	polargrass
	Carex lugens	□□	□□	□□	muskeg sedge
	Luzula nivalis	□	□	□	arctic wood-rush
Forbs	*Lupinus arcticus*	■■■	□□	■■■■	arctic lupine
	Astragalus umbellatus	■■■	■■■	■■■	tundra milk-vetch
	Oxytropis nigrescens	□□	□□	■■	blackish locoweed
	Pedicularis capitata	□	■	□	capitate lousewort
	Myosotis asiatica	□	□	□	mountain forget-me-not
Mosses	Mosses	■■■■	■■■■	■■■■	mosses
Lichens	Lichens	■■	■■	■■	lichens
	Flavocetraria spp.	□□		□□	paperdoll lichens

Mean Cover ■ < 1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

4.4.2 Chionoedaphic grid

Within bioclimate units, arctic ecosystems are predictably arranged on the landscape. The two main site-level drivers of this distribution are soil moisture and snow cover. The environmental relationship between ecosites can be illustrated on a chionoedaphic grid. This organizes ecosites by relative soil moisture regime (from very xeric to hydric) on the vertical axis and relative snow cover (from very exposed to very protected) on the horizontal axis (Figure 4-2). There is a generally positive correlation between soil moisture regime and snow cover. Ecosystems of drier sites commonly have little winter snow cover, and moist ecosystems are often on sites that also accumulate relatively deep snow cover.

Soil moisture is defined by Pojar et al. (1987) as the average amount of soil water available annually for evapotranspiration by vascular plants over several years. Krajina (1969) adopted nine relative soil moisture (SMR) classes, which are applied to the chionoedaphic grid. The water demands of arctic vegetation are relatively low; however, the extremes of the moisture gradient, particularly wetter conditions, affect vegetation communities in tundra environments. Keys to SMR are found in Appendix 5.

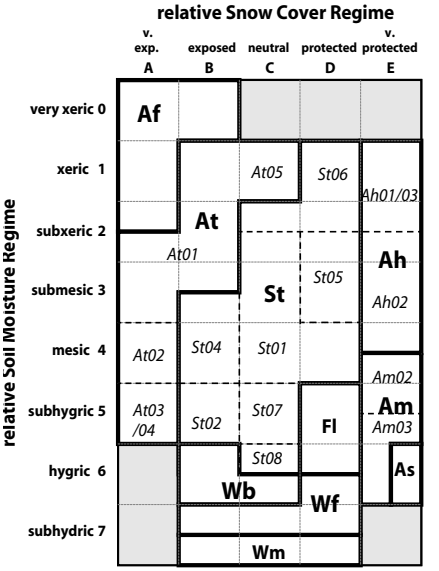


Figure 4-2. Example of a chionoedaphic grid

4.4.3 Relative snow cover regime (rSCR)

Snow has a profound influence on vegetation in tundra environments. Winter snow cover provides protection from desiccating winds and freezing temperatures, and provides early growing season moisture. Conversely, snow may shorten the length of the growing season if it is sufficiently deep or is in a cold location. Although total annual snow accumulation is one factor in site snow cover, the more important process is the redistribution of snow by prevailing winds. Snow redistribution is topographically driven, transported from wind-exposed convex sites to lee slopes and concavities in the landscape. This guide uses a five-category qualitative scale for relative snow cover regime.

A – Very Exposed: These sites are in the most exposed landscape positions, with extreme wind erosion of snow cover and a very thin snowpack relative to the average. These sites are the first to be free of snow in spring. They generally occur on the windward side of ridge crests.

B – Exposed: These are areas of relative snow loss in the landscape, with periodic snow thinning during high winds. Sites may be exposed during periods of low snow or high wind while most of the landscape remains covered. Sites are generally snow free relatively early in the growing season. Typical landscape positions include convex or windward slopes or elevated convex sites in flat terrain.

C – Neutral: These are sites with average wind effects on the landscape. Snow depths and snow release dates are average for the region. These are generally level areas or straight slopes on neutral or windward slopes.

D – Protected: These sites tend to accumulate more snow than others in the landscape, but they have limited capacity for deep accumulations. Sites become exposed after the majority of the landscape is already snow free and, except in the driest climates, are not exposed during the winter. Typical landscape positions are shallow slope hollows, cool aspect slopes, or areas with taller vegetation, which acts as a snow fence.

E – Very protected: These sites are zones of snow deposition that accumulate a deep snowpack relative to average sites. Sites are not exposed in the winter and have the latest snow release dates. Typical landscape positions are lee slopes directly downwind of abrupt slope breaks, or deep cross-loaded gullies.

Tools for determining relative rSCR are found in Appendix 5 (Table A5-4, Table A5-5 and Figure A5-7).

4.5 Taxonomic standards and terminology

The taxonomic standards applied in this guide are described in Section 1.4. The complete list of species used in the guide are presented with scientific and English common names in Appendix 4.

For most descriptions of vegetation in this guide, species are presented individually as they occur in the plot data. However, there are several cases where species have been combined for analysis and reporting. This approach was applied primarily where species are indicators for one or more ecosites and where field determination was uncertain or recent taxonomic revisions required interpretation of the historic plot data. These are some of the most important species combinations:

- *Betula nana* includes *B. glandulosa;* both occur in the Yukon Arctic Region and differentiation in the plot data is uncertain. Furthermore, these species likely hybridize in this region.
- *Dryas alaskensis* includes all the "*octopetala*" group that occurs in the Yukon Arctic Region: *D. ajanensis, D. hookeriana, D. incisa* and species recorded as *D. octopetala*. Recent taxonomic revisions exclude *D. octopetala* from Yukon, although most plot data identify this species. Collections and field observations by B. Bennett (pers. comm, 2016) indicate that *D. alaskensis* is the most widespread of this group in all habitats and geological types of the Yukon Arctic Region, and so this species is used in the guide to represent the entire species complex.

Other taxonomic groupings are applied in the guide where species have similar ecological value and/or where taxonomic differentiation in the data is poor. Most often species are simply grouped to the genus level, but in some cases species of different genera are combined:

- *Arctous* spp. — includes *Arctous alpinus* and *A. rubra;*
- *Douglasia* spp. — all species;
- *Draba* spp. — all species;
- *Eriophorum scheuchzeri* — includes *E. chamissonis;*
- *Hippuris* spp. — includes *H. lanceolata* and *H. vulgaris;*

- *Minuartia* spp. — all species;
- *Pedicularis* spp. — all species; and
- *Petasites frigidus* — includes *P. frigidus* var. *frigidus* and *P. frigidus* var. *palmatus*

Differentiation of bryophyte and lichen species is often poor in historical plot data for the Yukon Arctic Region, and is often recorded only to the level of life form. In most ecosite descriptions, the species list and cover values have been assigned from a subset of plots where the species data was collected. In some cases, however, no complete data was available and the description indicates only "moss" or "lichen." Genus-level lumping was applied to the following taxa in most cases:

- *Alectoria;*
- *Brachythecium;*
- *Cladonia;*
- *Dicranum;*
- *Flavocetraria;*
- *Peltigera;*
- *Pohlia;*
- *Polytrichum;*
- *Racomitrium;*
- *Sphagnum;*
- *Stereocaulon;* and
- *Umbilicaria.*

This guide applies the term "ground shrub" to woody species with a genetically low growth form that never exceeds 15 cm in height even under optimal growing conditions. Species include *Dryas* spp., *Cassiope* spp., dwarf *Salix* spp., *Rubus chamaemorus*, *Vaccinium vitis-idaea* and others. Species designated as ground shrubs are listed in Appendix 4.

5.0 Yukon Arctic Region ecosites: general description

For the ecosites described in this guide, four dominant environmental factors affect vegetation at various scales: climate (regional), mineralogy (regional/site), snow cover (site), and soil moisture (site). Additional site factors affect and define specific ecosystem groups. These include slope failures (disturbance ecosystems), concentrated animal activities (zooclimax ecosystems), exposure to saltwater influence (beachlands and estuarine ecosystems), and hydrological conditions (wetlands and flood ecosystems). This section describes Yukon Arctic Region ecosites in these contexts.

5.1 Ecosite classes

The 50 ecosites described in this guide are organized into 14 ecosite classes. Most ecosites are represented by a single plant association, but some are represented by several vegetation units. If the ecosite is represented by more than one vegetation unit, the number of vegetation units is provided in brackets beside the ecosite name.

5.1.1 Upland ecosite classes

Arctic/alpine fellfields (Af)

Arctic/alpine fellfields are ecosystems of winter-exposed locations where the dynamics of cryoturbation and wind deflation give rise to characteristic low vascular plant cover in a matrix of raw or lichen covered rock or mineral soil. Sites are generally xeric and nutritionally impoverished. A thin snowpack leads to active freeze–thaw cycles and wind scouring is common. Ecosites with <20% vascular plant cover are generally considered members of the fellfield group. Species that can tolerate wind dessication, unstable soils and extremely harsh climatic conditions predominate. **Af** ecosystems may occur on shattered bedrock (block field), active colluvium (scree), or cryoturbated and wind-deflated mineral soils.

The guide describes five fellfield ecosites:

- **Af01** Alaska mountain-avens – Blackish locoweed
- **Af02** Alaska mountain-avens – Skeleton-leaved willow
- **Af03** Skeleton-leaved willow / Lichens
- **Af04** Rocktripe – Green map lichen
- **Af05** Prickly saxifrage – Smelowskia – Poppy

Table 5-1 provides a comparative vegetation summary of fellfield ecosites.

Fellfield ecosites have small patches of vascular vegetation in extensive exposed rock and mineral soil from cryoturbation and wind deflation.

Arctic/alpine tundra (At)

Arctic/alpine tundra ecosystems are relatively well-vegetated ecosystems of mixed life form composition, commonly with an abundance of ground shrub species and a variable component of graminoids, forbs, mosses and lichens. They occur on cold circum-mesic sites that have thin to moderate snow cover.

The guide describes five tundra ecosites:

- **At01** Entire-leaved mountain-avens / Bearberry – Hedysarum
- **At02** Arctic willow – Entire-leaved mountain-avens – Tundra milk-vetch (2)
- **At03** Net-veined willow – Entire-leaved mountain-avens – Horsetail (2)
- **At04** Entire-leaved mountain-avens – Muskeg sedge (2)
- **At05** Alaska mountain-avens – Net-leaved willow – Lupine

A comparative vegetation summary of tundra ecosites is presented in Table 5-1.

Arctic/alpine heather snowbeds (Ah)

Arctic/alpine heath are Heath–dominated ecosystems that occur in snow-accumulating sites and generally dry to moist stable or weakly mobile substrates. *Cassiope tetragona* is the only mountain-heather species that occurs in the Yukon Arctic Region; it dominates all **Ah** ecosites.

The guide describes three heather snowbeds ecosites:

- **Ah01** Mountain heather – Alaska mountain-avens – Lupine (3)
- **Ah02** Mountain-heather – Mountain-avens – Brookfoam (2)
- **Ah03** Labrador tea / Mountain-heather – Lowbush cranberry

Table 5-1 provides a comparative vegetation summary of Heath ecosites.

Tundra ecosites have nearly continuous vegetation dominated by ground shrubs.

A relatively lush heather snowbed ecosystem with abundant brookfoam and lupine.

Arctic/alpine meadows (Am)

Arctic/alpine meadow ecosystems are lush tall sedge- or grass-dominated communities where forbs and horsetails are generally prominent. Vascular plant cover is typically lush, continuous and often of moderate stature (50 cm). These ecosystems occur on fresh to moist soils, usually well-developed. These soils have a deep and continuous winter snowpack that protects them and their vegetation from freezing; the active layer is typically deep. Sites are commonly well-watered from seepage and are in slope locations that encourage accumulation of snow and accelerated rates of snowmelt.

Table 5-1. Vegetation summary for fellfield (Af), tundra (At) and heath (Ah) ecosites

Stratum		Af01 45	Af02 87	Af03 39	Af04 19	Af05 8	Ah01 65
Shrubs	*Vaccinium uliginosum*		□□	□			■■■
	Betula nana		□□	□			■■
	Alnus viridis spp. *crispa*						
	Salix alaxensis						
	Salix glauca						
	Rhododendron tomentosum		□	□□	□		□
	Dasiphora fruticosa						□
	Rhododendron lapponicum						□
Ground shrubs	*Salix phlebophylla*		■■■	■■■			□□
	Dryas alaskensis	■■■	■■■	□		■	■■■
	Cassiope tetragona		□	□□	□		■■■■
	Vaccinium vitis-idaea		□	□□			□□
	Empetrum nigrum		□				□□
	Dryas integrifolia	□□					□□□
	Salix arctica						
	Salix reticulata						■■
	Arctous spp.	□	□□	□			■■
Ferns and allies	*Equisetum arvense*						
Graminoids	*Anthoxanthum monticola*	□	■■	■■	□	□	□
	Poa glauca					■■	
	Carex microchaeta		□	□□			
	Arctagrostis latifolia						
	Carex lugens						□
	Carex scirpoidea						□
	Eriophorum vaginatum						
Forbs	*Oxytropis nigrescens*	■■	■■	□		□	
	Saxifraga tricuspidata	□□	□□	□		■■	□
	Minuartia spp.	□	■	■		■	□
	Douglasia arctica	□	□	□		□	
	Silene acaulis	□	□			□	□
	Lupinus arcticus	□	□			□	■■
	Pedicularis spp.	□	□			□	■
	Papaver spp.	□	□			□	□
	Bistorta vivipara	□					□
	Boykinia richardsonii						
	Oxytropis spp.						□
	Hedysarum spp.	□					□
	Astragalus spp.	□					
	Bistorta plumosa						■
	Arnica spp.						□
	Geum spp.						□
	Petasites frigidus						□
	Pyrola grandiflora						□
	Saussurea angustifolia						□
	Tofieldia pusilla						□
Mosses	Mosses	□□	□□		□	□	□□□
	Polytrichum spp.		□□	■■■	□		□
	Aulacomnium turgidum						
Lichens	Lichens	□□	■■■	■■■■	■■■■■		□□
	Flavocetraria spp.	■■	■■	■■	□	□	■■
	Thamnolia vermicularis	■■	■■	■	□	□	□
	Alectoria spp.		□	□□	□		
	Cetraria spp.	□		□			
	Dactylina spp.						□
	Umbilicaria spp.	□□	■■■	■■■	■■■■■		
	Stereocaulon spp.	□	■■	■■	□		□

Mean Cover ■ < 1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Ah02 34	Ah03 58	At01 27	At02 88	At03 22	At04 30	At05 46	
■■	■■	□		■■	□	□□	bog blueberry
□□	■■	□		□		□	dwarf birch
□□							green alder
□□							feltleaf willow
□□		□		□□		□	grey-leaved willow
□	■■■						northern Labrador tea
□				□			shrubby cinquefoil
□		□		□	□	□	Lapland rosebay
	□□	□			□		skeleton-leaved willow
■■■	□□	□□	□□□	□□		■■■■■	Alaska mountain-avens
■■■■	■■■■	□□		■■	□□	□□	arctic mountain-heather
□	■■■						lowbush cranberry
□	■■	□					crowberry
□□□		■■■■■	■■■■■	■■■	■■■■		entire-leaved mountain-avens
		□	■■■■	□□	■■		arctic willow
■■■		■■	■■■	■■■	■■■	■■■	net-veined willow
□□	□□	■■		■■■	□□	□□	bearberries
□				■■■■	□□		common horsetail
	□				□	□	alpine sweetgrass
						□	glaucous bluegrass
	□					□□	small-awned sedge
	□	□	■■■	□□	■■	□	polargrass
□□	□	□	□□	□□	■■■■	□	muskeg sedge
□		■■		□		□	single-spike sedge
					■■■		tussock cotton-grass
		□	□			□□	blackish locoweed
						□	prickly saxifrage
□	□	□	□		□	□	stitchworts
						□	dwarf primrose
□		■				□	moss campion
■■	□	□□	■■■	□	□□	■■■	arctic lupine
■	□	■	□	■	■	■	louseworts
□		□	□		□	□	poppies
□		■	□	□	□	□	alpine bistort
■■■				□			Richardson's brookfoam
□		■■	□□		□	□	locoweeds
□		■■		■■		□□	hedysarums
□		□	■■■	□	□	□	milk-vetches
□	■■	□		□	■■	□	meadow bistort
□	□					□	arnicas
□		□				□	avens
□	□			□□	□□	□	arctic coltsfoot
□	□						arctic wintergreen
□	□	□		□	□	□	narrow-leaved sawwort
□		□		□			small false-asphodel
■■■■	□□□	■■■	■■■■	■■■■■	■■■■■	□□	mosses
	□□					□	haircap
□□	□					□	mountain groove moss
□□	□□	□□	■■	□	■■	□□	lichens
	■■	□□	□□	□	□□	■■	paperdoll lichens
	□	□□	□		□	□	whiteworm lichen
	□		□		□	□	witch's hair lichens
	□		□		□	□	Cetraria lichen
	■	□	□		□		finger lichens
	□□						rocktripe lichens
	□□	□				□	foam lichens

The guide describes four meadows:

- **Am01** Graceful mountain sedge – Horsetail – Mountain-sorrel
- **Am02** Chamisso's willow – Horsetail – Shootingstar
- **Am03** Bluejoint – Horsetail – Marsh violet
- **Am04** Altai fescue – Graceful mountain sedge – Mountain sagewort

Table 5-2 provides a comparative vegetation summary of meadow ecosites.

Creekside arctic meadow in a snow-accumulating gully in the eastern north slope

Arctic/alpine late snowbeds (As)

Very late snowbed or nivation ecosystems occur under very deep and/or persistent snowpacks that last well into the growing season. These ecosystems commonly have low plant cover with high cover of bare soil or rock. Since most vegetation cannot tolerate the short growing season and environmental conditions, species diversity is often low. Erosion during snowbed melting (nivation) and growing-season cryoturbation is extreme due to lack of vegetation cover and high soil moisture.

A single Late Snowbed ecosystem is described from Lambert (1968):

- **As01** Polar willow – Pygmy buttercup

Table 5-2 provides a comparative vegetation summary of snowbed ecosites.

See photo for As01 on page 92.

Arctic/alpine zooclimaxes (Az)

Zooclimax alpine ecosystems — those disturbed by animals — are highly localized habitats where animal activities are concentrated. Zooclimax ecosystems may result from animal burrowing (e.g., denning sites) and/or concentrated use (e.g., animal bedding or nesting sites). Animal activities affect most ecosystems, but the zooclimax class designation is restricted to those ecosystems where the vegetation is distinctively unrelated to site conditions because of animal use. In tundra environments, Az ecosystems are often more productive than adjacent ecosystems due to nutrient enrichment and soil disturbance.

The guide describes a single zooclimax ecosite:

- **Az01** Arctic willow – Trisetum – Jacob's-ladder (2)

Table 5-2 provides a vegetation summary of the zooclimax ecosite.

An undescribed zooclimax ecosystem on an Arctic ground squirrel colony with abundant fireweed (Chamerion angustifolium) *and Tilesius' mugwort* (Artemisia tilesii).

Disturbance tundra associations

The disturbance ecosystems described in this guide establish on naturally occurring thaw slumps on the coastal lowlands of the Yukon Arctic Region. Thaw failure scarps and slope creep from permafrost thawing lead to exposed mineral soil and mobile substrates. These substrates support distinct communities of species that are favoured by these conditions. Since these are

Table 5-2. Vegetation summary for meadow (Am), snow (As), zooclimax (Az) and disturbance (At$) ecosites

Stratum		Am01 11	Am02 22	Am03 6	Am04 6	As01 3
Shrubs	*Salix puxlchra*	□	□□	□□□		
	Spiraea stevenii			■■		
	Betula nana				▪	
	Vaccinium uliginosum				▪	
Ground shrubs	*Salix chamissonis*	□□	■■■■			
	Salix reticulata		□□□		□	
	Vaccinium vitis-idaea				■■	
	Salix polaris					■■■■
	Salix arctica					
	Dryas integrifolia					
Ferns and allies	*Equisetum arvense*	▪▪▪	■■■	■■■■		
Graminoids	*Carex podocarpa*	■■■■	▪▪▪	□□	■■	
	Arctagrostis latifolia	▪▪	▪▪		▪▪▪	
	Poa arctica	▪	□	□	▪	▪
	Calamagrostis spp.	□□		■■■■		
	Festuca altaica	□□			■■■■	
	Carex lachenalii		□□	▪		■■■
	Trisetum spicatum	□	□		▪	
	Eriophorum scheuchzeri					
	Alopecurus magellanicus					
	Poa spp.					
Forbs	*Oxyria digyna*	▪▪▪				■■■
	Artemisia norvegica	■■	▪▪▪	■■	■■■	▪
	Petasites spp.	▪▪	▪▪▪	■■	■■■	
	Aconitum delphiniifolium	■■	▪▪	■■	▪▪	
	Polemonium acutiflorum	▪▪	▪	■■	□	
	Micranthes nelsoniana	■■	▪▪			
	Myosotis asiatica	▪▪				
	Dodecatheon frigidum	■	▪▪▪		▪▪	▪
	Anemone richardsonii	▪	▪▪	▪		
	Artemisia tilesii	□□		□□		▪
	Pedicularis spp.		▪			
	Chamerion angustifolium			▪▪▪		
	Viola epipsila			■■■		
	Senecio lugens				▪	
	Minuartia spp.				□	■■■
	Ranunculus pygmaeus					■■■■
	Tephroseris frigida					
	Astragalus spp.					
	Sibbaldia procumbens					▪▪
	Ranunculus nivalis		□			▪
	Anemone narcissiflora					▪
	Saxifraga hyperborea					▪
	Lupinus arcticus					
	Castilleja elegans					
	Oxytropis spp.					
Mosses	*Sanionia uncinata*		▪▪▪			
	Pohlia spp.		□□			■■■
	Polytrichum spp.		□□			■■■■
	Dicranella subulata					
	Mosses					
	Warnstorfia fluitans					■

Mean Cover ■ < 1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ▪ 50-70% □ 25–50%

At$1 4	At$2 10	At$3 13	Az01 12	
				diamond-leaved willow
				Alaska spiraea
				dwarf birch
				bog blueberry
				Chamisso's willow
			■■	net-veined willow
				lowbush cranberry
				polar willow
		■■■■	■■■	arctic willow
			■■■	entire-leaved mountain-avens
	□□			common horsetail
				graceful mountain sedge
	■■■■	■■	□□	polargrass
	□			arctic bluegrass
				reedgrasses
				Altai fescue
				two-tipped sedge
	□		■■	spike trisetum
■■■				Scheuchzer's cotton-grass
		■		alpine meadow-foxtail
		□□		bluegrasses
				mountain-sorrel
				mountain sagewort
	■■■	□□		coltsfoots
				monkshood
			■■	tall Jacob's-ladder
			□	Nelson's saxifrage
		■■	□	Forget-me-not
				northern shootingstar
				yellow anemone
	■■		□	Tilesius' wormwood
	□	■■	■	louseworts
				fireweed
				marsh violet
				black-tip groundsel
			□	stitchworts
				pygmy buttercup
■■■				purple-haired groundsel
		■■■	■■	milk-vetches
				sibbaldia
				snow buttercup
				narcissus-flowered anemone
				pygmy saxifrage
		■■■		arctic lupine
		■■		elegant paintbrush
		■■	□	locoweeds
				sicklemoss
□				nodding-cap moss
				haircap
□□				awl-leaved forklet moss
		■■■■	■■■■	mosses
				floating hook moss

seral ecosystems, they are treated as seral associations and not as ecosites. Some sites will retain patches of the original tundra vegetation, which may expand and re-establish on the site over time.

The guide describes three common disturbance associations:

- **At$1** Mastodon flower
- **At$2** Polargrass – Tilesius' wormwood – Coltsfoot
- **At$3** Arctic willow – Arctic lupine – Milk-vetch

Table 5-2 provides a comparative vegetation summary of disturbance associations.

Shrub tundra (St)

The subarctic/subalpine shrub tundra class includes ecosystems with cold winters and short growing seasons. This limits the establishment and growth of trees, but is suitable for supporting woody shrubs capable of growing to moderate stature (0.2–2 m). The active layer is commonly 40 cm or more in depth. Shrub tundra develops on sites with dry to very moist soils.

The guide describes eight shrub tundra ecosites:

- **St01** Dwarf birch – Labrador tea /Crowberry (2)
- **St02** Dwarf birch – Labrador tea / Muskeg sedge
- **St03** Dwarf birch / Lowbush cranberry / Lichens
- **St04** Dwarf birch/ Alaska mountain-avens (2)
- **St05** Dwarf birch/ Altai fescue
- **St06** Green alder – Alaska spirea
- **St07** Richardson's willow / Horsetail
- **St08** Diamond-leaved willow – Dwarf birch / Coltsfoot / Peat moss

Table 5-3 provides a comparative vegetation summary of shrub tundra ecosites.

A zonal shrub tundra ecosystem dominated by dwarf birch on a gradual coastal slope.

Floodplains (Fl)

Floodplain ecosystems occur on sites adjacent to streams that are flooded for moderate periods during the freshet. Annual erosion and deposition of sediments (sands and silts) may limit understorey and humus development. In arctic environments these ecosystems are differentially more productive of upland vegetation due to the increased depth of the active layer and to nutrient enrichment from subirrigation.

The guide describes four floodplain ecosites:

- **Fl01** Diamond-leaved willow/ Coltsfoot – Horsetail
- **Fl02** Green alder / Bluejoint – Coltsfoot
- **Fl03** Alaska willow / Tilesius' wormwood – Bluejoint
- **Fl04** Alaska willow / Mountain-avens

Table 5-3 provides a comparative vegetation summary of floodplain ecosites.

Floodplain ecosystems occur adjacent to small to large active channels and are typically dominated by tall stature shrubs such as feltleaf willow (Salix alaxensis).

5.1.2 Wetland ecosite classes

Wetlands are ecosystems where soils are saturated by water for enough time that excess water is the principal determinant of vegetation and soils development. Wetlands have a relative abundance of hydrophytic (wetland-adapted) plant species. In temperate regions, bogs and fens with deep peat accumulations (derived largely from mosses and sedges) are typical. The Arctic Low Shrub Tundra zone is at the climatic limits of peatland development, and peat accumulations are typically thin.

Table 5-3. Vegetation summary for shrub tundra (St) and floodplain (Fl) ecosites

Stratum		St01 72	St02 36	St03 47	St04 43	St05 8
Shrubs	*Betula nana*	■■■■	■■■	■■■■	■■■■	■■■■■
	Rhododendron tomentosum	■■■	■■■	■■	□□	■■
	Vaccinium uliginosum	■■■	■■■	■■	■■■	■■■
	Salix glauca	□□	□□		■■■	□□□
	Alnus viridis ssp. crispa					
	Salix richardsonii					
	Salix pulchra	□□	■■■	□	□□	□□
	Spiraea stevenii	□		□		□□□
	Salix alaxensis					
	Salix hastata					
Ground shrubs	*Arctous* spp.	■■■	■■	■■■	■■■	■■
	Vaccinium vitis-idaea	■■■	■■■	■■■	□□	■■
	Empetrum nigrum	■■■	■■■	□□	□□	□□
	Salix reticulata				■■	
	Dryas alaskensis	□□		□	■■■	□□
	Rubus chamaemorus		□			
	Dryas integrifolia				□□□	
	Cassiope tetragona	□□	□	□	□□	□
	Salix phlebophylla	□□		■■	□□	
Ferns and allies	*Equisetum arvense*					
Graminoids	*Arctagrostis latifolia*	□	■■			
	Carex bigelowii	□	■■■		□	
	Anthoxanthum monticola	□□	□	■■	□	□
	Festuca altaica				□	■■■
	Poa arctica	□	□			□
	Calamagrostis canadensis				□	
Forbs	*Bistorta plumosa*	■■	■■	□	□	■
	Lupinus arcticus	□□	□	□	■■	□
	Pedicularis spp.	■	■	□	■	
	Bistorta vivipara				□	□
	Petasites frigidus	□	■■		□	□
	Micranthes nelsoniana	□				□
	Polemonium acutiflorum					
	Senecio lugens					
	Hedysarum spp.				□□	
	Aconitum delphiniifolium					■
	Parnassia spp.					
	Artemisia norvegica	□		□	□	□□
Mosses	Mosses	□□□	□□□		□□□	
	Polytrichum spp.	□□	□	■■		■■
	Hylocomium splendens	□□	□□	□	□□	■■
	Rhytidium rugosum	□□			□□	□□
	Sphagnum spp.	□	■■■			
Lichens	Lichens	□		□□□	□	
	Flavocetraria spp.	■■	■■	■■■	□□	□
	Peltigera spp.	□	□			■
	Stereocaulon spp.	□□	□	■■■	□	■■
	Nephroma spp.	□		□		
	Cladonia spp.	□□	□	□□	□	■■
	Masonhalea richardsonii	□		□		■
	Cetraria spp.	□		□		□
	Dactylina spp.	□	□	□		□
	Thamnolia vermicularis	□	□	□	□	

Mean Cover ■ < 1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

St06 5	St07 13	St08 22	Fl01 46	Fl02 12	Fl03 11	Fl04 15	
■■	□	■■■	□□	□	□	□□	dwarf birch
■■	□	□□	□	□			northern Labrador tea
■		□□	□□	□	□□	□	bog blueberry
					□	□□	grey-leaved willow
■■■■■■				■■■■■■			green alder
□□	■■■■■			□□□			Richardson's willow
□□	□□	■■■■■	■■■■■■	■■■	□		diamond-leaved willow
■■		□	□□	■■■			Alaska spiraea
	□				■■■■■	■■■■	feltleaf willow
					■■■		halberd willow
■■	□□				□	■■■	bearberries
■■■	□	■■	□	□	□		lowbush cranberry
■	□	■■	□	□	□		crowberry
□	□□□	□□	□□		□	■■	net-veined willow
□						□□	Alaska mountain-avens
		■■■					cloudberry
□□	□					■■■■	entire-leaved mountain-avens
□□		□				□□	arctic mountain-heather
							skeleton-leaved willow
□	■■■■	■■■	■■■■	□□	■■	□□	common horsetail
■■	■■	■■	□□	□	□		polargrass
□	□	□	□				Bigelow's sedge
□							alpine sweetgrass
						□□	Altai fescue
□	□	□	□	□			arctic bluegrass
□□		□□	□□	■■■■	□□□	□	bluejoint reedgrass
□	□	□	□				meadow bistort
	□					□	arctic lupine
	■	■	□	□	□	■	louseworts
□□	■		□	□	□	□	alpine bistort
□□	■■	■■■	■■■■	■■■	□		arctic coltsfoot
□	□	■	■■		□		Nelson's saxifrage
	□	□	■■		□		tall Jacob's-ladder
	□		□	□	■■	□	black-tip groundsel
	□			□	■■	■■	hedysarums
	□	□	■	□	□		monkshood
	□				■	□	grass-of-Parnassuses
□	□	□	□□			□	mountain sagewort
■■■	■■■■	■■■	□□□	□□□	□□□	□□	mosses
■	□	□	□	■■	□		haircap
□□		■■■	□□				step moss
							crumpled-leaf moss
□□		■■■■		□□			peat mosses
							lichens
□		□					paperdoll lichens
□	□□	□□	□		□		pelt lichens
□	□			□	□		foam lichens
□	□						paw lichens
■■				□□			clad lichens
							arctic tumbleweed
□□							Cetraria lichen
□							finger lichens
							whiteworm lichen

Bogs (Wb)

Bogs are nutrient-poor peatlands with distinctive communities of ericaceous shrubs and hummock-forming sphagnum species that are adapted to highly acid and saturated soil conditions. In temperate climates, bogs usually develop in basins where peat accumulation has raised the wetland surface above mineral enriched groundwater flow. In the low arctic, bogs occur on level or sloping sites where shallow permafrost maintains wet conditions and limits nutrients. Under these conditions, communities of bog-affiliated species flourish.

The guide describes two bog ecosites:

- **Wb01** Dwarf birch / Lowbush cranberry – Tussock cotton-grass (4)
- **Wb02** Dwarf birch – Labrador tea / Cloudberry / Peat moss (2)

Table 5-4 provides a comparative vegetation summary of bog ecosites.

A bog ecosystem with high production of cloudberry (Rubus chamaemorus).

Fens (Wf)

Fens are peatlands where groundwater inflow maintains relatively high mineral content within the rooting zone. These sites are characterized by non-ericaceous shrubs, sedges, brown mosses and lawn-forming peat mosses. In the Yukon Arctic Region, fens develop on seepage slopes and wet flats and in basins, where the water table is usually at or just below the peat surface for most of the growing season. Peat accumulations are often thin in low arctic environments. The active layer is >30cm deep on most Wf sites.

The guide describes five fen ecosites:

- **Wf01** Diamond-leaved willow / Water sedge / Shaggy peat moss (3)
- **Wf02** Tall cottongrass / Peat moss (2)
- **Wf03** Creeping sedge – Water sedge / Peat moss
- **Wf04** Scheuchzeri's cottongrass – Water sedge / Baltic peat moss
- **Wf05** Loose-flowered sedge / Peat moss
- **Wf06** Richardson's willow – Water sedge

Table 5-4 provides a comparative vegetation summary of fen ecosites.

A weakly patterned fen in the lower Firth River valley.

Marshes (Wm)

Marshes are productive mineral wetlands that are flooded to a shallow extent and dominated by emergent grass-like vegetation. A fluctuating or flowing water table is typical. Ecosystem productivity is relatively high due to deep active layers and high nutrient availability. In arctic environments these conditions are associated with larger ponds, lakes and slow-moving stream courses.

The guide describes two marsh ecosites:

- **Wm01** Pendantgrass
- **Wm02** Fisher's tundragrass – Water sedge

Table 5-4 provides a comparative vegetation summary of marsh ecosites.

Table 5-4. Vegetation summary for bog (Wb), fen (Wf) and marsh (Wm) ecosites

Stratum		Wb01 165	Wb02 50	Wf01 53	Wf02 22	Wf03 13
Shrubs	*Betula nana*	■■■	■■■■	□□	■	□
	Rhododendron tomentosum	■■■	■■■	□	□	□
	Vaccinium uliginosum	□□	■■■	□	□	□
	Salix pulchra	■■■	■■■	■■■	■■■	□
	Salix richardsonii					
Ground shrubs	*Vaccinium vitis-idaea*	■■■	■■■	□	□	
	Empetrum nigrum	■■	■■■			
	Rubus chamaemorus	■■	■■■■		□	
	Salix fuscescens			□□	□□	□
	Salix reticulata	□□			□	□
	Dryas integrifolia					□
	Salix arctica					□
	Arctous spp.	□□	□□			
	Andromeda polifolia		□	□	□	□
Ferns and allies	*Equisetum arvense*					
Graminoids	*Eriophorum vaginatum*	■■■■	■■	□	□□	
	Carex aquatilis			■■■■■	□□□	■■■■
	Eriophorum angustifolium			■■	■■■■■	□
	Carex chordorrhiza					■■■■
	Eriophorum scheuchzeri			□		■■
	Carex rariflora			□		□
	Carex bigelowii	■■	□□	□	□□	□□
	Arctagrostis latifolia	□	□		□	
	Carex spp.					
	Arctophila fulva					
	Carex rostrata					□□
	Carex rotundata					□□
	Dupontia fisheri					□
Forbs	*Bistorta plumosa*	■■	■■			
	Pedicularis spp.	■	■	□	□	□
	Petasites frigidus	□□	■■			
	Comarum palustre			□□		□□
	Bistorta vivipara				□	□
	Saxifraga hirculus					□
	Saxifraga cernua					
	Caltha palustris					
	Epilobium palustre					
	Hippuris spp.					
Mosses	*Aulacomnium palustre*		□	□□	□□	
	Polytrichum spp.	□	□□	□	□□	
	Aulacomnium turgidum	□□	□		□	
	Sphagnum spp.	■■■■	■■■■■	■■■■	■■■	■■■■
	Mosses	■■■■	□□□	□□□		□□□
	Pohlia spp.					
	Brachythecium spp.					
Lichens	*Peltigera* spp.	□	□			
	Flavocetraria spp.	■■	■■			
	Cladonia spp.	□□	□			
	Lichens	□□				

Mean Cover ■ < 1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Wf04 11	Wf05 5	Wf06 5	Wm01 11	Wm02 7	
□□	□□				dwarf birch
	□				northern Labrador tea
	□				bog blueberry
	□				diamond-leaved willow
		■■■■			Richardson's willow
□					lowbush cranberry
					crowberry
	□				cloudberry
□□	■■				Alaska bog willow
	□□	■■			net-veined willow
	□	■■			entire-leaved mountain-avens
		■■		□	arctic willow
		□			bearberries
	■■				bog-rosemary
	□	□		■■	common horsetail
		□□			tussock cotton-grass
□□□	■■	■■■■	■■	■■■	water sedge
□□	□	■■		□□	tall cotton-grass
					creeping sedge
■■■■■	□		□□		Scheuchzer's cotton-grass
	■■■■■	□			loose-flowered sedge
		□□			Bigelow's sedge
		□□			polargrass
		□□			sedges
			■■■■■	□	pendantgrass
□	□	□			beaked sedge
	□□□				round sedge
	□□	□		■■■■	Fisher's tundragrass
	□				meadow bistort
□	■	□		□	louseworts
		□		□	arctic coltsfoot
	□				marsh cinquefoil
	□	□			alpine bistort
	□	■		□	yellow marsh saxifrage
		□		■	nodding saxifrage
	□	□		□	yellow marsh-marigold
			□□		marsh willowherb
			□□		mare's-tails
□□					glow moss
□	■■				haircap
□	□				mountain groove moss
■■■■■	■■■■■	□	□		peat mosses
	□□	■■■■■	□□	■■■■	mosses
		□□	□	□□	nodding-cap moss
		□□			ragged moss
		□			pelt lichens
					paperdoll lichens
					clad lichens
					lichens

A pendantgrass marsh in an oxbow of the Running River.

5.1.3 Coastal ecosite classes

Coastal ecosystems occur at the marine interface and are affected by salt spray, brackish waters and tides. They include estuarine salt marshes (which have affinities with wetland ecosystems) and beachlands (which are distinct ecosystems on partially stabilized wave- and wind-deposited sands and on gravel beaches and dunes).

Beachlands (Bb)

Beachland ecosystems occur on unconsolidated beach and dune sediments (sands/ gravels/shells/cobbles) in the supra-tidal zone of the marine environment. These areas are affected by salt spray, wind and/or water erosion, and by deposition of marine sediments. Halophytes (salt-loving or salt-tolerant) and graminoid species that have adapted to continual burying by shifting sands are common in the beach and foredune zones. Ecosystems of stabilized dune deposits are included in this class and may have higher cover of shrubs and mosses than beachlands do.

The guide describes two beachland ecosites:

- **Bb01** Seabeach sandwort
- **Bb02** Arctic dunegrass (3)

Table 5-5 provides a comparative vegetation summary of beachland ecosites.

Estuarine – Salt marshes (Em)

Estuarine and salt marsh ecosystems are dominated by species tolerant of wet, brackish soils, and are found at the interface of a freshwater source and marine environment. These ecosystems are affected by occasional or diurnal tidal inundation. Community composition is simple, often only a few species, with a single graminoid species dominating the ecosystem.

A beachland ecosystem of seabeach sandwort and sea bluebells on a sandy-pebbly beach in driftwood.

The guide describes seven estuarine – salt marsh ecosites:

- **Em01** Creeping alkaligrass
- **Em02** Hoppner's sedge
- **Em03** Loose-flowered sedge – Arctic willow
- **Em04** Saltmarsh sedge
- **Em05** Mackenzie's sedge
- **Em06** Yellowish sedge – Fisher's tundragrass
- **Em07** Four-leaved mare's-tail

Table 5-5 provides a comparative vegetation summary of estuarine – salt marsh ecosites.

An estuarine – salt marsh ecosystem of alkaligrass (Puccinellia phyrganodes) *on raw alluvium in the Mackenzie River Delta.*

Table 5-5. Vegetation summary for beachland (Bb) and estuarine – salt marsh (Em) ecosites

Stratum		Bb01 4	Bb02 13	Em01 2	Em03 6	Em04 3
Ground shrubs	*Salix arctica*		□		■■■	
	Salix ovalifolia					□□□
Graminoids	*Leymus mollis* ssp. *villosissimus*	■	■■■■	□□		■■
	Puccinellia phryganodes			■■■		
	Arctophila fulva			■■		
	Carex subspathacea			□□		■■■
	Puccinellia tenella			□□		
	Carex rariflora				■■■■	
	Dupontia fisheri				■■	
	Alopecurus magellanicus				■	
	Carex glareosa					■■■■
	Carex mackenziei					
	Carex x *flavicans*					
Forbs	*Honckenya peploides*	■				
	Castilleja elegans		□□□			
	Stellaria longipes		□			
	Potentilla egedii			■		■■■
	Stellaria humifusa					
	Rhodiola integrifolia					■
	Hippuris tetraphylla					

Mean Cover ■ < 1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Em05 3	Em06 1	Em07 0	
			arctic willow
■■	■■		oval-leaved willow
			arctic dunegrass
			creeping alkaligrass
		■	pendantgrass
			Hoppner's sedge
			tundra alkaligrass
			loose-flowered sedge
■■	■■■		Fisher's tundragrass
			alpine meadow-foxtail
			saltmarsh sedge
■■■■			Mackenzie's sedge
	■■■■■		yellowish sedge
			seabeach starwort
			elegant paintbrush
			long-stalked starwort
	■■		coast silverweed
			saltmarsh starwort
			roseroot
		■■■	four-leaved mare's-tail

6.0 Yukon Arctic Region ecosites: detailed description

Upland Ecosite Classes

Tundra and related ecosites

Meadows and other ecosites

Disturbance associations

Shrub tundra ecosites

Class: Shrub tundra

Floodplain ecosites

Class: Floodplain

Wetland Ecosite Classes

Wetland ecosites

Coastal Ecosite Classes

Beachland ecosites

Estuarine ecosites

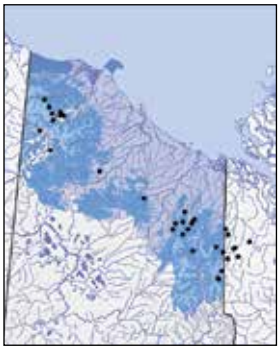
Af01 occurs in the **ARDSmn** subzone and at higher elevations in the Arctic Dwarf Shrub Tundra Lowland (ARDSlo) subzone**,** from the British Mountains south through Yukon Territory. It is widespread and abundant on windswept slopes and ridge crests in areas of calcareous geology.

Vegetation: A sparse vegetation cover is dominated most often by Alaska mountain-avens *(Dryas alaskensis)*, but entire-leaved mountain-avens *(D. integrifolia)* occurs on some sites. Although plant cover is often low, species diversity can be high. Alpine species may include moss campion *(Silene acaulis)*, blackish locoweed *(Oxytropis nigrescens)*, thoroughwort *(Bupleurum americanum)*, purple mountain and prickly saxifrages *(Saxifraga oppositifolia/S. tricuspidata)*, one-flowered cinquefoil *(Potentilla uniflora)*, Alaska phlox *(Phlox richardsonii* var. *alaskensis)*, dwarf primrose *(Douglasia arctica)*, woolly lousewort *(Pedicularis* lanata*)*, arctic stitchwort *(Minuartia arctica)* and a variety of small sedges *(Carex scirpoidea*, *C. rupestris, C. nardina)*.

The ground layer is dominated by lichens adapted to wind-exposed sites such as paperdoll lichens *(Flavocetraria nivalis* and *F. cucullata)*, white worm lichen *(Thamnolia vermicularis)*, finger lichen *(Dactylina arctica)* and limestone sunshine lichen *(Vulpicida tilesii)*.

Environment: Af01 occurs primarily on calcareous, rapidly drained ridges and wind-scoured slopes that are exposed through much of the winter. Extensive exposed mineral soil with surface pebble pavements from cryoturbation and wind deflation are typical. Turbic Cryosols develop on shallow, coarse, calcareous residuum over rock. Vegetation striping is a common feature.

Range map



Environment table

Bioclimates	ARDSmn (38) ARDSal (7)
Elevation	400 – 700 – 1060
Slope %	0 – 25 – 80
Moisture regime	X (SX)
Snow cover	VE (E)
Rock/mineral %	62
Active layer	Lithic
Important site features	wind-exposed; calcareous bedrock

Vegetation table

Stratum	No. of plots	Af01 45	
Ground shrubs	*Dryas alaskensis*	■■■	Alaska mountain-avens
Forbs	*Oxytropis nigrescens*	■■	blackish locoweed
	Saxifraga tricuspidata	□□	prickly saxifrage
	Bupleurum americanum	□	thoroughwort
	Hedysarum spp.	□	hedysarums
	Minuartia spp.	□	stitchworts
	Pedicularis spp.	□	louseworts
	Phlox richardsonii var. *alaskensis*	□	Alaska phlox
	Potentilla spp.	□	cinquefoils
	Silene acaulis	□	moss campion
Lichens	*Flavocetraria* spp.	■■	paperdoll lichens
	Thamnolia vermicularis	■■	whiteworm lichen
	Hypogymnia subobscura	■	heath bone lichen
	Ochrolechia spp.	■	saucer lichens
	Vulpicida tilesii	■	limestone sunshine lichen
	Lichens	□□	lichens

Mean Cover ■<1% ■■1–5% ■■■5–15% ■■■■15–30% ■■■■■30–50% ■■■■■■>50%
Constancy ■70–100% ■50-70% □25–50%

Comments: The related **Af02** and **Af03** occur in similar landscape positions in non-limestone areas. **Af01** is often adjacent to the floristically similar **At01** or **At05** ecosystems, which occupy slightly less exposed locations and have much higher vegetation cover overall.

Af02 Alaska mountain-avens – Skeleton-leaved willow

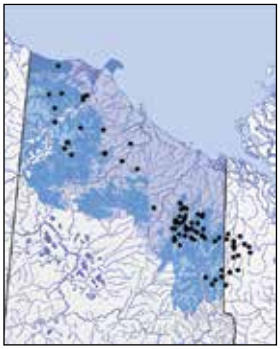
Af02 occurs in **ARDSmn** and **ARDSal** throughout the northern mountains, where it is common on windswept slopes and ridge crests in areas of non-calcareous geology.

Vegetation: An open to sparse vegetation cover is dominated by low patches of Alaska mountain-avens *(Dryas alaskensis)* and skeleton-leaved willow *(Salix phlebophylla).* Alpine sweetgrass *(Anthoxanthum monticola) and* blackish locoweed *(Oxytropis nigrescens)* commonly occur. Although plant cover is often low, species diversity can be high. Other alpine species favouring non-calcareous substrates occur, such as small-awned sedge *(Carex microchaeta)*, moss campion *(Silene acaulis)*, arctic stitchwort *(Minuartia arctica)* and saxifrages *(Saxifraga tricuspidata* and *S. bronchialis)*. There is typically some cover of ericaceous ground shrubs such as bog blueberry *(Vaccinium uliginosum)*, lowbush cranberry *(V. vitis-idaea)*, or crowberry *(Empetrum nigrum),* but species frequency is low.

The ground layer is dominated by lichens adapted to wind-exposed sites, such as paperdoll lichens *(Flavocetraria nivali*s and *F. cucullata)*, whiteworm lichen *(Thamnolia vermicularis)*, and sometimes, low cover of mosses such as rockmoss *(Racomitrium lanuginosum)* and haircap *(Polytrichum* spp.).

Environment: This ecosite occurs primarily on non-calcareous ridges and exposed slopes that are snow free through much of the winter. Extensive exposed soils and pebble pavements from cryoturbation and wind deflation are common. Soils are commonly Turbic Cryosols. Vegetation striping is a common feature.

Range map



Environment table

Bioclimates	ARDSmn (71) ARDSal (16)
Elevation	470 – 786 – 1292
Slope %	0 – 16 – 60
Moisture regime	X – SX
Snow cover	VE (E)
Rock/mineral %	49
Active layer	Lithic
Important site features	wind-exposed; non-calcareous bedrock

Vegetation table

Stratum	no. of plots	Af02 87	
Ground shrubs	*Dryas alaskensis*	■■■	Alaska mountain-avens
	Salix phlebophylla	■■■	skeleton-leaved willow
Graminoids	*Anthoxanthum monticola*	■■	alpine sweetgrass
	Carex microchaeta	□	small-awned sedge
Ferns and allies	*Selaginella sibirica*	□	Siberian spikemoss
Forbs	*Oxytropis nigrescens*	■■	blackish locoweed
	Minuartia arctica	■	arctic stitchwort
	Saxifraga tricuspidata	□□	prickly saxifrage
	Antennaria spp.	□	pussytoes
	Douglasia arctica	□	dwarf primrose
Mosses	*Polytrichum* spp.	□□	haircap mosses
	Racomitrium lanuginosum	□□	rock moss
Lichens	*Flavocetraria* spp.	■■	paperdoll lichens
	Thamnolia vermicularis	■■	whiteworm lichen
	Stereocaulon spp.	■■	foam lichens
	Umbilicaria spp.	□□□	rocktripe lichens
	Hypogymnia subobscura	□□	heath bone lichen
	Ochrolechia spp.	□□	saucer lichens
	Bryocaulon divergens	□	northern foxhair lichen
	Arctoparmelia separata	□	rippled rockfrog lichen
	Pseudephebe pubescens	□	fine rockwool lichen
	Alectoria ochroleuca	□	green witch's hair lichen
	Parmelia omphalodes	□	unsalted shield lichen
	Sphaerophorus fragilis	□	fragile coral lichen

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: Af02 occurs on sites with slightly more wind protection and better soil development than the related **Af03.**

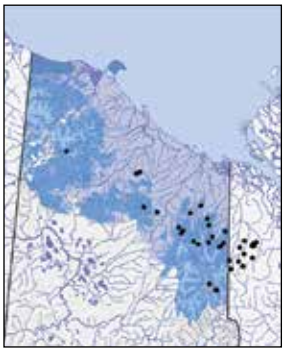
Af03 is an ecosite occurring primarily in the **ARDSmn** and **ARDSal** of the Richardson Mountains on highly wind-exposed rocky ridges and crests in areas of non-calcareous geology.

Vegetation: A sparse vegetation cover is dominated by skeleton-leaved willow *(Salix phlebophylla)* and a variety of lichens. Although vascular plant cover is typically low, species diversity can be quite high. Species of acidic sites such as alpine sweetgrass *(Anthoxanthum monticola)*, small-awned sedge *(Carex microchaeta)* and various ericaceous ground shrub species *(Vaccinium vitis-idaea*, *Loiseleuria procumbens)* are common. Protected hollows among rocks may support mountain-heather *(Cassiope tetragona)*. Other common affiliates include stitchworts *(Minuartia* spp.), spikemoss *(Selaginella siberica)* and northern wood-rush *(Luzula confusa)*.

The ground layer is dominated by saxicolous lichens of wind-exposed, non-calcareous substrates such as *Umbilicaria* species *(U. proboscidea, U. hyperborea)*, green map lichen *(Rhizocarpon geographicum)*, *Alectoria* species *(A. miniscula, A. ochroleuca, A. nigricans)*, northern foxhair lichen *(Bryocaulon divergens)*, paperdoll lichens *(Flavocetraria nivalis)*, *F. cucullata* and *Thamnolia vermicularis*. Haircap mosses *(Polytrichum piliferum/ juniperinum)* can be found scattered in protected locations with mineral soil.

Environment: This ecosite occurs primarily on rocky ridges and crests that are exposed through much of the winter. Most sites are dominated by frost-shattered rock and stone pavements with little soil. Generally, it does not occur on limestone or other calcareous bedrock types. Soils are Turbic Cryosols.

Range map



Environment table

Bioclimates	ARDSmn (38) ARDSal (7)
Elevation	400 – 700 – 1060
Slope %	0 – 25 – 80
Moisture regime	X (SX)
Snow cover	VE (E)
Rock/mineral %	62
Active layer	Lithic
Important site features	wind-exposed; calcareous bedrock

Vegetation table

Stratum	no. of plots	Af03 39	
Shrubs	*Rhododendron tomentosum*	□□	northern Labrador tea
	Vaccinium uliginosum	□	bog blueberry
Ground shrubs	*Salix phlebophylla*	■■■	skeleton-leaved willow
	Cassiope tetragona	□□	arctic mountain-heather
	Vaccinium vitis-idaea	□□	lowbush cranberry
Ferns and allies	*Selaginella sibirica*	□	Siberian spikemoss
Graminoids	*Anthoxanthum monticola*	■■	alpine sweetgrass
	Carex microchaeta	□□	small-awned sedge
	Luzula confusa	□	northern wood-rush
Forbs	*Minuartia* spp.	■	stitchworts
Mosses	*Polytrichum* spp.	■■■	haircap mosses
Lichens	*Umbilicaria* spp.	■■■	rocktripe lichens
	Flavocetraria spp.	■■	paperdoll lichens
	Stereocaulon spp.	■■	foam lichens
	Thamnolia vermicularis	■	whiteworm lichen
	Alectoria spp.	□□	witch's hair lichens
	Bryocaulon divergens	□□	northern foxhair lichen
	Ochrolechia spp.	□	Saucer lichens
	Hypogymnia subobscura	□	heath bone lichen
	Asahinea chrysantha	□	arctic-rag lichen
	Arctoparmelia separata	□	rippled rockfrog lichen
	Pseudephebe pubescens	□	fine rockwool lichen
	Sphaerophorus fragilis	□	fragile coral lichen

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: Af03 occurs on very exposed ridges with little soil. The related **Af02** occurs on similar but less extreme sites with better soils development.

Af04 Rocktripe – Greenmap lichen

Af04 is a widespread arctic-alpine ecosite of rocky blockfields in the western mountains, extending south through Yukon at high elevations above treeline. It is widespread and abundant in regions with hard-rock geology that weather poorly. This type of bedrock, and this ecosite, are common in the **ARDSal** and **ARDSmn** of the Richardson Mountains of the Yukon Arctic Region, but are infrequently sampled.

Vegetation: Extremely sparse vascular species cover is typical of **Af04**; vegetation is dominated by saxicolous lichens growing on stable rubble. The composition of this lichen community can vary based on rock type and exposure, but typically *Umbilicaria* species are prominent. Generally, a diversity of others lichens will occur. Taxa such as green map lichen *(Rhizocarpon geographicum)*, *Pseudephebe pubescens* and northern foxhair lichen *(Bryocaulon divergens)* are common, but many other species such as *Flavocetraria* spp., *Alectoria ochroleuca*, *Parmelia* spp. and *Cladonia* spp. also occur. Mosses are less common, but on some sites taxa such as *Racomitrium* spp. may occur in protected microsites between rocks.

Environment: Af04 generally occurs at high elevations on mountain ridges, plateaus and slopes in regions with rock types where frost shattering of the bedrock or slope failure produce stable blockfield (felsenmeer), with little or no mineral soil produced from weathering. Sites typically do not occur in snow accumulating areas. Soils are fragmental and often do not have any soil development.

Range map

Environment table

Bioclimates	ARDSmn (12) ARDSal (7)
Elevation	549 – 960 – 1645
Slope %	0 – 36 – 95
Moisture regime	VX(4) X(1)
Snow cover	VE-N
Rock/mineral %	99
Active layer	Lithic
Important site features	stable blockfield, usually of hard-rock geology

Vegetation table

Stratum	no. of plots	Af04 19	
Lichens	*Umbilicaria proboscidea*	■■■	netted rocktripe
	Umbilicaria hyperborea	■■■	blistered rocktripe
	Bryocaulon divergens	■■	northern foxhair lichen
	Pseudephebe pubescens	■■	fine rockwool lichen
	Rhizocarpon geographicum	■■	green map lichen
	Gowardia nigricans	■	gray witch's beard lichen
	Flavocetraria spp.	■	paperdoll lichens
	Arctoparmelia separata	■	rippled rockfrog lichen
	Allantoparmelia alpicola	■	rockgrub lichen
	Pseudephebe minuscula	■	coarse rockwool lichen

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: The related **Af05** occurs on more mobile talus where continual ravelling limits the establishment and development of saxicolous lichen cover.

Af05 is a common but infrequently sampled arctic-alpine ecosite occurring in the **ARDSmn** and **ARDSal** on unstable scree on steep mountain slopes.

Vegetation: Vegetation cover is usually low on these sites and variable in composition. Species tolerant of mobile and rocky soils occur, such as glaucous bluegrass *(Poa glauca)*, prickly saxifrage *(Saxifraga tricuspidata)*, smelowskia *(Smelowskia calycina* var. *porsildii*, *S. borealis)*, dwarf hawksbeard *(Askellia nana)*, cinquefoils *(Potentilla elegans*, *Potentilla uniflora)* and poppies *(Papaver* spp.) occur individually or in small patches.

Moss and lichen cover is usually very low as the constant movement and erosion of the scree limits establishment and growth of saxicolous lichens and mosses.

Environment: Af05 occurs at higher elevations on steep, rocky slopes that are continuously raveling. Surface rocks are typically in shapes that stabilize poorly, such as flat plates or rounded. These mobile soils generally have some mineral soil within the coarse fragment where vascular plants root. In the study area suitable rock types are often calcareous. Snow cover is variable in this ecosite, but they are generally not snow accumulating areas.

Range map

Environment table

Bioclimates	ARDSal (2) ARDSmn (6)
Elevation	468 – 681 – 975
Slope %	45 – 61 – 78
Moisture regime	VX – SX
Snow cover	E-N
Rock/mineral %	70
Active layer	Lithic
Important site features	unstable scree

Vegetation table

Stratum	no. of plots	Af05 8	
Ground shrubs	*Dryas alaskensis*	■	Alaska mountain-avens
Graminoids	*Poa glauca*	■■	glaucous bluegrass
Forbs	*Saxifraga tricuspidata*	■■	prickly saxifrage
	Smelowskia spp.	■	smelowskia
	Askellia nana	■	dwarf hawksbeard
	Papaver spp.	■■	poppies
	Minuartia spp.	■	stitchworts
	Potentilla spp.	■	cinquefoils
	Saxifraga bronchialis	■	spotted saxifrage
	Artemisia norvegica	■	mountain sagewort
	Bupleurum americanum	■	thoroughwort

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: This ecosite has been infrequently sampled and is poorly defined. Specific different types likely occur on talus and scree derived from different rock sources. **Af05** lacks the lichen cover of the related **Af04**, which also has low vascular vegetation; **Af04** occurs on stable talus and blockfield and has high cover of saxicolous lichens.

At01 Entire-leaved mountain-avens – Bearberry – Hedysarum

At01 is a common tundra ecosite of the **ARDSmn** and the inland **ARLS** occurring on well-developed, calcareous soils on slopes and flats with thin but mostly continuous winter snow cover.

Vegetation: Vegetative cover is moderate to high, with entire-leaved mountain avens *(Dryas integrifolia)* commonly forming a nearly continuous mat. A diversity of species is typical, although composition is variable and most species occur with relatively low cover. Bearberry *(Arctous alpina)* and net-veined willow *(Salix reticulata)* are common and occasionally abundant associates. Legumes such as arctic lupine *(Lupinus arcticus)*, alpine hedysarum *(Hedysarum alpinum)* and locoweeds *(Oxytropis nigrescens* and *O. maydelliana)* occur on most sites. A variety of other species common to calcareous sites occur: alpine bistort *(Bistorta vivipara)*, louseworts *(Pedicularis capitata*, *P. lanata)*, moss campion *(Silene acaulis)*, Lapland rosebay *(Rhododendron lapponicum)*, single-spike sedge *(Carex scirpoidea)*, northern false-asphodel *(Tofieldia coccinea)* and arctic stitchwort *(Minuartia arctica)*.

The moss/lichen layer is often poorly developed, but often includes a scattering of *Flavocetraria* spp. and *Thamnolia vermicularis*. Some sites may have significant moss cover of step moss *(Hylocomium splendens)*, mountain groove moss *(Aulacomnium turgidum)*, or others.

Environment: Sites typically have thin snow cover during winter. Site are well drained, with xeric to submesic conditions prevailing throughout most of the growing season. Cryoturbation features are common, but exposed soils and rock are not as extensive as in **Af01** and **Af02**. Soils are typically derived from limestone or other parent materials, producing a high soil pH. Most soils are classified as Turbic Cryosols.

Range map

Environment table

Bioclimates	ARDSmn (16) ARLS (11)
Elevation	80 – 460 – 883
Slope %	0 – 15 – 48
Moisture regime	X – SM
Snow cover	E
Rock/mineral %	30
Active layer	Moderate
Important site features	calcareous substrates

Vegetation table

Stratum	no. of plots	At01 27	
Ground shrubs	*Dryas integrifolia*	■■■■■	entire-leaved mountain-avens
	Salix reticulata	■■	net-veined willow
	Arctous spp.	■■	bearberries
	Cassiope tetragona	□□	arctic mountain-heather
	Rhododendron lapponicum	□	Lapland rosebay
Graminoids	*Carex scirpoidea*	■■	single-spike sedge
Forbs	*Oxytropis nigrescens*	■■	blackish locoweed
	Hedysarum alpinum	■■	alpine hedysarum
	Pedicularis capitata	■	capitate lousewort
	Silene acaulis	■	moss campion
	Bistorta vivipara	■	alpine bistort
	Lupinus arcticus	□□	arctic lupine
	Tofieldia coccinea	■■	northern false-asphodel
Mosses	*Hylocomium splendens*	□□	step moss
	Aulacomnium turgidum	□□	mountain groove moss
Lichens	*Flavocetraria* spp.	□□	paperdoll lichens

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: All other inland ecosites where *Dryas* species are a major component have a large proportion of *(Dryas alaskensis)*. In coastal locations and on limestone geology, such as in **At01**, entire-leaved mountain-aven *(Dryas integrifolia)* dominates. **Af01** is floristically similar, but is more wind-scoured and has lower overall vegetation cover.

At02 Arctic willow – Entire-leaved mountain-avens – Tundra milk-vetch

At02 is the zonal tundra ecosite of the **ARDSlo**. It is widespread on the till plains of Herschel Island and less common on the coastline of the western **ARLS,** where coastal humidity and cold winds have a pronounced influence.

Vegetation: A continuous cover of prostrate ground shrub mats, dominated by entire-leaved mountain-aven *(Dryas integrifolia),* arctic willow *(Salix arctica)* and net-veined willow *(Salix reticulata)*, make up the majority of plant cover. Tundra milk-vetch *(Astragalus umbellatus)* is a distinctive component of these ecosites, and occurs in showy clumps. Polargrass *(Arctagrostis latifolia)* is typically scattered through these sites. On some sites with slightly better soil moisture or active frost boils, patches of the nitrogen-fixing arctic lupine *(Lupinus arcticus)* occur. The moss layer may be well developed, but species information is limited in the available data.

Environment: Sites are on well-drained soils on coastal tundra flats, often with hummocky micro-topography. Snow cover is moderate and melts quickly in spring. Soils are commonly Turbic Cryosols, but Static Cryosols occur in some conditions. Improved soil nutrition from marine sources or moderated air temperatures may support At02 in contrast to other tundra ecosites.

Two subassociations are recognized: **At02.1** (Typic) and **At02.2** (Lupine)**,** where arctic lupine cover exceeds 10%.

Range map

Environment table

Bioclimates	ARDSlo (75) ARLS (13)
Elevation	0 – 65 – 160
Slope %	0 – 7 – 50
Moisture regime	M (SM)
Snow cover	N
Rock/mineral %	15
Active layer	Moderate
Important site features	coastal locations most common

Vegetation table

Stratum	no. of plots	At02 88	At02.1 56	At02.2 32	
Ground shrubs	*Salix arctica*	■■■■	■■■■	■■■■	arctic willow
	Dryas integrifolia	■■■■■	■■■■■	■■■■■	entire-leaved mountain-avens
	Salix reticulata	■■■	■■■	■■■	net-veined willow
Graminoids	*Arctagrostis latifolia*	■■■	■■■	■■■	polargrass
	Carex lugens	□□	□□	□□	muskeg sedge
	Luzula nivalis	□	□	□	arctic wood-rush
Forbs	*Lupinus arcticus*	■■■	□□	■■■■	arctic lupine
	Astragalus umbellatus	■■■	■■■	■■■	tundra milk-vetch
	Oxytropis nigrescens	□□	□□	■■	blackish locoweed
	Pedicularis capitata	□	■	□	capitate lousewort
	Myosotis asiatica	□	□	□	mountain forget-me-not
Mosses	Mosses	■■■■	■■■■	■■■■	mosses
Lichens	Lichens	■■	■■	■■	lichens
	Flavocetraria spp.	□□		□□	paperdoll lichens

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: At02 is found primarily near the coast. It is speculated that cool moist maritime air reduces evaporation and allows a more lush vegetation to thrive in otherwise dry soil conditions. Long-term monitoring of vegetation on Herschel island shows that polargrass has been increasing in abundance over the last 20 years.

At03 is a fairly common ecosite in the lower **ARDSmn** and **ARLS**. It occurs on moist pediment slopes that retain snow cover in winter and where permafrost thawing maintains active groundwater flow throughout the growing season.

Vegetation: Mats of entire-leaved mountain avens *(Dryas integrifolia)* and net-veined willow *(Salix reticulata)* on slightly elevated microsites in a matrix of common horsetail *(Equisetum arvense)* are a typical condition of this ecosite. Substantial surface water movement and mobile soils promote the growth of horsetails, which lends a distinct light-green cast to the vegetation. Some lower-elevation sites have cover of low-growing grey-leaved willow *(Salix glauca)*. A diversity of other species occurs, such as arctic willow *(S. arctica)*, Lapland rosebay *(Rhododendron lapponicum)*, bog blueberry *(Vaccinium uliginosum)*, mountain-heather *(Cassiope tetragona)*, red bearberry *(Arctous rubra)*, yellow marsh saxifrage *(Saxifraga hirculus)*, muskeg sedge *(Carex lugens)*, alpine hedysarum *(Hedysarum alpinum)* and louseworts *(Pedicularis capitata, P. sudetica).*

Moss cover is often high and is comprised of a mix of upland and wetland species, such as step moss *(Hylocomium splendens)*, crumpled-leaf moss *(Rhytidium rugosum)*, *Aulacomnium palustre* and *Tomentypnum nitens*. Species data are largely lacking in the available data.

Environment: This ecosite commonly occurs below steep slopes on gradual pediment slopes, but is also found in other areas that receive upslope seepage. Soils are Gleyed Turbic Cryosols that remain moist for much of the growing season and commonly show evidence of solifluction. The active layer is typically greater than 30 cm.

Two subassociations are recognized: **At03.1** (Typic) and the uncommon **At03.2** (Grey-leaved willow)**,** with significant cover of low-growing *Salix glauca*.

Range map

Environment table

Bioclimates	ARDSmn (11) ARLS (11)
Elevation	0 – 350 – 770
Slope %	0 – 14 – 30
Moisture regime	SM(1) M(3) SHG(5) HG(4)
Snow cover	N-P
Rock/mineral %	15
Active layer	Moderate
Important site features	gradual seepage slopes

Vegetation table

Stratum	no. of plots	At03 22	At03.1 19	At03.2 3	
Shrubs	*Vaccinium uliginosum*	■■	■■	□	bog blueberry
	Salix glauca			■■■■■	grey-leaved willow
Ground shrubs	*Arctous* spp.	■■■	■■	■■■	bearberries
	Salix reticulata	■■■	■■■	■■	net-veined willow
	Dryas integrifolia	■■■	■■■	□□	entire-leaved mountain-avens
	Cassiope tetragona	■■	■■	□□	arctic mountain-heather
	Salix arctica	□□	□□	□	arctic willow
	Rhododendron lapponicum	□	□		Lapland rosebay
Ferns and allies	*Equisetum arvense*	■■■■	■■■■	■■■■	common horsetail
Graminoids	*Arctagrostis latifolia*	□□	□□	□	polargrass
	Carex lugens	□□	□□	□	muskeg sedge
	Eriophorum angustifolium	□	□		tall cottongrass
Forbs	*Hedysarum* spp.	■■	□□	■■■	hedysarums
	Pedicularis capitata	■	□	■	captitate lousewort
	Petasites frigidus	□□	□□	□	arctic coltsfoot
	Bistorta plumosa	□	□	■	meadow bistort
	Bistorta vivipara	□	□	□	alpine bistort
	Tofieldia pusilla	□	□	□	small false-asphodel
Mosses	Mosses	■■■■■	■■■■■	■■■■■	mosses
	Rhytidium rugosum	■■	■■	□□□□	crumpled-leaf moss
	Hylocomium splendens	■■	■■	■■	step moss
	Aulacomnium palustre	■■	■■	■■	glow moss
	Tomentypnum nitens	■■	■■	■■	golden fuzzy fen moss

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: Similar ecosites, but with white spruce and tall willows, are common in the adjacent subarctic. Active groundwater flow and the resulting deepening of the active layer differentiates **At03** conditions from **Wb01,** the more common ecosite of pediment slopes.

At04 is an common tundra ecosite of **ARDSlo** on Herschel island; it is less common elsewhere in the **ARDSmn** and **ARLS,** where it occurs on moist level or gently sloping sites, usually with soil hummocks.

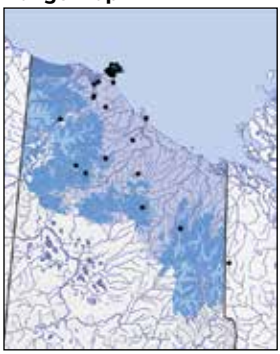
Vegetation: Plant cover is generally continuous, although some sites may have active frost boils with raw mineral soil. This ecosite is distinguished by the prominence of the tussock-forming muskeg sedge *(Carex lugens)*. Entire-leaved mountain-avens *(Dryas integrifolia)*, arctic willow *(Salix arctica)* and net-veined willow *(Salix reticulata)* are typical and occur on raised microsites (often frost mounds). Other common species include polargrass *(Arctagrostis latifolia)*, meadow bistort *(Bistorta plumosa),* louseworts *(Pedicularis capitata, P. sudetica, P. lanata),* tussock cottongrass *(Eriophorum vaginatum)*, alpine bistort *(Bistorta vivipara)* and yellow marsh saxifrage *(Saxifraga hirculus)*.

The moss layer is moderately developed and composed of a mix of upland and wetland-affiliated mosses, including glow moss *(Aulacomnium palustre)*, groove moss *(A. turgidum)*, fen moss *(Tomentypnum nitens)* and peat mosses *(Sphagnum* spp.)

Environment: At04 occurs on gradual lower-elevation middle and lower slopes where soils conditions are moist and vegetation cover is continuous. Sites are commonly distinctly cryoturbated, with small hummocks creating alternately moist and dry habitats. Soils tend to be loamy to coarse loamy, moderately well drained Orthic and Regosolic Turbic Cryosols. Snow cover is moderate and melts quickly in spring. Depth to permafrost is often 60 cm or greater.

Two subassociations are described: **At04.1** (Typic) and **At04.2** (Cottongrass)**,** which occurs on slightly moister sites.

Range map



Environment table

Bioclimates	ARDSlo (14) mn (7) ARLS (9)
Elevation	13 – 217 – 900
Slope %	0 – 3 – 15
Moisture regime	M – SHG
Snow cover	N-P
Rock/mineral %	8
Active layer	Deep
Important site features	moist but not wet hummocky tundra

Vegetation table

Stratum	no. of plots	At04 30	At04.1 19	At04.2 11	
Ground shrubs	*Salix arctica*	■■	■■■	□□	arctic willow
	Dryas integrifolia	■■■■	■■■■	■■■■	entire-leaved mountain-avens
	Salix reticulata	■■■	■■■	■■■	net-veined willow
Graminoids	*Carex lugens*	■■■■	■■■■	■■■	muskeg sedge
	Eriophorum vaginatum	■■■	□□	■■■■	tussock cottongrass
	Arctagrostis latifolia	■■	■■	■	polargrass
	Eriophorum angustifolium	□	■■		tall cottongrass
Forbs	*Bistorta plumosa*	■■	□	■	meadow bistort
	Pedicularis capitata	■	■	■	capitate lousewort
	Petasites frigidus	□□		■■	arctic coltsfoot
	Lupinus arcticus	□□	□□	□□	arctic lupine
	Astragalus umbellatus	□	■	□	tundra milk-vetch
	Papaver spp.	□	□	□	poppies
	Bistorta vivipara	□	□		alpine bistort
	Saxifraga hirculus	□	□	□	yellow marsh saxifrage
Mosses	*Aulacomnium turgidum*	■■	■■	■■	mountain groove moss
	Tomentypnum nitens	■■	■■	■■	golden fuzzy fen moss
	Bryum spp.	■■	■■	■■	thread moss
	Hylocomium splendens	■■	■■	■■	step moss
	Sphagnum spp.	■■	■■	■■	peat mosses
	Aulacomnium palustre	■■	■■	■■	glow moss
Lichens	Lichens	■■	□□	■■■	lichens
	Flavocetraria spp.	□□	□□	□□	paperdoll lichens

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: These sites can have a similar hummocky appearance to **Wb01**, but are drier, with a generally deeper active layer and a lack of peat accumulation. **At04.2** represents wetter examples of the ecosite more similar to **Wb01**.

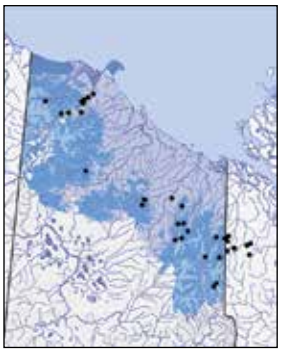
At05 is a widespread zonal tundra ecosite of **ARDSmn** and occurs at higher elevations of the **ARLS** on somewhat wind-protected slopes and flats with well-developed, mostly non-calcareous soils.

Vegetation: Vegetative cover is moderate to high, with Alaska mountain-avens *(Dryas alaskensis)* commonly forming a nearly continuous mat. A diversity of species is typical, although most species occur with relatively low cover. Net-veined willow *(Salix reticulata)* is common and occasionally abundant. Arctic lupine *(Lupinus arcticus)* is generally common, and other legumes such as alpine hedysarum *(Hedysarum alpinum)* and locoweeds *(Oxytropis nigrescens* and *O. maydelliana)* occur on many sites. A variety of other alpine species commonly occur, such as alpine bistort *(Bistorta vivipara)*, moss campion *(Silene acaulis)*, alpine bearberry *(Arctous alpina)* and arctic stitchwort *(Minuartia arctica)*.

The moss/lichen layer is often poorly developed, but frequently includes a scattering of paperdoll lichens *(Flavocetraria* spp.) and *Thamnolia vermicularis*. Some sites may have significant moss cover, often heron's-bill mosses *(Dicranum* spp.), step moss *(Hylocomium splendens),* or mountain groove moss *(Aulacomnium turgidum)*.

Environment: Sites typically have continuous snow cover during winter and are frequent on cooler aspects. Sites are well drained, with subxeric to mesic conditions prevailing throughout most of the growing season. Cryoturbation features are common, but exposed soils and rock are not as extensive as in the related **Af01** and **Af02**. Soils are commonly Turbic Cryosols derived from non-calcareous parent materials.

Range map



Environment table

Bioclimates	ARDS mn (30) al (3) ARLS (13)
Elevation	110 – 615 – 975
Slope %	0 – 21 – 55
Moisture regime	SX – M
Snow cover	N (E)
Rock/mineral %	18
Active layer	Moderate
Important site features	non-calcareous substrates

Vegetation table

Stratum	no. of plots	At05 46	
Shrubs	*Vaccinium uliginosum*	□□	bog blueberry
Ground shrubs	*Dryas alaskensis*	■■■■■	Alaska mountain-avens
	Salix reticulata	■■■	net-veined willow
	Arctous spp.	□□	bearberries
Graminoids	*Anthoxanthum monticola*	□	alpine sweetgrass
Forbs	*Lupinus arcticus*	■■■	arctic lupine
	Pedicularis spp.	■	louseworts
	Oxytropis nigrescens	□□	blackish locoweed
	Bistorta plumosa	□	meadow bistort
	Bistorta vivipara	□	alpine bistort
	Saussurea angustifolia	□	narrow-leaved sawwort
	Silene acaulis	□	moss campion
	Minuartia spp.	□	stitchworts
	Arnica spp.	□	arnicas
Mosses	*Dicranum spadiceum*	□□	brown heron's-bill moss
	Dicranum acutifolium	□□	sharp-leaved heron's-bill moss
	Hylocomium splendens	□□	step moss
	Aulacomnium turgidum	□□	mountain groove moss
Lichens	*Flavocetraria* spp.	■■	paperdoll lichens
	Stereocaulon spp.	□	foam lichens
	Thamnolia vermicularis	■■	whiteworm lichen
	Peltigera spp.	□□	pelt lichens
	Bryocaulon divergens	□	northern foxhair lichen
	Asahinea chrysantha	□	arctic-rag lichen
	Alectoria ochroleuca	□	green witch's hair lichen

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: At05 is related to **Af01** and **Af02,** which often occur in adjacent, more exposed sites. These units have similar dominant species, but **At05** is distinguished by its near continuous vegetation cover and an abundance of arctic/alpine forbs and ground shrubs. **At01** occurs on calcareous sites and **At05** is typically on non-calcareous substrates.

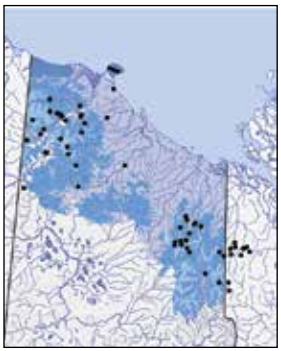
Ah01 is a widespread ecosite that occupies moisture-shedding, snow accumulation sites in the **ARDS** and the foothills of **ARLS**. This ecosite is common, but typically of restricted extent.

Vegetation: The vegetation of **Ah01** is typically dominated by mountain-avens *(Dryas alaskensis,* but *D. integrifolia* occurs on some sites) and mountain-heather *(Cassiope tetragona)*, with a higher vegetation cover and proportion of mountain-heather on sites with deeper snowpacks. Some sites with higher snow cover may have significant cover of low growing dwarf birch *(Betula nana)* or arctic lupine *(Lupinus arcticus)*. The vegetation is often diverse. Common associates include net-veined willow *(Salix reticulata)*, bog blueberry *(Vaccinium uliginosum)* and few-flowered lousewort *(Pedicularis capitata)*. The moss layer is variably developed; step moss *(Hylocomium splendens)*, dense heron's-bill moss *(Dicranum elongatum)* and mountain groove moss *(Aulacomnium turgidum)* occur on some sites. Sparse cover of paperdoll lichens *(Flavocetraria nivalis*, *F. cucullata),* whiteworm *(Thamnolia vermicularis),* finger lichen *(Dactylina arctica),* or foam lichens *(Stereocaulon* spp.) is common.

Environment: Moderate snow accumulation provides some winter protection but limited growing season moisture for these ecosites. They occur on a variety of slope positions where snow accumulates, including leeward upper slopes or concave hollows on slopes. Soils are subxeric to mesic Turbic Cryosols; frost hummocks are common,

Three ecosite subassociations are recognized: **Ah01.1** (Typic)**, Ah01.2** (Lupine), and **Ah01.3** (Dwarf birch).

Range map



Environment table

Bioclimates	ARDSmn (43) al (12) lo (3) ARLS (7)
Elevation	30 – 693 – 1320
Slope %	0 – 28 – 55
Moisture regime	SX – M
Snow cover	P(N)
Rock/mineral %	13
Active layer	Deep
Important site features	snow accumulation slopes and hollows

Vegetation table

Stratum	no. of plots	Ah01 65	Ah01.1 37	Ah01.2 17	Ah01.3 11	
Shrubs	*Vaccinium uliginosum*	■■■	■■	■■■	■■■	bog blueberry
	Betula nana	■■	□□	■■	■■■	arctic dwarf birch
	Rhododendron tomentosum	□	□		■■	northern Labrador tea
Ground shrubs	*Cassiope tetragona*	■■■■	■■■■	■■■■	■■■■	arctic white mountain-heather
	Dryas alaskensis	■■■	■■■	■■■■	■■■	Alaska mountain-avens
	Dryas integrifolia	□□□	□□□	□□□	□□□	entire-leaved mountain-avens
	Salix reticulata	■■	■■	■■■	■■■	net-veined willow
	Arctous spp.	■■	□□	□□	■■	bearberries
	Empetrum nigrum	□□	□□	□□	■■	crowberry
	Vaccinium vitis-idaea	□□	□□		■■	lowbush cranberry
Forbs	*Lupinus arcticus*	■■	■■	■■■	■■	arctic lupine
	Pedicularis spp.	■	■	■	■	louseworts
	Micranthes nelsoniana	□	■	□	□	Nelson's saxifrage
	Saussurea angustifolia	□	□	■	□	narrow-leaved sawwort
	Bistorta plumosa	□	□	■	□	meadow bistort
	Minuartia spp.	■	■	□□	■	stitchworts
Mosses	*Dicranum elongatum*	■■	■■	■■	■■	dense heron's-bill moss
	Hylocomium splendens	■■	■■	■■	■■	step moss
	Aulacomnium turgidum	■	■	■	■	mountain groove moss
	Polytrichum juniperinum	■	■	■	■	juniper haircap
Lichens	*Flavocetraria* spp.	■■	■■	■■	■■	paperdoll lichens
	Thamnolia vermicularis	□	□	□	■	whiteworm lichen
	Dactylina arctica	□	□	□	■	finger lichen

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: Snow protection of sites from winter temperatures and spring moisture from snow melt provide a suitable habitat for many plant species, and diversity can be high in these ecosites. Generally, sites with deeper snowpack and moister soils support **Ah02** and sites on acidic parent materials support **Ah03**.

Ah02 is a Beringian endemic ecosite occupying snow accumulation sites in the western **ARDSmn** and foothills of **ARLS** in areas of calcareous parent materials. This ecosite is uncommon and of moderate extent.

Vegetation: The vegetation of **Ah02** is typically dominated by mountain-avens *(Dryas integrifolia* or *D. alaskensis)* and mountain-heather *(Cassiope tetragona)*, with a high proportion of forbs and mosses. The presence of brookfoam *(Boykinia richardsonii)* is distinctive. Common associates include net-veined willow *(Salix reticulata)*, bog blueberry *(Vaccinium uliginosum)*, arctic lupine *(Lupinus arcticus)* and few-flowered lousewort *(Pedicularis capitata)*. Some sites may have substantial cover of low-growing Dwarf birch *(Betula nana)* or grey-leaved willow *(Salix glauca)*. The moss layer is often well-developed, with high cover mosses such as step moss *(Hylocomium splendens)*, crumpled-leaf moss *(Rhytidium rugosum)* and dense heron's-bill moss *(Dicranum elongatum)*; paperdoll lichens *(Flavocetraria nivalis*, *F. cucullata)* and finger lichen *(Dactylina arctica)* occur with low cover.

Environment: Relatively deep snow accumulations provide substantial winter cover and growing season moisture. They occur on a variety of slope positions, but are primarily found on lower receiving slopes. Soils are Turbic Cryosols developed on calcareous fine-textured substrates.

Two subassociations are recognized: **Ah02.1** (Typic) and the less common **Ah02.2** (Alder)**,** which occurs in areas transitional to the subarctic and has scattered to moderate cover of green alder *(Alnus viridis* ssp. *crispa)*.

Range map

Environment table

Bioclimates	ARDSmn (20) ARLS (13)
Elevation	49 – 533 – 900
Slope %	0 – 38 – 64
Moisture regime	M – SHG
Snow cover	P(VP)
Rock/mineral %	10
Active layer	Moderate
Important site features	cool, moist snow accumulation slopes; calcareous bedrock areas

Vegetation table

Stratum	no. of plots	Ah02 33	Ah02.1 26	Ah02.2 7	
Shrubs	*Alnus viridis* ssp. *crispa*	□□		■■■■	green alder
	Vaccinium uliginosum	■■	■■	■■	bog blueberry
	Betula nana	□□	□□	■■■	arctic dwarf birch
	Salix glauca			■■■	grey-leaved willow
Ground shrubs	*Cassiope tetragona*	■■■■	■■■■	■■■■	arctic white mountain-heather
	Salix reticulata	■■■	■■■	■■	net-veined willow
	Rhododendron lapponicum	□		■■	Lapland rosebay
	Dryas alaskensis	■■■	■■■	□□□	Alaska mountain-avens
	Dryas integrifolia	□□□	□□	■■■	entire-leaved mountain-avens
	Arctous spp.	□□	□□	□□	bearberries
	Andromeda polifolia	□□	□	■■	bog-rosemary
Forbs	*Boykinia richardsonii*	■■■	■■■	■■	Richardson's brookfoam
	Lupinus arcticus	■■	■■	■■	arctic lupine
	Pedicularis spp.	■	■	■	louseworts
	Papaver spp.	□	□	■	poppies
	Pyrola grandiflora	□	□	■	arctic wintergreen
	Saussurea angustifolia	□	□	■	narrow-leaved sawwort
	Tofieldia pusilla	□	□	■	small false-asphodel
Mosses	*Dicranum elongatum*	■■	■■	■■	dense heron's-bill moss
	Hylocomium splendens	■■	■■	■■	step moss
	Aulacomnium turgidum	■	■	■	mountain groove moss
	Polytrichum juniperinum	■	■	■	juniper haircap

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: Ah02 occupies more protected areas and moister sites than **Ah01** and often occurs downslope of that ecosite. The **Alder** variant has been found in the Firth River valley on sites directly adjacent to **Ah02.1**. Green alder is capable of rapid growth and expansion under favourable conditions and is expected to increase markedly with climate change.

Ah03 Labrador tea / Mountain-heather – Lowbush cranberry

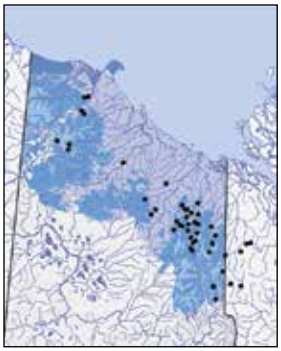
Ah03 is a widespread ecosite occupying snow accumulation sites in the **ARDSmn, ARDSal** and the foothills of **ARLS** in regions of non-calcareous geology. This ecosite is typically of restricted extent.

Vegetation: The vegetation of **Ah03** is typically dominated by mountain-heather *(Cassiope tetragona)*, with secondary cover of various ericaceous ground shrubs including lowbush cranberry *(Vaccinium vitis-idaea)*, bog blueberry *(V. uliginosum)*, Labrador tea *(Rhododendron tomentosum)* and crowberry *(Empetrum nigrum)*. Other species such as alpine sweetgrass *(Anthoxanthum monticola),* skeleton-leaved willow *(Salix phlebophylla),* and alpine bearberry *(Arctous alpina)* occur on some sites.

The moss and lichen layer is often well-developed, including species such as step moss *(Hylocomium splendens)*, dense heron's-bill moss *(Dicranum elongatum)*, juniper haircap *(Polytrichum juniperinum)* and a variety of lichens: finger lichen *(Dactylina arctica)*, paperdoll lichens *(Flavocetraria cucullata, F. nivalis)* and *Stereocaulon* spp.

Environment: Snow accumulations provide some winter protection for these ecosites. These sites commonly face east or north, with cool aspect and leeward to the prevailing winds, resulting in slower snow melt in the spring. Soil moisture is variable, but sites are always well drained. Soils are Turbic Cryosols, mostly derived from acidic rock types.

Range map



Environment table

Bioclimates	ARDSmn (37) al (7) ARLS (14)
Elevation	335 – 684 – 1128
Slope %	0 – 34 – 82
Moisture regime	SX – SHG
Snow cover	P (N)
Rock/mineral %	21
Active layer	Deep
Important site features	cool snow accumulation slopes; acidic bedrock areas

Vegetation table

Stratum	no. of plots	Ah03 58	
Shrubs	*Rhododendron tomentosum*	■■■	northern Labrador tea
	Betula nana	■■	arctic dwarf birch
	Vaccinium uliginosum	■■	bog blueberry
Ground shrubs	*Cassiope tetragona*	■■■■	arctic white mountain-heather
	Vaccinium vitis-idaea	■■■	lowbush cranberry
	Empetrum nigrum	■■	crowberry
	Arctous spp.	□□	bearberries
	Salix phlebophylla	□□	skeleton-leaved willow
	Loiseleuria procumbens	□□	alpine-azalea
Forbs	*Bistorta plumosa*	■■	meadow bistort
Mosses	*Dicranum elongatum*	■■	dense heron's-bill moss
	Hylocomium splendens	■■	step moss
	Aulacomnium turgidum	■	mountain groove moss
	Polytrichum juniperinum	■	juniper haircap
Lichens	*Flavocetraria* spp.	■■	paperdoll lichens
	Nephroma spp.	■■	green light lichen
	Lobaria linita	■■	cabbage lung lichen
	Masonhalea richardsonii	■■	arctic tumbleweed lichen
	Dactylina arctica	■■	finger lichen

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: The related **Ah01** occurs in similar site locations to **Ah03**, but on less acidic parent materials.

Am01 Graceful mountain sedge – Horsetail – Mountain-sorrel

Am01 occurs along small mountain rivulets, in gullies and on concave slopes with warm and neutral aspects that collect winter snow, primarily in the **ARDSmn**, but also at higher elevations of the **ARLS**. This ecosite is not common and usually of limited extent, but is visually and floristically distinct in the arctic mountains of Yukon.

Vegetation: This ecosite has a lush and diverse vegetation cover dominated by graminoids and forbs. Composition is variable, but tall graceful mountain sedge *(Carex podocarpa)* is distinctive. Other species such as common horsetail *(Equisetum arvense)*, or tall Jacob's-ladder *(Polemonium acutiflorum)* can be very abundant on some sites. A diverse mix of forbs such as mountain sorrel *(Oxyria digyna)*, arctic coltsfoot *(Petasites frigidus)*, mountain sagewort *(Artemisia norvegica)*, northern shootingstar *(Dodecatheon frigidum)*, monkshood *(Aconitum delphiniifolium)*, mountain forget-me-not *(Myosotis asiatica)* and riverbeauty *(Chamerion latifolium)* and many others may occur. Due to the high vascular plant cover, the moss and lichen layers are typically greatly reduced.

Environment: The **Am01** ecosite occurs on moist, gradually sloping gullies on aspects that accumulate snow in the winter and are protected from winter extremes by a deep snowpack where the snowpack melts relatively early. The active layer is very deep and sites are well watered from both snow melt and adjacent rivulets. Soils are Static or Turbic Cryosols.

Range map

Environment table

Bioclimates	ARDSmn (8) ARLS (3)
Elevation	365 – 582 – 868
Slope %	5 – 17 – 30
Moisture regime	SHG (HG)
Snow cover	P – VP
Rock/mineral %	2
Active layer	Moderate
Important site features	mountain gullies and rivulets

Vegetation table

Stratum	no. of plots	Am01 11	
Shrubs	*Salix pulchra*	■	diamond-leaved willow
	Spiraea stevenii	□□	Alaska spiraea
Ferns and allies	*Equisetum arvense*	■■■■	common horsetail
Graminoids	*Carex podocarpa*	■■■■■	graceful mountain sedge
	Arctagrostis latifolia	■■	polargrass
	Poa arctica	■	arctic bluegrass
	Trisetum spicatum	■	spike trisetum
	Festuca altaica	□□	Altai fescue
	Calamagrostis spp.	□□	reedgrasses
Forbs	*Oxyria digyna*	■■■	mountain-sorrel
	Arnica spp.	■■	arnicas
	Petasites frigidus	■■	arctic coltsfoot
	Micranthes nelsoniana	■■	Nelson's saxifrage
	Aconitum delphiniifolium	■■	monkshood
	Artemisia norvegica	■■	mountain sagewort
	Myosotis asiatica	■■	mountain forget-me-not
	Polemonium acutiflorum	■■	tall Jacob's-ladder
	Bistorta plumosa	■	meadow bistort
	Anemone richardsonii	■	yellow anemone
	Dodecatheon frigidum	■	northern shootingstar
	Artemisia tilesii	□□	Tilesius' wormwood
	Valeriana capitata	□	capitate valerian
	Ranunculus nivalis	□	snow buttercup
	Senecio lugens	□	black-tip groundsel
Mosses	*Sanionia uncinata*	□□	sicklemoss

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: Similar snow-accumulating hollows at lower elevations would support **Am02**, **Am03**, or possibly shrub-dominated ecosystems such as **FI01**. These sites provide very good habitat for voles and lemmings in the winter where constant snowpack and winter feed are suitable for subnivean life.

Am02 Chamisso's willow – Horsetail – Shootingstar

Am02 occurs in snow-accumulating gullies and old thaw slump hollows in the eastern lowlands of the Yukon Arctic Region. This ecosite is not common and usually of limited extent, but is a visually and floristically distinct ecosite in the eastern **ARLS** and the lower **ARDSmn**.

Vegetation: Am02 has lush, diverse, low-growing vegetation cover, with high cover of dwarf Chamisso's willow *(Salix chamissonis)* overtopped by common horsetail *(Equisetum arvense)* and a suite of forbs. Northern shootingstar *(Dodecatheon frigidum)*, arctic coltsfoot *(Petasites frigidus)*, mountain sagewort *(Artemisia norvegica)*, monkshood *(Aconitum delphiniifolium)*, yellow anemone *(Anemone richardsonii)* and Nelson's saxifrage *(Micranthes nelsoniana)* are often prominent, but other species, such as graceful mountain sedge *(Carex podocarpa)*, polargrass *(Arctagrostis latifolia)*, tall Jacob's-ladder *(Polemonium acutiflorum)*, two-tipped sedge *(Carex lachenalii)*, meadow bistort *(Bistorta plumosa)*, net-veined willow *(Salix reticulata)*, valerian *(Valeriana capitata)* and others also occur. Due to the high vascular plant cover, the moss layer is typically greatly reduced, although some sites have significant cover of sicklemoss *(Sanionia uncinata)*.

Environment: This ecosite occurs on concave slopes of deep gullies that accumulate abundant snow in the winter, protecting vegetation from winter extremes. The active layer is very deep and sites are well watered from snow melt and permafrost thaw. Despite the depth of snow accumulation, snow is released relatively quickly in the growing season. These sites may originally establish on thaw slumps. Soils are gleyed Static Cryosols or Regosols.

Range map

Environment table

Bioclimates	ARLS(18) ARDSmn(4)
Elevation	6 – 321 – 620
Slope %	4 – 20 – 43
Moisture regime	SHG (HG)
Snow cover	P – VP
Rock/mineral %	3
Active layer	Deep
Important site features	eastern foothill snow hollows and gullies

Vegetation table

Stratum	no. of plots	Am02 22	
Shrubs	*Salix pulchra*	■■	diamond-leaved willow
Ground shrubs	*Salix chamissonis*	■■■■■	Chamisso's willow
	Salix reticulata	■■■	net-veined willow
Ferns and allies	*Equisetum arvense*	■■■■	common horsetail
Graminoids	*Carex podocarpa*	■■■	graceful mountain sedge
	Arctagrostis latifolia	■■	polargrass
	Carex lachenalii	■■	two-tipped sedge
	Poa arctica	■	arctic bluegrass
	Trisetum spicatum	■	spike trisetum
Forbs	*Petasites frigidus*	■■■	arctic coltsfoot
	Artemisia norvegica	■■■	mountain sagewort
	Dodecatheon frigidum	■■■	northern shootingstar
	Micranthes nelsoniana	■■	Nelson's saxifrage
	Aconitum delphiniifolium	■■	monkshood
	Anemone richardsonii	■■	yellow anemone
	Polemonium acutiflorum	■	tall Jacob's-ladder
	Bistorta plumosa	■	meadow bistort
	Valeriana capitata	■	capitate valerian
	Pedicularis spp.	■	louseworts
	Arnica spp.	□	arnicas
	Ranunculus nivalis	□	snow buttercup
	Senecio lugens	□	black-tip groundsel
Mosses	*Sanionia uncinata*	■■■	sicklemoss
	Pohlia spp.	■■	nodding-cap moss
	Aulacomnium palustre	□□	glow moss
	Brachythecium spp.	□□	ragged moss
Lichens	*Peltigera* spp.	■■	pelt lichens

Mean Cover ■<1% ■■1–5% ■■■5–15% ■■■■15–30% ■■■■■30–50% ■■■■■■>50%
Constancy ■70–100% ■50-70% □25–50%

Comments: This ecosite is almost always bordered by the tall diamond-leaved willow *(Salix pulchra)* ecosite (**FI01b;** upland phase). **FI01b** occur in the peripheral areas of the snowbeds, where there is enough snow protection to deepen the active layer but snow release takes place early in the growing season.

Am03 Bluejoint – Horsetail – Marsh violet

Am03 occurs at lower elevations of the **ARLS** coastal plain and foothills on stabilized thaw slumps and late snow bed locations with very moist soil conditions and a deep active layer. This ecosite is uncommon and usually of limited extent.

Vegetation: This ecosite has lush vegetation cover dominated by bluejoint *(Calamagrostis canadensis)*, common horsetail *(Equisetum arvense)* and marsh violet *(Viola epipsila)*. A diverse mix of others species, such as tall Jacob's-ladder *(Polemonium acutiflorum)*, coltsfoot *(Petasites frigidus)*, mountain sagewort *(Artemisia norvegica)*, monkshood *(Aconitum delphiniifolium)*, polargrass *(Arctagrostis latifolia)*, fireweed *(Chamerion angustifolium)*, two-tipped sedge *(Carex lachenalii)*, yellow anemone *(Anemone richardsonii)* and many others occur. Due to the high vascular plant cover, the ground layer is typically greatly reduced.

Environment: The ecosite occurs in moist gullies and hollows, typically with somewhat unstable soils. These sites are generally protected from winter extremes by a moderate snowpack that melts early in the growing season. The active layer is very deep and sites are well watered from snow melt and permafrost thaw and in some cases from rivulet water. Soils are gleyed Static and Turbic Cryosols.

This ecosite is typically ringed by diamond-leaved willow communities **(Fl01b)** that establish in the peripheral zone of the snowbeds where there is a deeper active layer, but not excessive snow. In some cases **Am03** represents the second stage of community succession on stabilized thaw slumps.

Range map

Environment table

Bioclimates	ARLS (6)
Elevation	29 – 126 – 360
Slope %	5 – 18 – 35
Moisture regime	SHG
Snow cover	P-VP
Rock/mineral %	3
Active layer	Moderate
Important site features	snow hollows, partially stabilized thaw slumps

Vegetation table

Stratum	no. of plots	Am03 6	
Shrubs	*Salix pulchra*	■■■	diamond-leaved willow
	Spiraea stevenii	■■	Alaska spiraea
Ferns and allies	*Equisetum arvense*	■■■■	common horsetail
Graminoids	*Calamagrostis canadensis*	■■■■■	bluejoint reedgrass
	Carex podocarpa	■■	graceful mountain sedge
	Carex lachenalii	■	two-tipped sedge
	Poa arctica	■	arctic bluegrass
	Arctagrostis latifolia	□□	polargrass
	Carex aquatilis	□□	water sedge
Forbs	*Chamerion angustifolium*	■■■	fireweed
	Viola epipsila	■■■	marsh violet
	Petasites frigidus	■■	arctic coltsfoot
	Artemisia norvegica	■■	mountain sagewort
	Aconitum delphiniifolium	■■	monkshood
	Polemonium acutiflorum	■■	tall Jacob's-ladder
	Artemisia tilesii	■■	Tilesius' wormwood
	Anemone richardsonii	■	yellow anemone
	Stellaria longipes	■	long-stalked starwort
	Micranthes nelsoniana	□□	Nelson's saxifrage
	Dodecatheon frigidum	□	northern shootingstar
	Bistorta plumosa	□	meadow bistort
	Senecio lugens	□	black-tip groundsel
Mosses	*Brachythecium* spp.	■	ragged moss
	Sanionia uncinata	■	sicklemoss

Mean Cover ■<1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: Am03 has vegetation and site conditions related to **Am02**, but occurs on more unstable soils that favour the establishment of tall swards of bluejoint and limit the dwarf willows distinctive of **Am02**.

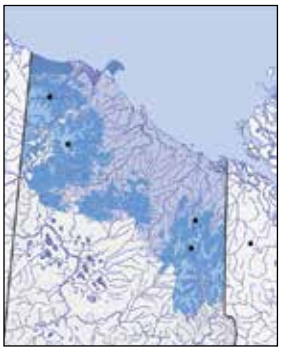
Am04 Altai fescue – Graceful mountain sedge – Mountain sagewort

Am04 is an uncommon and localized ecosite in the **ARDSmn** and the lower **ARDSal**. It occurs on insolation slopes that also collect winter snow.

Vegetation: This ecosite has lush vegetation cover dominated by Altai fescue *(Festuca altaica)*. Scattered low stature shrubs may occur. A diverse mix of other graminoid and forb species, such as graceful mountain sedge *(Carex podocarpa)*, mountain sagewort *(Artemisia norvegica)*, coltsfoot *(Petasites frigidus)*, northern shootingstar *(Dodecatheon frigidum)* and monkshood *(Aconitum delphiniifolium)* as well as other species such as lowbush cranberry *(Vaccinium vitis-idaea)* occur. With very high vascular plant cover on most sites, mosses and lichen cover is typically minimal.

Environment: The ecosite occurs in shallow gullies and hollows on insolated slopes that collect cross-loaded snow cover (wind-transported snow) during the winter and are generally protected from winter extremes by the moderate snowpack. The active layer is very deep, and sites are well watered early in the growing season from snow melt and permafrost thaw. Aspect and slope are incident (perpendicular) to the sun and are generally warmer than typical for the arctic environment. Soils are often Dystric Brunisols, indicating that permafrost is absent on these sites.

Range map



Environment table

Bioclimates	ARDSal (2) ARDSmn (4)
Elevation	335 – 699 – 1000
Slope %	0 – 13 – 30
Moisture regime	SHG (M)
Snow cover	N-P
Rock/mineral %	6
Active layer	Deep
Important site features	warm aspect, shallow snow accumulation gullies

Vegetation table

Stratum	no. of plots	Am04 6	
Shrubs	*Vaccinium uliginosum*	■	bog blueberry
	Betula nana	■	dwarf birch
	Salix pulchra	□□	diamond-leaved willow
	Spiraea stevenii	□□	Alaska spiraea
Ground shrubs	*Salix reticulata*	■■	net-veined willow
	Dryas alaskensis	■■	Alaska mountain-avens
	Vaccinium vitis-idaea	■■	lowbush cranberry
Graminoids	*Festuca altaica*	■■■■■	Altai fescue
	Arctagrostis latifolia	■■■	polargrass
	Carex podocarpa	■■	graceful mountain sedge
	Poa arctica	■	arctic bluegrass
	Trisetum spicatum	■	spike trisetum
	Poa alpina	■	alpine bluegrass
Forbs	*Petasites frigidus*	■■■	arctic coltsfoot
	Artemisia norvegica	■■■	mountain sagewort
	Aconitum delphiniifolium	■■	monkshood
	Dodecatheon frigidum	■■	northern shootingstar
	Senecio lugens	■■	black-tip groundsel
	Polemonium acutiflorum	■	tall Jacob's-ladder
	Valeriana capitata	■	capitate valerian
	Minuartia spp.	■	stitchworts
	Anemone parviflora	■	small-flowered anemone
	Sibbaldia procumbens	□□	sibbaldia

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: Am04 is an uncommon component of the Yukon Arctic Region, although related Altai fescue-dominated ecosystems are more widespread in more southern alpine regions. The related **St05** occurs at lower elevations or more exposed locations.

As01 Polar willow – Pygmy buttercup

As01 is an uncommon and localized ecosite occurring on deep-snow-accumulating sites of the eastern **ARLS**.

Vegetation: Plant cover is variable in **As01**, but is always dominated by polar willow *(Salix polaris)*. A variety of other species tolerant of prolonged snow cover and shortened growing seasons occur: Pygmy buttercup *(Ranunculus pygmaeus)*, two-tipped sedge *(Carex lachenalii)*, mountain-sorrel *(Oxyria digyna)*, arctic bluegrass *(Poa arctica)* and sibbaldia *(Sibbaldia procumbens)*. Moss cover is generally low, but species such as *Pohlia drummondii* or *Polytrichum* spp. may occur.

Environment: Heavy snow accumulations provide total winter protection, but also greatly shorten the growing season. Snow can persist into July or August in extreme years. The melting snow keeps soils moist through the short growing season. Abundant exposed soil is common.

Range map

Environment table

Bioclimates	ARLS (3)
Elevation	395 – 432 – 451
Slope %	3 – 30 – 48
Moisture regime	HG
Snow cover	VP
Rock/mineral %	70
Active layer	Moderate
Important site features	very late snowbeds

Vegetation table

Stratum	no. of plots	As01 3	
Ground shrubs	*Salix polaris*	■■■	polar willow
Graminoids	*Carex lachenalii*	■■	two-tipped sedge
	Poa arctica	■	arctic bluegrass
	Carex podocarpa	□□	graceful mountain sedge
	Arctagrostis latifolia	□	polargrass
Forbs	*Ranunculus pygmaeus*	■	pygmy buttercup
	Minuartia biflora	■	mountain stitchwort
	Oxyria digyna	■■	mountain-sorrel
	Sibbaldia procumbens	■■	sibbaldia
	Artemisia norvegica	■	mountain sagewort
	Dodecatheon frigidum	■	northern shootingstar
	Artemisia tilesii	■	Tilesius' wormwood
	Ranunculus nivalis	■	snow buttercup
	Anemone narcissiflora	■	narcissus-flowered anemone
	Saxifraga hyperborea	■	pygmy saxifrage
	Petasites frigidus	□	arctic coltsfoot
Mosses	*Polytrichum* spp.	■■	haircap
	Pohlia spp.	■■	nodding-cap moss
	Lophozia spp.	■	notchworts
	Warnstorfia fluitans	■	floating hook moss

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: This ecosite is described from Lambert (1968). In many years, the usual period of ecosite field sampling occurs before this ecosite is released from snow cover; as a result, few examples of it have been documented.

Az01 Arctic willow – Trisetum – Jacob's-ladder

Az01 is a spatially restricted ecosite occurring on the disturbed ground of fox dens on Herschel Island and the coastal lowland; all sampled locations are in the **ARDSlo**. Dens occur on well-drained soils with deep active layers that are easily excavated.

Vegetation: Vegetation is generally robust and diverse. Graminoid species dominate these ecosites: those on coastal sands with dunegrass *(Leymus mollis)* and elsewhere with trisetum *(Trisetum spicatum)* and bluegrass *(Poa pratensis* ssp. *alpigena).* Other graminoids may occur on some sites, including polargrass *(Arctagrostis latifolia),* red fescue *(Festuca rubra),* alkaligrasses *(Puccinellia* spp.*)* and curly sedge *(Carex rupestris)*. Upland sites generally have species typical of tundra ecosites, such as entire-leaved mountain-avens *(Dryas integrifolia)* and dwarf willows *(Salix reticulata* and *S. arctica).* All sites have a diversity of forbs, reflecting improved nutrients relative to the surrounding landscape. Jacob's-ladder *(Polemonium acutiflorum)* and legumes, e.g., *Astragalus* spp., *Oxytropis* spp., and arctic lupine *(Lupinus arcticus)* occur on most sites. A diverse array of other forbs, such as meadow bistort *(Bistorta plumosa)*, nakedstem wallflower *(Parrya nudicaulis)*, *Pedicularis* spp., Lindström's groundsel *(Tephroseris lindstroemii)*, thoroughwort *(Bupleurum americanum)*, northern hemlock-parsley *(Cnidium cnidiifolium)* and mountain forget-me-not *(Myosotis asiatica),* occur on some sites. Moss cover is high on many sites, but species are not identified in the available plot data.

Environment: Fox dens are associated with relatively warm, well-drained landscape positions. Preferred sites are streamside cutbanks and dunes; on Herschel Island foxes select sandy mounds in sloping and gullied terrain (Smith et al. 1988). Sandy Static Cryosols are characterized by faunal mixing and nutrient enrichment.

Inland sites generally have an abundance of Mountain-avens *(Dryas integrifolia:* **Az01.1**), while dens in coastal sands will have an abundance of Dunegrass *(Leymus mollis:* **Az01.2**).

Range map

Environment table

Bioclimates	ARDSlo (12)
Elevation	4 – 56 – 95
Slope %	0 – 15 – 30
Moisture regime	M (SX-SM)
Snow cover	E-N
Rock/mineral %	15
Active layer	Deep
Important site features	spatially restricted to fox den digs

Vegetation table

Stratum	no. of plots	Az01 12	Az01.1 8	Az01.2 4	
Ground shrubs	*Salix arctica*	■■■	■■■	■■■■	arctic willow
	Dryas integrifolia	■■■	■■■■	■	entire-leaved mountain-avens
	Salix reticulata	■■	■■	■	net-veined willow
Graminoids	*Arctagrostis latifolia*	■■	■■	■■	polargrass
	Trisetum spicatum	■■	■■	■■	spike trisetum
	Poa pratensis ssp. *alpigena*	□□□	■■■		Kentucky bluegrass
	Leymus mollis ssp. *villosissimus*	□□□		■■■	arctic dunegrass
	Festuca rubra ssp. *arctica*	□□	□	■■	arctic red fescue
	Carex rupestris	□□	□□	■	curly sedge
Forbs	*Polemonium acutiflorum*	■■	■■	■■	tall Jacob's-ladder
	Parrya nudicaulis	■■	■■	■	nakedstem wallflower
	Astragalus spp.	■■	■■	■	milk-vetches
	Pedicularis spp.	■	■	■■	louseworts
	Bistorta vivipara	▪	■	■■	alpine bistort
	Tephroseris lindstroemii	▪	□	■	Lindström's groundsel
	Papaver spp.	■	■	■	poppies
	Oxytropis spp.	▪	■■		locoweeds
	Myosotis asiatica	■	■	■	mountain forget-me-not
	Minuartia spp.	▪	▪	▪	stitchworts
	Lupinus arcticus	□		■■	arctic lupine
Mosses	Mosses	■■■■	■■■■	■■■■	mosses
Lichens	*Flavocetraria* spp.	▪	■■	■	paperdoll lichens

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ▪ 50-70% □ 25–50%

Comments: Dens excavated and inhabited by arctic fox may subsequently be used by red fox or ground squirrels. The main entrances to the den usually have a southern aspect (Smith et al. 1988). Similar organic enrichment and diversity of flora also develops on smaller raised features in low-lying terrain (e.g., peat palsas in polygonal wetlands) that are frequently used as perches by birds.

At$1 Mastodon flower

At$1 represents the first stage of plant succession on new or active thaw slumps and occurs throughout the coastal plain **ARLS** in small discrete patches. This seral association is common, but has been infrequently sampled.

Vegetation: Exposed wet mineral materials are first colonized by sparse cover of the annual mastodon flower *(Tephroseris palustris)*. A scattering of other species will occur in these ecosystems increasing in cover and diversity with site recovery. Species such as cottongrasses *(Eriophorum* spp.*)*, alkaligrasses *(Puccinellia* spp.), polargrass *(Arctagrostis latifolia)*, common horsetail *(Equisetum arvense)*, meadow-foxtail *(Alopecurus magellanicus)* and Tilesius' wormwood *(Artemisia tilesii)* are common establishing species. Patches of the original tundra ecosite vegetation often occur if they remained intact during the slump failure.

Environment: Seepage from the exposed scar plus the rapid initial thawing of the exposed permafrost not only keeps the soil saturated for several years, but also maintains a suitable substrate for the pioneer species. Exposed mineral soil coverage is commonly over 75 percent. Soils are Regosols.

Range map

Environment table

Bioclimates	ARLS(4)
Elevation	0 – 200 – 325
Slope %	5 – 10 – 15
Moisture regime	HG
Snow cover	P
Rock/mineral %	60
Active layer	Deep
Important site features	recent coastal and inland thaw failures

Vegetation table

Stratum	no. of plots	At$1 4	
Graminoids	*Eriophorum scheuchzeri*	■■■	Scheuchzer's cottongrass
	Arctagrostis latifolia	■■■	polargrass
	Puccinellia spp.	■■■	alkaligrasses
Forbs	*Tephroseris palustris*	■■■■	mastodon flower
Mosses	*Pohlia* spp.	■■	nodding-cap moss
	Dicranella subulata	■■	awl-leaved forklet moss

Mean Cover ■<1% ■■1–5% ■■■5–15% ■■■■15–30% ■■■■■30–50% ■■■■■■>50%
Constancy ■70–100% ■50-70% □25–50%

Comments: Once the scarp failure material stabilizes, succession will begin and **At$1** will progress into the **At$2** seral association or to a meadow ecosite such as **Am03** in suitable locations.

Mastadon flower established on recent permafrost scarp failure

At$2 Polargrass – Tilesius' wormwood – Coltsfoot

At$2 is a disturbance seral association occurring on partially stabilized permafrost slope failures along coastal bluffs and old thaw slumps in **ARLS** and **ARDSIo**. This ecosite is primarily found on coastal-facing bluffs and are variable in composition, representing a mid-seral state in disturbed tundra.

Vegetation: Species composition is variable but typically lush, reflecting deep active layers and abundant moisture. Polargrass *(Arctagrostis latifolia)*, coltsfoot *(Petasites frigidus)* and Tilesius' wormwood *(Artemisia tilesii)* are prominent on most sites, but species composition is variable and diverse. Species commonly occurring on some sites include horsetail *(Equisetum arvense)*, louseworts *(Pedicularis capitata*, *P. sudetica),* various grass species *(Alopecurus magellanicus*, *Poa arctica*, *Trisetum spicatum)* and meadow affiliated forbs, including *Astragalus alpinus*, mountain forget-me-not *(Myosotis asiatica)*, *Polemonium acutiflorum*, *Senecio lugens* and *Valeriana capitata)* and other forbs. Some patches of stable tundra vegetation often remain in these ecosites, commonly dominated by net-veined willow *(Salix reticulata)* and entire-leaved mountain-avens *(Dryas integrifolia)*. Occasionally there is minor willow cover *(Salix arctica, S. pulchra*, or *S. richardsonii)*. Moss cover is patchy and inconsistent, but liverwort *Marchantia polymorpha* and sicklemoss *(Sanionia uncinata)* occur on many sites.

Environment: This ecosystem occurs predominantly on coastal bluffs with soil creep and slumping caused by partial permafrost failure or by restabilization of thaw slump failure. High vegetation cover is typical, but some exposed soil occurs along failure cracks or in zones of recent slumping. Permafrost layers are typically deep, but thawing of upslope permafrost keeps soils moist through the growing season. Most sites are north-facing and accumulate snow cover.

Range map

Environment table

Bioclimates	ARLS (7) ARDSlo (3)
Elevation	3 – 115 – 440
Slope %	0 – 19 – 50
Moisture regime	M – SHG
Snow cover	P
Rock/mineral %	29
Active layer	Deep
Important site features	slumping coastal bluffs

Vegetation table

Stratum	no. of plots	At$2 10	
Shrubs	*Salix pulchra*	□□	diamond-leaved willow
Ground shrubs	*Salix arctica*	□□	arctic willow
Ferns and allies	*Equisetum arvense*	■■	common horsetail
Graminoids	*Arctagrostis latifolia*	■■■■	polargrass
	Poa arctica	■	arctic bluegrass
	Trisetum spicatum	■	spike trisetum
Forbs	*Petasites frigidus*	■■■	arctic coltsfoot
	Artemisia tilesii	■■	Tilesius' wormwood
	Pedicularis spp.	■	louseworts
	Senecio lugens	□□	black-tip groundsel
	Tripleurospermum maritimum	□□	arctic chamomile
	Myosotis asiatica	□□	mountain forget-me-not
	Polemonium acutiflorum	□□	tall Jacob's-ladder
	Tephroseris palustris	□□	mastodon flower
Mosses	*Marchantia polymorpha*	□□	umbrella liverwort
	Pohlia spp.	□□	nodding-cap moss
	Dicranella spp.	□□	forklet moss
	Leptobryum pyriforme	□□	golden thread moss
	Sanionia uncinata	□□	sicklemoss

Mean Cover ■<1% ■■1–5% ■■■5–15% ■■■■15–30% ■■■■■30–50% ■■■■■■>50%
Constancy ■70–100% ■50-70% □25–50%

Comments: At$2 probably represents more active thaw slumping sites than **At$3**.

At$3 Arctic willow – Arctic lupine – Milk-vetch

At$3 is a disturbance association of low-elevation coastal sites on Herschel Island *(**ARDSIo**)* with activesoil movement and cryoturbation (e.g., solifluction slopes, thaw-slumps, hummocky flats). This seral association is uncommon and generally limited in size but visually distinct in the arctic landscape due to lush growth and high productivity.

Vegetation: Arctic willow *(Salix arctica)* is abundant, although often overtopped by a rich array of colorful forbs, especially legumes such as milk-vetch *(Astragalus umbellatus* and *A. alpinus)*, field locoweed *(Oxytropis campestris)* and arctic lupine *(Lupinus arcticus)*. Other forbs, such as elegant paintbrush *(Castilleja elegans)*, mountain forget-me-not *(Myosotis asiatica)* and louseworts *(Pedicularis sudetica*, *P. verticillata*, or *P. capitata)* are common. Grasses such as polargrass *(Arctagrostis latifolia)* and alpine meadow-foxtail *(Alopecurus magellanicus)* are common on most sites. Moss cover may be high on some sites; species data are largely lacking in the available data.

Environment: This ecosite occurs predominantly on fine-textured, cryoturbated solifluction slopes and frost hummocked flats. High vegetation cover is typical, but exposed soil can be a prominent feature on sites with more recently active cryoturbation. Permafrost layers are typically deep.

Range map

Environment table

Bioclimates	ARDSlo (13)
Elevation	1 – 30 – 95
Slope %	1 – 31 – 95
Moisture regime	M – SHG
Snow cover	N – P
Rock/mineral %	6
Active layer	Shallow
Important site features	Herschel Island thaw slumps

Vegetation table

Stratum	no. of plots	At$3 13	
Ground shrubs	*Salix arctica*	■■■■■	arctic willow
Graminoids	*Arctagrostis latifolia*	■■	polargrass
	Poa spp.	■■	bluegrasses
	Alopecurus magellanicus	■	alpine meadow-foxtail
Forbs	*Astragalus* spp.	■■■	milk-vetches
	Lupinus arcticus	■■■	arctic lupine
	Pedicularis spp.	■■	louseworts
	Myosotis asiatica	■■	mountain forget-me-not
	Oxytropis spp.	■■	locoweeds
	Castilleja elegans	■■	elegant paintbrush
	Petasites frigidus	□□	arctic coltsfoot
	Minuartia spp.	□	stitchworts
	Micranthes hieraciifolia	□	hawkweed-leaved saxifrage
	Tephroseris lindstroemii	□	Lindström's groundsel
Mosses	Mosses	■■■■■	mosses

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50-70% □ 25–50%

Comments: This seral association is described only from Hershel Island, where it has climatic and floristic similarities to **At02**. Both are influenced by a marine-moderated climate.

St01 Dwarf birch – Labrador tea / Crowberry

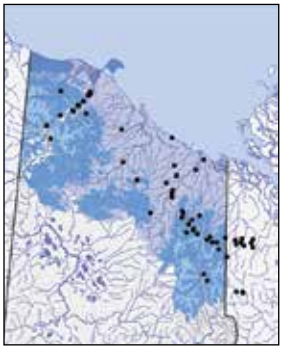
St01 represents the zonal ecosite in the **ARLS**, occurring on well-drained soils and neutral to slightly wind-protected locations. It is somewhat uncommon on the coastal plain due to a lack of suitable site conditions, occurring more widely in the ARLS foothills and at higher elevations in the **ARDSmn** on insolated slopes.

Vegetation: Vegetation is an open to closed canopy of low- to mid-statured dwarf birch *(Betula nana)*, with an abundance of ericaceous shrubs that include northern Labrador tea *(Rhododendron tomentosum)*, bog blueberry *(Vaccinium uliginosum)*, lowbush cranberry *(V. vitis-idaea)* and crowberry *(Empetrum nigrum)*. Shrub height and cover are partly related to winter snow cover and growing season temperatures. On better-protected sites near the subarctic, green alder *(Alnus viridis* ssp. *crispa)* may occur with significant cover. Other ground shrubs that often occur include alpine bearberry *(Arctous alpina)* and arctic mountain-heather *(Cassiope tetragona)*. A scattering of other species is typical and may consist of alpine sweetgrass *(Anthoxanthum monticola)*, alpine bistort *(Bistorta vivipara)* and others. Various mosses, such as mountain groove moss *(Aulacomnium turgidum)*, crumpled-leaf moss *(Rhytidium rugosum)*, dense heron's-bill moss *(Dicranum elongatum)*, juniper haircap *(Polytrichum juniperinum)*, step moss *(Hylocomium splendens)* and lichens (e.g., *Peltigera aphthosa*, *Cetraria islandica)* contribute to a moderately well-developed ground cover.

Environment: St01 occurs on (sub)mesic slopes and well-drained flats. Soils are Turbic Cryosols or Brunisols; exposed mineral soil may occur, but generally with low cover. The active layer is usually moderately deep (40 cm or greater). Snow cover is neutral to slightly snow accumulating.

The **Typic** subassociation (**St01**.1) is widespread and common. An uncommon **Alder** subassociation (**St01.2**) occurs in areas transitional to the subarctic.

Range map



Environment table

Bioclimates	ARLS(44) ARDSmn(26)
Elevation	0 – 425 – 805
Slope %	0 – 23 – 59
Moisture regime	SM – M (SX, SHG)
Snow cover	N (P)
Rock/mineral %	11
Active layer	Moderate
Important site features	zonal sites at low to moderate elevations

Vegetation table

Stratum	no. of plots	St01 70	St01.1 67	St01.2 3	
Shrubs	*Betula nana*	■■■■	■■■■	■■■■	dwarf birch
	Vaccinium uliginosum	■■■	■■■	■■■	bog blueberry
	Rhododendron tomentosum	■■■	■■■	■■■	northern Labrador tea
	Salix pulchra	□□	□□	□□	diamond-leaved willow
	Alnus viridis ssp. *crispa*			■■■■	green alder
	Spiraea stevenii			■■	Alaska spiraea
Ground shrubs	*Vaccinium vitis-idaea*	■■■	■■■	■■■	lowbush cranberry
	Empetrum nigrum	■■■	■■■	■■■	crowberry
	Arctous spp.	■■■	■■■	■■■	bearberries
	Cassiope tetragona	□□	□□	□	arctic mountain-heather
	Dryas alaskensis	□□	□□		Alaska mountain-avens
Ferns and allies	*Lycopodium* spp.			□	clubmoss
Graminoids	*Anthoxanthum monticola*	□□	■■		alpine sweetgrass
Forbs	*Bistorta plumosa*	■■	■■	■	meadow bistort
	Pedicularis spp.	■	■	□	louseworts
	Lupinus arcticus	□□	□□		arctic lupine
	Petasites frigidus			□□	arctic coltsfoot
Mosses	*Hylocomium splendens*	□□	□□	□□	step moss
	Polytrichum spp.	□□	□□	□□	haircap
	Sphagnum spp.			■■	peat mosses
Lichens	*Flavocetraria* spp.	■■	■■		paperdoll lichens
	Stereocaulon spp.	□□	■■		foam lichens
	Cladonia spp.	□□	□□	□	clad lichens
	Thamnolia vermicularis	□	□		whiteworm lichen
	Peltigera spp.	□	□		pelt lichens

Mean Cover ■<1% ■■1–5% ■■■5–15% ■■■■15–30% ■■■■■30–50% ■■■■■■>50%
Constancy ■70–100% ■50–70% □25–50%

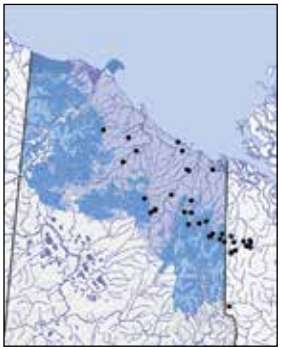
Comments: The floristically similar **St03** occurs in more wind-exposed sites on ridges and convex slopes than **St01**. **St03** has very low shrub growth, often occurring in protected hollows with low overall vegetation cover and significant exposed rock pavement. This ecosite occurs throughout the Canadian Low Arctic.

St02 is a common and occasionally extensive ecosite of the **ARLS** and **ARDSmn**. It occurs primarily east of the Firth River on mesic to moist gradual pediment slopes in the mountains and coastal plain.

Vegetation: Vegetation is characterized by an open canopy of low-growing shrubs such as dwarf birch *(Betula nana)* and northern Labrador tea *(Rhododendron tomentosum)*, often overtopped by the tussock forming muskeg sedge *(Carex lugens)*. Other species associated with non-calcareous tundra occur, such as diamond-leaved willow *(Salix pulchra)*, bog blueberry *(Vaccinium uliginosum)*, lowbush cranberry *(Vaccinium vitis-idaea)* and crowberry *(Empetrum nigrum)*. Some forbs are often present, such as meadow bistort *(Bistora plumosa)*, coltsfoot *(Petasites frigidus)* and narrow-leaved sawwort *(Saussurea angustifolia)*. Moss cover is often high, with Sphagnum mosses occurring in wetter inter-hummocks and upland mosses such as step moss *(Hylocomium splendens)*, mountain groove moss *(Aulacomnium turgidum)*, and heron's-bill moss *(Dicranum elongatum)* on elevated sites.

Environment: St02 occupies intermediate site conditions between the wetter tussock cottongrass ecosite (**Wb01)** and drier shrub tundra (**St01**), often occurring on the upper areas of pediment slopes or on better drained convexities on gradual slopes. The snow cover regime is neutral. Because of the insulating effect of high vegetation cover and fine-textured soils, the active layer is often within 40 cm of the surface. Sites are commonly hummocky and the structure of the ecosite is similar to that of **Wb01** ecosites. Most sites have soils classified as Turbic Cryosols and they primarily occur on acidic substrates.

Range map



Environment table

Bioclimates	ARLS (27) ARDSmn (15)
Elevation	6 – 446 – 849
Slope %	0 – 11 – 38
Moisture regime	SHG –M
Snow cover	N (P)
Rock/mineral %	4
Active layer	Moderate
Important site features	moist tundra

Vegetation table

Stratum	no. of plots	St02 42	
Shrubs	*Betula nana*	■■■	dwarf birch
	Vaccinium uliginosum	■■■	bog blueberry
	Rhododendron tomentosum	■■■	northern Labrador tea
	Salix pulchra	■■■	diamond-leaved willow
Ground shrubs	*Vaccinium vitis-idaea*	■■■	lowbush cranberry
	Empetrum nigrum	■■■	crowberry
	Arctous spp.	■■	bearberries
	Rubus chamaemorus	□	cloudberry
Graminoids	*Carex lugens*	■■■	muskeg sedge
	Arctagrostis latifolia	■■	polargrass
	Eriophorum vaginatum	■■	tussock cottongrass
Forbs	*Bistorta plumosa*	■■	meadow bistort
	Petasites frigidus	■■	arctic coltsfoot
	Pedicularis spp.	■	louseworts
	Saussurea angustifolia	□	narrow-leaved sawwort
Mosses	*Sphagnum* spp.	■■■	peat mosses
	Hylocomium splendens	□□	step moss
	Dicranum spp.	□□	heron's-bill moss
	Aulacomnium spp.	□□	groove moss
Lichens	*Flavocetraria* spp.	■■	paperdoll lichens
	Stereocaulon spp.	□	foam lichens
	Cladonia spp.	□	clad lichens
	Thamnolia vermicularis	□	whiteworm lichen
	Peltigera spp.	□	pelt lichens

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comment: St02 is generally less common than the closely related **Wb01.**

St03 Dwarf birch / Lowbush cranberry / Paperdoll

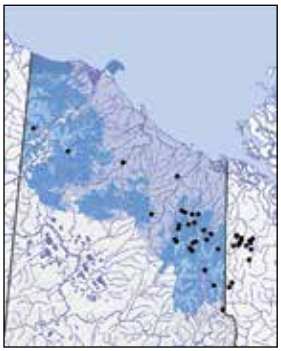
St03 is a common low shrub ecosite occurring on dry, wind-exposed non-calcareous tundra in the **ARDSmn** and foothills in the **ARLS**.

Vegetation: Plant cover is typically patchy, with vegetation in protected microsites in a matrix of wind-deflated mineral materials and rock. It is characterized by prostrate dwarf birch *(Betula nana)* and low ericaceous shrubs such as bog blueberry *(Vaccinium uliginosum)*, bearberries *(Arctous* spp.), northern Labrador tea *(Rhododendron tomentosum)* and lowbush cranberry *(V. vitis-idaea)* usually not more than 20 cm in height.
A scattering of other species is typical and may consist of alpine sweetgrass *(Anthoxanthum monticola)*, skeleton-leaved willow *(Salix phlebophylla)*, small-awned sedge *(Carex microchaeta)* and louseworts *(Pedicularis* spp.)

The ground layer is typically sparse lichen cover consisting of paperdoll *(Flavocetraria nivalis* and *F. cucullata)*, foam *(Stereocaulon* spp.), green witches hair *(Alectoria ochroleuca)* and whiteworm *(Thamnolia vermicularis)* lichens.

Environment: St03 occurs on dry rocky windblown ridges and convex windward slopes where high winds reduce winter snow cover. These sites typically have pronounced cryoturbation features with high cover of exposed wind-deflated bare soil with a rocky surface horizon. Soils are Turbic Cryosols and moderately acidic.

Range map



Environment table

Bioclimates	ARDSmn (31) ARLS (16)
Elevation	192 – 641 – 1006
Slope %	0 – 20 – 53
Moisture regime	SX (X, SM)
Snow cover	E
Rock/mineral %	32
Active layer	Moderate
Important site features	windblown ridges and convex windward slopes

Vegetation table

Stratum	no. of plots	St03 47	
Shrubs	*Betula nana*	■■■■	dwarf birch
	Vaccinium uliginosum	■■	bog blueberry
	Rhododendron tomentosum	▪▪	northern Labrador tea
Ground shrubs	*Vaccinium vitis-idaea*	■■■	lowbush cranberry
	Arctous spp.	■■■	bearberries
	Salix phlebophylla	▪▪	skeleton-leaved willow
	Empetrum nigrum	□□	crowberry
Graminoids	*Anthoxanthum monticola*	■■	alpine sweetgrass
	Carex microchaeta	□	small-awned sedge
Forbs	*Pedicularis* spp.	□	louseworts
Mosses	*Polytrichum piliferum*	▪▪	haircap
Lichens	*Flavocetraria* spp.	■■■	paperdoll lichens
	Stereocaulon spp.	■■■	foam lichens
	Cladonia spp.	□□	clad lichens
	Umbilicaria spp.	□□	rocktripe lichens
	Alectoria ochroleuca	□	green witches hair
	Thamnolia vermicularis	□	whiteworm lichen
	Masonhalea richardsonii	□	arctic tumbleweed

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ▪ 50–70% □ 25–50%

Comments: St03 is the wind-exposed version of the related **St01** ecosite, and these two concepts intergrade. **St01** has taller shrub stature, little exposed soil and a better developed and more diverse herb layer.

St04 is a common low-shrub tundra ecosite, occurring commonly on warm aspect slopes in the **ARDSmn** and on warm well-drained sites in the ARLS in areas of calcareous parent materials.

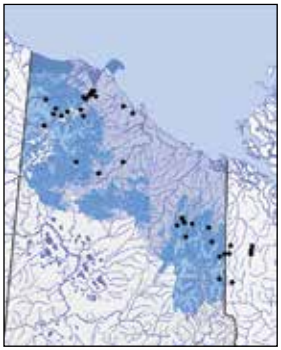
Vegetation: Dwarf birch *(Betula nana)*, willows (most commonly *Salix glauca)* and Alaska mountain avens *(Dryas alaskensis)* are dominant, but typically there is high species diversity. Shrub stature is moderate (to 50 cm) in warmer localities, but of reduced height in more exposed sites. Other common ground shrubs include bog blueberry *(Vaccinium uliginosum)*, net-veined willow *(Salix reticulata)*, bearberry *(Arctous alpinus or A. rubra)* and Lapland rosebay *(Rhododendron lapponicum)*. The forb layer is diverse, including species such as arctic lupine *(Lupinus arcticus)*, alpine hedysarum *(Hedysarum alpinus)* and capitate lousewort *(Pedicularis capitata)* among others.

Moss and lichen cover is often low. Upland mosses such as step moss *(Hylocomium splendens)*, crumpled-leaf moss *(Rhytidium rugosum)* and wiry fern moss *(Abientinella abientina)*, as well as lichens such as *Stereocaulon* spp. and *Cladonia* spp., are typical.

Environment: St04 occurs on warm, insolated and well-drained slopes, inactive floodplains and in upland depressions where a shallow winter snowpack protects the low-lying vegetation from wind erosion and the extreme cold of winter. Topography is commonly straight, with little evidence of cryoturbation, but some sites may have low hummocks. The ecosite generally occurs in areas with non-acidic parent materials.

Two subassociations are described: the **Typic** (**St04.1)** is dominated by dwarf birch with minor cover of willows; and the grey-leaved willow-dominated **St04.2,** which occurs on more calcareous sites.

Range map



Environment table

Bioclimates	ARDSmn (30) ARLS (15)
Elevation	0 – 521 – 980
Slope %	0 – 27 – 125
Moisture regime	SX – M
Snow cover	N
Rock/mineral %	15
Active layer	Moderate
Important site features	calcareous soils, warm aspects or well-drained flats

Vegetation table

Stratum	no. of plots	St04 45	St04.1 30	St04.2 15	
Shrubs	*Betula nana*	■■■■	■■■■	■■■	dwarf birch
	Vaccinium uliginosum	■■■	■■■	■■	bog blueberry
	Rhododendron tomentosum		□□		northern Labrador tea
	Salix glauca	■■■	□□	■■■■	grey-leaved willow
	Dasiphora fruticosa			□□	shrubby cinquefoil
Ground shrubs	*Dryas alaskensis*	■■■	■■■	■■■■	Alaska mountain-avens
	Dryas integrifolia	□□	□□	■■■	entire-leaved mountain-avens
	Arctous spp.	■■■	■■■	■■■	bearberries
	Vaccinium vitis-idaea	□□	■■		lowbush cranberry
	Cassiope tetragona	□□	■■		arctic mountain-heather
	Salix reticulata	■■	□□	■■	net-veined willow
Graminoids	*Anthoxanthum monticola*	□	■		alpine sweetgrass
	Festuca altaica	□		□	Altai fescue
Forbs	*Lupinus arcticus*	■■	■■■	□□	arctic lupine
	Pedicularis spp.	■	■	□	louseworts
	Bistorta plumosa	□	■		meadow bistort
	Saxifraga tricuspidata	□	□	■	prickly saxifrage
	Oxytropis spp.	□	□	□□	locoweeds
	Saussurea angustifolia	□	□		narrow-leaved sawwort
	Hedysarum spp.	□□		■■	hedysarums
	Bistorta vivipara			□	alpine bistort
	Senecio lugens			□	black-tip groundsel
Mosses	*Hylocomium splendens*	□□	□□	□□	step moss
	Rhytidium rugosum	□	□	□□	crumpled-leaf moss
	Abientinella abientina	□	□	□	wiry fern moss
Lichens	*Flavocetraria* spp.	□□	■■	□□	paperdoll lichens
	Cladonia spp.	□□	■■	□□	clad lichens
	Stereocaulon spp.	□□	□□	□□	foam lichens

Mean Cover ■<1% ■■1–5% ■■■5–15% ■■■■15–30% ■■■■■30–50% ■■■■■■>50%
Constancy ■70–100% ■50–70% □25–50%

Comments: St04 has similar herb layer vegetation to **At05**, but occurs on warmer aspects or lower elevations where improved temperature conditions support low shrubs.

St05 is an uncommon ecosite in the **ARLS** and **ARDSmn,** where it is restricted to warm-aspect, often insolated, slopes in sites protected from cold winds during the growing season.

Vegetation: This ecosite is characterized by the occurence of the tussock-forming Altai fescue *(Festuca altaica)* under an open canopy of mid-statured dwarf birch *(Betula nana)*, and bog blueberry *(Vaccinium uliginosum)*. Ground shrubs such as lowbush cranberry *(V. vitis-idaea)*, alpine bearberry *(Arctous alpina)* and northern Labrador tea *(Rhododendron tomentosum)* are common and abundant on some sites. Other species that occur regularly include monkshood *(Aconitum delphiniifolium)*, arctic lupine *(Lupinus arcticus)*, small-awned sedge *(Carex microchaeta)* and meadow bistort *(Bistorta plumosa)*. Moss cover of step moss *(Hylocomium splendens)* or other mosses can be high on some plots and there is commonly some cover of *Stereocaulon* and *Cladina* lichens.

Environment: St05 occurs on inland, protected, insolated slopes with deep, well-drained, generally non-calcareous, soils. Soils are commonly classified as Brunisols. Soil moisture is typically mesic and drier. Snow cover is average for this region, but often disappears earlier in the growing season than in some ecosites. These warm site conditions are not common in the Yukon Arctic Region, but are more common in more southerly latitudes.

Range map

Environment table

Bioclimates	ARDSmn (5) ARLS (3)
Elevation	350 – 614 – 840
Slope %	1 – 37 – 65
Moisture regime	SM – M
Snow cover	N (E)
Rock/mineral %	3
Active layer	Deep
Important site features	warm aspect slopes

Vegetation table

Stratum	no. of plots	St05 83	
Shrubs	*Betula nana*	■■■■■	dwarf birch
	Vaccinium uliginosum	■■■	bog blueberry
	Rhododendron tomentosum	■■	northern Labrador tea
	Spiraea stevenii	□□□	Alaska spiraea
	Salix glauca	□□□	grey-leaved willow
	Salix pulchra	□□	diamond-leaved willow
Ground shrubs	*Vaccinium vitis-idaea*	■■	lowbush cranberry
	Arctous spp.	■■	bearberries
	Dryas alaskensis	□□	Alaska mountain-avens
Graminoids	*Festuca altaica*	■■■	Altai fescue
	Carex microchaeta	□	small-awned sedge
Forbs	*Bistorta plumosa*	■	meadow bistort
	Aconitum delphiniifolium	■	monkshood
	Lupinus arcticus	□	arctic lupine
Mosses	*Polytrichum* spp.	■■	haircap
	Hylocomium splendens	■■	step moss
	Rhytidium rugosum	□□	crumpled-leaf moss
Lichens	*Stereocaulon* spp.	■■	foam lichens
	Cladonia spp.	■	clad lichens
	Peltigera spp.	■	pelt lichens
	Masonhalea richardsonii	■	arctic tumbleweed

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: Similar Altai fescue-dominated ecosystems are widespread and common at more southerly latitudes in the Subarctic and Boreal regions.

St06 is an uncommon ecosite of the eastern **ARLS** that occurs on upper snow-accumulating slopes of low coastal plain hills with thin, rapidly drained soils.

Vegetation: This ecosite has a closed vegetation cover of tall-stature green alder *(Alnus viridis* ssp. *crispa)*, commonly with minor cover of Alaska spirea *(Spiraea stevenii)*, bog blueberry *(Vaccinium uliginosum)* and dwarf birch *(Betula nana)* in the understorey. The herb layer vegetation is variable, but commonly much reduced due to shading and abundant litter fall from alder. Low cover of northern Labrador tea *(Rhododendron tomentosum)*, lingonberry *(V. vitis-idaea)*, crowberry *(Empetrum nigrum)*, arctic bearberry *(Arctous alpina)*, bluejoint *(Calamagrostis canadensis)*, stiff club moss *(Lycopodium annotinum)* and/or fireweed *(Chamerion angustifolium)* occur on many sites. Moss and lichen cover are often negligible due to shading and abundant litter fall from alder.

Environment: This ecosite occurs on moderate to steep low-elevation leeside slopes (generally east-facing) where snow accumulation protects vegetation in the winter and prevents soil freezing. Soils are often a thin mantle of till or regolith over rock with rapid drainage. Soils are most commonly classified as Static Cryosols.

Range map

Environment table

Bioclimates	ARLS (7)
Elevation	15 – 118 – 191
Slope %	20 – 41 – 65
Moisture regime	SM (M)
Snow cover	P
Rock/mineral %	10
Active layer	Lithic or Deep
Important site features	well-drained slopes, often with thin soils; snow accumulating

Vegetation table

Stratum	no. of plots	St06 7	
Shrubs	*Alnus viridis* ssp. *crispa*	■■■■■■	green alder
	Betula nana	■■	dwarf birch
	Rhododendron tomentosum	■■	northern Labrador tea
	Spiraea stevenii	■■	Alaska spiraea
	Vaccinium uliginosum	■	bog blueberry
	Salix pulchra	□□	diamond-leaved willow
Ground shrubs	*Vaccinium vitis-idaea*	■■■	lowbush cranberry
	Arctous spp.	■■	bearberries
	Empetrum nigrum	■	crowberry
	Cassiope tetragona	□□	arctic mountain-heather
Graminoids	*Arctagrostis latifolia*	■■	polargrass
Forbs	*Petasites frigidus*	□□	arctic coltsfoot
	Bistorta vivipara	□□	alpine bistort
	Bistorta plumosa	□	meadow bistort
	Stellaria longipes	□	long-stalked starwort
Mosses	*Polytrichum* spp.	■	haircap
	Sphagnum spp.	□□	peat mosses
	Hylocomium splendens	□□	step moss
	Dicranella spp.	□□	forklet moss
Lichens	*Cladonia* spp.	■■	clad lichens
	Cetraria spp.	□□	Cetraria lichen
	Peltigera spp.	□	pelt lichens
	Flavocetraria spp.	□	paperdoll lichens
	Nephroma spp.	□	paw lichens

Mean Cover ■<1% ■■1–5% ■■■5–15% ■■■■15–30% ■■■■■30–50% ■■■■■■>50%
Constancy ■70–100% ■50–70% □25–50%

Comments: The similar **FI02** is also dominated by dense stands of tall green alder. It typically occurs on floodplains, but also occurs on river valley slopes where some seepage and fine-textured soils support bluejoint reedgrass (**FI02b**). **St06** by contrast occurs on dry sites with thin or coarse-textured soils and a variable but generally sparse understorey.

St07 is an uncommon ecosite in the **ARLS**, occurring only along the coastal fringe in moist seepage gullies.

Vegetation: St07 is characterized by the dominance of low- to moderate-stature Richardson's willow *(Salix richardsonii)*, and species common to seepage sites, such as common horsetail *(Equisetum arvense)*, coltsfoot *(Petasites frigidus)* and polargrass *(Arctagrostis latifolia)*, are generally present and abundant. A diversity of species is common on most sites, but composition is variable among sites. Most of the forb species that occur indicate snow protection, such as black-tip groundsel *(Senecio lugens)*, Tilesius' wormwood *(Artemisia tilesii)*, mountain sagewort *(Artemisia norvegica)*, monkshood *(Aconitum delphiniifolium)* and capitate valerian *(Valeriana capitata)*. Widely occurring tundra species such as alpine bistort *(Bistorta vivipara)*, astragalus (alpine milk-vetch: *Astragalus alpinus, A. umbellatus),* arctic lupine *(Lupinus arcticus)*, willows *(Salix reticulata*, *S. arctica*, *Salix pulchra)*, water sedge *(Carex aquatilis)* and others also occur on many sites.

The moss layer is often well-developed but variable. Species of wet sites such as glow moss *(Aulacomnium palustre),* fen moss *(Tomentypnum nitens)* and liverwort *(Marchantia polymorpha)* are most common, but upland species such as mountain groove moss *(Aulacomnium turgidum), Polytrichum juniperinum, Brachythecium* spp. and *Peltigera* spp. commonly occur.

Environment: Sites are typically found in concave coastal slopes, which receive some seepage from permafrost thawing through the season and snow protection in the winter. Often these sites have partial slope failures and down-slope movement of soil. Soils are gleyed Regosols and Static Cryosols and the active layer is usually deep.

Range map

Environment table

Bioclimates	ARLS (9) ARDSlo (4)
Elevation	1 – 32 – 73
Slope %	0 – 23 – 170
Moisture regime	SHG
Snow cover	P
Rock/mineral %	35
Active layer	Deep (Moderate)
Important site features	moist concave slopes on the coast

Vegetation table

Stratum	no. of plots	St07 13	
Shrubs	*Salix richardsonii*	■■■■■	Richardson's willow
	Salix pulchra	□□	diamond-leaved willow
Ground shrubs	*Salix reticulata*	□□□	net-veined willow
	Salix arctica	□□□	arctic willow
Ferns and allies	*Equisetum arvense*	■■■■	common horsetail
Graminoids	*Arctagrostis latifolia*	■■	polargrass
	Carex aquatilis	□□	water sedge
	Trisetum spicatum	□	spike trisetum
Forbs	*Petasites frigidus*	■■	arctic coltsfoot
	Pedicularis spp.	■	louseworts
	Astragalus spp.	■	milk-vetches
	Bistorta vivipara	■	alpine bistort
	Lupinus arcticus	□	arctic lupine
	Artemisia tilesii	□	Tilesius' wormwood
	Senecio lugens	□	black-tip groundsel
	Artemisia norvegica	□	mountain sagewort
	Aconitum delphiniifolium	□	monkshood
	Parnassia spp.	□	grass-of-Parnassus
Mosses	Mosses	■■■■	mosses

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: On the Mackenzie River Delta, the **St07** ecosite occurs on slightly elevated drainage channels.

St08 Diamond-leaved willow – Dwarf birch/ Coltsfoot / Peat moss

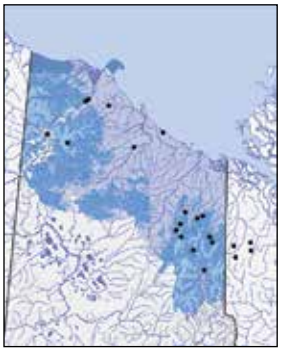
St08 is an uncommon ecosite of the **ARDSmn** and **ARLS** that occurs on moist to wet seepage slopes, mainly at the start of rivulets or others sites where unchannelized drainage ways create a mosaic of mesic to wet habitats. This uncommon ecosite is typically of limited spatial extent.

Vegetation: St08 sites typically have a continuous vegetation cover. Diamond-leaved willow *(Salix pulchra)* and dwarf birch *(Betula nana)* have moderate cover, but are of low stature. The herb layer is well developed; coltsfoot *(Petasites frigidus)* and cloudberry *(Rubus chamaemorus)* are the most prominent members. Common horsetail *(Equisetum arvense)* and other forbs typical of moist sites such as polargrass *(Arctagrostis latifolia)* and Nelson's saxifrage *(Micranthes nelsoniana)* are common. An array of species typical of non-calcareous tundra frequently occur, including lowbush cranberry *(Vaccinium vitis-idaea),* dwarf willows *(Salix arctica* and *S. reticulata)*, alpine bearberry *(Arctous alpina)*, crowberry *(Empetrum nigrum)*, narrow-leaved sawwort *(Saussurea angustifolia)*, and bog blueberry *Vaccinium uliginosum*.

Moss cover is usually high and dominated by peat moss *(Sphagnum* spp.), but other species such as step moss *(Hylocomium splendens)* and glow moss *(Aulacomnium palustre)* are also common.

Environment: St08 occurs on cool, gradual to moderately sloping shallow gullies with unchannelized surface seepage and ephemeral rivulets. Soils are commonly fine-textured Static or Turbic Cryosols that may have a thin organic surface horizon. The permafrost depth is typically shallow to moderate (>40 cm). Most sites are concave and accumulate some snow, which insulates the ecosite from winter extremes.

Range map



Environment table

Bioclimates	ARDSmn (13) ARLS (9)
Elevation	3 – 524 – 958
Slope %	0 – 15 – 35
Moisture regime	SHG – HG (SHD)
Snow cover	(N) P
Rock/mineral %	6
Active layer	Moderate
Important site features	un-channelled small rivulets in sloping ground

Vegetation table

Stratum	no. of plots	St08 22	
Shrubs	*Salix pulchra*	■■■■■	diamond-leaved willow
	Betula nana	■■■	dwarf birch
	Vaccinium uliginosum	□□	bog blueberry
	Rhododendron tomentosum	□□	northern Labrador tea
Ground shrubs	*Rubus chamaemorus*	■■■	cloudberry
	Vaccinium vitis-idaea	■■	lowbush cranberry
	Empetrum nigrum	■■	crowberry
Ferns and allies	*Equisetum arvense*	■■■	common horsetail
Graminoids	*Arctagrostis latifolia*	■■	polargrass
Forbs	*Petasites frigidus*	■■■	arctic coltsfoot
	Pedicularis spp.	■	louseworts
	Micranthes nelsoniana	■	Nelson's saxifrage
	Bistorta plumosa	□	meadow bistort
Mosses	*Sphagnum* spp.	■■■■	peat mosses
	Hylocomium splendens	■■■	step moss
Lichens	*Peltigera* spp.	□□	pelt lichens

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: St08 is floristically and environmentally related to **FI01**, which often occurs along small streams where channelized stream flow leads to more productive conditions and deeper active layers. **FI01** always has taller and denser shrub growth and generally lacks the high moss cover of **St08**.

FI01 is a common arctic and subarctic ecosite that occurs along small creeks, drainage gullies in pediment slopes and occasionally on peripheral zones of snowbeds with moist seepage and deep active layers in the **ARLS** and lower **ARDSmn**. This common ecosite is widespread in the non-calcareous mountains and within pediment slopes, but is usually limited to the narrow zone adjacent to flowing water where seepage deepens the active layer.

Vegetation: This lush ecosite has continuous vegetation, often with very high cover of tall (>2 m) diamond-leaved willow *(Salix pulchra)*. In the understorey, coltsfoot *(Petasites frigidus)* and common horsetail *(Equisetum arvense)* always occur, but there is typically a mix of other forbs typical of rich moist sites, including tall Jacob's ladder *(Polemonium acutiflorum)*, dotted saxifrage *(Micranthes nelsoniana)*, capitate valerian *(Valeriana capitata)*, bluejoint *(Calamagrostis canadensis)* and others. The moss layer is typically sparse; species such as *Sanionia uncialis, Philonotis fontana* and *Bryum pseudotriquetrum/weigelii* occasionally occur.

Environment: FI01 occurs on floodplains of small creeks, gullies with seepage and ephemeral rivulets (**FI01a; alluvial phase**), and also on moist sites adjacent to coastal arctic meadows where deep snow protects the site in winter, deepens the active layer and provides moisture in the growing season **(FI01b; snowbed phase**). Soils are typically coarse-textured along creeks, but may be fine-textured in sites with no active drainage channels. The active layers are typically deep (>100 cm). Soils are often Regosols or Static Cryosols, with relatively deep active layers derived from acidic parent materials.

Range map

Environment table

Bioclimates	ARDSmn (20) ARLS (26)
Elevation	3 – 355 – 762
Slope %	0 – 16 – 42
Moisture regime	SHG (HG)
Snow cover	P (VP)
Rock/mineral %	1
Active layer	Deep
Important site features	stream gullies in pediment slopes, small streams, and wet snowbed edges

Vegetation table

Stratum	no. of plots	FI01 46	
Shrubs	*Salix pulchra*	■■■■■■	diamond-leaved willow
	Vaccinium uliginosum	□□	bog blueberry
	Betula nana	□□	dwarf birch
Ferns and allies	*Equisetum arvense*	■■■■	common horsetail
Graminoids	*Calamagrostis canadensis*	□□	bluejoint reedgrass
	Arctagrostis latifolia	□□	polargrass
Forbs	*Petasites frigidus*	■■■■	arctic coltsfoot
	Polemonium acutiflorum	■■	tall Jacob's-ladder
	Micranthes nelsoniana	■■	Nelson's saxifrage
	Aconitum delphiniifolium	■	monkshood
	Artemisia norvegica	□□	mountain sagewort
	Valeriana capitata	□	capitate valerian
Mosses	*Bryum weigelii*	□□	Duval's thread moss
	Philonotis fontana	□□	spring moss
	Sanionia uncinata	□□	sicklemoss

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: The snowbed phase of **FI01** is relatively uncommon and usually occurs around the edge of low-elevation arctic meadow ecosites (**Am02** or **Am03**). The alluvial phase is the most common ecosite along small drainages in the pediment slopes and foothills. The related low-statured **St08** occurs at higher elevations or more exposed locations with shallower active layers.

FI02 occurs on coastal plain floodplains of larger streams with gravelly, non-calcareous alluvium found in the eastern **ARLS**.

Vegetation: This ecosite has high cover of tall-statured green alder *(Alnus viridis* ssp. *crispa)* that sometimes creates enough shade and litter fall to limit understorey development. Scattered cover of shorter-stature shrubs such as diamond-leaved willow *(Salix pulchra)*, Richardson's willow *(S. richardsonii)* and Alaska spirea *(Spiraea stevenii)* are common in the understorey. Bluejoint *(Calamagrostis canadensis)* occurs on all sites and with very high cover on some floodplains; elsewhere, coltsfoot *(Petasites frigidus)* is more common. Other species that occasionally occur include wild red currant *(Ribes triste)*, common horsetail *(Equisetum arvense)*, Tilesius' wormwood *(Artemisia tilesii)*, fireweed *(Chamerion angustifolium)*, bristly clubmoss *(Lycopodium annotinum)*, monkshood *(Aconitum delphiniifolium)* and yellow anemone *(Anemone richardsonii)*. The moss layer is poorly developed, with scattered *Polytrichum* spp., *Brachythecium* spp. and *Sanionia uncialis*.

Environment: This ecosite occurs on the floodplains of larger lowland streams with relatively coarse floodplain materials of non-calcareous origin (**FI02a;** alluvial phase); and, occasionally, on valley slope breaks where snow cover and improved drainage create a deep active layer (**FI02b;** snowbed phase). **FI02** occurs on stream reaches with relatively powerful floods (as indicated in gravelly substrates), but also seem to predominate along streams without calcareous bedload, being replaced by the **FI04** where headwaters have limestone geology. Snow cover regime is protected.

Range map

Environment table

Bioclimates	ARLS (12)
Elevation	0 – 71 – 278
Slope %	0 – 7 – 30
Moisture regime	M – SHG
Snow cover	P
Rock/mineral %	50
Active layer	Deep
Important site features	larger streams with non-calcareous bedload and seepage slopes on river valley slopes

Vegetation table

Stratum	no. of plots	FI02 12	
Shrubs	*Alnus viridis* ssp. *crispa*	■■■■■■	green alder
	Salix pulchra	■■■	diamond-leaved willow
	Spiraea stevenii	■■■	Alaska spiraea
	Salix richardsonii	□□□	Richardson's willow
Ground shrubs	*Empetrum nigrum*	□	crowberry
Ferns and allies	*Equisetum arvense*	□□	common horsetail
	Lycopodium annotinum	□□	bristly clubmoss
Graminoids	*Calamagrostis canadensis*	■■■■	bluejoint reedgrass
Forbs	*Petasites frigidus*	■■■	arctic coltsfoot
	Chamerion angustifolium	□□	fireweed
	Artemisia tilesii	□□	Tilesius' wormwood
Mosses	*Polytrichum* spp.	■■	haircap
	Eurhynchium pulchellum	□	elegant beaked moss
	Sanionia uncinata	□□	sicklemoss
	Brachythecium spp.	□	ragged moss

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: Floodplains with green alder appear to be limited to larger drainages without limestone in the bedload, which occur only in the eastern portion of the Yukon Arctic Region. Willows, especially Alaska willow, occupy floodplains of streams with limestone geology in the headwaters (**FI03** and **FI04**).

FI03 is an uncommon ecosite in the **ARLS** and **ARDSmn**. It occurs on the active floodplain of larger streams on gravelly, well-drained substrates, usually those with a limestone sediment source. This ecosite occurs as linear communities along water courses and is usually of limited extent.

Vegetation: Alaska willow *(Salix alaxensis)* is prominent on all sites, with an open cover of medium to tall stature. Understorey species diversity is often high, but community composition varies depending on recent flood history and substrate texture. Forbs are usually a prominent feature; hedysarum *(Hedysarum* spp.*)*, black-tip groundsel *(Senecio lugens)*, Siberian aster *(Eurybia sibirica)*, Tilesius' wormwood *(Artemisia tilesii)* and fireweed *(Chamerion angustifolium)* commonly occur. On sites with finer textures, meadow horsetail *(Equisetum pratense)* and bluejoint reedgrass *(Calamagrostis canadensis)* become significant components.

Mosses and lichens are generally infrequent.

Environment: This ecosite occurs along larger streams on the active floodplain, with most sites experiencing annual flooding. These active floodplains often have heterogenous patterns of surface soil textures ranging from sandy to gravelly. Soils are cumulic or orthic Regosols. **FI03** occurs in systems that drain watersheds with limestone geology. These sites are relatively productive due to active subirrigation and a very deep active layer. Snow cover regime is protected.

Range map

Environment table

Bioclimates	ARDSmn (4) ARLS (7)
Elevation	0 – 347 – 640
Slope %	0 – 1 – 5
Moisture regime	SHG – M
Snow cover	P
Rock/mineral %	23
Active layer	Deep
Important site features	moderate to large streams generally with calcareous bedload

Vegetation table

Stratum	no. of plots	FI03 11	
Shrubs	*Salix alaxensis*	■■■■■	feltleaf willow
	Salix hastata	■■■	halberd willow
Ferns and allies	*Equisetum arvense*	■■	common horsetail
Graminoids	*Calamagrostis canadensis*	□□□	bluejoint reedgrass
Forbs	*Senecio lugens*	■■	black-tip groundsel
	Hedysarum spp.	■■	hedysarums
	Parnassia spp.	■	grass-of-Parnassuses
	Eurybia sibirica	■	Siberian aster
	Chamerion latifolium	□□	river beauty
	Artemisia tilesii	□	Tilesius' wormwood
Mosses	*Sanionia uncinata*	□□	sicklemoss
	Philonotis fontana	□□	spring moss
	Eurhynchium pulchellum	□	elegant beaked moss
	Grimmia spp.	□	grimmia

Mean Cover ■<1% ■■1–5% ■■■5–15% ■■■■15–30% ■■■■■30–50% ■■■■■■>50%
Constancy ■70–100% ■50–70% □25–50%

Comments: FI04 may occur on the same stream reaches as **FI03,** but on inactive portions of the floodplain.

FI04 is a common ecosite in areas of the western **ALRS** and **ARDS** that are underlain with calcareous rocks. There it occurs along ephemeral rivulets on moderate-gradient mountain slopes and on the inactive floodplains of lower gradient systems.

Vegetation: An open cover of medium to tall Alaska willow *(Salix alaxensis)* is typical. The understorey is comprised of common tundra species, with species indicative of wetter sites occurring directly adjacent to the water course. Entire-leaved mountain-avens *(Dryas integrifolia)* always has prominent cover. Other common species include shrubby cinquefoil *(Dasiphora fruticosa)*, red bearberry *(Arctous rubra)*, net-veined willow *(Salix reticulata)*, alpine hedysarum *(Hedysarum alpinum)*, death-camas *(Zigadenus elegans)*, river beauty *(Chamerion latifolium)* and arctic lupine *(Lupinus arcticus)*. On sites with more near-surface seepage common horsetail can be abundant.

Mosses are generally of low cover, but species such as sickle moss *(Sanionia uncinatus)* may have significant cover on some sites.

Environment: This ecosite occurs as linear communities along small watercourses with stable calcareous substrates that are sub-irrigated at depth but rarely flooded, such as ephemeral rivulets on mountain slopes or the inactive floodplains of larger creek systems. Soils are generally rapidly drained, gravelly Static Cryosols that are dry near the surface, but with water tables found at depth. Relative snow cover is generally neutral to protected.

Range map

Environment table

Bioclimates	ARDSmn (11) ARLS (4)
Elevation	360 – 599 – 878
Slope %	0 – 21 – 45
Moisture regime	SX – SHG
Snow cover	N (P)
Rock/mineral %	18
Active layer	Moderate
Important site features	mountain rivulets and inactive gravel flats – calcareous

Vegetation table

Stratum	no. of plots	FI04 15	
Shrubs	*Salix alaxensis*	■■■■	feltleaf willow
	Dasiphora fruticosa	■	shrubby cinquefoil
	Betula nana	□□	dwarf birch
	Shepherdia canadensis	□	soapberry
Ground shrubs	*Dryas integrifolia*	■■■■	entire-leaved mountain-avens
	Arctous spp.	■■■	bearberries
	Salix reticulata	■■	net-veined willow
	Cassiope tetragona	□□	arctic mountain-heather
Ferns and allies	*Equisetum arvense*	□□	common horsetail
Graminoids	*Festuca altaica*	□□	Altai fescue
	Carex scirpoidea	□	single-spike sedge
Forbs	*Hedysarum* spp.	■■	hedysarums
	Zigadenus elegans	■	mountain death-camas
	Pedicularis spp.	■	louseworts
	Anemone parviflora	■	small-flowered anemone
	Boykinia richardsonii	□□	Richardson's brookfoam
	Parnassia spp.	□	grass-of-Parnassuses
	Eurybia sibirica	□	Siberian aster
	Chamerion latifolium	□	river beauty
	Lupinus arcticus	□	arctic lupine
	Arnica spp.	□	arnicas
Mosses	*Eurhynchium pulchellum*	□	elegant beaked moss
	Sanionia uncinata	□□	sicklemoss
	Philonotis fontana	□□	spring moss

Mean Cover ■<1% ■■1–5% ■■■5–15% ■■■■15–30% ■■■■■30–50% ■■■■■■>50%
Constancy ■70–100% ■50–70% □25–50%

Comments: FI04 occurs on the inactive portion of floodplains, which is different from other Floodplain ecosystems described in this guide.

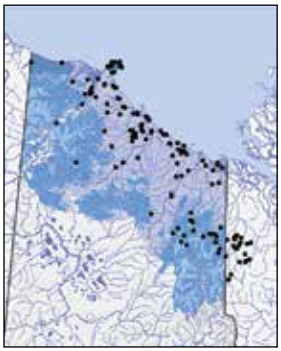
Wb01 is a widespread and extensive ecosite in the **ARLS** and lower **ARDS**, where it occurs on gradual pediment slopes and plains with wet soils and shallow active layers.

Vegetation: Sites are distinct, with abundant tussock cottongrass *(Eriophorum vaginatum)*. There is a poorly to moderately developed low shrub layer of dwarf birch *(Betula nana)* and northern Labrador tea *(Rhododendron tomentosum)* often of similar or lower stature to the cottongrass. Other common species include diamond-leaved willow *(Salix pulchra)*, bog blueberry *(Vaccinium uliginosum)*, lowbush cranberry *(Vaccinium vitis-idaea)* and crowberry *(Empetrum nigrum)*. Peat mosses *(Sphagnum* spp.) are dominant in hollows and low hummocks, and other mosses and lichens, such as step moss *(Hylocomium splendens)*, mountain groove moss *(Aulacomnium turgidum)* and dense heron's-bill moss *(Dicranum elongatum)* occur on elevated microsites.

Environment: This ecosite is found on gradual receiving slopes at a range of elevations. Shallow peat 20 to 30 cm in depth over frozen, ice-rich and fine-textured mineral soils is typical, but it may be thinner on some sites. Soils are classified as gleyed Turbic, gleyed Static, or Organic Cryosols. In the mountains, **Wb01** often occurs on pediment slopes where seepage flows along permafrost, which is usually within 35 cm of the surface. Snow cover regime is neutral.

Four subassociations are described with different shrub components: **Typic** with Dwarf birch (**Wb01.1)**; sites with slightly more active seepage and Diamond-leaved willow (**Wb01.2**); slightly wetter or colder sites with a Sparse birch component (**Wb01.3)**, and sites near the subarctic boundary, with somewhat deeper active layers and some cover of Alder (**Wb01.4**).

Range map



Environment table

Bioclimates	ARLS (109) ARDSmn (31) ARDSlo (15) ARDSal (5)
Elevation	5 – 318 – 975
Slope %	0 – 7 – 31
Moisture regime	SHG – SHD
Snow cover	N
Rock/mineral %	4
Active layer	Shallow
Important site features	fine-textured pediment slopes and flats; thin peaty layers over frozen mineral soil

Vegetation table

Stratum	no. of plots	Wb01 165	Wb01.1 74	Wb01.2 58	Wb01.3 28	Wb01.4 5	
Shrubs	*Betula nana*	■■■	■■■	■■■	■■	■■■	dwarf birch
	Rhododendron tomentosum	■■■	■■■	■■	■■■	■■■	northern Labrador tea
	Vaccinium uliginosum	□□	■■	□□		■■	bog blueberry
	Salix pulchra	■■■	■■	■■■		□	diamond-leaved willow
	Alnus viridis ssp. *crispa*					■■■■	green alder
Ground shrubs	*Vaccinium vitis-idaea*	■■■	■■■	■■	■■■	■■■	lowbush cranberry
	Empetrum nigrum	■■	■■	□□	■■	■■■	crowberry
	Rubus chamaemorus	■■	■■	□□	■■	■■	cloudberry
	Arctous spp.		□□			■■	bearberries
Graminoids	*Eriophorum vaginatum*	■■■■	■■■■■	■■■■	■■■■■	■■■■	tussock cottongrass
	Carex lugens	■■	■■	■■		■	muskeg sedge
Forbs	*Bistorta plumosa*	■■	■	■■	□	■	meadow bistort
	Pedicularis spp.	■	■	■		■	louseworts
	Petasites frigidus	□□	□□	□□			arctic coltsfoot
Mosses	*Sphagnum lenense*	■■■	■■■	■■■	■■■■	■■■	little brown peat moss
	Sphagnum rubellum	■■■	■■■	■	■■■		peat moss
	Sphagnum recurvum	□	□	□	■■■		peat moss
	Sphagnum girgensohnii	□	□	□	□	■■■	green peat moss
	Hylocomium splendens	■■	■■	■■	■■	■■	step moss
	Dicranum spp.	■	■	□□	■	■■	heron's-bill mosses
	Aulacomnium turgidum			■■		■	mountain groove moss
	Aulacomnium palustre			■■■			glow moss
Lichens	*Flavocetraria* spp.	■■	■■	■■	■■	■■	paperdoll lichens
	Cladonia spp.	□□		□	□□	■■	clad lichens
	Dactylina arctica	□	□	□	□	□	finger lichen
	Cladina spp.	□	□	□			reindeer lichens

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: This ecosite has the floristic indicators of bogs such as ericaceous shrubs and acid-loving sphagnum species, but are not strictly ombrotrophic. They may have quite thin organic matter accumulations, in which they differ from the "classic" bogs of southern latitudes.

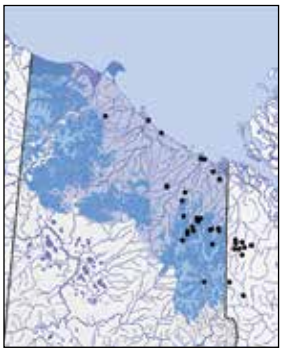
Wb02 is a common bog ecosite occupying gradual slopes and level areas with restricted drainage in the **ARLS** and **ARDSmn** of the Richardson Mountains.

Vegetation: This ecosite is characterized by an open shrub cover of low-growing dwarf birch *(Betula nana)*, northern Labrador tea *(Rhododendron tomentosum)*, and often, bog blueberry *(Vaccinium uliginosum)* and diamond-leaved willow *(Salix pulchra)*. Dwarf woody plants typical of poor sites are common, including an abundance of cloudberry *(Rubus chamaemorus)*, lowbush cranberry *(Vaccinium vitis-idaea)* and crowberry *(Empetrum nigrum)*. Peat mosses *(Sphagnum* spp.) dominate the well developed moss layer and form low hummocky topography associated with drier and wetter microsites. The ground cover may include more hydrophytic species between the hummocks.

Environment: This ecosite is restricted to cold slopes with slow-moving soil water, which promotes the accumulation of organic matter and leads to permafrost forming near the soil surface. Soil water is perched on the permafrost layer and retained in the organic matter. Rooting zone conditions are acidic, even in regions dominated by basic parent materials. Soils are Turbic or Static Cryosols, often with a peaty surface horizon. Sites are neutral to protected snow cover regime.

Two subassociations are recognized: **Typic** sites are common and dominated by low-growing dwarf birch (**Wb02.1**), but cover of green alder may be present in areas in transition to the subarctic (**Wb02.2**).

Range map



Environment table

Bioclimates	ARLS (34) ARDSmn (16)
Elevation	2 – 442 – 838
Slope %	0 – 13 – 60
Moisture regime	HG – M
Snow cover	N (P)
Rock/mineral %	3
Active layer	Shallow
Important site features	wet slopes with more active seepage – non-calcareous areas

Vegetation table

Stratum	no. of plots	Wb02 50	Wb02.1 44	Wb02.2 6	
Shrubs	*Betula nana*	■■■■	■■■■	■■■■	dwarf birch
	Rhododendron tomentosum	■■■	■■■	■■■■	northern Labrador tea
	Salix pulchra	■■■	■■■	■■■	diamond-leaved willow
	Vaccinium uliginosum	■■■	■■	■■■■	bog blueberry
	Alnus viridis ssp. *crispa*			■■■■■	green alder
	Spiraea stevenii			■■	Alaska spiraea
Ground shrubs	*Rubus chamaemorus*	■■■■	■■■■	■■■	cloudberry
	Vaccinium vitis-idaea	■■■	■■■	■■■	lowbush cranberry
	Empetrum nigrum	■■■	■■■	■■■	crowberry
	Arctous spp.	□□		■■	bearberries
	Andromeda polifolia			■■	bog-rosemary
Ferns and allies	*Lycopodium* spp.			■■■	clubmoss
Graminoids	*Eriophorum vaginatum*	■■	■■	■	tussock cottongrass
	Arctagrostis latifolia	□	□	■■	polargrass
	Carex lugens			■■	muskeg sedge
Forbs	*Petasites frigidus*	■■	■■	■■	arctic coltsfoot
	Bistorta plumosa	■■	■■	■	meadow bistort
	Pedicularis spp.	■	■	■■	louseworts
Mosses	*Sphagnum girgensohnii*	■■■■■	■■■■	■■■■■■	green peat moss
	Sphagnum recurvum	■■■	■■■	■■■	peat mosses
	Sphagnum rubellum	■	■	□□	peat mosses
	Polytrichum spp.	□□	□□	■■	haircap mosses
	Hylocomium splendens	■■■	■■■	■■■	step moss
	Aulacomnium palustre		■■		glow moss
	Dicranum spp.	□	□	□	heron's-bill moss
	Aulacomnium turgidum	□	□	□	mountain groove moss
Lichens	*Flavocetraria* spp.	□	□	□	paperdoll lichens
	Cladonia amaurocraea	□		■	quill clad lichen

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: These sites are related to **Wb01,** but seem to occur in areas with more active water flow. They are differentiated from it by absent or minimal cover of tussock cottongrass. Cloudberry production in this ecosite is often extremely high.

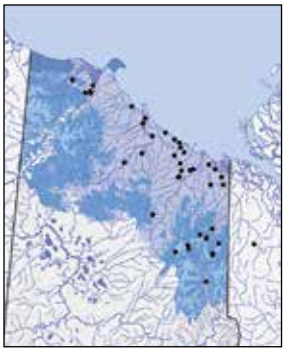
Wf01 is a widely distributed ecosite throughout the coastal plain **ARLS** and less commonly in the **ARDSmn** of the Richardson Mountains. There it occupies wet sites in a variety of landscape positions, including wet lake margins and other small water bodies, flat basins, and gradually sloping drainage ways.

Vegetation: The vegetation is always dominated by water sedge *(Carex aquatilis)*, but other secondary species are sometimes prominent. In the most common condition, low-growing diamond-leaved willow *(Salix pulchra)* occurs overtopped by the sedges. Minor cover of dwarf birch *(Betula nana)* or Alaska bog willow *(Salix fuscescens)* occur on some sites. On wetter sites there is relatively low cover of shrubs, and species typical of wetter sites become more common, such as Scheuchzer's cottongrass *(E. scheuchzeri)*, loose-flowered sedge *(Carex rariflorum)*, or even marsh cinquefoil *(Comarum palustre)* where there is deeper standing water. There is typically a well-developed moss layer composed of species typical of non-acidic conditions. *Sphagnum squarrosum* is common, but other indicators of relatively rich conditions such as hook and water mosses are prominent on some sites.

Environment: Wf01 occurs in wet flats in the coastal plain and along slow-moving tundra streams, water tracks, the margins of polygonal ground and on lakeshores. The water table is usually near the surface, and some sites may be inundated for part of the year. Soils are gleyed Static Cryosols with peaty humus layers or Organic Cryosols. Sites are neutral to protected snow cover regime.

Three subassociations are described: **Typic** with low-growing willows (**Wf01.1**); sites with sparse willow and water sedge (**Wf01.2**); and sites with some open water and marsh cinquefoil (**Wf01.3**).

Range map



Environment table

Bioclimates	ARDSmn (11) ARLS (42)
Elevation	1 – 299 – 890
Slope %	0 – 4 – 15
Moisture regime	SHD – HG (HD)
Snow cover	N (P)
Rock/mineral %	20
Active layer	Moderate
Important site features	wet flats

Vegetation table

Stratum	no. of plots	Wf01 53	Wf01.1 29	Wf01.2 12	Wf01.3 12	
Shrubs	*Salix pulchra*	■■■	■■■■	■■	□	diamond-leaved willow
	Betula nana	□□	■■	□□		dwarf birch
Graminoids	*Carex aquatilis*	■■■■■	■■■■■	■■■■	■■■■■	water sedge
	Eriophorum angustifolium	■■	■■	□□	■	tall cottongrass
	Eriophorum scheuchzeri			■■		Scheuchzer's cottongrass
Forbs	*Comarum palustre*	□□		□	■■■	marsh cinquefoil
	Pedicularis spp.		□			louseworts
Mosses	*Sphagnum angustifolium*	■■■	■■■	■■	■■	peat moss
	Sphagnum squarrosum	■■■■	■■■	■■■■	■■	shaggy peat moss
	Sphagnum recurvum	□□	■■			peat moss
	Sphagnum girgensohnii		■■■			green peat moss
	Sphagnum lenense	■■	■■			little brown peat moss
	Aulacomnium palustre		■■			glow moss
	Calliergon stramineum	□□		□□		straw water moss
	Drepanocladus aduncus	□□	□□		■■	common hook moss
	Calliergon cordifolium		□□		■■	heart-leaved water moss

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: The related **Wf02** occurs in similar habitats, but with a generally more inland and montane distribution. These two ecosite concepts intergrade, with many sites that have both water sedge and narrow-leaved cottongrass in a variable mix. **Wf01** probably represents sites with more active groundwater flow and base-rich minerology than **Wf02**.

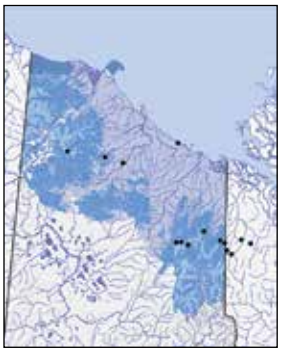
Wf02 is a widely distributed but spatially limited ecosite of the **ARLS** foothills and the **ARDSmn,** where it occurs on gentle slopes and water tracks with some groundwater flow throughout the growing season.

Vegetation: It is characterized by a high abundance of narrow-leaved cottongrass *(Eriophorum angustifolium)* and peat mosses such as *Sphagnum girgensohnii* and *S. lenense*. Scattered cover of low growing shrubs, such as diamond-leaved willow *(Salix pulchra)*, Alaska bog willow *(S. fuscescens)*, and dwarf birch *(Betula nana)* is common, but these are of lower stature than the cottongrass that dominates these sites. Water sedge *(Carex aquatilis)* is a common associate. The moss layer is variable in cover and species composition.

Environment: Wf02 occurs on poorly drained, gradually sloping water tracks where the continuous gradual groundwater flow is near or at the surface for most of the growing season. Some surface water flow is common, drainage is poor, and the moisture regime is hygric to subhydric. There may be some evidence of frost action, such as solifluction features or hummocks, but these are usually weakly defined. Soils are gleyed Static or Turbic Cryosols with peaty humus layers or Organic Cryosols. Sites are neutral or snow cover protected.

Two subassociations are described: **Typic** (**Wf02.1**), with limited shrub cover; and Diamond-leaved willow (**Wf02.2**), with >10% low-growing *S. pulchra*.

Range map



Environment table

Bioclimates	ARDSmn (9) ARLS (13)
Elevation	0 – 476 – 920
Slope %	0 – 6 – 22
Moisture regime	HG(2) SHD(5) HD(11)
Snow cover	N – P
Rock/mineral %	1
Active layer	Moderate
Important site features	wet gradual slopes and flats

Vegetation table

Stratum	no. of plots	Wf02 22	Wf02.1 14	Wf02.2 8	
Shrubs	*Salix pulchra*	■■■	□	■■■■	diamond-leaved willow
	Betula nana	■	□	■	dwarf birch
	Rhododendron tomentosum	□		■	northern Labrador tea
Ground shrubs	*Salix fuscescens*			■■	Alaska bog willow
Graminoids	*Eriophorum angustifolium*	■■■■■	■■■■■■	■■■■■	tall cottongrass
	Eriophorum vaginatum			■	tussock cottongrass
	Carex lugens			□□	muskeg sedge
	Carex aquatilis	□□□	■■■		water sedge
	Eriophorum scheuchzeri				Scheuchzer's cottongrass
Forbs	*Pedicularis* spp.	□		■	louseworts
	Comarum palustre				marsh cinquefoil
Mosses	*Sphagnum lenense*	■■■	■■	■■■	little brown peat moss
	Aulacomnium palustre			■■■	glow moss
	Polytrichum commune	□□	□□	■	haircap moss
	Aulacomnium turgidum	□		□	mountain groove moss
	Calliergon stramineum	□□	□□	□□	straw water moss
	Drepanocladus aduncus	□		□	common hook moss
	Sphagnum girgensohnii	■■■	□□	■■■■	green peat moss
	Sphagnum platyphyllum	□		■	flat-leaved peat moss
	Sphagnum balticum	□□	■■	□□	Baltic peat moss

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

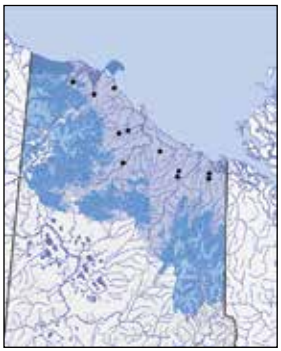
Comments: The related **Wf01** occurs in similar habitats, but apparently with more base-rich groundwater or coastal distribution. **Wf02** is generally restricted to mountainous environments where soils are generally more acidic than **Wf01**.

Wf03 is an uncommon ecosite in the **ARLS,** occurring in level, patterned wetlands and other perennially saturated organic deposits underlain by permafrost. This ecosite is rarely extensive.

Vegetation: Creeping sedge *(Carex chordorrhiza)* is the characteristic site species, but water sedge *(Carex aquatilis)* and Scheuchzer's cottongrass *(Eriophorum scheuchzeri)* are common on most sites. Moss cover is variable. Minerophyllic *Sphagnum* spp. tolerant of submersion such as *S. platyphyllum* and *S. lindbergii* are common; other "brown mosses" such as *Scorpidium* spp. or *Drepanocladus* spp. may occur on some sites. Most **Wf03** sites are patterned and any elevated ridges will be occupied by any variety of species typical of drier site conditions.

Environment: Sites are very poorly drained, subhydric to hydric, and minerotrophic, with surface water present during most of the growing season. Water is perched on frozen fine-textured mineral soils. Soils are gleyed Turbic Cryosols with a peaty surface horizon or Organic Cryosols. Typical locations are in low-centred polygons or ridged fens, but sites may also occur in other level areas such as drained lake basins that have begun infilling with peat. The active layer is shallow to moderately deep. Snow cover regime is neutral.

Range map



Environment table

Bioclimates	ARLS (13)
Elevation	0 – 110 – 174
Slope %	0 – 0 – 1
Moisture regime	HD (SHD)
Snow cover	N
Rock/mineral %	0
Active layer	Moderate
Important site features	polygonal ground and basins with permanent very shallow water

Vegetation table

Stratum	no. of plots	Wf03 13	
Shrubs	*Betula nana*	□	dwarf birch
Graminoids	*Carex aquatilis*	■■■■	water sedge
	Carex chordorrhiza	■■■■	creeping sedge
	Eriophorum scheuchzeri	■■	Scheuchzer's cottongrass
	Eriophorum angustifolium	□	tall cottongrass
Mosses	*Sphagnum* spp.	■■■	peat mosses
	Sphagnum squarrosum	■■■	shaggy peat moss
	Sphagnum lindbergii	■■	brown-stemmed peat moss
	Sphagnum platyphyllum	■■	flat-leaved peat moss
	Sphagnum orientale	■	Oriental peat moss

Mean Cover ■<1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: Wf03 ecosystems are wetter than the related **Wf01**, usually with standing water at the surface through most of the growing season. At a distance, these two ecosites may look similar, but the occurrence of *Carex chordorrhiza* with its surface running stolons is distinctive.

Wf04 Scheuchzer's cottongrass – Water sedge / Baltic peat moss

Wf04 is an uncommon ecosite that occurs with limited extent in the **ARLS** and **ARDSal** on sites with shallow standing water such as low-centred polygons, thawed frost cracks and shallow depressions in extensive pediment plains.

Vegetation: The vegetation is typified by a high cover of Scheuchzer's cottongrass *(Eriophorum scheuchzeri)* and a component of water sedge *(Carex aquatilis)*. Other species that occasionally occur include narrow-leaved cottongrass *(Eriophorum angustifolium)*, marsh cinquefoil *(Comarum palustre)* and swollen beaked sedge *(Carex rotundata)*. Baltic peat moss *(Sphagnum balticum)* is commonly dominant, but other minerophyllic peat mosses (e.g., *Sphagnum lindbergii)* and "brown mosses" are also common.

Environment: Sites are very poorly drained, subhydric and weakly minerotrophic, with surface water present during most of the growing season. Soils usually have some organic matter accumulations. Suitable conditions for this ecosite seem to occur in a variety of habitat types, from coastal pediments to higher-elevation shallow depressions in tundra. Soils are gleyed Static and Turbic Cryosols. Snow cover regime is neutral to protected.

No subassociations are recognized.

Range map

Environment table

Bioclimates	ARLS (7) ARDSal (4)
Elevation	100 – 392 – 1067
Slope %	0 – 2 – 9
Moisture regime	HD (SHD)
Snow cover	N – P
Rock/mineral %	0
Active layer	Shallow
Important site features	water hollows in tussock tundra; small waterbodies

Vegetation table

Stratum	no. of plots	Wf04 11	
Ground shrubs	*Salix fuscescens*	□□	Alaska bog willow
Graminoids	*Eriophorum scheuchzeri*	■■■■■	Scheuchzer's cottongrass
	Carex aquatilis	□□□	water sedge
Mosses	*Sphagnum balticum*	■■■■■	Baltic peat moss
	Warnstorfia exannulata	■■■	ringless hook moss
	Polytrichum commune	■	common haircap
	Aulacomnium turgidum	□	mountain groove moss
	Sphagnum contortum	■	twisted peat moss
	Sphagnum lindbergii	□□	brown-stemmed peat moss
	Drepanocladus aduncus	□□	common hook moss
	Bryum weigelii	□	Duval's thread moss

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: This ecosite is related to **Wf03**, which occurs in similar habitats but with more circum-neutral soils and only in coastal locations. Scheuchzer's cottongrass can also occur with abundance in more productive marsh habitats in conjunction with *Arctophila fulva* (**Wm01**).

Wf05 is an uncommon and spatially limited ecosite occurring at lower elevations of the eastern **ARLS** in infilling basins or low-centred polygons with saturated peat and a water table permanently at the soil surface.

Vegetation: This ecosite is characterized by the dominance of loose-flowered sedge *(Carex rariflora)*. Associated species vary, but often include round-fruited sedge *(C. rotundata)* and water sedge *(C. aquatilis)*. Peat moss species tolerant of submersion or permanent saturation, such as *Sphagnum balticum*, *S. lenense* or *S. obtusum,* commonly occur. On elevated moss hummocks within **Wf05**, species of wet acidic sites such as Labrador tea *(Rhododendron tomentosum),* Alaska bog willow *(Salix fuscescens)* and bog-rosemary *(Andromeda polifolia)* may occur.

Environment: Wf05 occurs in infilling oxbows, shallow basins and low-centred polygons where the watertable is just above the surface of a shallow, saturated peat horizon. **Wf05** occurs in weakly acidic to weakly minerotrophic conditions and is generally absent from areas underlain by calcareous substrates. The active layer in this ecosite is often shallow (<35 cm). Snow cover regime is neutral to protected.

Range map

Environment table

Bioclimates	ARLS (4) ARDSlo (1)
Elevation	59 – 214 – 411
Slope %	0 – 1 – 4
Moisture regime	HD (SHD)
Snow cover	N (P)
Rock/mineral %	0
Active layer	Shallow
Important site features	Shallow peat and low energy surface water flow

Vegetation table

Stratum	no. of plots	Wf05 5	
Shrubs	*Betula nana*	□□	dwarf birch
	Rhododendron tomentosum	□	northern Labrador tea
	Vaccinium uliginosum	□	bog blueberry
Ground shrubs	*Salix fuscescens*	■■	Alaska bog willow
	Andromeda polifolia	■■	bog-rosemary
Graminoids	*Carex rariflora*	■■■■■	loose-flowered sedge
	Carex aquatilis	■■	water sedge
	Carex rotundata	■■■	round sedge
	Eriophorum scheuchzeri	□	Scheuchzer's cottongrass
Forbs	*Pedicularis* spp.	■	louseworts
Mosses	*Sphagnum* spp.	■■	peat mosses
	Sphagnum balticum	■■■■	Baltic peat moss
	Sphagnum lenense	■■■	little brown peat moss
	Sphagnum squarrosum	■■■	shaggy peat moss
	Polytrichum commune	■■	common haircap
	Sphagnum obtusum	■■	obtuse peat moss
	Sphagnum compactum	□	compact peat moss
	Aulacomnium turgidum	□	mountain groove moss

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: This ecosite is poorly delimited due to few plots and field observations. The similar **Em03** occurs on the Mackenzie River Delta, where *Carex rariflora* occurs with oval-leaved willow on weakly brackish, shallowly flooded flats.

Wf06 is an uncommon ecosite of the **ARLS**, occurring only directly adjacent to the coast on weakly active drainage ways.

Vegetation: Wf06 is characterized by the dominance of low-growing Richardson's willow *(Salix richardsonii)* and water sedge *(Carex aquatilis)*. Shrub height can vary from 30 cm to 1.2 m. Narrow-leaved cottongrass *(Eriophorum angustifolium)* occurs on many sites, but with generally lower cover than water sedge. On wetter sites, the species list is reduced, but where there is some frost mounding a diversity of species often occurs on the resulting drier microsites. These may include arctic willow *(Salix arctica)*, net-veined willow *(S. reticulata)*, entire-leaved mountain-avens *(Dryas integrifolia)*, common horsetail *(Equisetum arvense)*, yellow marsh saxifrage *(Saxifraga hirculus)*, two-flowered rush *(Juncus biglumis)*, louseworts (e.g., *Pedicularis sudetica)* or tussock-forming graminoids such as tussock cottongrass *(E. vaginatum)* and muskeg sedge *(Carex lugens)*, among others. The moss layer can be well-developed; it is usually dominated by mosses such as golden star moss *(Campylium stellatum)* or fen moss *(Tomentypnum nitens)*, but bryophyte data are limited.

Environment: Sites may be flooded for brief periods and typically are saturated for the rest of the growing season. Soils are poorly drained, with a thin peat layer on top of gleyed mineral substrates. Soils are commonly classified as gleysolic Static Cryosols. In the Yukon Arctic Region, **Wf06** occurs only in close proximity to the coast, often in sites with some snow accumulation (SCR is protected).

Range map

Environment table

Bioclimates	ARDSlo (3) ARLS (2)
Elevation	6 – 31 – 57
Slope %	0 – 3 – 6
Moisture regime	HG
Snow cover	P
Rock/mineral %	0.1
Active layer	Moderate
Important site features	gradual drainage ways adjacent to the coast

Vegetation table

Stratum	no. of plots	Wf06 5	
Shrubs	*Salix richardsonii*	■■■■	Richardson's willow
Ground shrubs	*Salix arctica*	■■	arctic willow
	Dryas integrifolia	■■	entire-leaved mountain-avens
	Salix reticulata	■■	net-veined willow
Ferns and allies	*Equisetum arvense*	□	common horsetail
Graminoids	*Carex aquatilis*	■■■■	water sedge
	Eriophorum angustifolium	■■	tall cottongrass
	Eriophorum vaginatum	□□	tussock cottongrass
	Carex lugens	□□	muskeg sedge
Forbs	*Saxifraga hirculus*	■	yellow marsh saxifrage
	Pedicularis sudetica	□	Sudeten lousewort
	Bistorta vivipara	□	alpine bistort
	Petasites frigidus	□	arctic coltsfoot
	Pyrola spp.	□	wintergreens
Mosses	Mosses	■■■■■	mosses

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: Wf06 is a common ecosite of the southern central Canadian arctic east of the Mackenzie River Delta in areas underlain with calcareous till.

Wm01 is a widespread marsh ecosite of the circumpolar Low Arctic. This ecosite is usually of limited extent, but may occasionally cover several hectares. It is found primarily near sea level, but has been observed in shallow in-filling lakes at higher elevations in the **ARLS**.

Vegetation: The rhizomatous pendant grass *(Arctophila fulva)* is the dominant and sometimes only vascular species. Other emergent species, such as mare's-tail *(Hippuris lanceolata)*, Scheuchzer's cottongrass *(Eriophorum scheuchzeri)*, and water horsetail *(Equisetum fluviatile)* may be abundant or even dominant on some sites. Water sedge *(Carex aquatilis)*, mastodon flower *(Tephroseris palustris)*, aquatic *Ranunculus* spp. or submerged "brown mosses" such as *Drepanocladus* spp. may also occur.

Environment: These wetlands are continually inundated and shallow water usually covers these sites entirely. **Wm01** stands occur along lake margins, shallow ponds and slow-moving streams in water up to 1 m in depth. The rooting substrate is completely saturated throughout the growing season and the active layer is usually very deep. Soils are Gleysols (or non-soils) with soft, mucky surface horizons. Wave action and water circulation limits peat accumulation and results in relatively high nutrient availability. This ecosite is tolerant of slightly brackish water.

These relatively simple ecosystems have been infrequently sampled in the Yukon Arctic Region. Based on field observations, several subassociations could be identified based on secondary dominant species, but the available data are very limited. Potential subtypes include sites with lance-leaved mare's-tail *(Hippuris lanceolata)* in more stagnant waters, with water horsetail *(Equisetum fluviatile)* in sediment accumulating fluvial sites, or with Scheuchzer's cottongrass *(Eriophorum scheuchzeri)*.

Range map

Environment table

Bioclimates	ARLS (11)
Elevation	1 – 162 – 335
Slope %	0 – 0 – 2
Moisture regime	HG(1) SHD(1) HD(7)
Snow cover	N
Rock/mineral %	0
Active layer	Deep
Important site features	shallow to deep water bodies

Vegetation table

Stratum	no. of plots	Wm01 11	
Graminoids	*Arctophila fulva*	■■■■■	pendant grass
	Carex aquatilis	■■	water sedge
	Eriophorum scheuchzeri	□□	Scheuchzer's cottongrass
Forbs	*Hippuris* spp.	□□	mare's-tails
	Equisetum fluviatile	□□	water horsetail
	Epilobium palustre	□□	marsh willowherb
Mosses	*Drepanocladus aduncus*	□□□	common hook moss
	Calliergon cordifolium	□□	heart-leaved water moss
	Pohlia spp.	□	nodding-cap moss

Mean Cover ■<1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: Wm01 sites with *Hippuris* spp. occur commonly in the Mackenzie River Delta in shallow ponds and oxbows. Freshwater sites are generally occupied by *Hippuris lanceolatus* and those sites influenced with more brackish water by *Hippuris tetraphylla* (see Estuarine Ecosites section).

Wm02 is a widespread arctic ecosite that occurs in shallow freshwater or weakly brackish ponds and low-centred polygonal ground adjacent to the coastline. In the Yukon Arctic Region, this ecosite is not common and has been sampled largely from the **ARDSlo** on Herschel Island.

Vegetation: High cover of Fisher's tundragrass *(Dupontia fisheri)* and water sedge *(Carex aquatilis)* is characteristic. Other graminoid species may occur peripherally, including pendant grass *(Arctophila fulva)*, tall cottongrass *(Eriophorum angustifolium)*, or meadow-foxtail *(Alopecurus magellanicus)*. Common horsetail *(Equisetum arvense)*, nodding saxifrage *(Saxifraga cernua)* and yellow marsh-marigold *(Caltha palustris)* occur on some sites. There is occasionally a high cover of mosses, but species data are not available.

Environment: Typical sites are level or gradually sloping, poorly drained and shallowly flooded basins near the coast. Standing water to 20 cm may occur for some period of the growing season, but often sites are merely saturated at the surface. The ground surface may be smooth or have some patterning, with this ecosite occurring in low polygon centres or troughs. Soils can be a variety of textures from sandy to clayey, and are often gleyed Static or Turbic Cryosols. Grazing from geese is heavy in some areas. This ecosite may reflect elevated phosphorus provided by marine sources. Snow cover regime is neutral to protected.

Range map

Environment table

Bioclimates	ARDSlo (6) ARLS (1)
Elevation	1 – 32 – 84
Slope %	1 – 4 – 6
Moisture regime	SHG – HD
Snow cover	N (P)
Rock/mineral %	30
Active layer	Moderate
Important site features	shallow depressions near coast

Vegetation table

Stratum	no. of plots	Wm02 7	
Ferns and allies	*Equisetum arvense*	■■	common horsetail
Graminoids	*Dupontia fisheri*	■■■■	Fisher's tundragrass
	Carex aquatilis	■■	water sedge
	Eriophorum angustifolium	□□	tall cottongrass
	Alopecurus magellanicus	□□	alpine meadow-foxtail
	Arctophila fulva	□	pendant grass
Forbs	*Saxifraga cernua*	■	nodding saxifrage
	Caltha palustris	□□	yellow marsh-marigold
Mosses	Mosses	■■■■	mosses

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: On the Mackenzie River Delta, the floristically similar **Em06** ecosite occurs, but it is dominated by *Carex* x *flavicans* (a hybrid of *C. aquatilis* x *C. subspathacea)* and has more distinctly brackish waters.

Bb01 is a common but rarely extensive circumpolar Low Arctic ecosite occurring on sandy and pebbly marine beaches exposed to highest tide saltwater flooding, erosion and salt spray. The beach habitats suitable for this ecosite are not common in the Yukon Arctic Region and this site has been sampled only on the **ARDSlo,** although sites have been observed along the **ARLS** coastline.

Vegetation: Vegetation cover is very sparse, characterized by patchy clumps of seabeach sandwort *(Honckenya peploides)*, sometimes with the scattered presence of other dune or shore zone species such as arctic dunegrass *(Leymus mollis* ssp. *villosissimum)* or sea bluebells *(Mertensia maritima)*.

Environment: Bb01 occurs on sandy/pebbly beaches at the storm tide elevation, usually on the oceanward side of the strand line and interspersed in driftwood. It may also occur in somewhat protected embayments with low intensity erosion from winds or waves. Most coastline beach deposits along the Yukon coastline do not support this ecosite, because they are too exposed to waves and subsequent high levels of erosion/deposition. Soils are Regosols.

Range map

Environment table

Bioclimates	ARDSlo (4)
Elevation	1 – 5 – 8
Slope %	0 – 1 – 2
Moisture regime	SX-M
Snow cover	N (E)
Rock/mineral %	77
Active layer	Deep
Important site features	beach strandline

Vegetation table

Stratum	no. of plots	Bb01 4	
Graminoids	*Leymus mollis* ssp. *villosissimus*	■	arctic dunegrass
Forbs	*Honckenya peploides*	■	seabeach sandwort
	Mertensia maritima	□	sea bluebells

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: Bb01 often occurs on beach fronts; **Bb02** occurs inland on more stabilized and rarely flooded beach ridges and sand flats.

Bb02 is a common **ARLS** and **ARDSlo** shore-zone ecosite on well-drained supratidal sand and pebble beaches and dunes. The habitats suitable for this ecosite are not common in the Yukon Arctic Region, where actively eroding foreshores are common.

Vegetation: Vegetation cover is generally sparse in the typic situation, but becomes moderately high under increasingly stabilized conditions on protected flats and dunes. Arctic dunegrass *(Leymus mollis* ssp. *villosissimus)* is the diagnostic species for this ecosite. In more exposed sites, few other species will occur other than beach species typical of **Bb01** *(Honckenya peploides*, *Mertensia maritima, Stellaria humifusa)* or beach pea *(Lathyrus japonicus)*. On stabilized beaches that are protected from wave and wind erosion, a diversity of other species may become established, such as arctic willow *(Salix arctica)*, oval-leaved willow *(S. ovalifolia)*, Tilesius' wormwood *(Artemisia tilesii)*, arctic lupine *(Lupinus arcticus)*, spike trisetum *(Trisetum spicatum) a*nd others. Mosses may begin to establish on stabilizing sites that are no longer exposed to salt water.

Environment: Arctic dunegrass binds mobile substrates and is tolerant of salt spray and wind. Most exposed **Bb02** locations have abundant exposed sand/pebbles and driftwood is common. On increasingly stable sites in **Bb02.2** and **Bb02.3**, moss cover begins to cover the ground surface. Soils are rapidly drained, sandy/gravelly Regosols.

Three subassociations are described: **Bb02.1** (**Typic**) occurs on active and windblown beaches and dunes; **Bb02.2** (Arctic willow) occurs on stabilized beaches; and **Bb02.3** (Primrose) occurs on stabilized dunes inland from the coastline.

Range map

Environment table

Bioclimates	ARDSlo(8) ARLS(5)
Elevation	0 – 19 – 99
Slope %	0 – 6 – 33
Moisture regime	SX – M
Snow cover	E – N
Rock/mineral %	41
Active layer	Deep
Important site features	dunes and back beach

Vegetation table

Stratum	no. of plots	Bb02 13	Bb02.1 5	Bb02.2 6	Bb02.3 2	
Ground shrubs	*Salix arctica*	□□		■■■	■■■	arctic willow
	Salix ovalifolia			■	■	oval-leaved willow
Ferns and allies	*Equisetum arvense*			■		common horsetail
Graminoids	*Leymus mollis* ssp. *villosissimus*	■■■■	■■■■	■■■■	■■■■	arctic dunegrass
	Trisetum spicatum	□		■■		spike trisetum
	Festuca rubra ssp. *arctica*			■■		arctic red fescue
	Alopecurus magellanicus				■■	alpine meadow-foxtail
Forbs	*Artemisia tilesii*	□		■■		Tilesius' wormwood
	Lupinus arcticus			■■		arctic lupine
	Pedicularis spp.	□		■	■	louseworts
	Astragalus spp.	□		■		milk-vetches
	Castilleja elegans	□		■		elegant paintbrush
	Stellaria longipes			■		long-stalked starwort
	Achillea millefolium			■		yarrow
	Lathyrus japonicus		□□			beach pea
	Honckenya peploides		□□			seabeach sandwort
	Mertensia maritima		□	□		sea bluebells
	Minuartia spp.			□	■	stitchworts
	Cochlearia groenlandica			□	■	Greenland scurvy-grass
	Primula borealis				■■■	northern primrose
	Lomatogonium rotatum				■	marsh felwort
	Tripleurospermum maritimum				■	arctic chamomile
Mosses	Mosses	■■■		■■■	■■■■	mosses
	Leptobryum pyriforme			□		golden thread moss
	Funaria hygrometrica			□		common cord moss
Lichens	*Flavocetraria* spp.			□		paperdoll lichens
	Stereocaulon condensatum			□		granular soil-foam lichen

Mean Cover ■ <1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

Comments: Bb02 often occurs behind **Bb01** on beach fronts. On estuarine flats, **Bb02** often occurs adjacent to wetland and esturine ecosites on elevated sand deposits.

Although much of the Yukon coastline is affected by open wave action and is dominated by unstable gravel beaches and eroding bluffs, stable estuarine ecosites occur where the larger river systems enter the Beaufort Sea and deposit fine sediments into delta landforms. These ecosites, which occur at the freshwater/marine interface, are poorly sampled in the Yukon Arctic Region. This guide presents general descriptions of some of the ecosites sampled or observed in the Yukon, although most of these ecosites are not based on extensive plot data. Estuarine ecosites that are supported by sufficient plot data include **Em01** and **Em02**; others are based on observations and minimal plot data. Some of the ecosites described below are derived from descriptions in other regions of the North American arctic.

Many of the extensive estuarine ecosites of the Mackenzie River Delta that include **Em03, Em05, Em06** and **Em07** appear to be unique to the area, since they are not described from other regions or found on smaller estuary deltas of the Yukon Arctic Region. Similar ecosites are undoubtedly found in the outer Mackenzie River Delta in the Northwest Territory, but no relevant data or descriptions have been found for this area. The typical position of ecosites within the Mackenzie River Delta is presented in Figure 6-1. Further work is required to adequately describe these ecosites.

Em01 Creeping alkaligrass (Puccinellia phyrganodes)

Em01 is a circumpolar Arctic ecosite that occurs on imperfectly drained, actively depositional and regularly flooded fine-textured marine deposits on tidal flats and on shore zones eroded by ice. In the Yukon, it has been sampled only in the Mackenzie River Delta, where it forms extensive stands directly adjacent to watercourses on silty flats. It likely also occurs on the deltas of some of the other larger river deltas in the region.

Vegetation: Creeping alkaligrass *(Puccinellia phryganodes)* is always dominant and may form a dense turf or, in more recently deposited sediments, merely scattered runners. Other salt-tolerant coastal species may occur, but typically with low cover. They may include such species as saltmarsh starwort *(Stellaria humifusa)*, sea plantain *(Plantago maritima)*, coast silverweed *(Potentilla egedii)*, shore buttercup *(Ranunculus cymbalaria)* and scurvy-grass *(Cochlearia officinalis)*.

Environment: This ecosite is typically located directly adjacent to open water on raw, muddy mineral fluvial/marine materials or eroded tundra. **Em01** occurs at lower elevations and on more frequently flooded sites than **Em02** and may experience high levels of grazing by waterfowl.

Em02 Hoppner's sedge (Carex subspathacea)

Em02 is a widespread circumpolar Low and mid-Arctic ecosite restricted to protected coastal flats and depressions that are subject to brackish water flooding and often experience extensive goose grazing. In the Yukon Arctic

Region, this ecosite has been sampled in deltas of the Firth, Blow and Running rivers and on the protected lee coast of Herschel Island.

Vegetation: Hoppner's sedge *(Carex subspathacea)* forms a sparse to dense turf. Common associates include saltmarsh starwort *(Stellaria humifusa)* and coast silverweed *(Potentilla egedii)*. Other saline-tolerant species may occur on some sites, sometimes with significant cover. These include creeping alkaligrass *(Puccinellia phryganodes)*, tussock alkaligrass *(P. vaginata)*, Fisher's tundra grass *(Dupontia fisheri)*, salt-marsh sedge *(Carex glareosa)*, bear sedge *(C. ursina)*, scurvy-grass *(Cochlearia groenlandica)*, circumpolar reedgrass *(Calamagrostis deschampsioides)*, and arctic daisy *(Arctanthemum arcticum)*.

Environment: Em02 occurs on imperfectly drained, fine textured sediments in brackish marshes of estuaries and the margins of brackish lagoons. Sites remain wet throughout the growing season, but are flooded only occasionally. **Em02 o**ften occurs adjacent to **Em01** on sites slightly more removed from and elevated above the watercourse. A similar ecosite that occurs in the Mackenzie River Delta, **Em06**, is dominated by the hybrid yellowish sedge *(C. subspathacea* x *aquatilis = C.* x *flavicans)* and Fisher's tundra grass *(Dupontia fisheri)*.

Em03 Oval-leaved willow / Sparse-flowered sedge (Salix ovalifolia/Carex rariflora)

Em03 occurs extensively on sandy/silty flats slightly elevated above **Em06**. This ecosite has lawns of sparse-flowered sedge *(Carex rariflora)* with low-growing oval-leaved willow *(Salix ovalifolia)* or arctic willow *(S. arctica)*, typically of equal or lower stature than the sedge. A scattering of other estuarine species from adjacent ecosites will occur. In the field, the darker green hue of **Em03** distinguishes it from the fresh green colour of **Em06**, which commonly occurs adjacent to it. While apparently common in the Mackenzie River Delta, this ecosite has been infrequently sampled.

Em04 Saltmarsh sedge (Carex glareosa)

Several observations of sites dominated by saltmarsh sedge *(Carex glareosa)* have been made on elevated sites adjacent to **Em02 Happner's sedge** *(Carex subspathacea)* ecosite. Vegetation cover is generally very high and intermixed with other estuarine species. Saltmarsh sedge prefers coarse sand and pebble deposits in the upper portions of estuary strongly influenced by freshwater.

Saltmarsh sedge- dominated ecosystems are common in the arctic, being the most common saltmarsh vegetation in some regions, but have been infrequently sampled in the Yukon. **Em04** sites have been sampled in the Yukon on the Running and Blow River deltas, on the protected coastline of Herschel Island, and are likely to occur on the Mackenzie River Delta.

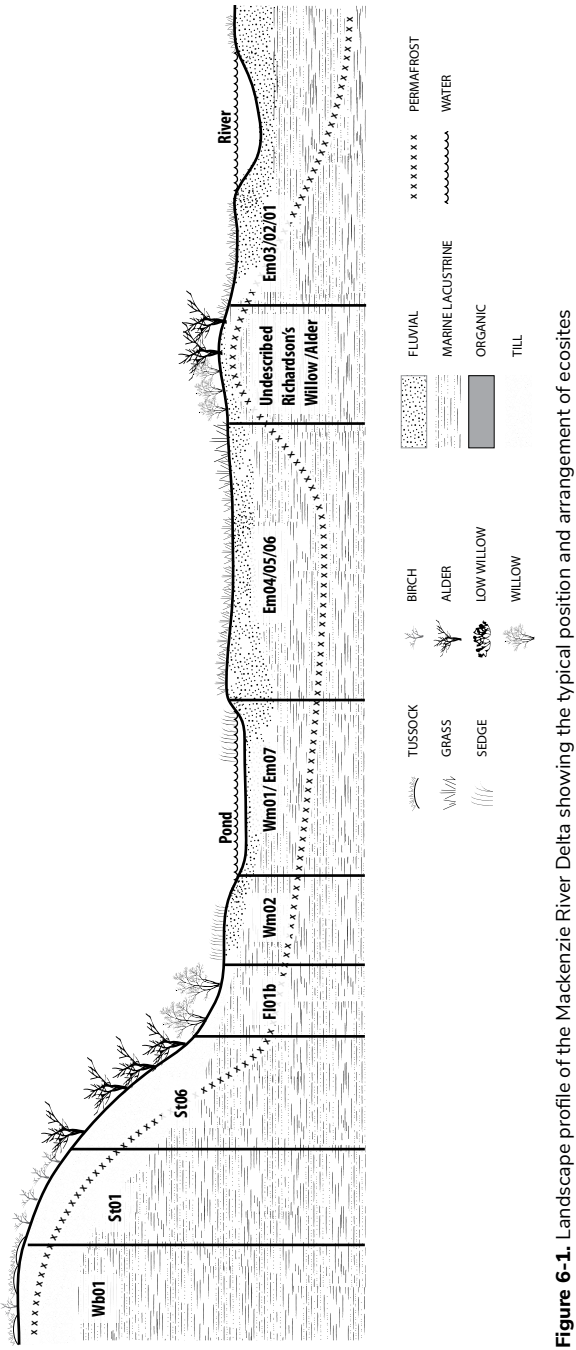


Figure 6-1. Landscape profile of the Mackenzie River Delta showing the typical position and arrangement of ecosites

Em05 Mackenzie's sedge (Carex mackenziei)

Ecosystems dominated by Mackenzie's sedge *(Carex mackenziei)* have been observed in the delta, where they occur in more saturated and stagnant locations of the estuary still affected by brackish waters. Em05 often occurs in extensive sedge saltmarsh flats and not directly connected to actively flowing river channels.

Em06 Yellowish sedge – Fisher's tundra grass (Carex x flavicans – Dupontia fisheri)

Em06 occurs extensively on flats in the Mackenzie River Delta that experience prolonged brackish water flooding. Water tables are maintained at or just below the surface through most of the growing season.

This ecosite has high cover of yellowish sedge *(Carex* x *flavicans,* a hybrid between *C. subspathacea and C. aquatilis)* and a minor component of Fisher's tundra grass *(Dupontia fisheri)*. While apparently widespread in the Mackenzie River Delta, this ecosite has not been extensively sampled.

Em07 Four-leaved mare's-tail (Hippuris tetragona)

Shallow brackish ponds that occur in the saltmarsh flats of the outer Mackenzie River Delta commonly support stands of four-leaved mare's-tail *(Hippuris tetragona)*, with a scattering of other species such as pendant grass *(Arctophila fulva)* and aquatic species of buttercup *(Ranunculus* spp.) and pondweed *(Stuckenia* spp.). The related **Wm01** occurs in similar habitats removed from saltwater influence and often has a high component of lance-leaved mare's-tail *(Hippuris lanceolata)*, which prefers less brackish conditions.

Although apparently it occurs frequently in small ponds on the outer the Mackenzie River Delta, this ecosite has not been formally sampled.

Shrub ecosystems on the Mackenzie River Delta

Shrub-dominated ecosystems occur throughout the Yukon portion of the Mackenzie River Delta, but few sites have been sampled. The vast majority of the delta is occupied by saltmarsh ecosystems. However, there are some locations that have become isolated from surface and groundwater flow and permafrost has reestablished. This both elevates sites above the estuary flats and impedes drainage, which encourages peat accumulation. Under these conditions ecosystems dominated by green alder *(Alnus viridis* ssp. *crispa)* or Richardson's willow *(Salix richardsonii)* may establish.

Green alder ecosystems

Observed green alder-dominated sites have an open cover of moderate to tall statured green alder *(Alnus viridis* ssp. *crispa)* shrubs. Other shrub species, such as dwarf birch *(Betula nana)*, Richardson's willow *(Salix richardsonii)*, Labrador tea *(Rhododendron tomentosum)* and bog rosemary *(Andromeda*

polifolia), have been present in the few sites visited. The understorey largely reflects peatland conditions and is dominated by ericaceous ground shrubs such as lowbush cranberry *(Vaccinium vitis-idaea)* and crowberry *(Empetrum nigrum)* in a lawn of peatland mosses such as golden fuzzy fen moss *(Tomentypnum nitens)*. Northern groundcone *(Boschniakia rossica)*, the alder parasite, often occurs in abundance in these ecosystems. Sites have peat accumulations with a shallow permafrost depth.

Richardson's willow ecosystems

Similar to green alder stands on the Mackenzie River Delta, Richardson's willow ecosystems occur on sites that have become isolated from flooding or river groundwater and have accumulated deep peat layers, which are frozen at 20–40 cm depth. These stands may occur on dry elevated sediment accumulation sites or on permafrost sites that have been pushed to higher elevations than the alder sites or in watertracks with permafrost but some water movement.

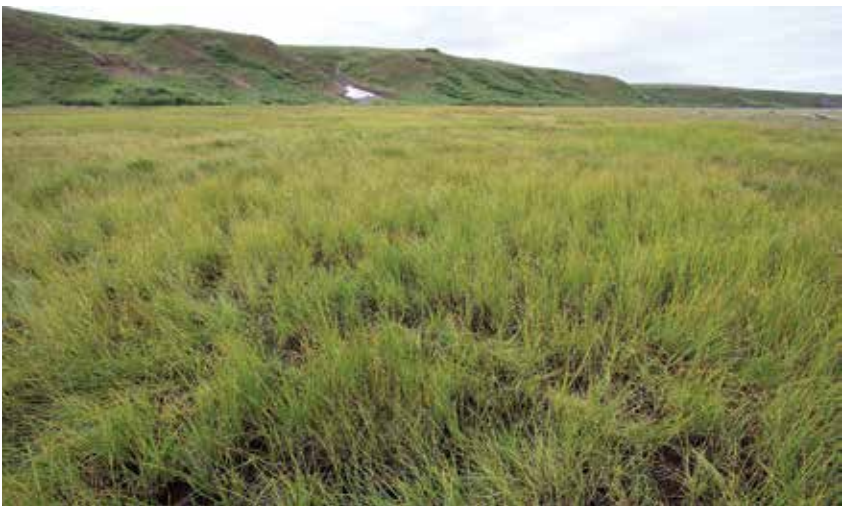
Stands with deep peat, frozen at depth but with well-drained surface horizons, support moderate stature (<1 m) willows overtopping a diversity of graminoids, including hair-like sedge *(Carex capillaris)* and red fescue *(Festuca rubra)*. On raised low ridges, low-growing (<30 cm) willow hybrids of Richardson's and arctic willow commonly occur on shallow well-drained peat over marine sediments. The understorey has a diversity of species, including variegated horsetail *(Equisetum variegatum)* and alpine hedysarum *(Hedysarum alpinum)*. The moss cover is dominated by non-peatland mosses such as *Bryum* spp. and *Ceratodon purpureum*.

Extensive estuarine – salt marshes on alluvium of Mackenzie River Delta surround occasional shallow ponds and stands of shrub-dominated ecosystems.

Puccinellia phryganodes (**Em01**) flats in the Mackenzie River Delta are common on raw, fine-textured river sediments directly adjacent to active river channels. The light-green community in the right distance is the *Carex x flavicans – Dupontia fisheri* ecosite (**Em05**).

Sites that are slightly elevated and removed from active river channels are occupied by *Carex rariflora*-dominated ecosystems, which typically have scattered cover of low-statured willows (**Em03**).

Ecosystems dominated by hybrids of *Carex aquatilis* and *C. subspathacea (= Carex* x *flavicans)* (**Em06**) are extensive on the outer zones of the Mackenzie River Delta, occurring on broad, level floodplain sediments often adjacent to **Em01.**



Carex mackenziei ecosystems (**Em05**) occur on sites permanently saturated by stagnant and slightly brackish waters, often with peat accumulations and sometimes with abundant buried driftwood.

Hippuris tetraphylla and *H. lanceolata* marshes occur in shallow waters on the Mackenzie River Delta. *H. tetraphylla* occurs in stagnant brackish pools (**Em07**) and *H. lanceolata* in freshwater sites with more active hydrology and increasing cover of *Arctophila fulva* (**Wm01**); shown here.

Alnus viridis ssp. *crispa* stands occur in localized but sometimes extensive areas of the Mackenzie River Delta that have become isolated from warm river waters, allowing permafrost to re-establish.

7.0 Yukon Arctic Region bioclimate units and associated ecosites

7.1 Yukon Arctic Region

Location and distribution: The Yukon Arctic Region is bounded to the north by the Beaufort Sea, to the south by the Subarctic Woodland zone in the Old Crow basin and to the east by the Mackenzie River in the Northwest Territories (Figure 7-1). A narrow corridor of Subarctic also extends north along the protected Firth River Valley. The Subarctic is differentiated most clearly from the Yukon Arctic Region by the presence of tree species on zonal and azonal sites, reflecting a more benign growing season climate. In contrast, the Yukon Arctic Region is treeless and dominated by low and ground shrub tundra. In this section, the distribution of ecosites in the Arctic bioclimatic units is presented. A detailed description of the Yukon Arctic Region environment is presented in Section 3.2.

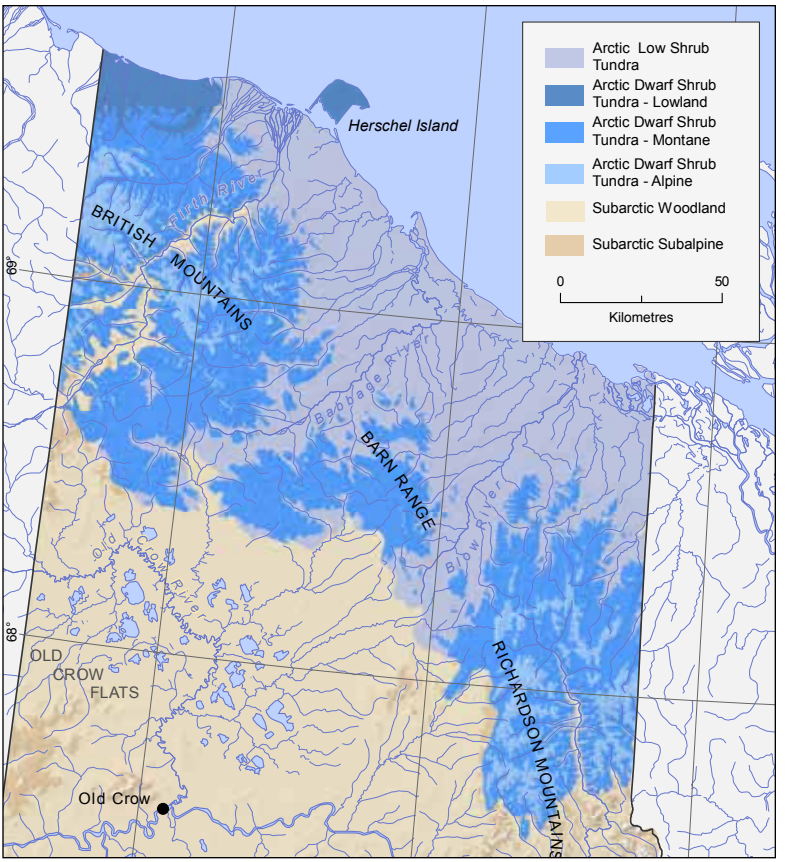


Figure 7-1. Bioclimatic units of the Yukon Arctic Region and adjacent zones

Vegetation: In Yukon, the Yukon Arctic Region is subdivided into two bioclimate zones: the Arctic Low Shrub Tundra zone (**ARLS**) and the Arctic Dwarf Shrub Tundra zone (**ARDS**). The **ARLS** occurs below the Arctic Dwarf Shrub Tundra Montane (**ARDSmn**) subzone in the mountains as temperature declines with elevation. Along the coast in the west, the **ARLS** gives way to the Lowland Arctic Dwarf Shrub Tundra Lowland subzone (**ARDSlo**), where colder oceanic influences predominate and shrub cover is greatly reduced (Figure 7-1).

7.1.1 Differentiating features

The Yukon Arctic Region bioclimate zones are differentiated by the composition and physiognomy of the vegetation community that occurs on zonal sites (Table 7-1). The most important feature of the Arctic Low Shrub Tundra zone is the presence of low shrubs, often >40 cm tall on zonal sites. By contrast, low shrubs do not occur widely in the Arctic Dwarf Shrub Tundra zone and are generally restricted to riparian sites. The accumulation of humus or peat leads to more acidic growing conditions in the ARLS, while the ARDS is more affected by parent material characteristics.

Table 7-1. Comparative vegetation for zonal ecosites of the Yukon Arctic Region zones

Stratum		ARLS	ARDS	
Shrubs	*Betula nana*	■■■■		dwarf birch
	Vaccinium uliginosum	■■■	□	bog blueberry
	Rhododendron tomentosum	■■■		northern Labrador tea
	Salix pulchra	□□		diamond-leaved willow
Ground shrubs	*Vaccinium vitis-idaea*	■■■		lowbush cranberry
	Empetrum nigrum	■■■■		crowberry
	Arctous alpina	■■■	□	bearberries
	Cassiope tetragona	□□	□□	arctic mountain-heather
	Dryas alaskensis/integrifolia	□□	■■■■	mountain-avens
	Salix arctica		■■■	arctic willow
	Salix reticulata		■■■	net-veined willow
Graminoids	*Anthoxanthum monticola*	□□		alpine sweetgrass
Forbs	*Bistorta plumosa*	■■	■■	meadow bistort
	Pedicularis spp.	■	■	louseworts
	Lupinus arcticus	□	■■■	arctic lupine
	Astragalus spp.		■■■	milk-vetches
	Oxytropis spp.		■■	locoweeds
Mosses	*Hylocomium splendens*	□□		step moss
Lichens	*Flavocetraria* spp.	■■	■■	paperdoll lichens
	Stereocaulon spp.	□□		foam lichens
	Cladonia spp.	□□		clad lichens
	Thamnolia vermicularis		□	whiteworm lichen

Mean Cover ■ < 1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

7.2 Arctic Low Shrub Tundra zone (ARLS)

Location and distribution: The Arctic Low Shrub Tundra zone occurs between sea level and up to 350–500 metres elevation in the foothills of the British and Richardson mountains. The **ARLS** occurs below the Arctic Dwarf Shrub Tundra Montane subzone in the mountains and is bounded to the south and east by the Subarctic Woodland zone in the Old Crow basin and the Mackenzie River Delta. Along the coast of the Beaufort Sea to the west of the Firth River, the **ARLS** gives way to the Lowland Arctic Dwarf Shrub Tundra subzone, where colder oceanic influences predominate and shrub cover is greatly reduced.

Vegetation: The greatest ecosystem diversity in the Yukon Arctic Region occurs in the **ARLS.** This is partly due to more favourable climate and partly due to the higher diversity of site and landscape conditions.

The zonal vegetation of the ARLS is defined by the **St01** ecosite (Dwarf birch – Labrador tea / Crowberry). The ecosite has mid-stature shrubs (often >40 cm tall) of arctic dwarf birch *(Betula nana)*, bog blueberry *(Vaccinium uliginosum)*, other ericaceous ground shrubs, and occasionally willows *(Salix glauca* or *S. pulchra)*. See Table 7-2 and Figure 7.2.

In the **ARLS**, azonal tussock cottongrass bog/tundra (**Wb01**) is more extensive than the zonal ecosite due to the presence of extensive pediment slopes and plains of poorly drained fine-textured materials.

Fellfield (**Af**) and tundra (**At**) ecosystems are uncommon and of limited extent in the ARLS, occurring primarily on wind-exposed ridges in the foothills. In the subdued topography of the **ARLS**, ecosystems associated with snowbeds are localized to gullies, river valleys and slope hollows. Mountain-heather snowbeds (**Ah**) are relatively uncommon in the coastal lowlands, where more productive arctic meadows (**Am**)or tall shrub ecosystems (**St**) occupy snow accumulation zones. Shrub floodplain (**Fl**) ecosystems are found along small and larger water courses throughout the **ARLS** and typically support tall-shrub physiogonomy (>2 m). See Figure 7-2.

Poorly drained flats, depressions and lake margins are common on the glaciated coastal plain, where most fen (**Wf**) and marsh (**Wm**) ecosystems occur. However, sloping fens do occur in the foothills on sites with continual seepage and poorly drained substrates.

Vegetated beaches and dunes are generally very uncommon and localized along the coastline. Estuarine – Saltmarshes (**Em**) are more common, occurring on the deltas of all of the major drainages. The Mackenzie River Delta occurs in the **ARLS** and is a globally significant estuarine ecosystem.

Toward the southern and eastern boundaries of the ARLS that are contiguous with the Subarctic Woodland, patches of open forest occur along riparian corridors or warm aspect slopes. These woodlands are stands of white spruce *(Picea glauca)* or balsam poplar *(Populus balsamifera)*.

Differentiating features: The ARLS is differentiated from the adjacent ARDS by the wide presence of low shrubs in most ecosystems and tall shrub-dominated (>2 m) ecosystems occurring along water courses and some upland sites. Similar sites in the ARDS are of low stature. Tussock tundra and other sites that accumulate significant peat deposits are far more extensive in the ARLS.

The ARDS does support low shrub species, but they are generally much less common and restricted to azonal sites. Tall shrub communities are absent.

Subzones: The **ARLS** bioclimate zone is equivalent to the "E" bioclimate subzone in the Circumpolar Arctic Vegetation Map (CAVM Team 2003). No subzones are defined in the Yukon Arctic Region.

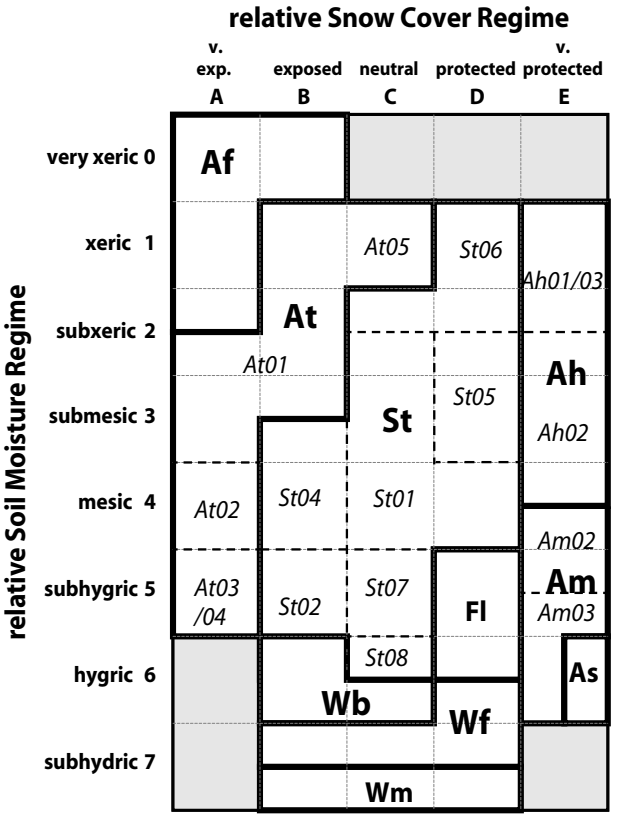


Figure 7-2. Chionoedaphic grid for upland ecosystems of the Arctic Low Shrub Tundra Zone (ARLS)

Table 7-2. Ecosites of the Arctic Low Shrub Tundra Zone (ARLS)

Upland Ecosites	
ARLS/Af02	Alaska mountain-avens – Skeleton-leaved willow [1]
ARLS/Af03	Skeleton-leaved willow / Lichens [1]
ARLS/At01	Entire-leaved mountain-avens / Bearberry – Hedysarum
ARLS/At02	Arctic willow – Entire-leaved mountain-avens – Tundra milk-vetch [1]
ARLS/At03	Net-veined willow – Entire-leaved mountain-avens – Horsetail
ARLS/At04	Entire-leaved mountain-avens – Muskeg sedge
ARLS/At05	Alaska mountain-avens – Net-leaved willow – Lupine
ARLS/Ah01	Mountain-heather – Alaska mountain-avens
ARLS/Ah02	Mountain-heather – Mountain-avens – Brookfoam
ARLS/Ah03	Labrador tea / Mountain-heather – Lowbush cranberry
ARLS/Am02	Chamisso's willow – Horsetail
ARLS/Am03	Bluejoint – Horsetail
ARLS/As01	Polar willow – Pygmy buttercup [1]
ARLS/Az01	Arctic willow – Trisetum – Jacob's-ladder [1]
Disturbance Associations	
ARLS/At$1	Mastodon flower
ARLS/At$2	Polargrass – Tilesius' wormwood – Coltsfoot
Shrub Tundra Ecosites	
ARLS/St01	Dwarf birch – Labrador tea /Crowberry **zonal ecosystem**
ARLS/St02	Dwarf birch – Labrador tea / Muskeg sedge
ARLS/St03	Dwarf birch / Lowbush cranberry / Lichens
ARLS/St04	Dwarf birch / Alaska mountain-avens
ARLS/St05	Dwarf birch / Altai fescue [1]
ARLS/St06	Green alder – Alaska spirea
ARLS/St07	Richardson's willow / Horsetail [1]
ARLS/St08	Diamond-leaved willow – Dwarf birch / Coltsfoot / Peat moss

Floodplain Ecosites	
ARLS/Fl01	Diamond-leaved willow/ Coltsfoot – Horsetail
ARLS/Fl02	Green alder / Bluejoint – Coltsfoot
ARLS/Fl03	Alaska willow / Tilesius' wormwood – Bluejoint
ARLS/Fl04	Alaska willow / Mountain-avens
Wetland Ecosites	
ARLS/Wb01	Dwarf birch / Lowbush cranberry – Tussock cottongrass
ARLS/Wb02	Dwarf birch – Labrador tea / Cloudberry / Peat moss
ARLS/Wf01	Diamond-leaved willow / Water sedge / Shaggy peat moss
ARLS/Wf02	Tall cottongrass / Peat moss
ARLS/Wf03	Creeping sedge – Water sedge / Peat moss
ARLS/Wf04	Scheuchzeri's cottongrass – Water sedge / Baltic peat moss [1]
ARLS/Wf05	Loose-flowered sedge / Peat moss [1]
ARLS/Wf06	Richardson's willow – Water sedge
ARLS/Wm01	Pendantgrass
ARLS/Wm02	Fisher's tundragrass – Water sedge [1]

1. These ecosites are uncommon and are infrequently sampled in the bioclimate subzone.

Coastal lowlands landscape in the ARLS

The coastal lowlands landscape has extensive, low-gradient, fine-textured and poorly drained till dominated by tussock cottongrass (**Wb01**). In pediment locations that accumulate snow and/or are better drained there may be an abundance of dwarf birch or green alder. Low hills with shallow till or with regolith over bedrock dot this landscape. Sites with some relief and better drained soils will support zonal shrub tundra ecosite (**St01**); however, because of the pervasiveness of fine-textured and poorly drained pediment slopes, zonal ecosystems do not dominate the landscape. Arctic tundra ecosystems occur only on relatively exposed sites such as convex windblown ridges. Shallow drainage gullies occur throughout the pediments, eventually draining into broad, U-shaped river valleys. Flood ecosystems and meadows occur in both these landscape positions where winter snow accumulation and active water flow act to deepen the active layer. See Figure 7-3.

A typical coastal plain landscape near the Blow river with extensive gradual tussock cottongrass flats and increased shrub growth on lee slopes and gullies.

Coastal river valleys support the most productive ecosystems in the Yukon Arctic Region, with arctic meadows, marshes and tall-shrub-dominated riparian flood ecosystems.

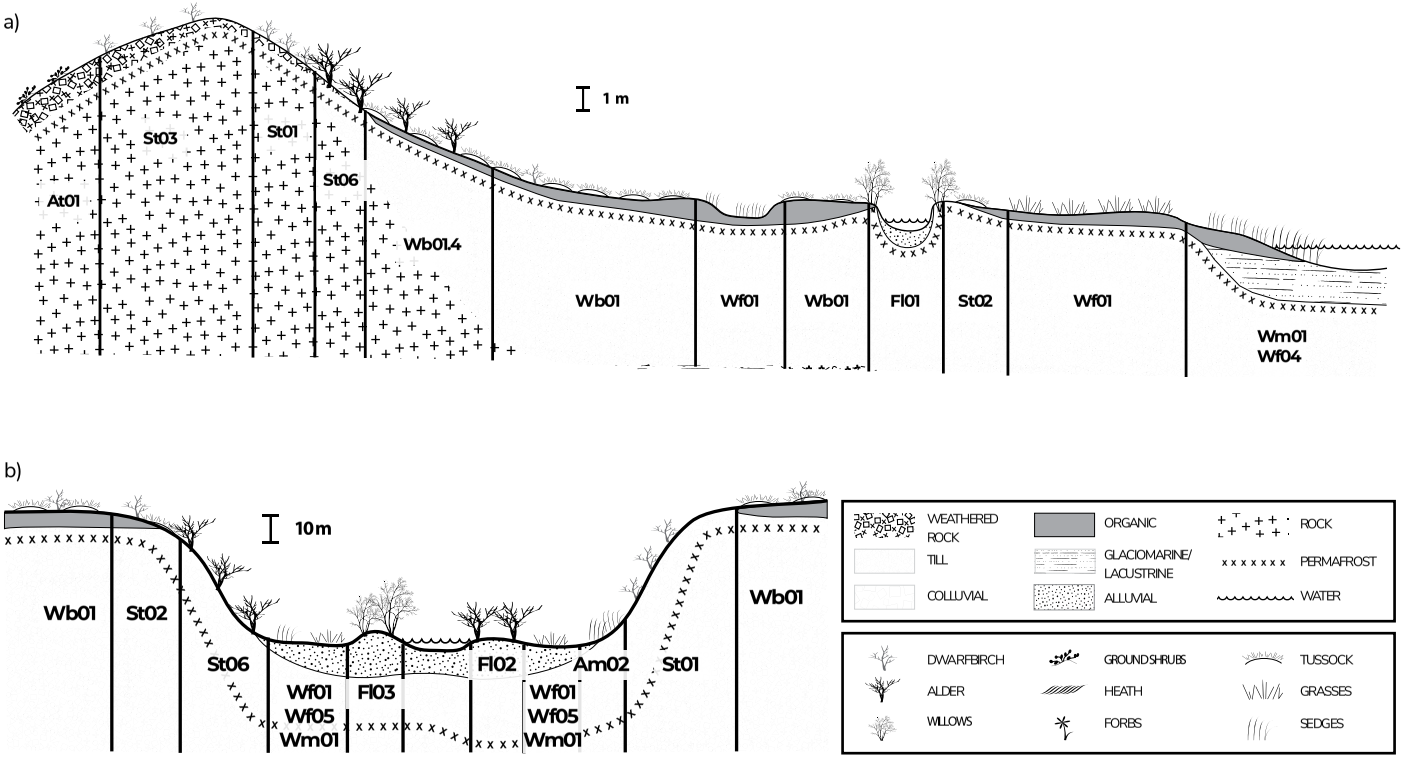


Figure 7-3. Landscape profile of **a)** coastal plain and **b)** coastal river valley landscape, showing the typical position and arrangement of ecosites

Coastline and delta landscapes in the ARLS

Ecosystems along the coastline of the Beaufort Sea are distinctive in the arctic landscape. The influence of ocean-cooled air temperatures, active sedimentation and erosion, and saline/brackish water create arrangements of ecosystems not found elsewhere in the region. The beachland **(Bb)** and estuarine – salt marsh **(Em)** groups of ecosites are found exclusively at the coastal interface. Along much of the coastline are actively eroding headlands that are dominated by permafrost slumps and failures. Pebble beaches occur throughout the coast, but only in scattered locations that are elevated enough to support beachland ecosystems. Estuarine – salt marsh ecosites are restricted to the deltas of larger rivers where they enter the ocean. The extent of these ecosystems is typically relative to the size of the river. See Figure 7-4.

Eroding bluffs are common along the Yukon coastline. Areas of slowly slumping till and glaciomarine sediments, which occur among raw failures, support lush seral ecosystems.

The beachland (Bb) and estuarine – salt marsh (Em) groups of ecosites are found exclusively at the coastal interface.

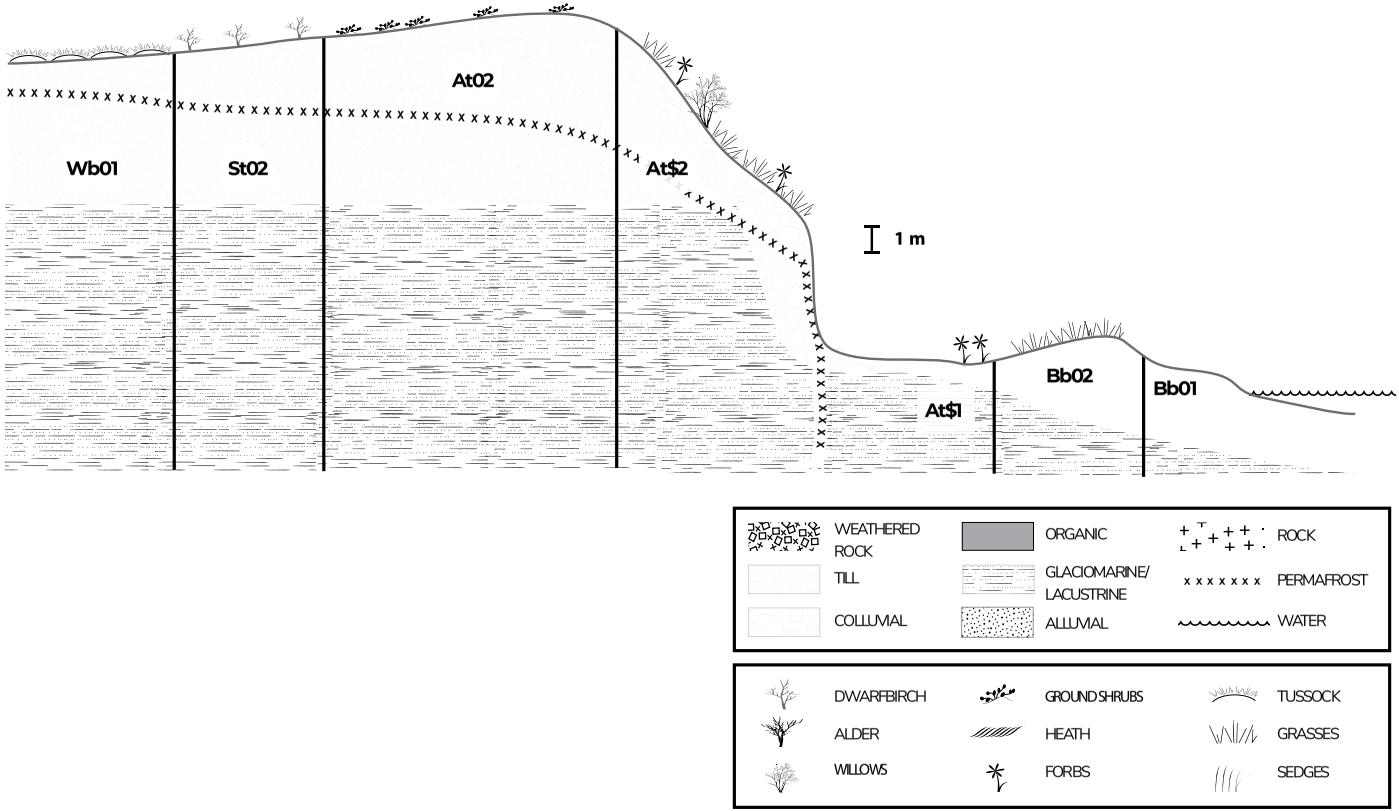


Figure 7-4. Landscape profile of a coastal bluff landscape showing the typical position and arrangement of ecosites

7.3 Arctic Dwarf Shrub Tundra zone (ARDS)

Location and distribution: The Arctic Dwarf Shrub Tundra zone **(ARDS)** occurs above the Arctic Low Shrub Tundra zone **(ARLS)** in the British and Richardson Mountains between approximately 500 and 1,500 metres. This zone also occurs at low elevations on Herschel Island and along the coast west of the Firth River extending into the Alaskan coastal plain.

Vegetation: Zonal vegetation in the ARDS is dominated by *Dryas* species. Low shrubs (>40 cm) occur but are restricted to riparian and snow protected sites and tall shrub ecosystems only occur in areas transitional to the ARLS. Distribution of vegetation on the landscape is described in the sections on each subzone. This bioclimate zone is equivalent to the "D" and "C" bioclimate subzones in Circumpolar Arctic Vegetation Map (CAVM Team 2003).

Subzones: Three **ARDS** bioclimate subzones are described:

- **Arctic Dwarf Shrub Tundra Lowland (ARDSlo)** subzone occurs on Herschel Island and at low elevations (<350 m) along the coastal plain west of the Firth River. The **ARDSlo** is equivalent to the "D" bioclimate subzone in Circumpolar Arctic Vegetation Map (CAVM Team 2003).
- **Arctic Dwarf Shrub Tundra Montane (ARDSmn)** subzone occurs in the foothills and mountains between 350–500 and 1,000 metres. The **ARDSmn** is equivalent to the "D" bioclimate subzone in Circumpolar Arctic Vegetation Map (CAVM Team 2003).
- **Arctic Dwarf Shrub Tundra Alpine (ARDSal)** subzone at elevations above 950–1,000 metres in the northern mountains. The **ARDSal** is equivalent to the "C" bioclimate subzone in Circumpolar Arctic Vegetation Map (CAVM Team 2003).

Differentiating features: The ARDS is differentiated from the adjacent ARLS by the limited occurrence of low shrubs in most ecosystems and tall shrub-dominated (>2 m) ecosystems occurring along water courses and some upland sites. Similar sites in the ARLS are of tall stature. Tussock tundra is far more extensive in the ARLS. The ARDS does support low shrub species but they are generally much less common and restricted to azonal sites.

Table 7-3 compares the zonal ecosite vegetation of the three ARDS subzones. All subzones have mountain-avens as the leading species, but *Dryas alaskensis* is more common inland and *D. integrifolia* is more common towards the coast. The ARDSal is generally sparsely vegetated over much of the landscape except in snow accumulation areas. The ARDSmn supports similar but more diverse and robust plant communities. In the ARDSlo, secondary species in the mountain-avens tundra are more abundant and tundra ecosystems relatively lush.

Table 7-3. Comparative vegetation for zonal ecosites of the three ARDS subzones

Stratum		ARDSlo At02	ARDSmn At05	ARDSal Af01	
Ground shrubs	*Potentilla spp.*			□	dwarf cinquefoils
	Silene acaulis		□	□	arctic mountain-heather
	Dryas alaskensis		■■■■	■■■	Alaska mountain-avens
	Dryas integrifolia	■■■■	□□	□□□	entire-leaved mountain-avens
	Arctous alpina		□□		alpine bearberry
	Salix reticulata	■■■	■■■		net-veined willow
	Salix arctica	■■■■			arctic willow
Graminoids	*Arctagrostis latifolia*	■■■			polargrass
Forbs	*Oxytropis nigrescens*		■■	■■	blackish locoweed
	Lupinus arcticus	■■■	■■■	□	arctic lupine
	Astragalus umbellatus	■■■			tundra milk-vetch
	Oxytropis campestris	■■			field locoweed
	Pedicularis capitata	□	□		capitate lousewort
Mosses	*Hylocomium splendens*	■■■	□□		step moss
Lichens	*Flavocetraria* spp.	□□	■■	■■	paperdoll lichens
	Thamnolia vermicularis			■■	whiteworm lichen

Mean Cover ■ < 1% ■■ 1–5% ■■■ 5–15% ■■■■ 15–30% ■■■■■ 30–50% ■■■■■■ >50%
Constancy ■ 70–100% ■ 50–70% □ 25–50%

7.3.1 Arctic Dwarf Shrub Tundra Lowland subzone (ARDSlo)

Location and distribution: The Arctic Dwarf Shrub Tundra Lowland subzone (**ARDSlo)** is a subzone of the **ARDS.** It occupies a relatively small spatial area of the Yukon Arctic Region. The majority of sampling is from Herschel Island, but this subzone extends from west of the Firth River into the Alaska coastal plain. Ecosystem diversity is not as high as in the **ARLS** due to the more harsh climates of this area and the more limited landscape diversity. Incomplete field sampling may not have captured the full diversity and distribution of **ARDSlo** ecosystems.

Vegetation: Ecosystems of this lowland subzone support more forbs and graminoids than on comparable sites in other Yukon Arctic Region bioclimates. The **ARDSlo** is typified by high vegetation cover dominated by entire-leaved mountain-avens *(Dryas integrifolia)*, with abundant arctic willow *(Salix arctica)* and tundra milk-vetch *(Astragalus umbellatus)*. Recent climate change in this subzone has also led to the pervasive presence of polargrass *(Arctagrostis latifolia)* on zonal sites (**At02**).

The less drought-like climate conditions restrict fellfield ecosystems (**Af)** to only the most extremely windblown sites. Wetter tundra and bog ecosystems dominated by muskeg sedge (**At04**) or tussock cottongrass (**Wb01**) are widespread and common. Richardson's willow drainage slopes (**St07**) and fens (**Wf06**) are the most common shrub-dominated ecosystem. Shrub-dominated floodplain ecosystems have not been sampled, but are presumed to occur along streams in the coastal floodplain. Fens (**Wf**) and marshes (**Wm02**) have been infrequently sampled, but occur in suitable habitats. The coastal plain in

the **ARDSlo** is non-glaciated and wetland site conditions are much less common in this landscape. See Figure 7-5.

This subzone is distinct enough from the other **ARDS** subzones that it might constitute a zone, but in the Yukon Arctic Region this subzone occupies a relatively small area and is under-sampled. Comparison with the ecosystems of the adjacent Alaskan coastal plain may clarify this classification.

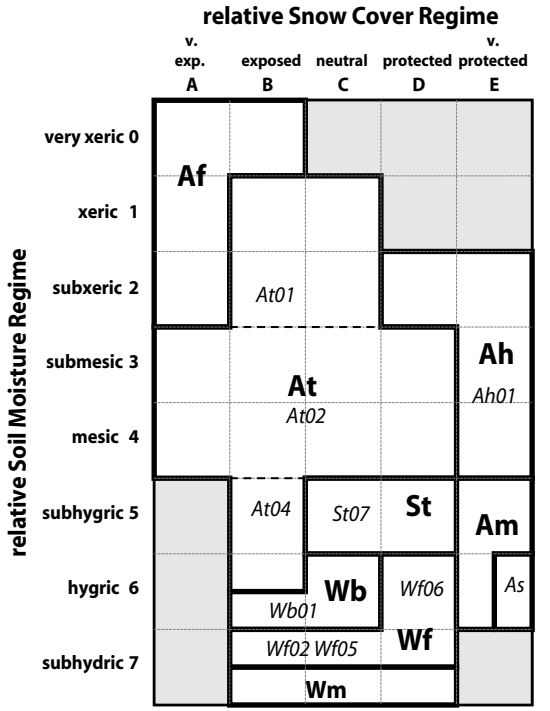


Figure 7-5. Chionoedaphic grid for the Arctic Dwarf Shrub Tundra Lowland (ARDSlo) subzone

Table 7-4. Ecosites of the Arctic Dwarf Shrub Tundra Lowland (ARDSlo) subzone

Tundra and related ecosites	
ARDSlo/Af01	Alaska mountain-avens – Blackish locoweed [1]
ARDSlo/At02	Arctic willow – Entire-leaved mountain-avens – Tundra milk-vetch **zonal ecosystem**
ARDSlo/At03	Net-veined willow – Entire-leaved mountain-avens – Horsetail [1]
ARDSlo/At04	Entire-leaved mountain-avens – Muskeg sedge
ARDSlo/Ah01	Mountain-heather – Alaska mountain-avens [1]
Meadows and other ecosites	
ARLS/Az01	Arctic willow – Trisetum – Jacob's-ladder
Disturbance associations	
ARDSlo/At$2	Polargrass – Tilesius' wormwood – Coltsfoot
Shrub tundra ecosites	
ARDSlo/St04	Dwarf birch / Alaska mountain-avens [1]
ARDSlo/St07	Richardson's willow / Horsetail
Floodplain ecosites	
ARDSlo/Fl01	Diamond-leaved willow/ Coltsfoot – Horsetail [2]
ARDSlo/Fl03	Alaska willow / Tilesius' wormwood – Bluejoint [2]
ARDSlo/Fl04	Alaska willow / Mountain-avens [2]
Wetland ecosites	
ARDSlo/Wb01	Dwarf birch / Lowbush cranberry / Tussock cottongrass
ARDSlo/Wf02	Tall cottongrass / Peat moss [2]
ARDSlo/Wf04	Scheuchzer's cottongrass – Water sedge / Baltic peat moss [2]
ARDSlo/Wf05	Loose-flowered sedge / Peat moss
ARDSlo/Wf06	Richardson's willow – Water sedge
ARDSlo/Wm01	Pendantgrass [2]
ARDSlo/Wm02	Fisher's tundragrass – Water sedge

1. These ecosites are uncommon and are infrequently sampled in the bioclimate subzone.
2. These ecosites that have not been sampled but are presumed to occur; these units have not been placed on the chionoedaphic grid.

7.3.2 Arctic Dwarf Shrub Tundra Montane (ARDSmn) subzone

Location and distribution: The Arctic Dwarf Shrub Tundra Montane (ARDSmn) subzone is the most extensive of the **ARDS** subzones in the Yukon, occupying the upper foothills and mountains of the British, Barn and Richardson mountains below 1,000 m elevation.

Vegetation: The **ARDSmn**, which has high ecosystem diversity, is topographically complex. The typically shallow soils derived from bedrock also lead to ecological expressions of geology, especially in fellfield ecosystems. Mountain-avens tundra ecosystems predominate in the **ARDSmn**, occurring on wind-blown ridges and slopes (**Af**), mesic zonal slopes (**At05**) and moist tundra (**At03/04**) on lower slopes and flats. A gradient of site conditions and vegetation composition is described by discrete units in this guide to simplify this complexity. Ecosystems on mobile scree and stable talus with low cover of vascular vegetation are widespread but poorly sampled. Mountain-heather ecosystems (**Ah**) are common in this landscape, occurring where windblown snow fills shallow convex and lee slopes. Deeper gullies that accumulate significant snowpack support meadow ecosystems (**Am**), but these very distinctive ecosystems are uncommon throughout the subzone. Floodplain ecosystems (**Fl**) are similarly restricted. See Figure 7-6 and Table 7-5.

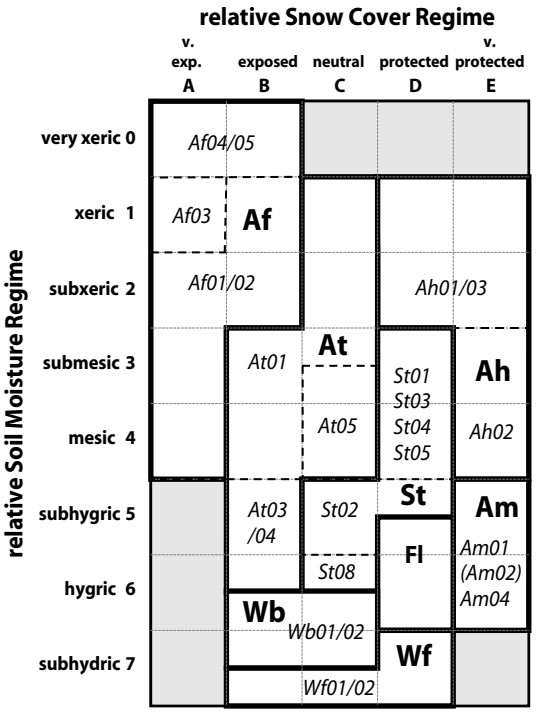


Figure 7-6. Chionoedaphic grid for the Arctic Dwarf Shrub Tundra Montane (ARDSmn) subzone

Table 7-5. Ecosites of the Arctic Dwarf Shrub Tundra Montane (ARDSmn) subzone

Tundra and related ecosites	
ARDSmn/Af01	Alaska mountain-avens – Blackish locoweed
ARDSmn/Af02	Alaska mountain-avens – Skeleton-leaved willow
ARDSmn/Af03	Skeleton-leaved willow / Lichens
ARDSmn/Af04	Rocktripe – Green map lichen
ARDSmn/Af05	Prickly saxifrage – Smelowskia – Poppy
ARDSmn/At01	Entire-leaved mountain-avens / Bearberry – Hedysarum
ARDSmn/At03	Net-veined willow – Entire-leaved mountain-avens – Horsetail
ARDSmn/At04	Entire-leaved mountain-avens – Muskeg sedge
ARDSmn/At05	Alaska mountain-avens – Net-leaved willow – Lupine **zonal ecosystem**
ARDSmn/Ah01	Mountain-heather – Alaska mountain-avens
ARDSmn/Ah02	Mountain-heather – Mountain-avens – Brookfoam
ARDSmn/Ah03	Labrador tea / Mountain-heather – Lowbush cranberry
Meadows and other ecosites	
ARDSmn/Am01	Graceful mountain sedge – Horsetail – Mountain-sorrel
ARDSmn/Am02	Chamisso's willow – Horsetail [1]
ARDSmn/Am04	Altai fescue – Graceful mountain sedge – Mountain sagewort
Shrub tundra ecosites	
ARDSmn/St01	Dwarf birch – Labrador tea /Crowberry [1]
ARDSmn/St02	Dwarf birch – Labrador tea / Muskeg sedge [1]
ARDSmn/St03	Dwarf birch / Lowbush cranberry / Lichens
ARDSmn/St04	Dwarf birch / Alaska mountain-avens
ARDSmn/St05	Dwarf birch / Altai fescue
ARDSmn/St08	Diamond-leaved willow – Dwarf birch / Coltsfoot / Peat moss
Floodplain ecosites	
ARDSmn/Fl01	Diamond-leaved willow/ Coltsfoot – Horsetail [1]
ARDSmn/Fl04	Alaska willow / Mountain-avens
Wetland ecosites	
ARDSmn/Wb01	Dwarf birch / Lowbush cranberry / Tussock cottongrass
ARDSmn/Wb02	Dwarf birch – Labrador tea / Cloudberry / Peat moss
ARDSmn/Wf01	Diamond-leaved willow / Water sedge / Shaggy peat moss
ARDSmn/Wf02	Tall cottongrass / Peat moss

1. These ecosites are uncommon and are infrequently sampled in the bioclimate subzone.

Low-shrub-dominated upland ecosystems (**St**) do occur in the **ARDSmn** at lower elevations of the subzone and less typically in azonal locations such as insolation slopes and snow accumulation sites. Bogs (**Wb**) occur on gradual pediment slopes and level areas, but suitable site conditions are generally uncommon. Fens (**Wf**) are similarly restricted in distribution, but occur on gradual receiving slopes with significant groundwater flow.

Mountain landscapes

In the mountains, topography drives ecosystem distribution through its influence on wind redistribution of snow, differential solar heating and soil moisture accumulation. Extensive regolith (frost-shattered rock) on ridges and colluvium on slopes support the lightly vegetated communities represented by **Af03**, **Af04** and **Af05** ecosites. Finer textured sediments and moisture accumulate on low gradient pediment slopes in the valleys and support **At03** and **At04**, but these site conditions are much less common than in the coastal lowlands. Small mountain streams with active alluvium occur in most valley bottoms, but are of limited extent (**St08/Fl01**). Snow cover is very uneven in mountainous landscapes; snow is removed by wind from ridges and windward slopes and deposited on leeside slopes, hollows and valley bottoms. Lee positions are also typically cool aspects and so snow cover on these sites is both deep in winter and persistent into the growing season, often supporting more productive ecosystems (**Ah** and **Am**). See Figure 7-7.

A mountain landscape in the Richardson Mountains with a typical arrangement of lightly vegetated colluvium and regolith on windblown ridges and slopes, tundra and heath on protected colluvial slopes, and wetter ecosystems on pediment slopes and alluvium.

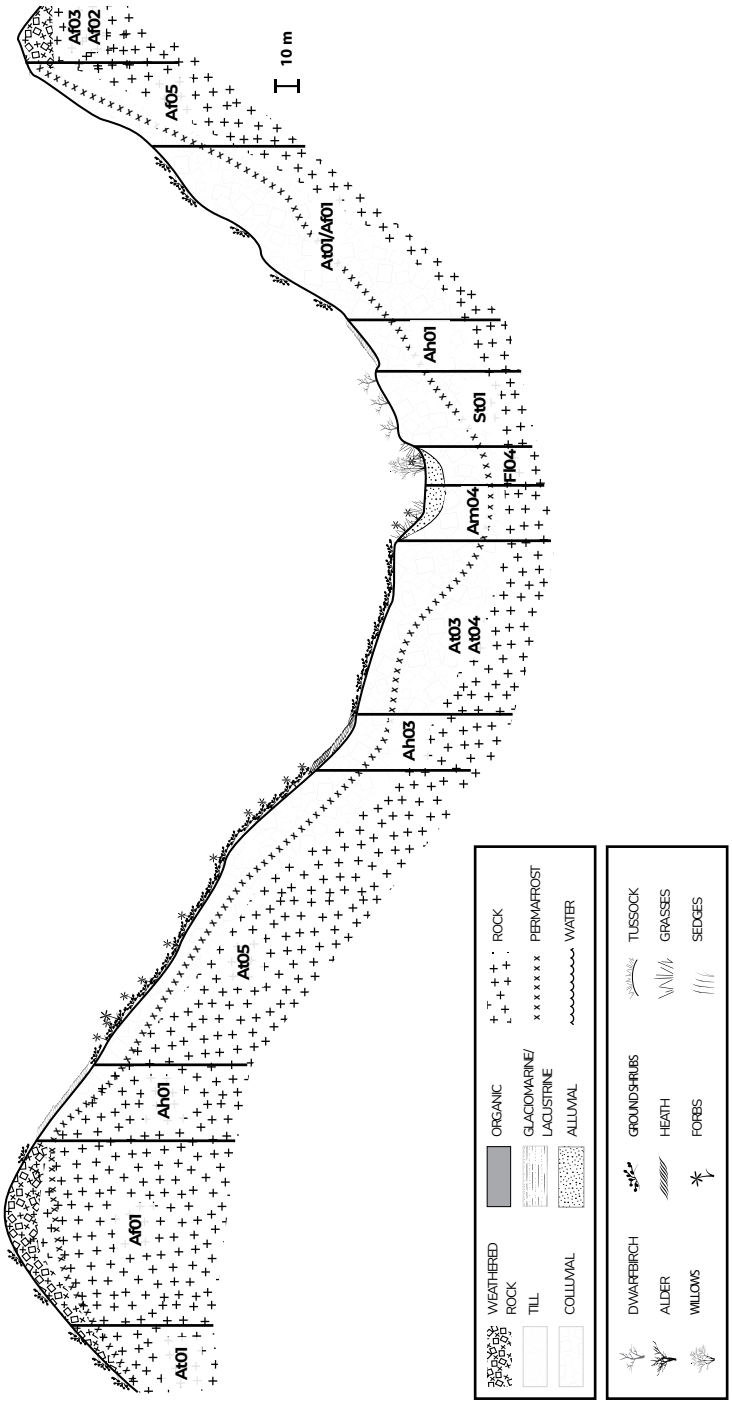


Figure 7-7. Landscape profile showing the typical position and arrangement of ecosites

7.3.3 Arctic Dwarf Shrub Tundra Alpine subzone (ARDSal)

Location and distribution: The Arctic Dwarf Shrub Tundra Alpine subzone (ARDSal) has limited extent in the Yukon Arctic Region, occurring only on the highest mountains above the **ARDSmn** montane subzone at elevations greater than 950–1,000 metres.

Vegetation: Steep topography with reduced site diversity and harsh climate limit the number of ecosites recognized in the subzone. Fellfield ecosystems with low vegetation cover dominate the landscape. Fellfield ecosites dominated by Alaska mountain-avens (**Af01** and **Af02)** are common and represent the zonal condition on calcareous and non-calcareous substrates, respectively. Fellfield ecosystems with little vascular vegetation are also widespread on cobble regolith and scree (**Af04** and **Af05**). Well vegetated ecosystems occur only where snow accumulations protect sites from winter exposure and provide early growing season moisture. Mountain-heather snowbeds (**Ah**) occur frequently, but with limited spatial coverage. Meadows (**Am**) and wetlands (**Wb/Wf**) are very uncommon in this subzone but do occur in some restricted locations. See Figure 7-8 and Table 7-6.

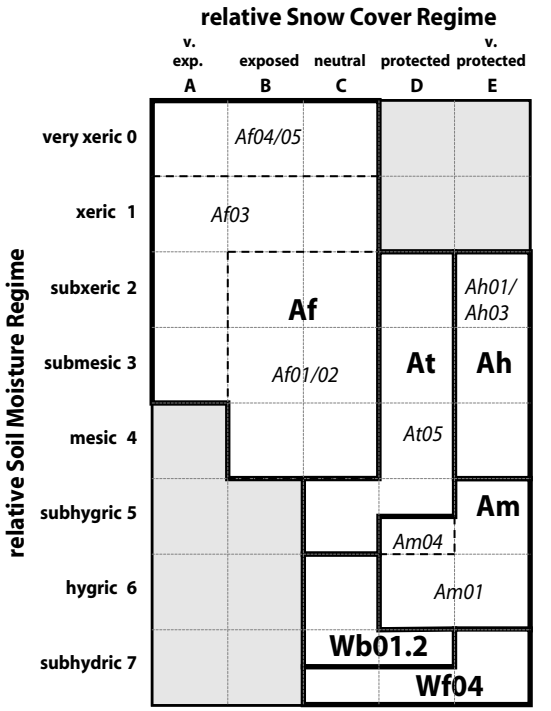


Figure 7-8. Chionoedaphic grid for the Arctic Dwarf Shrub Tundra Alpine (ARDSal) subzone

Table 7-6. Ecosites of the Arctic Dwarf Shrub Tundra Alpine (ARDSal) subzone

Tundra and related ecosites	
ARDSal/Af01	Alaska mountain-avens – Blackish locoweed **zonal ecosystem**
ARDSal/Af02	Alaska mountain-avens – Skeleton-leaved willow **zonal ecosystem**
ARDSal/Af03	Skeleton-leaved willow / Lichens
ARDSal/Af04	Rocktripe – Green map lichen
ARDSal/Af05	Prickly saxifrage – Smelowskia – Poppy
ARDSal/At05	Alaska mountain-avens – Net-leaved willow – Lupine
ARDSal/Ah01	Mountain-heather – Alaska mountain-avens
ARDSal/Ah03	Labrador tea / Mountain-heather – Lowbush cranberry
Meadows and other ecosites	
ARDSal/Am01	Graceful mountain sedge – Horsetail – Mountain-sorrel [1]
ARDSal/Am04	Altai fescue – Graceful mountain sedge – Mountain sagewort [1]
Wetland ecosites	
ARDSal/Wb01	Tussock cottongrass - Lowbush cranberry
ARDSal/Wf04	Scheuchzer's cottongrass – Water sedge / Baltic peat moss [1]

1. These ecosites are uncommon and are infrequently sampled in the bioclimate subzone.

Literature cited

Ballantyne, C.K. 1998. “Age and significance of mountain-top detritus.” *Permafrost and Periglacial Processes* 9: 327–345.

B.C. Ministry of Environment and B.C. Ministry of Forests and Range. 2010. *Field Manual for Describing Terrestrial Ecosystems.* 2nd edition. Land Management Handbook #25, Victoria, B.C.

Bird, C.D. 1974. Botanical studies in the Yukon and Northwest Territories carried out in 1972 in connection with Geological Survey of Canada field parties run by Dr. O. Hughes and Dr. N. Rutter. G.S.C. Open File Report 227, Geological Survey Canada. 402 pp.

Boggs, K., A. Garibaldi, J. Stephens and T. Helt. 1999. Landsat derived map and land cover descriptions for Gates of the Arctic National Park and Preserve. Natural Resource Technical Report NPS/GAAR/NRTR—1999 /001. National Park Service, Fort Collins, Colorado.

Boggs, Keith, Tina V. Boucher and Monica L. McTeague. 2015. *Plant Association Classification for Northern Alaska.* Alaska Natural Heritage Program, University of Alaska, Anchorage, Alaska. 147 pp.

Bostock, H.J. 1987. *Physiography of the Canadian Cordillera with special reference to the area north of the fifty-fifth parallel.* Ottawa: Geological Survey of Canada, Memoir 247. 106 pp.

Braun-Blanquet, J. 1972. *Plant sociology: the study of plant communities.* G.D. Fuller and H.S. Conrad (trans.). Hafner, N.Y.

Braumandl, T.F. and M.P. Curran. 1992. *A Field Guide for Site Identification for the Nelson Forest Region.* British Columbia Ministry of Forests, Victoria. British Columbia, Canada, 309 pp.

Brouillet, L., F. Coursol, S.J. Meades, M. Favreau, M. Anions, P. Bélisle and P. Desmet. 2018. VASCAN: the Database of Vascular Plants of Canada. http://data.canadensys.net/vascan. Accessed March 4, 2018.

Burn, C.R. 1998. Field investigations of permafrost and climatic change in northwest North America. Proceedings, Seventh International Conference on Permafrost, 23–26 June 1989, Yellowknife, NWT and Nordicana, Quebec, pp. 107–120.

Burn, C.R. (ed.) 2012. *Herschel Island/Qikiqtaryuk: a natural and cultural history of Yukon’s Arctic island.* Whitehorse: Wildlife Management and Advisory Council (North Slope). 242 pp.

Catto, N.R. 1996. “Richardson Mountains, Yukon-Northwest Territories: The northern portal of the postulated ‘ice-free corridor’.” *Quaternary International* 32: 3–19.

CAVM Team. 2003. Circumpolar Arctic Vegetation Map. (1:7,500,000 scale). Conservation of Arctic Flora and Fauna (CAFF) Map No. 1. U.S. Fish and Wildlife Service, Anchorage, Alaska.

Cody, W.J. 1996. *Flora of the Yukon Territory.* 1996. NRC Research Press, Ottawa, Ontario, Canada.

Cray, H.A. and W.H. Pollard. 2015. "Vegetation recovery patterns following permafrost disturbance in a low arctic setting: case study of Herschel Island, Yukon, Canada." *Arctic, Antarctic and Alpine Research* 47(1): 99–113.

Day, J.H. 1983. *The Canadian Soil Information System (CanSIS). Manual for Describing Soils in the Field.* 1982 revised. Expert Committee on Soil Survey. Agriculture Canada, Ottawa.

De Cáceres, Miquel, et al. "A comparative framework for broad-scale plot-based vegetation classification." *Applied Vegetation Science* 18.4 (2015): 543–560.

de Groot, A., W. MacKenzie, R. Klassen, I. Ronalds and K. McKenna. 2011. Classification and Description of Vegetation Associations in Arctic Regions. Phase 3: Sub-Arctic database completion and Arctic vegetation classification association descriptions. Government of Canada, International Polar Year (IPY) and Environment Yukon, Whitehorse, Yukon, Canada.

Drew, J.V. and R.E. Shanks. 1965. "Landscape relationships of soils and vegetation in the forest-tundra ecotone, upper Firth River valley." *Alaska-Canada. Ecological Monographs*: 35(3) 285–306.

Duk-Rodkin, A. 1999. Glacial Limits Map of Yukon. Indian & Northern Affairs Canada/ Department of Indian & Northern Development: Exploration & Geological Services Division, Geoscience Map 1999-2. Accessed June 1, 2020. http://data.geology.gov.yk.ca/Compilation/29#Info.

Environment Yukon. 2017. *Field Manual for Describing Yukon Ecosystems.* Whitehorse, Yukon: Department of Environment, Government of Yukon.

Environment Yukon. 2015. Yukon Biophysical Inventory. [Digital biophysical inventory plot data and associated documents]. Available from Ecological and Landscape Classification Program, Department of Environment, Whitehorse, Yukon.

Faber-Langendoen, D., T. Keeler-Wolf, D. Meidinger, D. Tart, C. Josse, G. Navarro, B. Hoagland, S. Ponomarenko, J. Saucier, A. Weakley and P. Comer. 2014. "EcoVeg: a new approach to vegetation description and classification." *Ecological Monographs* 84: 533–561.

Flora of North America Editorial Committee (ed.). (1993–2015). *Flora of North America* (Vols. 1–9, 19–28). New York and Oxford.

Fraser, R., D. McLennan, S. Ponomarenko and I. Olthof. 2012. "Image-based predictive ecosystem mapping in Canadian arctic parks." *International Journal of Applied Earth Observation and Geoinformation* 14 (1): 129–138.

French, Hugh M. 2007. *The Periglacial Environment.* Third edition. Chichester, UK: John Wiley and Sons.

French, H.M. 1987. Periglacial processes and landforms in the western Canadian Arctic. In *Periglacial processes and landforms in Britain and Ireland.* pp. 27–43.

French, H.M. and D.G. Harry. 1992. "Pediments and cold-climate conditions, Barn Mountains, unglaciated northern Yukon." Geografiska Annaler. Series A. *Physical Geography* 74 (2/3): 145–157.

Gordey, S.P. and A.J. Makepeace. (comp.) 1999: Yukon bedrock geology in Yukon digital geology, S.P. Gordey and A.J. Makepeace (comp.); Geological Survey of Canada Open File D3826 and Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada, Open File 1999-1(D).

Government of Yukon. 2015. Eastern North Slope. Yukon Biophysical Inventory System. Retrieved from https://apps.gov.yk.ca/yeis-biophys, September 2016.

Government of Yukon. 2005. Herschel Island. Yukon Biophysical Inventory System. Retrieved from https://apps.gov.yk.ca/yeis-biophys, September 2016.

Government of Yukon. 1993. Richardson Mountains. Yukon Biophysical Inventory System. Retrieved from https://apps.gov.yk.ca/yeis-biophys, September 2016.

Government of Yukon. 1989. Western North Slope. Yukon Biophysical Inventory System. Retrieved from https://apps.gov.yk.ca/yeis-biophys, September 2016.

Haszard, S. and J. Shaw. 2000. Rat River biodiversity, cultural and historical assessment. Gwich'in Renewable Resource Board Report 00-01. Inuvik, Northwest Territories. 78 pp.

Holt, E.A., B. McCune and P. Neitlich. 2009. "Macrolichen communities in relation to soils and vegetation in the Noatak National Preserve, Alaska." *Botany* 87: 241–252.

Hopkins, D.M., J.V. Matthews, C.E. Schweger and S.B. Yound (eds.). 1982. *Paleoecology of Beringia.* New York: Academic Press. 489 pp.

Hulten, E. 1968. *Flora of Alaska and Neighboring Territories: A manual of the vascular plants.* Stanford, California: Stanford University Press. 1008 pp.

Jefferies, R.L. 1977. "The vegetation of salt marshes at some coastal sites in arctic North America." *Journal of Ecology* 65: 661–672.

Janowicz, Ric. 2004 Watersheds and hydrologic regions. In C.A.S. Smith, J.C. Meikle and C.F. Roots (eds.), *Ecoregions of the Yukon Territory: Biophysical properties of Yukon Landscapes.* Agriculture and Agri-Food Canada, PARC Technical Bulletin No. 04-01, Summerland, British Columbia, pp. 15–18.

Jorgensen, T. and D. Meidinger. 2015. The Alaska Yukon Region of the Circumboreal Vegetation map (CBVM). CAFF Strategies Series Report. Conservation of Arctic Flora and Fauna, Akureyri, Iceland.

Jorgenson, J.C., P.E. Joria, T.R. McCabe, B.E. Reitz, M.K. Raynolds, M. Emers and M.A. Williams. 1994. *User's Guide for the land-cover map of the coastal plain of the Arctic National Wildlife Refuge.* 46 pp.

Howes, D.E. and E. Kenk. 1997. *Terrain classification system for British Columbia.* Version 2. B.C. Min. Environ., Lands and Parks, MOE manual 10. Victoria, B.C.

Karasiuk, D.J. 1993. Ecological overview of Northern Yukon National Park. Chapter 1 in *Northern Yukon National Park Resource Description and Analysis*. Natural Resource Conservation Section, Canadian Parks Service, Prairie and Northern Region, Winnipeg.

Kennedy, Catherine E. 2012. Vegetation. In C.R. Burn (ed.). *Herschel Island/Qikiqtaryuk: a natural and cultural history of Yukon's Arctic island.* Whitehorse: Wildlife Management and Advisory Council (North Slope), pp. 80–86.

Kennedy, Catherine E. 1993. Vegetation of Northern Yukon National Park. Chapter 8 in *Northern Yukon National Park Resource Description and Analysis.* Natural Resource Conservation, Canadian Parks Service, Prairie and Northern Region, Winnipeg. 82 pp.

Kruskal, J.B. 1964. "Multidimensional scaling by optimizing goodness-of-fit to a nonmetric hypothesis." *Psychometrika* 29: 1–28.

Lambert, J.D.H. 1968. The ecology and successional trends of tundra plant communities in the low arctic subalpine zone of the Richardson and British Mountains of the Canadian western arctic. PhD thesis. University of British Columbia. 164 pp. + appendices.

Lantuit, H., W.H. Pollard, N. Couture, M. Fritz, L. Schirmeister, H. Meyer and H.-W. Hubberten. 2012. "Modern and late Holocene retrogressive thaw slump activity on the Yukon coastal plain and Herschel Island, Yukon Territory, Canada." *Permafrost and Periglacial Processes* 23 (1) 39–51.

Lauriol, B. 1990. "Cryoplanation terraces, northern Yukon." *Canadian Geographer* 34: 347–351.

Lloyd, D., K. Angove, G. Hope and C. Thompson. 1990. *A Guide to Site Identification and Interpretation for the Kamloops Forest Region.* B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 23. 399 p.

MacKenzie, W.H. 2012. *Biogeoclimatic ecosystem classification of non-forested ecosystems in British Columbia.* Prov. B.C., Victoria, B.C. Tech. Rep. 068.

MacKenzie, W.H. and J.R. Moran. 2004. *Wetlands of British Columbia: a guide to identification.* Res. Br., B.C. Min. For., Victoria, B.C. Land Manage. Handbook No. 52.

MacKenzie, W. and A.G. MacHutchon. 1996. *Habitat classification for the Firth River valley, Ivvavik National Park, Yukon.* Western Arctic District, Parks Canada, Inuvik. 81 pp.

MacKenzie, William H. and Russell Klassen. 2019. VPro 15: Software for management of ecosystem data and classification. BC. Min. For. and Range, Research Branch, Victoria BC. www.for.gov.bc.ca/hre/becweb/resources/ software/vpro/index.html. Accessed July 11, 2016.

MacKenzie, William H. and Del V. Meidinger. 2018. "The Biogeoclimatic Ecosystem Classification Approach: an ecological framework for vegetation classification." *Phytocoenologia* 48 (2): 203–213.

MacKenzie, William H., Catherine Kennedy and Adrian deGroot. 2014. Arctic vegetation associations of the Yukon Territory. Prepared for Government of Yukon and Wildlife Management Advisory Council (North Slope). 72 pp. + appendices.

MacKinnon, A.K.A., J. Pojar and R. Coupé (eds.). 1992. *Plants of Northern British Columbia.* B.C. Ministry of Forests and Lone Pine Publishing, Vancouver.

Mathews, W.H. 1986. Physiography of the Canadian Cordillera. Geological Survey of Canada, Map 1701A.

McCune, B. and M.J. Mefford. 2011. PC-ORD. Mulivariate Analysis of Ecological Data. Version 6. MjM Software, Glenden Beach, Oregon.

Mueller-Dombois, D. and H. Ellenberg. 1974. *Aims and Methods of Vegetation Ecology.* New York: John Wiley and Sons.

Northern Ecosystem Analysis and Mapping Laboratory and Arctic Field Ecology, University of Alaska, Fairbanks.

Oswald, E.T. and J.P. Senyk. 1977. *Ecoregions of Yukon Territory.* Canadian Forestry Service. Pacific Forest Research Centre, Victoria, B.C., Information Report BC-X–164. 115 pp.

Parks Canada. 2012. *Ecosystem Mapping of Ivvavik National Park.* Ecosytem Monitoring Program, Parks Canada. Unpublished data.

Pfister, Robert D. and Stephen F. Arno. "Classifying forest habitat types based on potential climax vegetation." *Forest Science* 26.1 (1980): 52–70.

Pojar, J. and A. McKinnon. 2013. *Alpine Plants of British Columbia, Alberta and Northwest North America.* With A. Pojar, C. Bjork and H. Roemer. Lone Pine Publishing. Edmonton, Alberta, Canada.

Pojar, J., K. Klinka and D.V. Meidinger. 1987. "Biogeoclimatic ecosystem classification in British Columbia." *For. Ecol. Manage.* 22: 119–154.

Rains, M.C. 2002. The effects of periglacial processes on landforms, soils and vegetation in terrestrial ecosystems. In J. Moiut, P. Moyle and S. Yarnell (eds.). *Glacial and periglacial processes and hydrogeomorphic and ecological drivers in high-latitude watersheds.* Davis, CA.

Rampton, V.N. 1982. *Quaternary geology of the Yukon Coastal Plain.* Geological Survey of Canada, Bulletin 317, 49 pp. + 5 maps.

Raynolds M.A., D.A. Walker and H.A. Maier. 2006. Alaska Arctic Tundra Vegetation Map. Scale 1:4,000,000. Conservation of Arctic Flora and Fauna (CAFF) Map No. 2, U.S. Fish and Wildlife Service, Anchorage, Alaska. www.arcticatlas.org/maps/themes/ak/akCommList_table1. Accessed March 30, 2018.

Ritchie, J.C. 1984. *Past and Present Vegetation of the Far Northwest of Canada.* Toronto: University of Toronto Press. 251 pp.

Schickhoff, Udo, Marilyn D. Walker and Donald A. Walker. 2002. "Riparian willow communities on the Arctic Slope of Alaska and their environmental relationships: a classification and ordination analysis." *Phytocoenologia* 32 (2): 145–204.

SCWG (Soil Classification Working Group). 1998. *The Canadian System of Soil Classification.* 3rd edition. Agric. Agri-Food Can. NRC Res. Press, Ottawa, Ont. Publication. 1646.

Smith, C.A.S., C.E. Kennedy, A.E. Hargrave and K.M. McKenna. 1989. *Soil and Vegetation of Herschel Island.* Report No. 1 of the Yukon Soil Survey. Land Resource Research Centre Contribution No. 88–26, Research Branch, Agriculture Canada. 101 pp. + maps.

Smits, C.M.M., C.A.S. Smith and B.G. Slough. 1988. "Physical characteristics of arctic fox *(Alopex lagopus)* dens in northern Yukon Territory, Canada." *Arctic* 41 (1): 12–16.

Viereck, L.A., C.T. Dyrness, A.R. Batten and K.J. Wenzlick. 1992. *The Alaska vegetation classification.* Gen. Tech. Rep. PNW-GTR-286. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 278 pp.

Vitt, D.H., J.E. Marsh and R.B. Bovey. 2007. *Mosses, Lichens and Ferns of Northwest North America: A photographic field guide.* Edmonton: Lone Pine Publishing.

Walker, M.D. 1987. Vegetation and floristics of pingos, Central Arctic Coastal Plain, Alaska. Dissertation, Botanicae, 149, Stuttgart: J. Cramer. 283 pp.

Warner, B.G. and C.D.A. Rubec (eds.). 1997. *The Canadian Wetland Classification System.* 2nd Edition. National Wetlands Working Group, Wetlands Research Centre, University of Waterloo, Waterloo, Ontario. 68 pp.

Welch, David M. 1993a. Geology of Northern Yukon National Park. Chapter 3 in *Northern Yukon National Park Resource Description and Analysis.* Natural Resource Conservation Section, Canadian Parks Service, Prairie and Northern Region, Winnipeg. 54 pp.

Welch, David M. 1993b. Geomorphology of Northern Yukon National Park. Chapter 4 In *Northern Yukon National Park Resource Description and Analysis.* Natural Resource Conservation Section, Canadian Parks Service, Prairie and Northern Region, Winnipeg. 110 pp.

Welch, David M. and C.A.S. Smith. 1993. Soils of the Northern Yukon National Park. Chapter 5 in *Northern Yukon National Park Resource Description and Analysis.* Natural Resource Conservation Section, Canadian Parks Service, Prairie and Northern Region, Winnipeg. 50 pp.

Welsh, L.L. and J.K. Rigby. 1971a. *Botanical and physiographic reconnaissance of northern Yukon.* Brigham Young University, Science Bulletin, Biological Series, 14: 1–16.

Welsh, L.L. and J.K. Rigby. 1971b. *Geologic control of vegetation in northern Yukon.* Geological Society of America 214th Annual Meeting, Abstracts with Programs 3: 418–419.

Wiken, E.B., D.M. Welch, G.R. Ironside and D.G. Taylor. 1981. *The Northern Yukon: an ecological land survey.* Lands Directorate, Environment Canada, Ecological Land Classification Series, No.6, Vancouver, B.C./Ottawa, Ontario. 197 pp. + map.

Yukon Conservation Data Centre. 2015. Rare species database. Rare plant information sheets of the Inuvialuit Traditional Territory. Whitehorse: Yukon Department of Environment. 26 pp. www.env.gov.yk.ca/cdc.

Yukon Ecoregions Working Group, 2004. Yukon Coastal Plain, Southern Arctic Ecozone; and British Richardson Mountains, Taiga Cordillera Ecozone. In C.A.S. Smith, J.C. Meikle and C.F. Roots (eds.). *Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes.* Agriculture and Agri-Food Canada, PARC Technical Bulletin No. 04-01, Summerland, British Columbia.

Yukon Geological Survey. 2018. *Bedrock Geology.* Accessed June 1, 2020. www.geology.gov.yk.ca/update_yukon_bedrock_geology_map.html.

Appendices

Appendix 1. Data and methods

Data compilation

Ecosystem plot data collected in the Yukon Arctic Region were initially compiled for the International Polar Year from published and unpublished sources by De Groot et al. (2011). All plot data were entered into and compiled with the ecosystem plot database program VPro15 (MacKenzie and Klassen 2019). In 2014, additional plots were added from the Yukon Biophysical Inventory System (Environment Yukon 2015), and in 2015 plots were added from additional fieldwork undertaken in the eastern portion of the Yukon Arctic Region. A total of 1,741 Yukon Arctic Region plots were compiled from all sources. Spatial distribution of plots in the Yukon Arctic Region is fairly complete, but with a higher density of information from Ivvavik, Herschel Island and the Richardson Mountains (Figure A1). Principal data sources and their plot contribution to the classification are presented in Table A1. Full citations are found in the reference section.

Table A1. Plot data sources and contribution to ecosite descriptions

Author reference	Years	Area of Study	Plots	Plots used
Lambert 1968	1968	Eastern Yukon and NWT	153	135
Smith et al. 1989	1985–86	Herschel Island and North Coast	167	107
Government of Yukon 1989	1988–89	North Slope (Western)	203	166
Government of Yukon 1993	1991–93	Richardson Mountains	647	483
MacKenzie and MacHutchon 1996	1993–95	Ivvavik National Park	157	132
Government of Yukon 2005	2000–05	Herschel Island	105	84
Parks Canada 2012	2009–12	Ivvavik National Park	125	95
Government of Yukon 2015	2015	North Slope (Eastern)	184	159
Total plots			1,741	1,361

All plots used in this guide were collected using the relevé method. In most cases, individual plot size was not recorded, but most projects collected using plot sizes between 25 m^2 and 400m^2. The quality of vegetation data varies between projects, particularly for the non-vascular component of the vegetation. In many projects, moss and lichens were not identified to species, but were recorded simply as life form totals. These plots are used in the classification, but only those plots with moss and lichen species recorded are used to describe the non-vascular species composition of ecosites. Plots where prominent vascular species were not recorded were not incorporated into the analysis.

Most of the data set includes basic site information, including latitude/longitude, elevation, aspect, slope grade and position. In addition, most plots include an assessment of soil moisture or drainage. A minority of plots (~20%) have soil classification information following the Canadian System of

Soil Classification (SCWG 1998), including terrain information, soil chemical analysis, and/or an assessment of active layer depth.

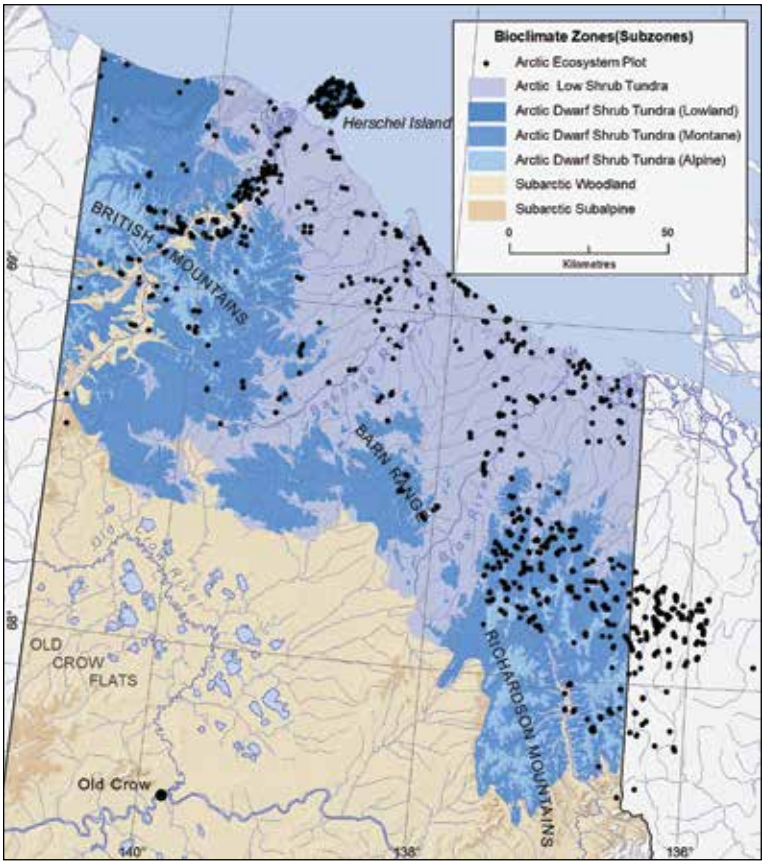


Figure A1. Distribution of Yukon Arctic Region ecosystem plots used in this guide

Data analysis

Ecosystem units were developed following a biogeoclimatic ecosystem classification approach (MacKenzie and Meidinger 2018) using a series of stepwise procedure of successive approximations (Pfister and Arno 1980). The working plant classification unit of YBEC is the association. Ecosites are created to delineate units of consistent and differentiating vegetation composition (association) and site condition. These units are expert-delineated, node-based, extensive and intensive and based primarily on vegetation differentiation of site condition (MacKenzie and Meidinger 2018). The initial plot grouping is attained by relevé table sorting by knowledgeable experts (De Cáceres et al. 2015), and assessed with diagnostic tabling options from the VPro software (MacKenzie and Klassen 2019). Preliminary tables

were created, based on dominance-type groupings and guidance from field work and previous classifications using species cover data. These initial groups were then subjected to more formal tabular analysis using Braun-Blanquet methods (Mueller-Dombois and Ellenberg 1974). The final vegetation tables presented in this guide are produced from Vpro15 (MacKenzie and Klassen 2019).

Results

Of the 1,741 compiled plots, 380 were not used in the classification because they were considered poor quality, transitional, or none recurring types. Units were defined using the remaining 1,361 plots from the arctic regions of the Yukon and adjacent Northwest Territories (Table AI).

Generally, a minimum of 5 plots were required when defining a formal vegetation unit. In some cases, however, where ecosystems have simple composition and types are well known from other regions, units are described from fewer plots.

A total of 50 ecosites and 74 vegetation units (associations and subassociations) are defined. The associations in the guide are coded and organized in 14 ecosite classes.

Table A2. Number of syntaxon described by ecosite class

Ecosite Class	No. of ecosites	No. of vegetation units
Fellfield (Af)	5	5
Heather Snowbed (Ah)	3	5
Meadow (Am)	4	4
Late Snow (As)	1	1
Shrub Tundra (At)	5	8
Zooclimax (Az)	1	2
Disturbance Tundra	0	3
Beachland (Bb)	2	4
Estuarine Saltmarshes (Em)	7	7
Floodplain (Fl)	4	4
Shrub Tundra (St)	8	10
Bogs (Wb)	2	6
Fens (Wf)	6	9
Marshes (Wm)	2	5

Associations are crosswalked (i.e., cross-referenced) to several related treatments in Appendix 3. Related concepts from the *plant association classification* from Boggs, Boucher and McTeague (2015), Braun-Blanquet units from Lambert (1968), and the CAVM units of Raynolds, Walker and Maier (2016) are presented.

Appendix 2. List of ecosites and associations

Ecosite code	Ecosite name	Plant association code	Alaska habitat types
Af01	Alaska mountain-avens – Blackish locoweed	Draf01	Dry
Af02	Alaska mountain-avens – Skeleton-leaved willow	Draf02	Dry
Af03	Skeleton-leaved willow / Lichens	Saph01	Dry
Af04	Rocktripe – Green map lichen	Umsp01	Dry
Af05	Prickly saxifrage – Smelowskia – Poppy	Satr01	Dry
Ah01	Mountain-heather – Alaska mountain-avens	Cate20	
Ah01.1	Mountain-heather – Alaska mountain-avens	Cate20t	Mesic
Ah01.2	Mountain-heather – Alaska mountain-avens – Lupine	Cate20l	Mesic
Ah01.3	Dwarf birch / Mountain-heather – Alaska mountain-avens	Cate20b	Mesic
Ah02	Mountain-heather – Mountain-avens – Brookfoam	Cate21t	
Ah02.1	Mountain-heather – Mountain-avens – Brookfoam	Cate21t	Mesic
Ah02.2	Green alder / Mountain-heather – Mountain-avens – Brookfoam	Alvi20	Mesic
Ah03	Labrador tea / Mountain-heather – Lowbush cranberry	Cate22	Mesic
Am01	Graceful mountain sedge – Horsetail – Mountain-sorrel	Capo31	Moist
Am02	Chamisso's willow – Horsetail	Sach33	Moist
Am03	Bluejoint – Horsetail	Caca35	Moist
Am04	Altai fescue – Graceful mountain sedge – Mountain sagewort	Feal30	Mesic
As01	Polar willow – Pygmy buttercup	Sapo36	Moist
At01	Entire-leaved mountain-avens / Bearberry – Hedysarum	Drin10	Dry/Mesic
At02	Arctic willow – Entire-leaved mountain-avens – Tundra milk-vetch	Saar20	
At02.1	Arctic willow – Entire-leaved mountain-avens – Tundra milk-vetch	Saar20t	Mesic
At02.2	Arctic willow – Entire-leaved mountain-avens – Tundra milk-vetch - Arctic Lupine	Saar20l	Mesic
At03	Net-veined willow – Entire-leaved mountain-avens – Horsetail	Sare30	Moist
At03.1	Net-veined willow – Entire-leaved mountain-avens – Horsetail	Sare30t	Moist
At03.2	Grey-leaved willow / Entire-leaved mountain-avens – Horsetail	Sare30g	Moist
At04	Entire-leaved mountain-avens – Muskeg sedge	Calu28	Moist
At04.1	Entire-leaved mountain-avens – Muskeg sedge	Calu28t	Moist
At04.2	Entire-leaved mountain-avens – Muskeg sedge - Tussock cottongrass	Calu28c	Moist
At05	Alaska mountain-avens – Net-leaved willow – Lupine	Draf03	Dry/Mesic

Appendix 2 (continued)

Ecosite code	Ecosite name	Plant association code	Alaska habitat types
Az01	Arctic willow – Trisetum – Jacob's-ladder	Drin	Mesic
Az01.1	Arctic willow – Mountain-avens – Trisetum – Jacob's-ladder	Drin22	Dry/Mesic
Az01.2	Arctic willow – Dunegrass - Trisetum – Jacob's-ladder	Saar23	Dry/Mesic
At$1	Mastodon flower	Tepa38	Moist
At$2	Polargrass – Tilesius' wormwood – Coltsfoot	Arla33	Mesic
At$3	Arctic willow – Arctic lupine – Milk-vetch	Saar22	Mesic
St01	Dwarf birch – Labrador tea /Crowberry	Bena21	Mesic
St01.1	Dwarf birch – Labrador tea /Crowberry	Bena21t	Mesic
St01.2	Green alder - Dwarf birch – Labrador tea /Crowberry	Bena21a	Mesic
St02	Dwarf birch – Labrador tea / Muskeg sedge	Bena30	Moist
St03	Dwarf birch / Lowbush cranberry / Lichens	Bena01	Dry
St04	Dwarf birch / Entire-leaved mountain-avens	Bena22	Mesic
St04.1	Dwarf birch / Entire-leaved mountain-avens	Bena22t	Mesic
St04.2	Grey-leaved willow - Dwarf birch / Entire-leaved mountain-avens	Bena22w	Mesic
St05	Dwarf birch / Altai fescue	Bena19	Mesic
St06	Green alder – Alaska spirea	Alvi21	Dry/Mesic
St07	Richardson's willow / Horsetail	Sari36	Moist
St08	Diamond-leaved willow – Dwarf birch / Coltsfoot / Peat moss	Sapu38	Moist
Fl01	Diamond-leaved willow/ Coltsfoot – Horsetail	Sapu35	Flood
Fl02	Green alder / Bluejoint – Coltsfoot	Alvi35	Flood
Fl03	Alaska willow / Tilesius' wormwood – Bluejoint	Saal35	Flood
Fl04	Alaska willow / Mountain-avens	Saal28	Flood
Wb01	Dwarf birch / Lowbush cranberry / Tussock cottongrass	Erva41	Moist/Wet
Wb01.1	Dwarf birch / Tussock cottongrass - Lowbush cranberry	Erva41t	Moist/Wet
Wb01.2	Dwarf birch - Diamond-leaved willow / Tussock cottongrass - Lowbush cranberry	Erva41w	Moist/Wet
Wb01.3	Tussock cottongrass - Lowbush cranberry	Erva41c	Moist/Wet
Wb01.4	Green alder - Dwarf birch / Tussock cottongrass - Lowbush cranberry	Alvi41	Moist/Wet
Wb02	Dwarf birch – Labrador tea / Cloudberry / Peat moss		Moist/Wet
Wb02.1	Dwarf birch – Labrador tea / Cloudberry / Peat moss	Bena40t	Moist/Wet
Wb02.2	Green alder - Dwarf birch – Labrador tea / Cloudberry / Peat moss	Bena40a	Moist/Wet
Wf01	Diamond-leaved willow / Water sedge / Shaggy peat moss		Wet
Wf01.1	Diamond-leaved willow / Water sedge / Shaggy peat moss	Caaq56w	Wet
Wf01.2	Water sedge / Shaggy peat moss	Caaq56t	Wet

Appendix 2 (continued)

Ecosite code	Ecosite name	Plant association code	Alaska habitat types
Wf01.3	Water sedge / Marsh cinquefoil	Caaq56c	Wet
Wf02	Tall cottongrass / Peat moss		Wet
Wf02.1	Tall cottongrass / Peat moss	Eran53	Wet
Wf02.2	Diamond-leaved willow / Tall cottongrass / Peat moss	Sapu53	Wet
Wf03	Creeping sedge – Water sedge / Peat moss	Cach52	Wet
Wf04	Scheuchzer's cottongrass – Water sedge / Baltic peat moss	Ersc65	Wet
Wf05	Loose-flowered sedge / Peat moss	Cara54	Wet
Wf06	Richardson's willow – Water sedge	Sari53	Moist/Wet
Wm01	Pendantgrass	Arfu65	Wet
Wm01.1	Pendantgrass	Arfu65t	Wet
Wm01.2	Mare's-tail - Pendantgrass	Arfu65m	Wet
Wm01.3	Scheuchzer's cottongrass – Pendantgrass	Arfu65c	Wet
Wm01.4	Water horsetail - Pendantgrass	Arfu65h	Wet
Wm02	Fisher's tundragrass – Water sedge	Dufi64	Wet
Bb01	Seabeach sandwort	Hope10	Saline
Bb02	Arctic dunegrass	Lemo10	Saline
Bb02.1	Arctic dunegrass	Lemo10t	Saline
Bb02.2	Arctic willow – Arctic dunegrass	Lemo10w	Saline
Bb02.3	Arctic dunegrass - Northern primrose	Lemo10p	Saline
Em01	Creeping alkaligrass	Puph35	Saline
Em02	Hoppner's sedge	Casu35	Saline
Em03	Loose-flowered sedge – Arctic willow	Cara34	Saline
Em04	Saltmarsh sedge	Cagl33	Saline
Em05	MacKenzie's sedge	Cama36	Saline
Em06	Yellowish sedge - Fisher's tundragrass	Dufi35	Saline
Em07	Four-leaved mare's-tail	Hite	Saline

Appendix 3. Crosswalk of Yukon ecosites to other classifications

Ecosite code	This guide	Boggs, Boucher and McTeague (2015)	Raynolds ,Walker and Maier (2006)	Lambert (1968)
Af01	Alaska mountain-avens – Blackish locoweed	*Dryas octopetala*	25. *Dryas integrifolia – Oxytropis nigrescens* (~); 8. *Dryas integrifolia – Ochrolechia frigida* (~)	*Lupino – Dryadetum alaskensis (depauperatum)*
Af02	Alaska mountain-avens – Skeleton-leaved willow			
Af03	Skeleton-leaved willow / Lichens	*Salix phlebophylla*	35. *Salix phlebophylla – Vaccinium uliginosum;* 14. *Salix phlebophylla – Arctous alpina* (~)	*Salicetum phlebophyllae*
Af04	Rocktripe – Green map lichen	*Umbilicaria spp Sparse (Talus Field)*	74. *Umbilicaria* spp. – *Rhizocarpon geographicum*	
Af05	Prickly saxifrage – Smelowskia – Poppy			
Ah01	Mountain-heather – Alaska mountain-avens	*Dryas octopetala – Cassiope tetragona*	11. *Cassiope tetragona – Dryas integrifolia subtype Depauperate* (~)	
Ah01.1	Mountain-heather – Alaska mountain-avens	*Dryas octopetala – Cassiope tetragona*		
Ah01.2	Mountain-heather – Alaska mountain-avens – Lupine			
Ah01.3	Dwarf birch / Mountain-heather – Alaska mountain-avens	*Cassiope tetragona; Cassiope tetragona – Anthoxanthum monticola* ssp. *alpinum Sparse (Acidic)*		
Ah02	Mountain-heather – Mountain-avens – Brookfoam		79. *Cassiope tetragona – Dryas integrifolia subtype Novosieversia glaciale* (~)	
Ah02.1	Mountain-heather – Mountain-avens – Brookfoam			
Ah02.2	Green alder / Mountain-heather – Mountain-avens – Brookfoam			

Appendix 3 (continued)

Ecosite code	This guide	Boggs, Boucher and McTeague (2015)	Raynolds ,Walker and Maier (2006)	Lambert (1968)
Ah03	Labrador tea / Mountain-heather – Lowbush cranberry		62. *Cassiope tetragona – Carex microchaeta*; 64. *Cassiope tetragona – Loiseleuria procumbens*	
Am01	Graceful mountain sedge – Horsetail – Mountain-sorrel			*Salicetum chamissonis (Caricosum montanensis)*
Am02	Chamisso's willow – Horsetail			*Salicetum chamissonis (Equisetosum arvensis)*
Am03	Bluejoint – Horsetail		18. *Calamagrostis canadensis – Rubus arcticus* (~)	
Am04	Altai fescue – Graceful mountain sedge – Mountain sagewort			*Salicetum chamissonis (Equisetosum arvensis)*
As01	Polar willow – Pygmy buttercup		63. *Salix rotundifolia subtype Ranunculus nivalis*	*Salicetum pseudopolaris*
At$1	Mastodon flower			
At$2	Polargrass – Tilesius' wormwood – Coltsfoot			
At$3	Arctic willow – Arctic lupine – Milk-vetch	*Salix arctica*		
At01	Entire-leaved mountain-avens / Bearberry – Hedysarum	*Dryas integrifolia (Upland) ; Dryas integrifolia (Floodplain)*	34. *Dryas integrifolia – Lupinus arcticus*	
At02	Arctic willow – Entire-leaved mountain-avens – Tundra milk-vetch			
At02.1	Arctic willow – Entire-leaved mountain-avens – Tundra milk-vetch			
At02.2	Arctic willow – Entire-leaved mountain-avens – Tundra milk-vetch – Arctic Lupine			

Appendix 3 (continued)

Ecosite code	This guide	Boggs, Boucher and McTeague (2015)	Raynolds ,Walker and Maier (2006)	Lambert (1968)
At03	Net-veined willow – Entire-leaved mountain-avens – Horsetail	*Equisetum arvense – Salix reticulata*	81. *Carex bigelowii – Dryas integrifolia subtype Equisetum arvense*	
At03.1	Net-veined willow – Entire-leaved mountain-avens – Horsetail			
At03.2	Grey-leaved willow / Entire-leaved mountain-avens – Horsetail			
At04	Entire-leaved mountain-avens – Muskeg sedge	*Carex lugens – Dryas octopetala , Carex lugens*	27a. *Carex bigelowii – Dryas integrifolia subtype Carex membranacea*	
At04.1	Entire-leaved mountain-avens – Muskeg sedge			
At04.2	Entire-leaved mountain-avens – Muskeg sedge – Tussock cottongrass			
At05	Alaska mountain-avens – Net-leaved willow – Lupine	*Dryas octopetala*	36. *Dryas octopetala – Carex scirpoidea*	*Lupino – Dryadetum alaskensis (Dryado – salicetosum reticulatae – glaucae)*
Az01	Arctic willow – Trisetum – Jacob's-ladder			
Az01.1	Arctic willow – Mountain-avens – Trisetum – Jacob's-ladder			
Az01.2	Arctic willow – Dunegrass – Trisetum – Jacob's-ladder			
Bb01	Seabeach sandwort	*Honckenya peploides*		
Bb02	Arctic dunegrass			
Bb02.1	Arctic dunegrass	*Leymus mollis*		
Bb02.2	Arctic willow – Arctic dunegrass	*Leymus mollis – Lathyrus japonicus var. maritimus*		
Bb02.3	Arctic dunegrass – Northern primrose			

Appendix 3 (continued)

Ecosite code	This guide	Boggs, Boucher and McTeague (2015)	Raynolds ,Walker and Maier (2006)	Lambert (1968)
Em01	Creeping alkaligrass	*Puccinellia phryganodes*	78. *Puccinellia phryganodes-Carex ramenskii*	
Em02	Hoppner's sedge	*Carex subspathacea*		
Em03	Loose-flowered sedge – Arctic willow			
Em04	Saltmarsh sedge	*Carex glareosa*		
Em05	MacKenzie's sedge			
Em06	Yellowish sedge – Fisher's tundragrass			
Fl01	Diamond-leaved willow/ Coltsfoot – Horsetail		65. *Salix pulchra-Valeriana capitata;* 68. *Salix pulchra-Hylocomium splendens*	
Fl02	Green alder / Bluejoint – Coltsfoot	*Alnus viridis* ssp. *fruticosa / Arctagrostis latifolia (provisional)*	67. *Alnus viridis-Boschniakia rossica subtype Salix richardsonii* (~)	
Fl03	Alaska willow / Tilesius' wormwood – Bluejoint	*Salix alaxensis*	66. *Salix alaxensis-Chamerion latifolium subtype Parnassia kotzebui*	
Fl04	Alaska willow / Mountain-avens	*Salix alaxensis / Dryas octopetala*		
St01	Dwarf birch – Labrador tea /Crowberry			*Betulo – Ledetum decumbentis*
St01.1	Dwarf birch – Labrador tea /Crowberry			*Betulo – Ledetum decumbentis*
St01.2	Green alder – Dwarf birch – Labrador tea / Crowberry	*Alnus viridis* ssp. *fruticosa / Vaccinium uliginosum*	45. *Alnus viridis-Boschniakia rossica subtype Carex bigelowii (alder savannas)*	
St02	Dwarf birch – Labrador tea / Muskeg sedge	*Betula nana – Carex lugens*	76. *Betula nana-Salix pulchra*	

Appendix 3 (continued)

Ecosite code	This guide	Boggs, Boucher and McTeague (2015)	Raynolds ,Walker and Maier (2006)	Lambert (1968)
St03	Dwarf birch / Lowbush cranberry / Lichens	*Betula nana / Lichen*		*Vaccinio – Betuletum glandulosae*
St04	Dwarf birch / Entire-leaved mountain-avens			
St04.1	Dwarf birch / Entire-leaved mountain-avens	*Betula nana*		
St04.2	Grey-leaved willow – Dwarf birch / Entire-leaved mountain-avens	*Salix glauca*		
St05	Dwarf birch / Altai fescue			
St06	Green alder – Alaska spirea			
St07	Richardson's willow / Horsetail	*Salix richardsonii*	33. *Salix richardsonii-Anemone parviflora subtype Salix richardsonii* (~)	*Salicetum pulchrae (Salicosum richardsonii)*
St08	Diamond-leaved willow – Dwarf birch / Coltsfoot / Peat moss	*Salix pulchra*		*Salicetum pulchrae(Salicetosum pulchrae)*
Wb01	Dwarf birch / Lowbush cranberry / Tussock cottongrass			*Betulo – Eriophoretum vaginati*
Wb01.1	Dwarf birch / Tussock cottongrass – Lowbush cranberry	*Betula nana – Eriophorum vaginatum*	50. *Betula nana-Eriophorum vaginatum*	
Wb01.2	Dwarf birch – Diamond-leaved willow / Tussock cottongrass – Lowbush cranberry	*Salix pulchra – Eriophorum vaginatum*	42. *Eriophorum vaginatum–Sphagnum* spp. *subtypes Betula nana and Salix pulchra*	

Appendix 3 (continued)

Ecosite code	This guide	Boggs, Boucher and McTeague (2015)	Raynolds ,Walker and Maier (2006)	Lambert (1968)
Wb01.3	Tussock cottongrass – Lowbush cranberry	*Eriophorum vaginatum*	16. *Eriophorum vaginatum–Sphagnum* spp. *subtype Sphagnum compactum;* 17. *Eriophorum vaginatum–Sphagnum* spp. *subtype Ledum decumbens;* 46. *Eriophorum vaginatum–Sphagnum* spp. *subtype Chamerion angustifolium;* 47. *Eriophorum vaginatum–Sphagnum* spp. *subtype Cladina rangiferina*	
Wb01.4	Green alder – Dwarf birch / Tussock cottongrass – Lowbush cranberry	*Alnus viridis* ssp. *fruticosa / Betula nana / Carex lugens*		
Wb02	Dwarf birch – Labrador tea / Cloudberry / Peat moss	*Rubus chamaemorus*	43. *Ledum decumbens-Rubus chamaemorus*	*Betulo – Chamaimoretum*
Wb02.1	Dwarf birch – Labrador tea / Cloudberry / Peat moss			*Betulo – Chamaimoretum*
Wb02.2	Green alder – Dwarf birch – Labrador tea / Cloudberry / Peat moss			*Betulo – Chamaimoretum (Alnetosum crispae)*
Wf01	Diamond-leaved willow / Water sedge / Shaggy peat moss		59. *Carex aquatilis – Betula nana*	*Carecetum aquatilis (Salicosum arbutifoliae)*
Wf01.1	Diamond-leaved willow / Water sedge / Shaggy peat moss	*Salix pulchra – Carex aquatilis*		
Wf01.2	Water sedge / Shaggy peat moss	*Carex aquatilis / Dwarf shrub ; Carex aquatilis / Sphagnum spp*		*Carecetum aquatilis*
Wf01.3	Water sedge / Marsh cinquefoil	*Carex aquatilis*	57. *Carex aquatilis – Eriophorum angustifolium subtype Carex rostrata*	

Appendix 3 (continued)

Ecosite code	This guide	Boggs, Boucher and McTeague (2015)	Raynolds ,Walker and Maier (2006)	Lambert (1968)
Wf02	Tall cottongrass / Peat moss		58. *Carex aquatilis – Eriophorum angustifolium subtype Sphagnum* spp.	*Eriophoretum angustifolii*
Wf02.1	Tall cottongrass / Peat moss	*Eriophorum angustifolium* ssp. *subarcticum*		*Eriophoretum angustifolii*
Wf02.2	Diamond-leaved willow / Tall cottongrass / Peat moss	*Salix pulchra – Eriophorum angustifolium*		*Eriophoretum angustifolii (salicetosum pulchrae)*
Wf03	Creeping sedge – Water sedge / Peat moss		77. *Carex aquatilis – Eriophorum angustifolium subtype Carex chordorrhiza*	
Wf04	Scheuchzer's cottongrass – Water sedge / Baltic peat moss	*Eriophorum chamissonis*	54. *Carex aquatilis – Eriophorum scheuchzeri / Ledum decumbens – Sphagnum* spp. *complex*	*Eriophoretum scheuchzeri*
Wf05	Loose-flowered sedge / Peat moss		56. *Carex aquatilis – C. rariflora / Empetrum nigrum – Sphagnum* spp. *complex*	*Caricetum rariflorae*
Wf06	Richardson's willow – Water sedge	*Salix richardsonii / Eriophorum angustifolium*		
Wm01	Pendantgrass	*Arctophila fulva*		*Arctophiletum fulvae*
Wm01.1	Pendantgrass			
Wm01.2	Mare's-tail – Pendantgrass			
Wm01.3	Scheuchzer's cottongrass – Pendantgrass			
Wm01.4	Water horsetail – Pendantgrass			
Wm02	Fisher's tundragrass – Water sedge	*Dupontia fisheri*	10. *Eriophorum angustifolium – Carex aquatilis subtype Dupontia fisheri*	

Note: Uncertainty in the crosswalked Yukon ecosites to other classifications is indicated by (~).

Appendix 4. Species applied in guide

This appendix lists all the taxa applied in this field guide, along with the common name. The taxonomic standards used for this list are outlined in Section 1.4. In cases where space is constrained, a shortened common name is used in the guide. In Table A-4, the truncated name is shown in bold font.

Table A-4. Plant species list for the Yukon Arctic Region

Stratum	Scientific name	Common name
Trees	Picea glauca	white spruce
	Populus balsamifera	balsam poplar
Shrubs	*Alnus viridis* ssp. *crispa*	green alder
	Betula glandulosa	shrub birch
	Betula nana	dwarf birch
	Dasiphora fruticosa ssp. *floribunda*	shrubby cinquefoil
	Rhododendron tomentosum	northern **Labrador tea**
	Ribes triste	wild red currant
	Salix alaxensis	felt-leafed willow
	Salix brachycarpa	short-fruited willow
	Salix glauca	grey-leaved willow
	Salix hastata	halberd willow
	Salix pulchra *	diamond-leaved willow
	Salix richardsonii	Richardson's willow
	Shepherdia canadensis	soapberry
	Spiraea stevenii *	Alaska spiraea
	Vaccinium uliginosum	bog blueberry
	Andromeda polifolia	bog-rosemary
Ground shrubs	*Arctous alpina*	alpine bearberry
	Arctous rubra	red bearberry
	Arctous spp.	bearberry
	Cassiope tetragona	arctic mountain-heather
	Dryas integrifolia	entire-leaved mountain-avens
	Dryas alaskensis *	Alaska mountain-avens
	Dryas spp.	mountain-avens
	Empetrum nigrum	crowberry
	Linnaea borealis	twinflower
	Loiseleuria procumbens *	alpine-azalea
	Rhododendron lapponicum *	Lapland rosebay
	Rubus chamaemorus	cloudberry
	Salix arctica	arctic willow
	Salix arctophila	northern willow
	Salix chamissonis *	Chamisso's willow
	Salix fuscescens	Alaska bog willow
	Salix ovalifolia *	oval-leaved willow
	Salix phlebophylla *	skeleton-leaved willow

Table A-4 (continued)

Stratum	Scientific name	Common name
	Salix polaris	polar willow
	Salix reticulata	net-veined willow
	Vaccinium microcarpum	small bog cranberry
	Vaccinium vitis-idaea	lowbush cranberry
Ferns and allies	Equisetum arvense	common **horsetail**
	Equisetum fluviatile	water horsetail
	Equisetum scirpoides	dwarf scouring-rush
	Equisetum variegatum	variegated scouring-rush
	Lycopodium annotinum	bristly clubmoss
	Selaginella siberica	Siberian spikemoss
Graminoids	Alopecurus magellanicus	alpine **meadow-foxtail**
	Anthoxanthum monticola	alpine sweetgrass
	Arctagrostis latifolia	polargrass
	Arctophila fulva	pendantgrass
	Calamagrostis canadensis	bluejoint reedgrass
	Calamagrostis deschampsioides	circumpolar reedgrass
	Carex aquatilis	water sedge
	Carex lugens *	muskeg sedge
	Carex capillaris	hairlike sedge
	Carex chordorrhiza	creeping sedge
	Carex glareosa	saltmarsh sedge
	Carex lachenalii	two-tipped sedge
	Carex mackenziei	Mackenzie's sedge
	Carex membranacea	fragile sedge
	Carex microchaeta	small-awned sedge
	Carex obnupta	slough sedge
	Carex podocarpa	graceful mountain sedge
	Carex rariflora	loose-flowered sedge
	Carex rostrata	beaked sedge
	Carex rotundata	round sedge
	Carex rupestris	curly sedge
	Carex scirpoidea	single-spike sedge
	Carex spp.	sedges
	Carex subspathacea	Hoppner's sedge
	Carex ursina	bear sedge
	Carex x flavicans	yellowish sedge
	Eriophorum angustifolium	tall cottongrass
	Eriophorum chamissonis	Chamisso's cottongrass
	Eriophorum scheuchzeri	Scheuchzer's cottongrass
	Eriophorum vaginatum	tussock cottongrass
	Festuca altaica	Altai fescue
	Festuca baffinensis	Baffin fescue
	Festuca brachyphylla	alpine fescue
	Festuca rubra	red fescue
	Festuca rubra ssp. *arctica*	arctic red fescue

Table A-4 (continued)

Stratum	Scientific name	Common name
	Festuca spp.	fescues
	Juncus balticus	arctic rush
	Juncus biglumis	two-flowered rush
	Juncus spp.	rushes
	Leymus mollis	dunegrass
	Leymus mollis ssp. *villosissimus*	**arctic dunegrass**
	Luzula confusa	northern wood-rush
	Poa arctica	arctic bluegrass
	Poa glauca	glaucous bluegrass
	Poa pratensis ssp. *alpigena*	Kentucky bluegrass
	Poa spp.	bluegrasses
	Puccinellia arctica	arctic alkaligrass
	Puccinellia phryganodes	creeping alkaligrass
	Puccinellia tenella ssp. *langeana*	tundra alkaligrass
	Puccinellia vaginata	tussock alkaligrass
	Trisetum spicatum	spike trisetum
Forbs	*Aconitum delphiniifolium*	monkshood
	Androsace chamaejasme *	fairy candelabra
	Anemone narcissiflora	narcissus-flowered anemone
	Anemone parviflora	small-flowered anemone
	Anemone richardsonii	yellow anemone
	Antennaria spp.	pussytoes
	Arctanthemum arcticum	arctic daisy
	Arnica lessingii *	purple arnica
	Artemisia norvegica ssp. *saxatilis*	mountain sagewort
	Artemisia tilesii	Tilesius' wormwood
	Askellia nana *	dwarf hawksbeard
	Astragalus alpinus	alpine milk-vetch
	Astragalus umbellatus *	tundra milk-vetch
	Bistorta plumosa	meadow bistort
	Bistorta vivipara	alpine bistort
	Boschniakia rossica	ground cone
	Boykinia richardsonii *	Richardson's brookfoam
	Bupleurum americanum *	thoroughwort
	Caltha palustris	yellow marsh-marigold
	Castilleja elegans	elegant paintbrush
	Castilleja hyperborea	northern paintbrush
	Cerastium beeringianum *	Bering chickweed
	Cerastium spp.	chickweeds
	Chamerion angustifolium	fireweed
	Chamerion latifolium	river beauty
	Cochlearia groenlandica	Greenland scurvy-grass
	Comarum palustre	marsh cinquefoil
	Dodecatheon frigidum *	northern shootingstar
	Douglasia arctica	Mackenzie River **dwarf primrose**

Table A-4 (continued)

Stratum	Scientific name	Common name
	Draba glabella	smooth draba
	Dupontia fisheri	Fisher's tundragrass
	Epilobium anagallidifolium	alpine willowherb
	Epilobium palustre	marsh willowherb
	Erigeron grandiflorus	large-flowered daisy
	Erigeron spp.	fleabane
	Eurybia sibirica	Siberian aster
	Eutrema edwardsii *	Edward's wallflower
	Gentianella propinqua	four-parted gentian
	Geum glaciale *	glacier avens
	Hedysarum alpinum	alpine hedysarum
	Hedysarum boreale ssp. *mackenzii*	northern hedysarum
	Hedysarum spp.	hedysarums
	Hippuris lanceolata	lance-leaved mare's-tail
	Hippuris tetraphylla	four-leaved mare's-tail
	Hippuris vulgaris	common mare's-tail
	Honckenya peploides	seabeach sandwort
	Lagotis glauca *	narrow-leaved weaselsnout
	Lloydia serotina	alp lily
	Lomatogonium rotatum	marsh felwort
	Lupinus arcticus	arctic lupine
	Mertensia maritima	sea bluebells
	Micranthes hieraciifolia *	hawkweed-leaved saxifrage
	Micranthes nelsoniana	Nelson's saxifrage
	Micranthes reflexa	Yukon saxifrage
	Minuartia arctica *	arctic stitchwort
	Minuartia biflora	mountain stitchwort
	Minuaria macrocarpa	large-fruited stichwort
	Minuartia rossii	reddish sitchwort
	Minuartia rubella	boreal stitchwort
	Minuartia spp.	stitchworts
	Myosotis asiatica *	Forget-me-not
	Oxyria digyna	mountain-sorrel
	Oxytropis borealis var. *viscida*	sticky locoweed
	Oxytropis campestris	northern yellow locoweed
	Oxytropis nigrescens *	blackish locoweed
	Papaver spp.	poppies
	Parnassia kotzebuei	Kotzebue's grass-of-Parnassus
	Parnassia palustris	northern grass-of-Parnassus
	Parrya nudicaulis	nakedstem wallflower
	Pedicularis capitata	capitate lousewort
	Pedicularis labradorica	Labrador lousewort
	Pedicularis lanata	woolly lousewort
	Pedicularis langsdorffii	Langsdorf's lousewort
	Pedicularis lapponica	Lapland lousewort

Table A-4 (continued)

Stratum	Scientific name	Common name
	Pedicularis spp.	louseworts
	Pedicularis sudetica	Sudeten lousewort
	Pedicularis verticillata *	whorled lousewort
	Petasites frigidus	arctic coltsfoot
	Petasites spp.	coltsfoots
	Phlox richardsonii var. *alaskensis*	Alaska phlox
	Polemonium acutiflorum	tall Jacob's-ladder
	Polemonium boreale *	northern Jacob's-ladder
	Potentilla biflora *	two-flowered cinquefoil
	Potentilla egedii	coast silverweed
	Potentilla elegans	elegant cinquefoil
	Potentilla nivea *	snow cinquefoil
	Potentilla uniflora *	one-flowered cinquefoil
	Primula borealis *	northern primrose
	Primula stricta	upright primrose
	Pyrola grandiflora	arctic wintergreen
	Pyrola spp.	wintergreens
	Ranunculus hyperboreus	arctic buttercup
	Ranunculus nivalis	snow buttercup
	Ranunculus pedatifidus	birdfoot buttercup
	Ranunculus pygmaeus	pygmy buttercup
	Ranunculus spp.	buttercups
	Ranunculus turneri *	Turner's buttercup
	Rhodiola integrifolia	roseroot
	Rumex arcticus	arctic dock
	Saussurea angustifolia *	narrow-leaved sawwort
	Saxifraga bronchialis	spotted saxifrage
	Saxifraga cernua	nodding saxifrage
	Saxifraga eschscholtzii	cushion saxifrage
	Saxifraga exilis	spreading saxifrage
	Saxifraga hirculus	yellow marsh saxifrage
	Saxifraga hyperborea	pygmy saxifrage
	Saxifraga serpyllifolia	thyme-leaved saxifrage
	Saxifraga tricuspidata	prickly saxifrage
	Senecio lugens	black-tip groundsel
	Senecio spp.	groundsels
	Sibbaldia procumbens	sibbaldia
	Silene acaulis	moss campion
	Silene involucrata ssp. *involucrata*	arctic campion
	Silene repens	pink catchfly
	Silene spp.	campions
	Smelowskia borealis *	northern smelowskia
	Stellaria humifusa	saltmarsh starwort
	Stellaria longipes	long-stalked starwort
	Stellaria longipes var. *monantha*	long-stalked starwort

Table A-4 (continued)

Stratum	Scientific name	Common name
	Stuckenia spp.	pondweeds
	Taraxacum spp.	dandelions
	Tephroseris frigida	purple-haired groundsel
	Tephroseris lindstroemii	Lindström's groundsel
	Tephroseris palustris	mastodon flower
	Tofieldia coccinea *	northern false-asphodel
	Tofieldia pusilla *	small false-asphodel
	Triglochin maritima	seaside arrow-grass
	Tripleurospermum maritimum	arctic chamomile
	Valeriana capitata *	capitate valerian
	Viola epipsila *	marsh violet
	Wilhelmsia physodes	arctic-flower
	Zigadenus elegans	mountain death-camas
Mosses	*Abientinella abientina*	wiry fern moss
	Aulacomnium palustre	glow moss
	Aulacomnium spp.	groove moss
	Aulacomnium turgidum	mountain groove moss
	Bartramia ithyphylla	straight-leaved apple moss
	Brachythecium albicans	lawn moss
	Brachythecium spp.	ragged mosses
	Bryum pseudotriquetrum	marsh thread moss
	Bryum weigelii	Duval's thread moss
	Bryum spp.	thread moss
	Calliergon stramineum	straw water moss
	Campylium stellatum	golden star moss
	Ceratodon purpureum	fire moss
	Dicranella spp.	forklet moss
	Dicranella subulata	awl-leaved forklet moss
	Dicranum elongatum	dense heron's-bill moss
	Dicranum scoparium	broom heron's-bill moss
	Dicranum spadiceum	heron's-bill moss
	Distichium capillaceum	erect-fruited iris moss
	Drepanocladus spp.	hook mosses
	Hylocomium splendens	step moss
	Philonotis fontana	spring moss
	Plagiomnium ellipticum	marsh leafy moss
	Pohlia drummondii	Drummond's thread moss
	Pohlia nutans	nodding thread moss
	Polytrichastrum alpinum	stiff-leaved haircap moss
	Polytrichum commune	common haircap moss
	Polytrichum juniperinum	juniper haircap moss
	Polytrichum piliferum	awned haircap moss
	Polytrichum sexangulare	snow-patch haircap
	Racomitrium spp.	rock mosses
	Racomitrium lanuginosum	hoary rock moss

Table A-4 (continued)

Stratum	Scientific name	Common name
	Rhytidium rugosum	crumpled-leaf moss
	Sanionia uncinata	sicklemoss
	Scorpidium spp.	scorpion-moss
	Sphagnum angustifolium	poor-fen peat moss
	Sphagnum balticum	Baltic peat moss
	Sphagnum compactum	compact peat moss
	Sphagnum girgensohnii	green peat moss
	Sphagnum lenense	little brown peat moss
	Sphagnum lindbergii	Lindberg's peat moss
	Sphagnum orientale	peat moss
	Sphagnum recurvum	peat moss
	Sphagnum rubellum	peat moss
	Sphagnum spp.	peat mosses
	Sphagnum squarrosum	shaggy peat moss
	Timmia austriaca	false-polytrichum
	Tomenthypnum nitens	golden fuzzy fen moss
	Warnstorfia fluitans	floating hook moss
Liverworts	*Lophozia kunzeana*	leafy liverwort
	Lophozia latifolia	leafy liverwort
	Lophozia sudetica	leafy liverwort
	Marchantia polymorpha	umbrella liverwort
Lichens	*Alectoria miniscula*	witch's-hair
	Alectoria nigricans	grey witch's-hair
	Alectoria ochroleuca	green witch's-hair
	Allantoparmelia alpicola	rockgrub lichen
	Arctoparmelia separata	rippled rockfrog lichen
	Asahinea chrysantha	arctic-rag lichen
	Bryocaulon divergens	northern foxhair lichen
	Cetraria islandica	Iceland lichen
	Cladina rangiferina	grey reindeer lichen
	Cladonia chlorophaea	mealy pixie-cup
	Cladonia spp.	clad lichens
	Dactylina arctica	dead man's fingers
	Flavocetraria cucullata	curled paperdoll lichen
	Flavocetraria nivalis	crinkled paperdoll lichen
	Gowardia nigricans	gray witch's beard lichen
	Hypogymnia subobscura	heath bone lichen
	Lobaria liniata	cabbage lung lichen
	Masonhalea richardsonii	arctic tumbleweed lichen
	Nephroma arcticum	green light lichen
	Ochrolechia spp.	saucer lichen
	Parmelia omphalodes	unsalted shield lichen
	Parmelia spp.	shield lichens
	Peltigera aphthosa	freckle pelt lichen
	Peltigera canina	dog pelt lichen

Table A-4 (continued)

Stratum	Scientific name	Common name
	Peltigera didactyla	temporary pelt
	Peltigera spp.	pelt lichens
	Pseudophebe minuscula	coarse rockwool lichen
	Pseudophebe pubescens	fine rockwool lichen
	Rhizocarpon geographicum	green map lichen
	Solorina crocea	chocolate chip lichen
	Sphaerophorus fragilis	fragile coral lichen
	Stereocaulon spp.	foam lichens
	Thamnolia vermicularis	whiteworm lichen
	Umbilicaria spp.	rocktripe lichens
	Umbilicaria hyperborea	blistered rocktripe lichen
	Umbilicaria proboscidea	netted rocktripe lichen
	Vulpicida pinastri	powdered sunshine lichen
	Vulpicida tilesii	limestone sunshine lichen

* Species of Beringian origin

Appendix 5. Keys and codes

Table A5-1. Terms used in the keys

Term	Definition
Ridge crest	Comprises the meso-scale height of land and the strongly, water-shedding convex slopes immediately adjacent.
Upper slope	The uppermost portion of a meso-scale slope; slope profile generally convex; soil water mostly shedding but some water receiving from crest.
Middle slope	The portion of a slope between the upper and lower slopes; soil water is shedding and receiving more or less equally.
Lower slope	The moisture-receiving area towards the base of a slope; the slope profile is usually somewhat concave. Sites located near the base of a slope that are not moisture-receiving are treated as middle slope positions in the keys.
Toe slope	Gently-sloped areas directly below the lower slope, transitioning to the level area or depression at the base of the slope.
Level	Any broad level area; the surface profile is generally more-or-less horizontal, with no distinct aspect and minimal slope (<5%).
Depression	Profile concave in all directions; usually in flat or subdued topography or at the base of a slope.
Alluvium/fluvial landforms	Post-glacial, active floodplain deposits along rivers and streams in valley bottoms; usually a series of low benches and channels.
Southerly aspect	SW, S and SE aspects inclusive for slopes >5%.
Average soil texture	Soil texture class occupying majority of the upper 50 cm of the mineral soil or to bedrock contact. Where contrasting textures are both present in equal amounts, a texture of the materials combined. Where rooting is restricted to the organic horizons, use the organic material codes. Use soil texture keys to determine soil texture.
Coarse fragment content	The coarse fragment content (% by volume) of the upper 50 cm of mineral soil profile, or rooting zone where it extends deeper, or to bedrock contact.
Soil coarse	Soil contains >70% coarse fragments; or soil texture is sandy (LS, S); or loamy (SL, L) with >50% volume of coarse fragments.
Soil fine	Soil is silty (SiL, Si) or clayey (SiCL, CL, SC, SiC, C) with <20% volume of coarse fragments.
Soil medium	Includes the remaining soils i.e., SL, L with ≤50% volume of coarse fragments; or fine-textured soils with ≥20% coarse fragments.
Gleyed, gleying	Soils that have orange-coloured mottles indicative of periodic oxidation and reduction due to a fluctuating water table (this includes faint, distinct and prominent mottles); or, soils that are dull yellowish, blue or olive in colour indicative of permanent saturation.
Prominent mottles	Mottles that differ by 3 or more hues from the matrix, or by ≥2 units of value or chroma when hue varies by 2 pages (using Munsell soil colour charts), by ≥3 units of value or chroma or both chroma and value differ by 2 when hue differs by 1, or by 4 units of value or chroma if hue is the same.

Table A5-1 (continued)

Term	Definition
Distinct mottles	Mottles that differ by 2 or more hues from the matrix or by 2 units of chroma and/or value when hue is the same or differs by one page (using Munsell soil colour charts).
Faint mottles	Mottles that do not meet the above criteria.

Organic soils	Soils of Organic Order, specifically those that are water saturated, have greater than 40 cm of organic material on surface if mesic or humic peat, or greater than 60 cm if fibric peat. Fibric peat consists of well-preserved fibre (40%), identified after rubbing; mesic peat is intermediate composition between fibric and humic; and humic peat consists of decomposed organic material (10%), identified after rubbing. See Canadian System of Soil Classification for details.
Mor Humus Form	Soil characterized by matted Fm horizon and abundant fungal mycelia. Insect droppings absent. For keying purposes, includes soil where no F or organic accumulation is present.
Moder Humus Form	Soil characterized by Fa or Fz horizon with loosely arranged, often granular structure reflecting insect activity; insect droppings present; fungal mycelia may also be present but not dominating; or soil characterized by having both F and Ah horizons greater than 2 cm.
Mull Humus Form	Soil characterized by well-developed Ah (dark coloured, organically enriched) mineral horizon reflecting active mixing of mineral and organic horizons.

Restricting layer	Layer that restricts the downward movement of soil water; includes bedrock, cemented or very compacted horizon, permafrost.
Soil depth	Depth from the ground (forest floor) surface to bedrock, or other impermeable layer, but not including permafrost.
Near-surface permafrost	Soil layer that is “permanently” frozen; this can be difficult to distinguish from “seasonal frost,” but date of observation and features of the ecosystem can provide clues as to whether ice is permafrost or seasonal.
Calcareous	Soils that fizz/effervesce when dilute hydrochloric acid is applied. For these purposes, soils that are calcareous in the rooting zone have an impact on soil nutrition.
High salinity	Saline sites are recognizable by the white salts on the soil surface, or in the rooting zone when the soils are dry. Salinity can also be measured: saline soils have an electrical conductivity >4 dS/m.
Water table	The surface of groundwater saturated materials in a soil.
Depth to water table	Depth to water table can be determined by the depth below the soil surface to the level of standing water in a soil pit. However, the water table is dynamic and may not be present when observing the soil.
Depth to gleying	Depth from the surface to mottles or gley colours. These mottles are an indication of a fluctuating water table resulting in alternating reducing and oxidizing conditions. Gley colour, with no mottles, indicates permanent saturation.
Seepage	Seepage is subsurface flowing water, which may be observed on sloping sites receiving soil water. It may not form a stable water table, particularly in coarse-textured materials.
Soil shallow	Soils where soil depth limits available moisture; generally <25 cm.

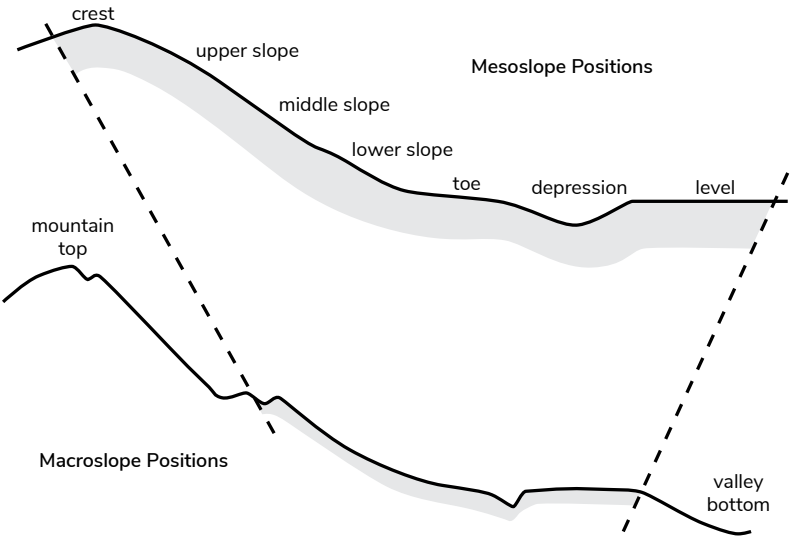


Figure A5-1. Mesoslope position

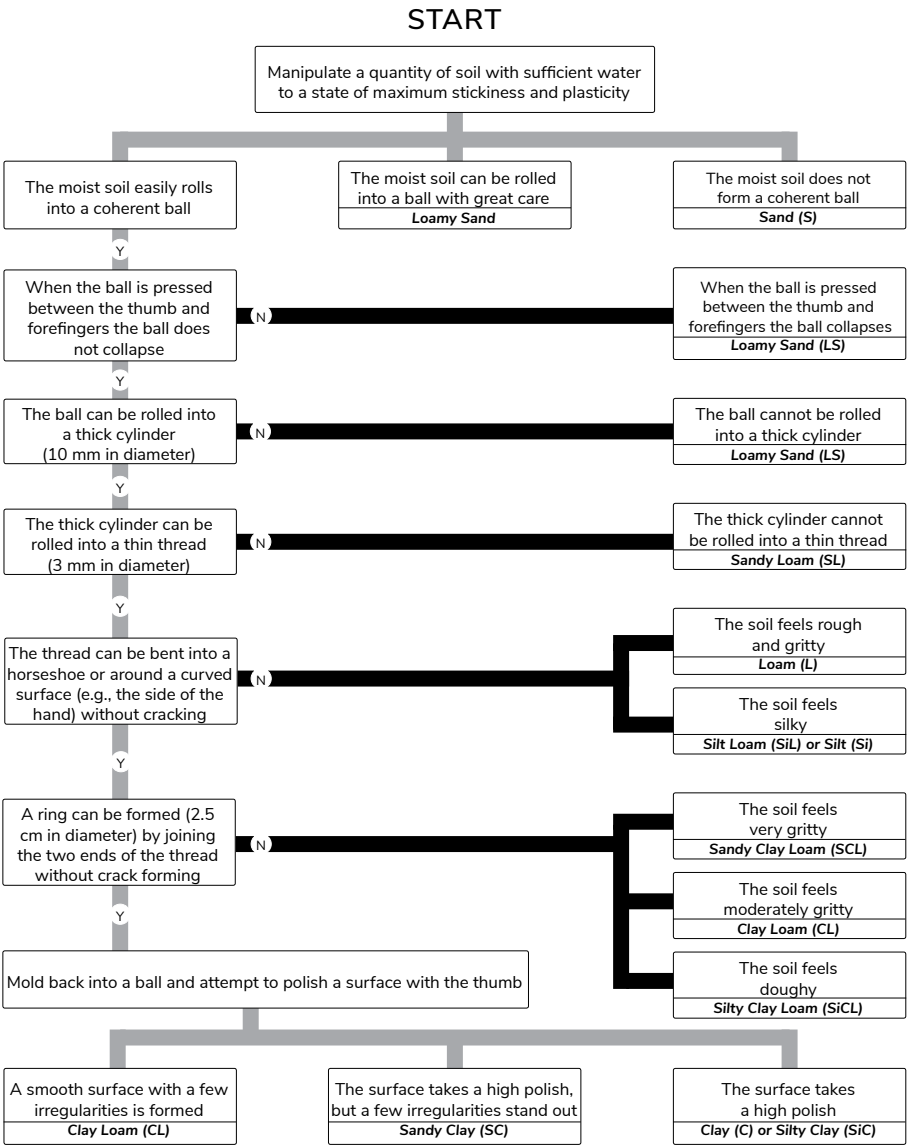


Figure A5-2. Soil texturing flow chart using the ball test

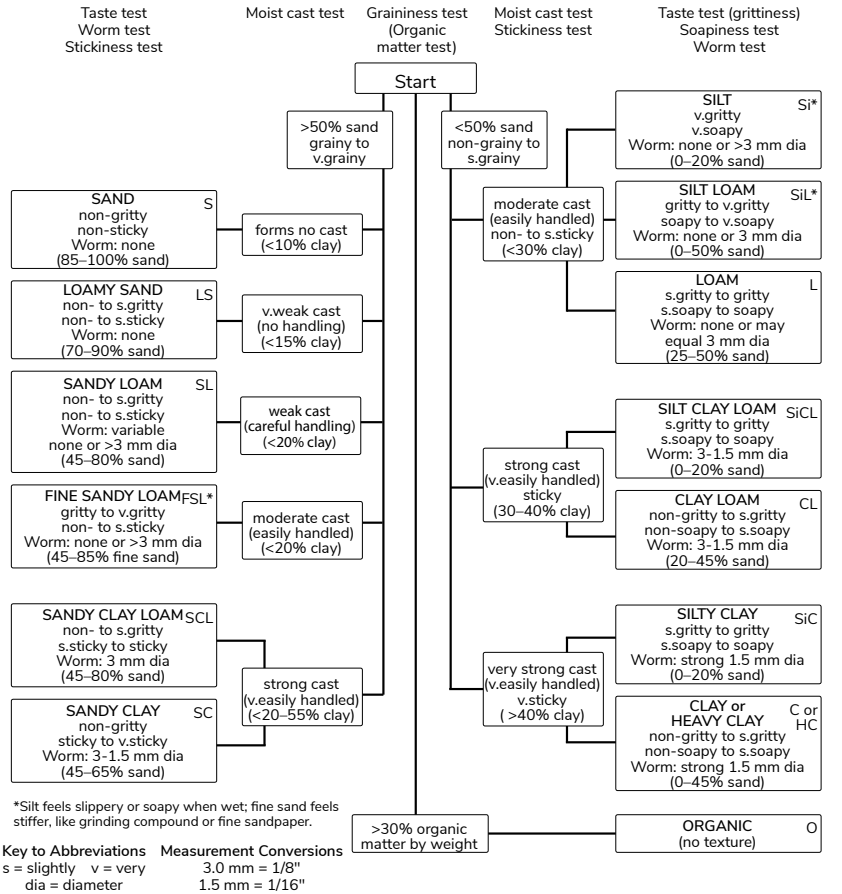
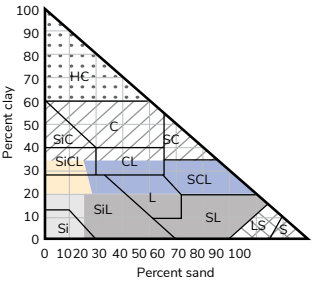


Figure A5-3. Soil texturing flow chart using the graininess test



Family Particle Size

Code	Description
Organic Material Codes	
FI	Fibric
ME	Mesic
HU	Humic
W	Woody
Substitute Classes for Volcanic and Thixotrophic soil	
Ci	Cindery
A	Ashy
AS	Ashy-skeletal
T	Thixotropic
TS	Thixotropic-skeletal

Code	Description
Code fragments ≥70%	
F	Fragmental
Coarse fragments ≥35% and <70%	
SS	Sandy-skeletal
CLS	Coarse-loamy-skeletal
FLS	Fine-loamy-skeletal
SIS	Silty-skeletal
CS	Clayey-skeletal
Code fragments <35%	
S	Sandy
CL	Coarse-loamy
FL	Fine-loamy
CSI	Coarse-silty
FSI	Fine-silty
FC	Fine-clayey
VFC	Very-fine-clayey

Very fine clayey	Fine-silty	Fine-loamy	Sandy
Fine-clayey	Coarse-silty	Coarse-loamy	

Figure A5-4. Soil texture classes

Note: Triangle shows soil texture classes and rooting zone particle size when coarse fragments are <35%. Percentages of clay and sand determine the textural classes of soil; the remaining proportion of each class is silt.

Table A5-2. Key to humus form

Note: If no humus is present, treat as MOR in SNR key.

1a. Rapid to imperfectly drained sites; humus form not saturated for prolonged periods. Soil is mineral or upland Folisol.

2a. Ah horizon <2 cm and combined thickness of F and H horizons if present ≥Ah.

3a. >50% thickness of F horizon(s) is Fm ..... MORS (R)

4a. Decaying wood >35% of organic matter volume in humus form profile **Lignomor (LR)**

4b. Decaying wood ≤ 35% of organic matter volume in humus form profile.

5a. F horizon >50% of thickness of F and H horizon ..... **Hemimor (HR)**

5b. Hh horizon >50% of thickness of F and H horizons..... **Humimor (UR)**

5c. Hr horizon >50% of thickness of F and H horizons..... **Resimor (RR)**

3b. F horizon(s) includes Fz and/or Fa..... MODERS (D)

6a. Decaying wood >35% of organic matter volume in humus form profile. ..... **Lignomoder (LD)**

6b. Decaying wood ≤ 35% of organic matter volume in humus form profile.

7a. Fa horizon >50% of thickness of F horizons; or Fm horizon present. ..... **Mormoder (RD)**

7b. Fz (or Hz) horizon >50% of thickness of F horizons ..... **Leptomoder (TD)**

2b. Ah horizon ≥2cm and combined thickness of F and H horizons ≥2 ..... MODERS (D)

8a. Ah horizon formed by infiltration or accumulation of organic materials by mechanical intermixing (gravity, wind, flooding, ice churning or root churning) ..... **Paramoder (PD)**

8b. Ah formed by soil fauna activity or root decomposition; Fa and/or Fz horizons present.

9a. F and H horizons greater than or equal to thickness of Ah horizon;. **Leptomoder (TD)**

9b. Ah >combined F and H horizons;..... **Mullmoder (MD)**

2c. Combined thickness of F and H horizons <2cm and Ah horizon ≥2cm ..... MULLS (L)

10a. Rhizogenous Ah horizon formed from decomposition of dense fine roots.... **Rhizomull (ZL)**

10b. Zoogenous Ah horizon formed through actions of abundant earthworms .. **Vermimull (VL)**

10c. Ah formed by infiltration or accumulation of organic materials by mechanical intermixing (gravity, wind, flooding, ice-frost churning or root-churning)..... **Paramull (PL)**

1b. Poor to very poorly drained sites; Humus is saturated for prolonged periods. Soils are Gleysols, Fibrisols, Mesisols, Humisols, Organic Cryosols, or Gleysolic or Histic subgroups of Turbic or Static Cryosols

11a. Combined thickness of F, H, and O horizons <2 cm and Ah horizon >2cm..... **Hydromull (YL)**

11b. Combined thickness of F, H, and O horizons ≥2 cm.

12a. Thickness of F and H horizons ≥O horizons.

13a. F horizon(s) is Fm. ..... **Hydromor (YR)**

13b. F horizon(s) includes Fz and/or Fa, F is not present or Ah ≥2..... **Hydromoder (YD)**

12b. Combined thickness of O horizons greater than F and H horizons.

14a. O horizons ≤ 40cm and Ah horizon >2cm..... **Moder (D)**

14b. Of horizon >50% of thickness of O horizons ..... **Fibrimor (FR)**

14c. Om horizon >50% of thickness of O horizons..... **Mesimor (MR)**

14d. Oh horizon >50% of thickness of O horizons ..... **Saprimoder (SD)**

Table A5-3. Relative soil moisture regime (SMR): codes and classes

Code	Class	Description	Water source
0	Very xeric	Water removed extremely rapidly in relation to supply; soil is moist for a negligible time after precipitation.	Precipitation
1	Xeric	Water removed very rapidly in relation to supply; soil is moist for brief periods following precipitation.	Precipitation
2	Subxeric	Water removed rapidly in relation to supply; soil is moist for short periods following precipitation.	Precipitation
3	Submesic	Water removed readily in relation to supply; water available for moderately short periods following precipitation.	Precipitation
4	Mesic	Water removed somewhat slowly in relation to supply; soil may remain moist for a significant, but sometimes short period of the year. Available soil moisture reflects climatic inputs.	Precipitation in moderate- to fine-textured soils; limited seepage in coarse-textured soils
5	Subhygric	Water removed slowly enough to keep soil wet for a significant part of growing season; some temporary seepage and possibly mottling below 20 cm.	Precipitation and seepage
6	Hygric	Water removed slowly enough to keep soil wet for most of growing season; permanent seepage and mottling; gleyed colours common.	Seepage
7	Subhydric	Water removed slowly enough to keep water table at or near surface for most of year; gleyed mineral or organic soils; permanent seepage <30 cm below surface.	Seepage or permanent water table
8	Hydric	Water removed so slowly that water table is at or above soil surface all year; gleyed mineral or organic soils.	Permanent water table
9	Aquatic	Water is well above the sediment bed all year.	Water body

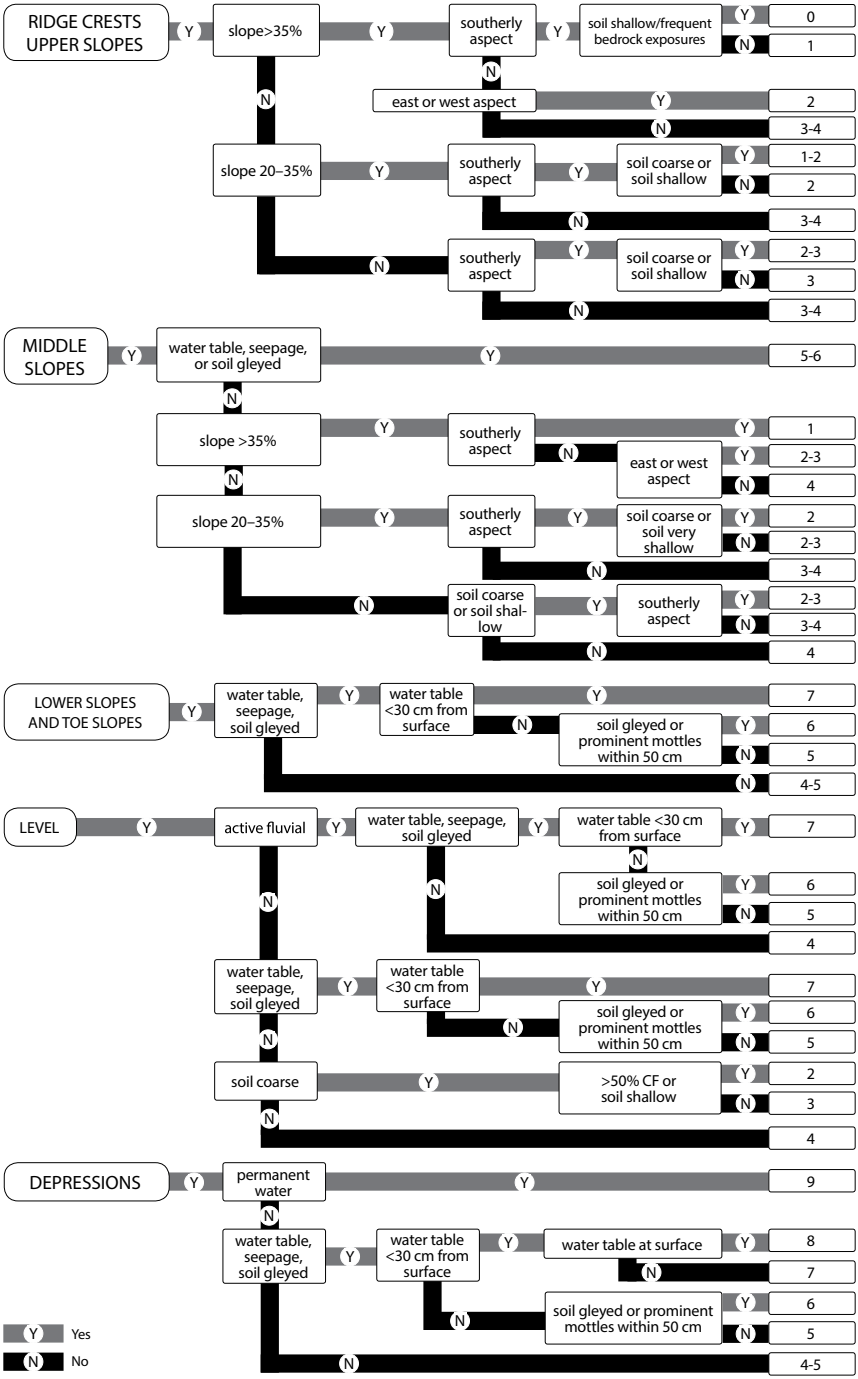
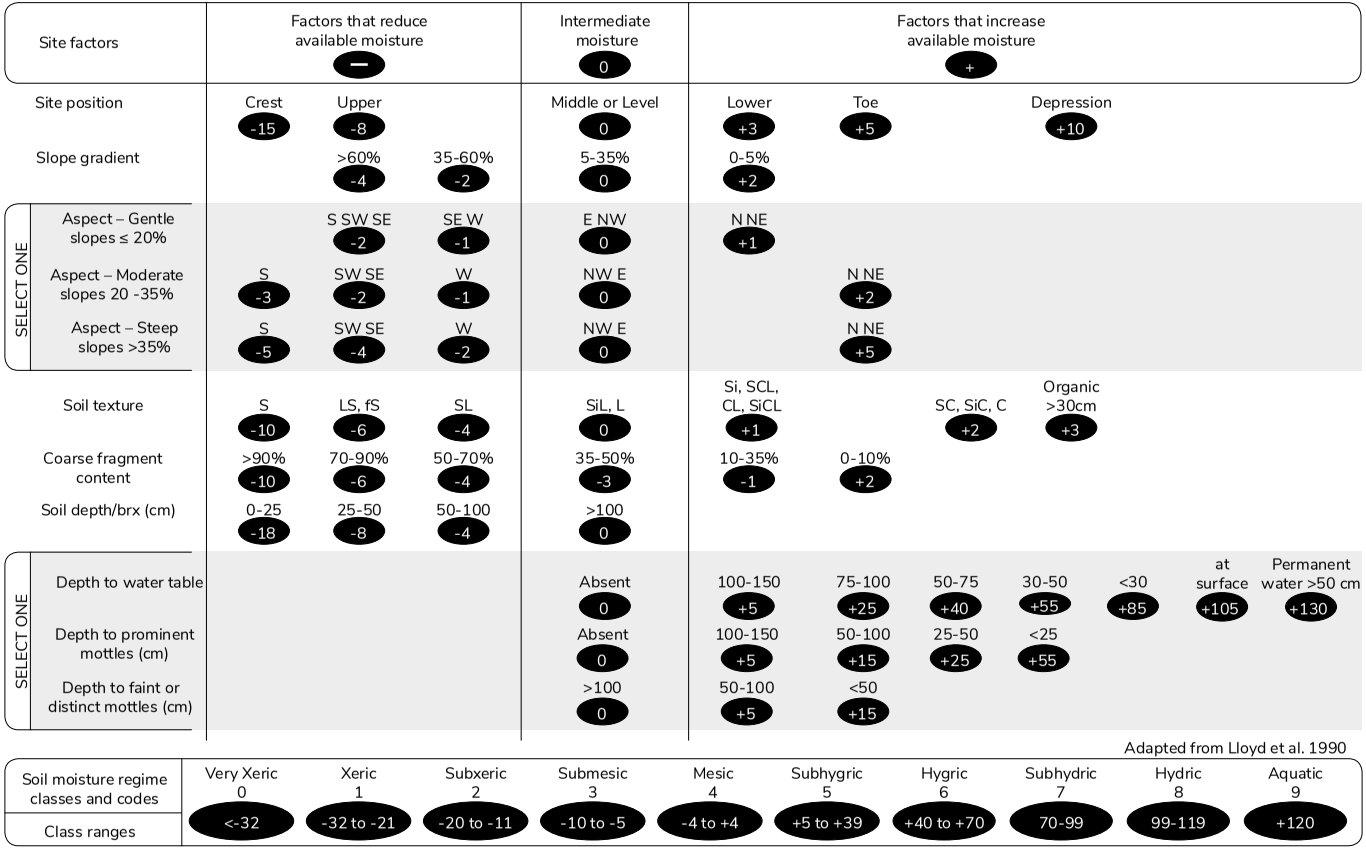


Figure A5-5. Soil Moisture Regime (SMR) flow chart



Adapted from Lloyd et al. 1990

Figure A5-6. Soil Moisture Regime (SMR) additive chart

Table A5-4. Description of Relative Snow Cover Regime (rSCR) Classes

Code	Class	Description
A	Very Exposed	Sites in the most exposed landscape positions that experience extreme wind transport of snow and will have a very thin snowpack relative to the average in the landscape. Generally on the windward side of ridge crests. These sites are the first to be snow free in spring.
B	Exposed	Areas of relative snow loss in the landscape and experience snow thinning in the winter time. Convex or windward slopes or elevated convex sites in flat terrain. Sites may be exposed during periods of low snow or high wind while most of the landscape remains covered. Sites are generally snow free relatively early in the growing season.
C	Neutral	Sites with "average" wind effects for the region in question. These are generally level areas or straight slopes on neutral or windward slopes. Snow depths and snow release dates are average for the region.
D	Protected	Sites that tend to accumulate snow relative to others in the landscape but have limited capacity for deep accumulations. Shallow slope hollows, cool aspect slopes or areas with taller vegetation that act as snow fences. Sites become exposed after the majority of the landscape is already snow free.
E	Very Protected	Sites that are zones of snow deposition and may accumulate deep snow pack relative to average sites in the zone. Lee slopes directly downwind of abrupt slope breaks such as ridges or deep cross-loaded gullys. Sites with the latest snow release dates on the landscape.

Table A5-5. Factors affecting relative snow cover regime (rSCR)

	A very exposed	B exposed	C neutral	D protected	E very protected
Slope shape	convex	straight		concave	
Wind aspect	venturi	windward	neutral	leeward	windbreak
Mesoslope	crest / upper	level / mid / lower		depressions	gullies
Macro-position	apex	upper	mid	lower / valley	
Solar aspect	warm	neutral		cold / shaded	

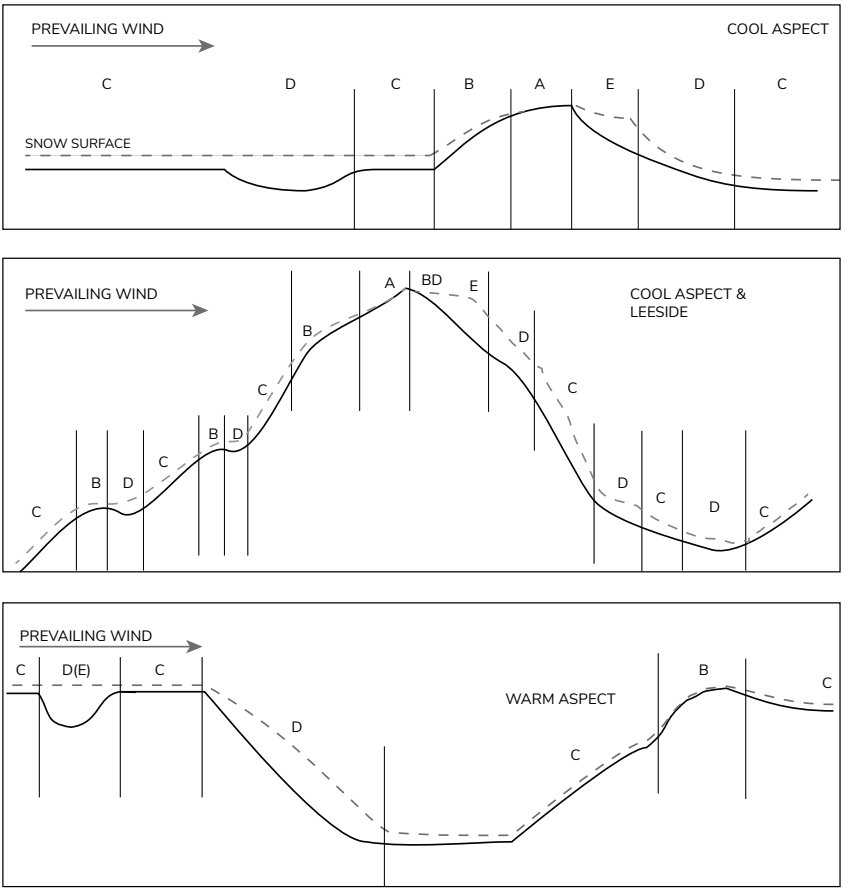


Figure A5-7. Typical landscape positions of relative snow cover regimes (rSCRs)
A: very exposed B: exposed C: neutral D: protected E: very protected

Table A5-6. Drainage class codes and descriptions

Code	Drainage class	Description
VR	Very rapidly drained	Water is removed from the soil very rapidly in relation to supply. Water source is precipitation and available water storage capacity following precipitation is essentially nil. Soils are typically fragmental or skeletal, shallow, or both.
R	Rapidly drained	Water is removed from the soil rapidly in relation to supply. Excess water flows downward if underlying material is pervious. Subsurface flow may occur on steep gradients during heavy rainfall. Water source is precipitation. Soils are generally coarse textured or shallow.
W	Well drained	Water is removed from the soil readily, but not rapidly. Excess water flows downward readily into underlying pervious material or laterally as subsurface flow. Water source is precipitation. On slopes, subsurface flow may occur for short durations, but additions are equaled by losses. Soils are generally intermediate in texture and lack restricting layers.
MW	Moderately well drained	Water is removed from the soil somewhat slowly in relation to supply because of imperviousness or lack of gradient. Precipitation is the dominant water source in medium-to-fine-textured soils; precipitation and significant additions by subsurface flow are necessary in coarse-textured soils.
I	Imperfectly drained	Water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season. Excess water moves slowly downward if precipitation is the major source. If subsurface water or groundwater (or both) is the main source, the flow rate may vary but the soil remains wet for a significant part of the growing season. Precipitation is the main source if available water storage capacity is high; contribution by subsurface or groundwater flow (or both) increases as available water storage capacity decreases. Soils generally have a wide range of texture, and some mottling is common.
P	Poorly drained	Water is removed so slowly in relation to supply that the soil remains wet for much of the time that it is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface or groundwater flow (or both), in addition to precipitation, are the main water sources. A perched water table may be present. Soils are generally mottled and/or gleyed or organic and are often associated with wetlands.
VP	Very poorly drained	Water is removed from the soil so slowly that the water table remains at or near the surface for most of the time the soil is not frozen. Groundwater flow and subsurface flow are the major water sources. Precipitation is less important, except where there is a perched water table with precipitation exceeding evapotranspiration. Typically associated with wetlands. Soils are gleyed or organic.

Source of descriptions: Day (1983)

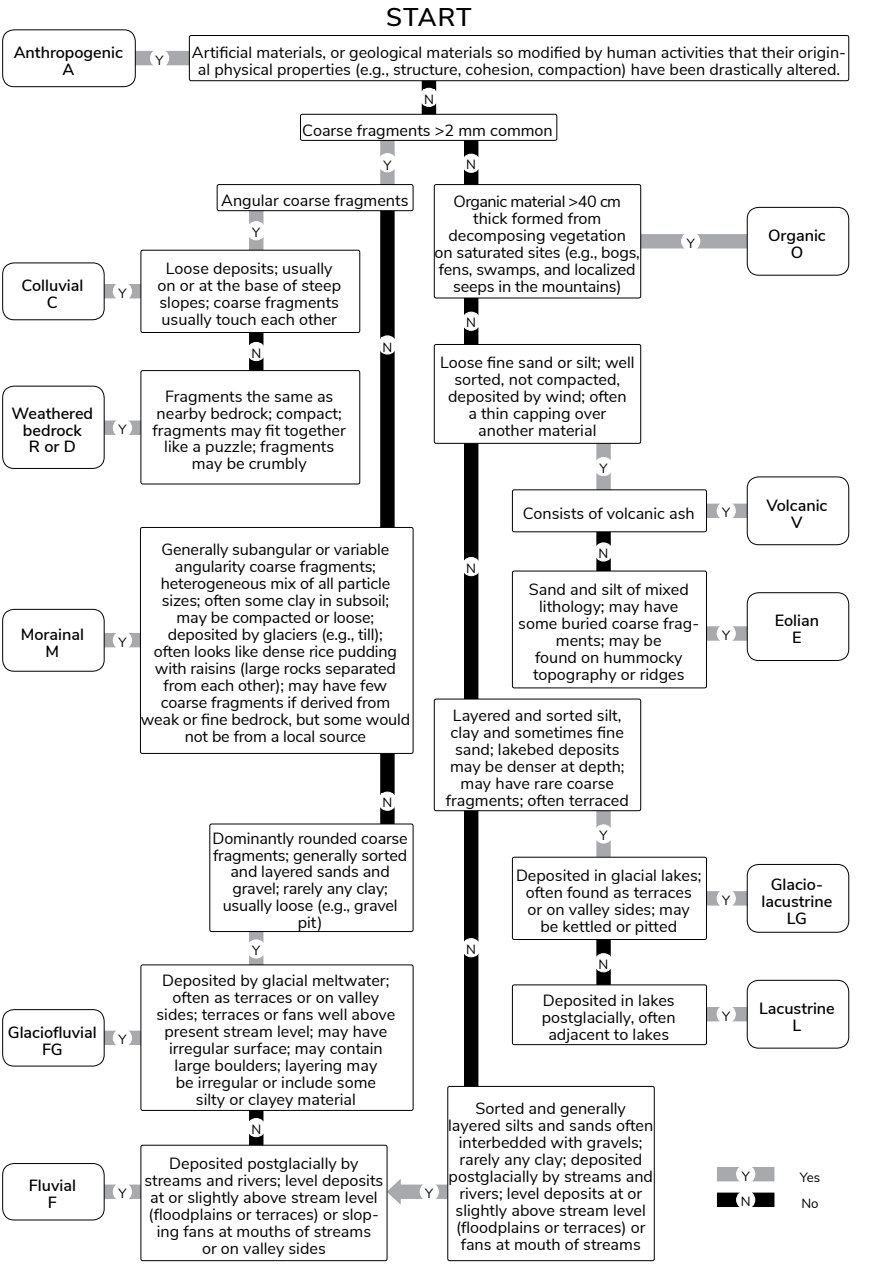


Figure A5-8. Key to parent materials

Source: Adapted from B.C. Ministry of Environment and B.C. Ministry of Forests and Range (2010); Braumandl and Curran (1992); and Lloyd et al. (1990).

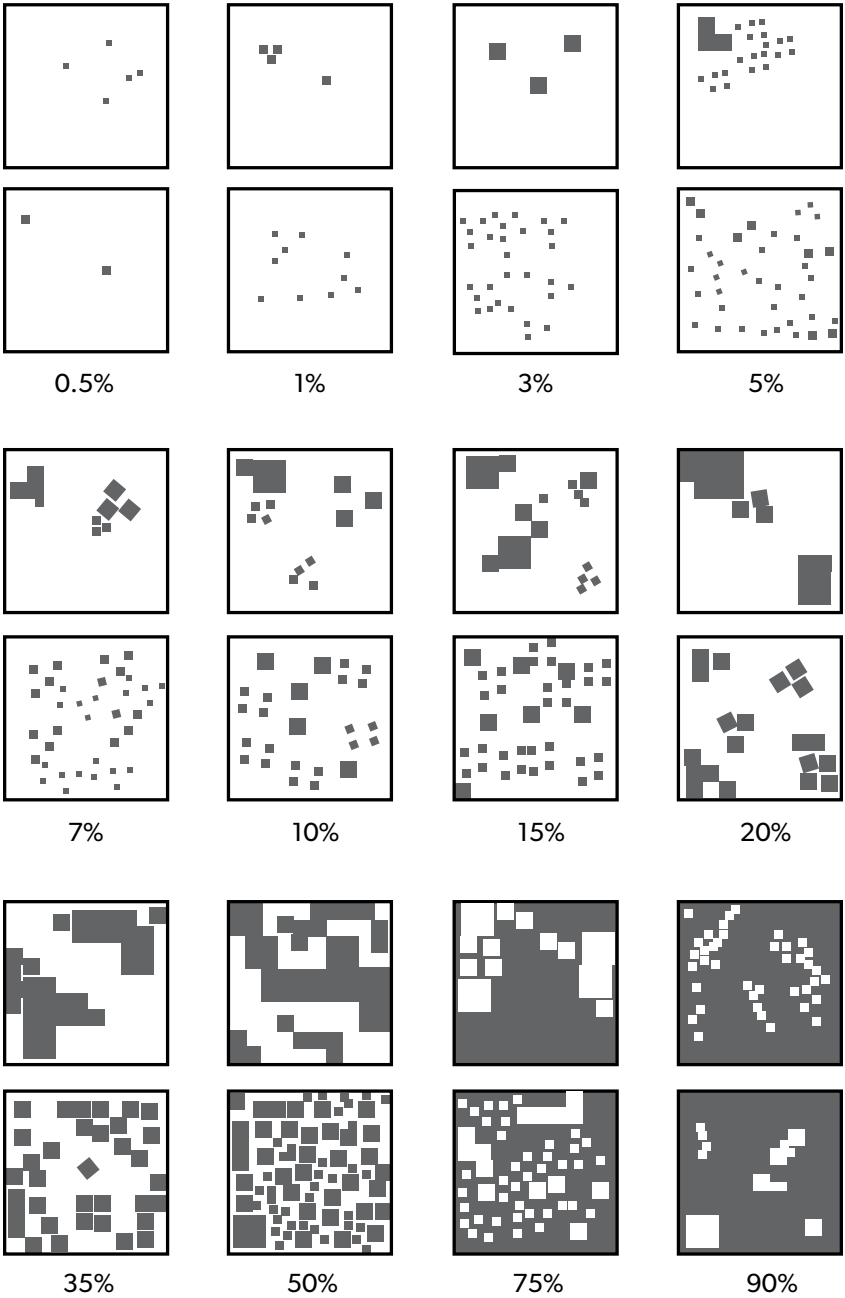


Figure A5-9. Visual aid for determining percent cover of plant species

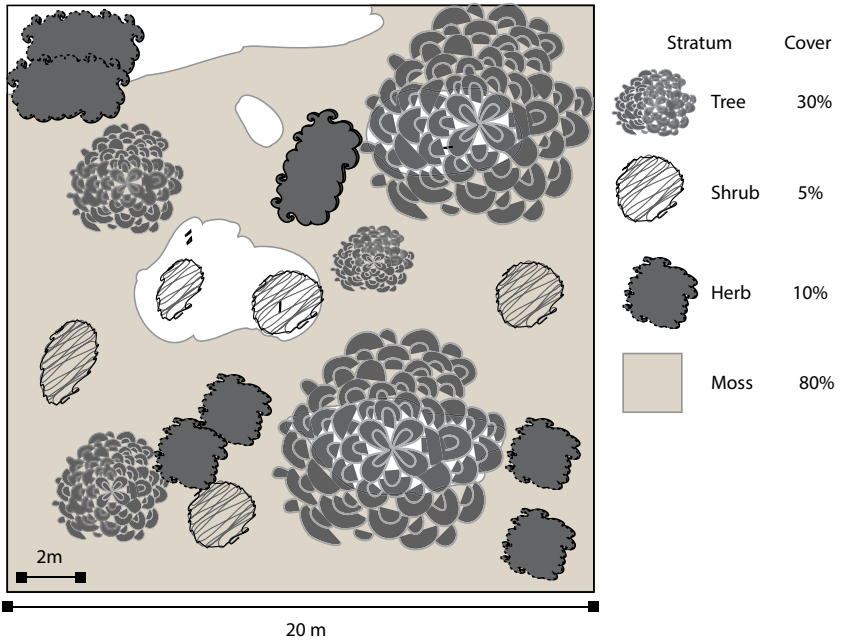


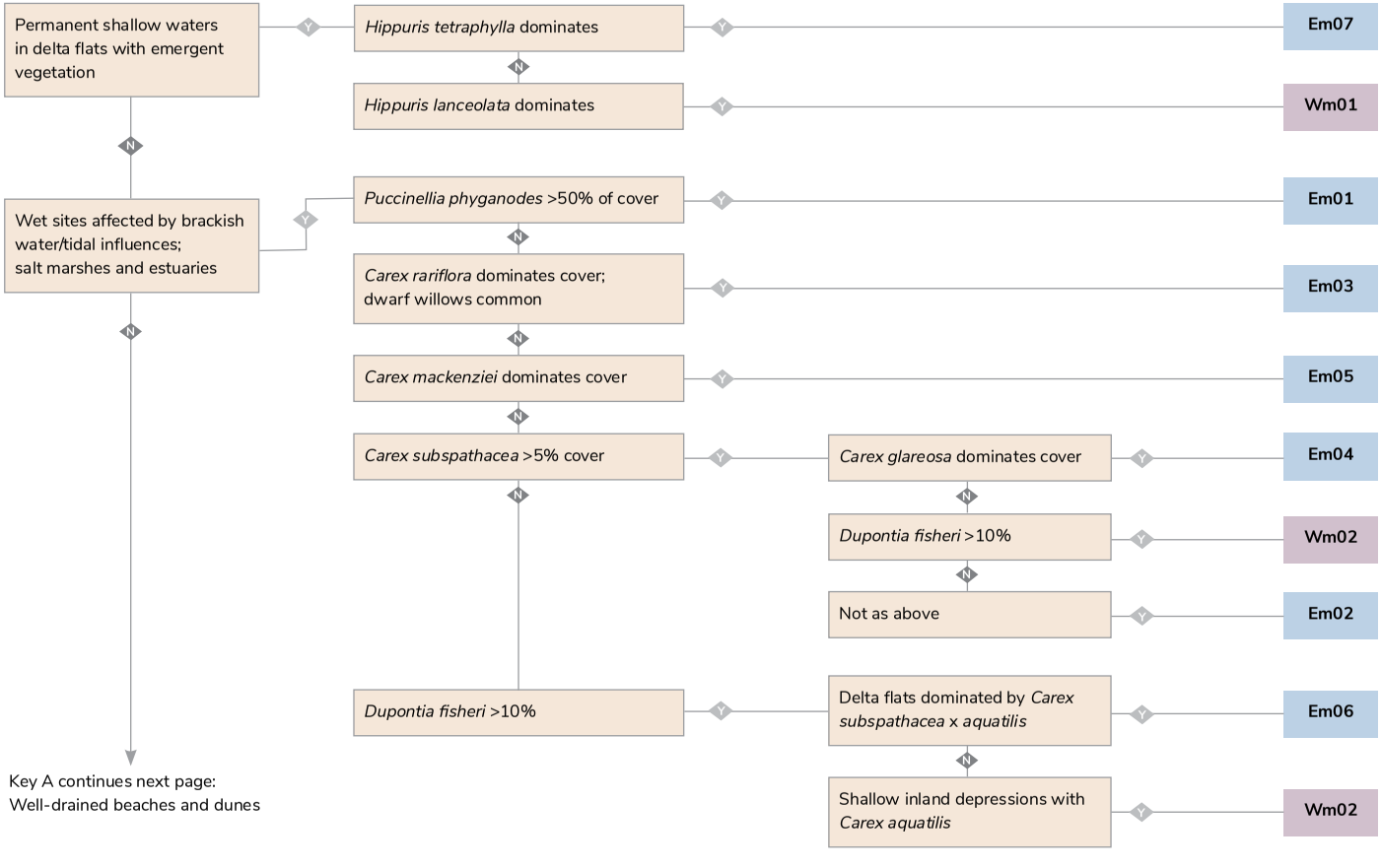
Figure A5-10. Determining per cent cover of plant species (example)

Appendix 6. Keys to ecosites

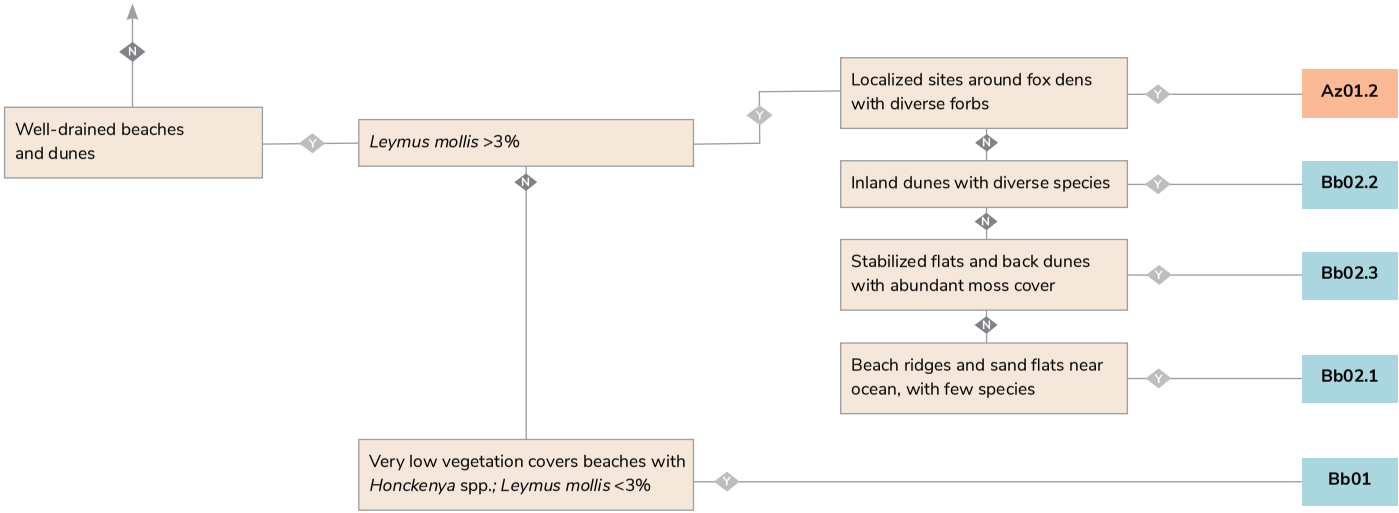
Select the best key from the characteristics below:

Ecosystems of estuaries and the marine shore zone	**Ecosite Key A** **Page 224** Salt marshes, Estuaries, Beaches
Lush, moist to wet non-shrub-dominated ecosystems dominated by graminoids or forbs; some sites may have >10% shrub species cover, but these are of lower stature than graminoids and forbs	**Ecosite Key B** **Page 226** Fens, Marshes, Meadows
Ecosystems with shrub species (>20 cm, but typically taller) greater than 10% cover; understorey composition is variable	**Ecosite Key C** **Page 229** Shrub tundra, Floodplains, Bogs
Ecosystems not as above; mostly low-statured, upland ecosystems of mixed life forms with low cover (<10%) of shubs >20 cm	**Ecosite Key D** **Page 232** Tundra, Fellfield, Heath (Meadows, Bogs)

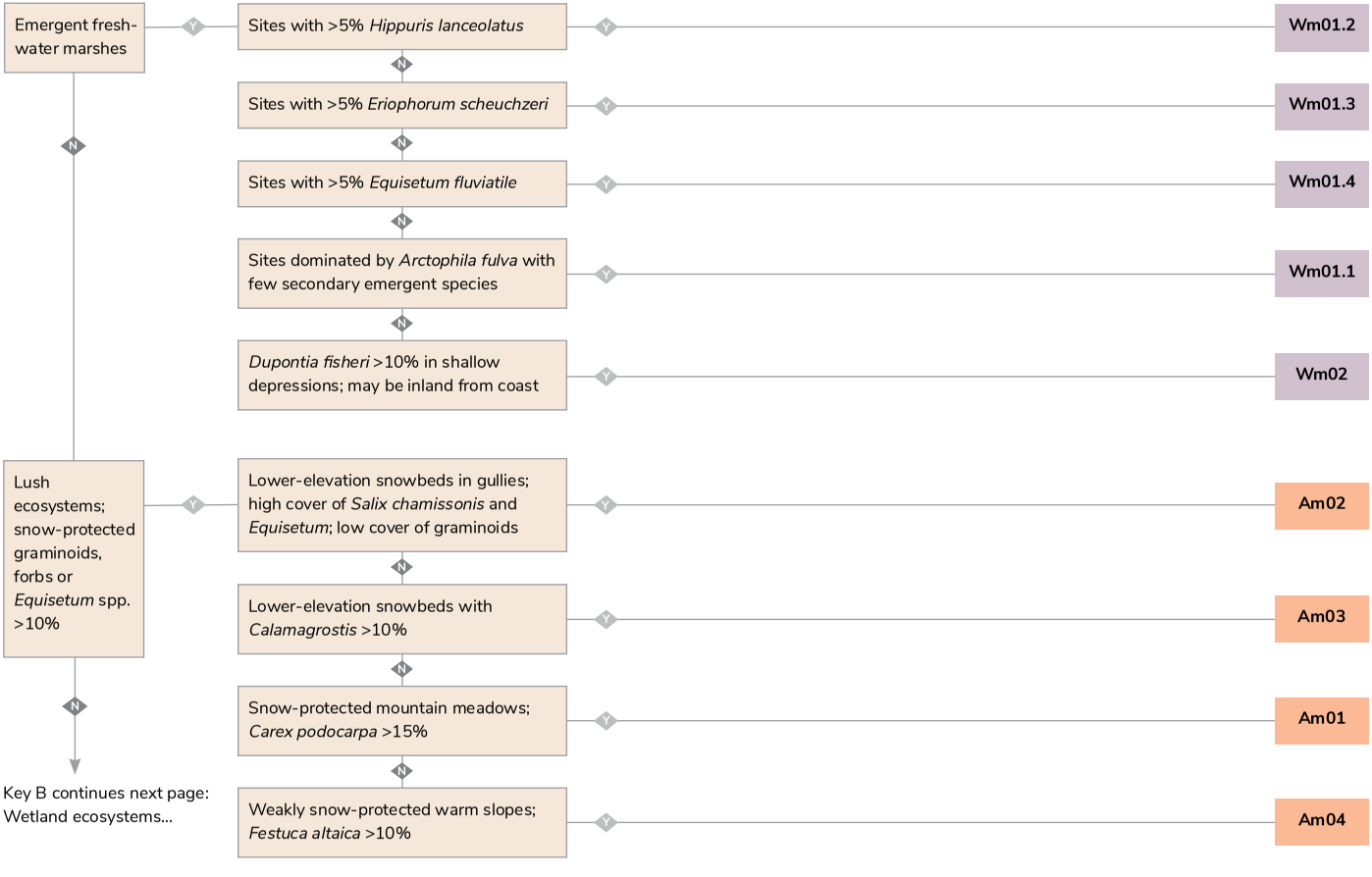
Ecosite Key A. Ecosystems of Estuaries and the Marine Shore Zone: Salt marshes, Estuaries, Beaches



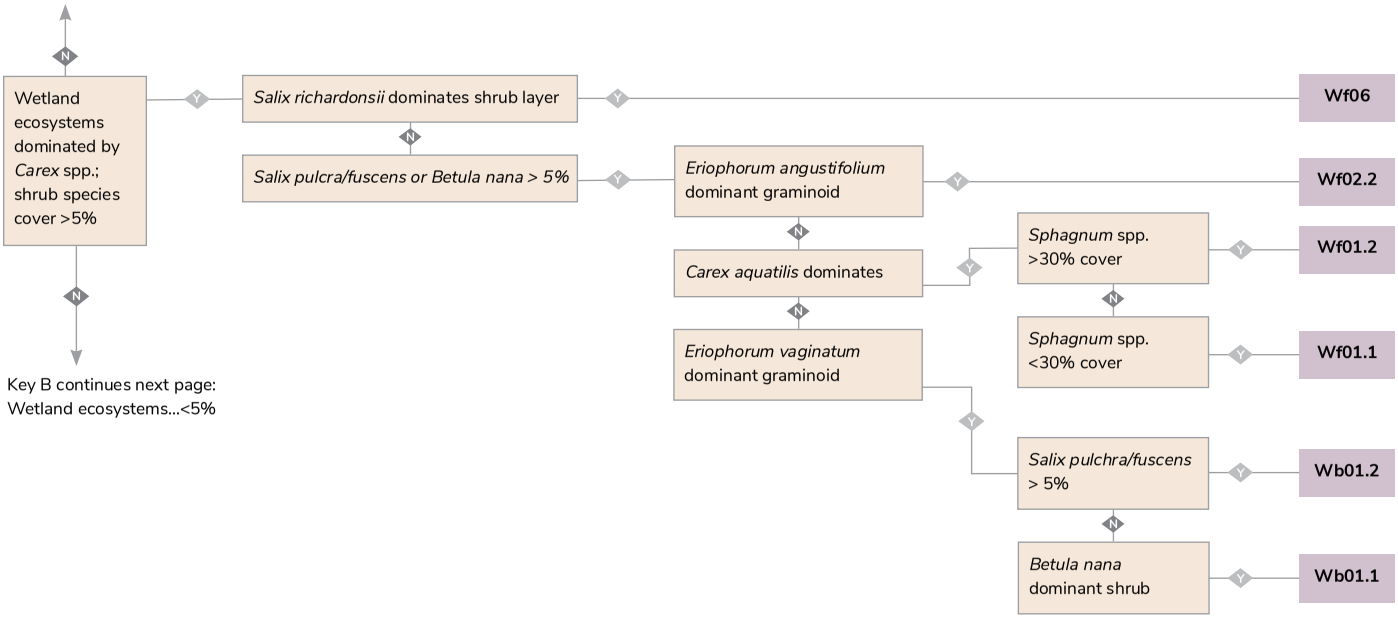
Ecosite Key A (continued)**. Ecosystems of Estuaries and the Marine Shore Zone: Salt marshes, Estuaries, Beaches**



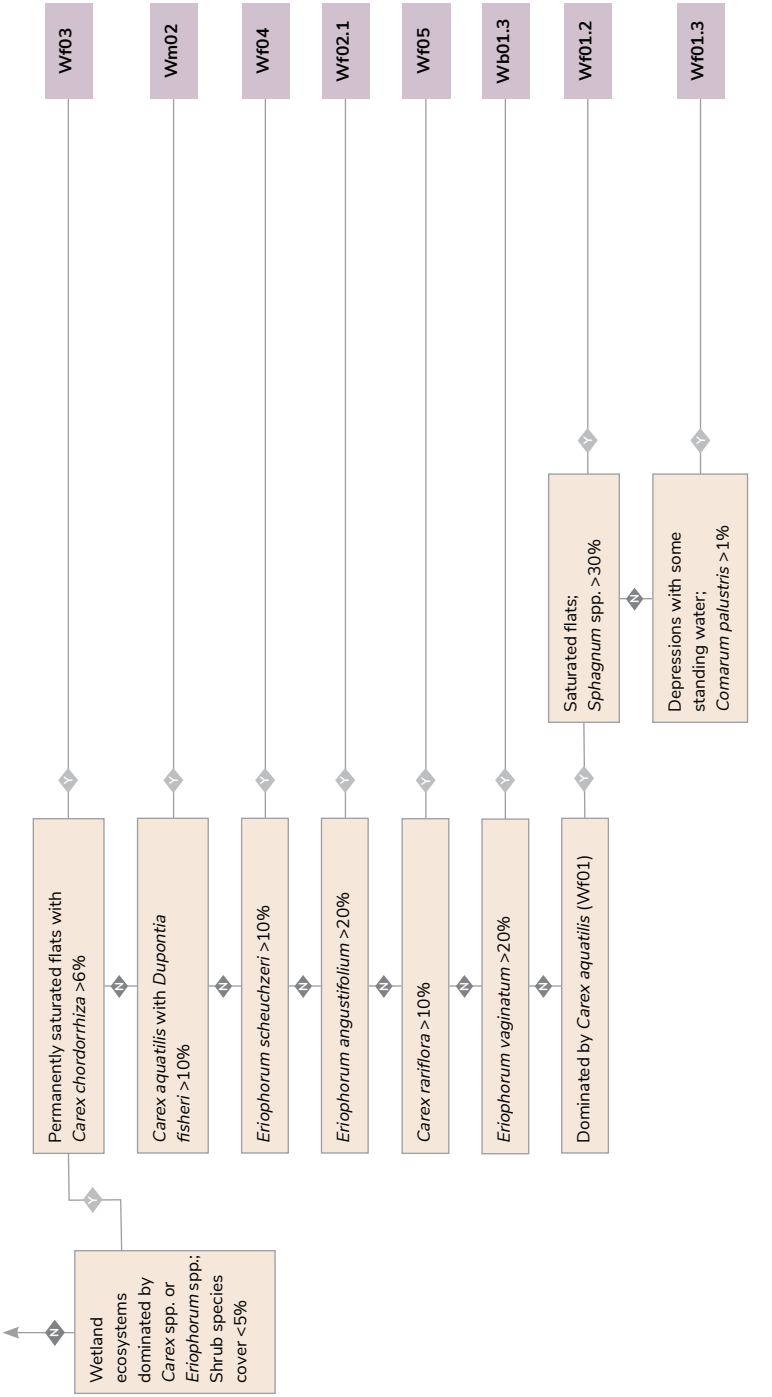
Ecosite Key B. Lush graminoid-dominated ecosystems: Fens, Marshes, Meadows



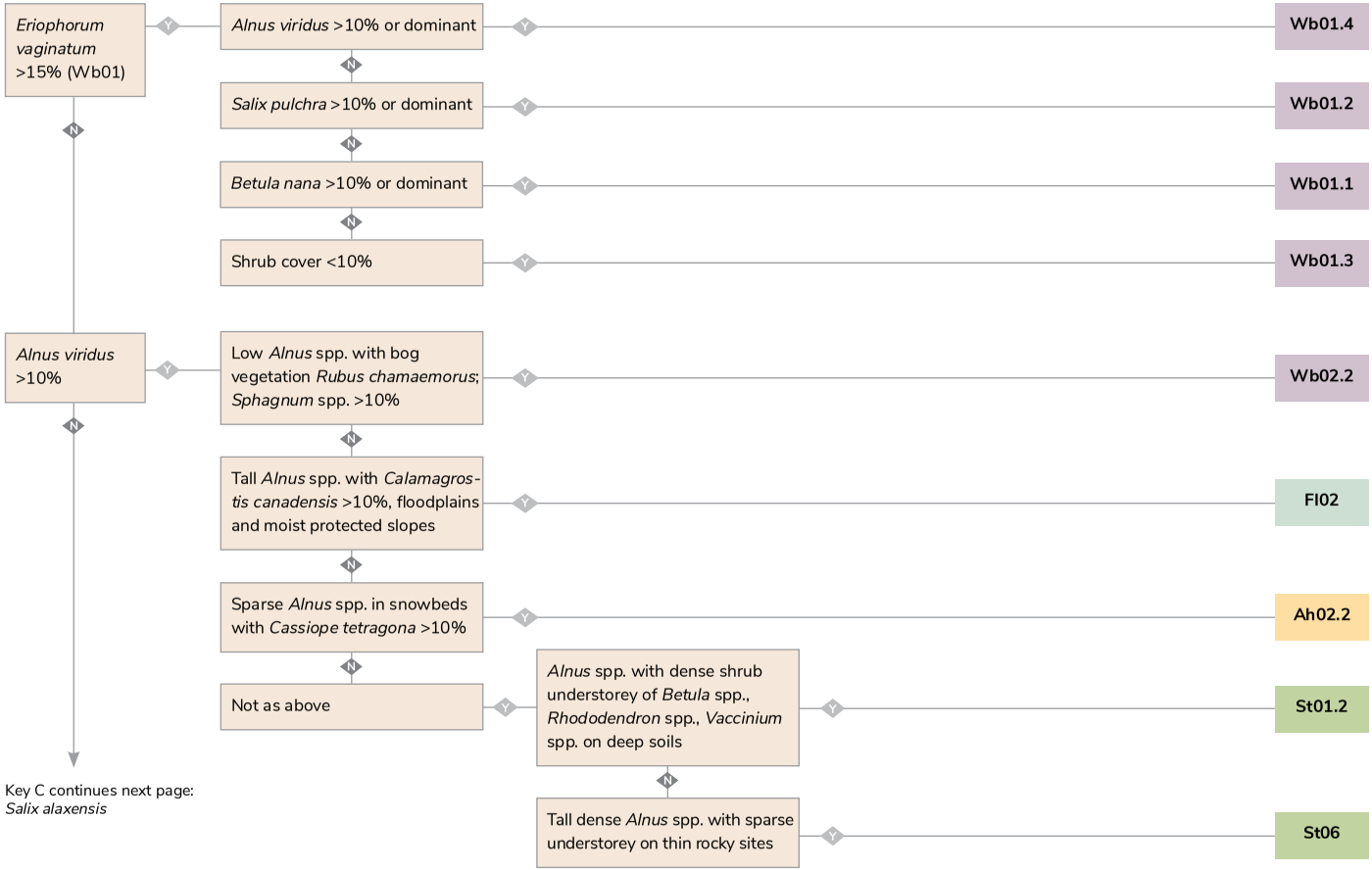
Ecosite Key B (continued)**. Lush graminoid-dominated ecosystems: Fens, Marshes, Meadows**



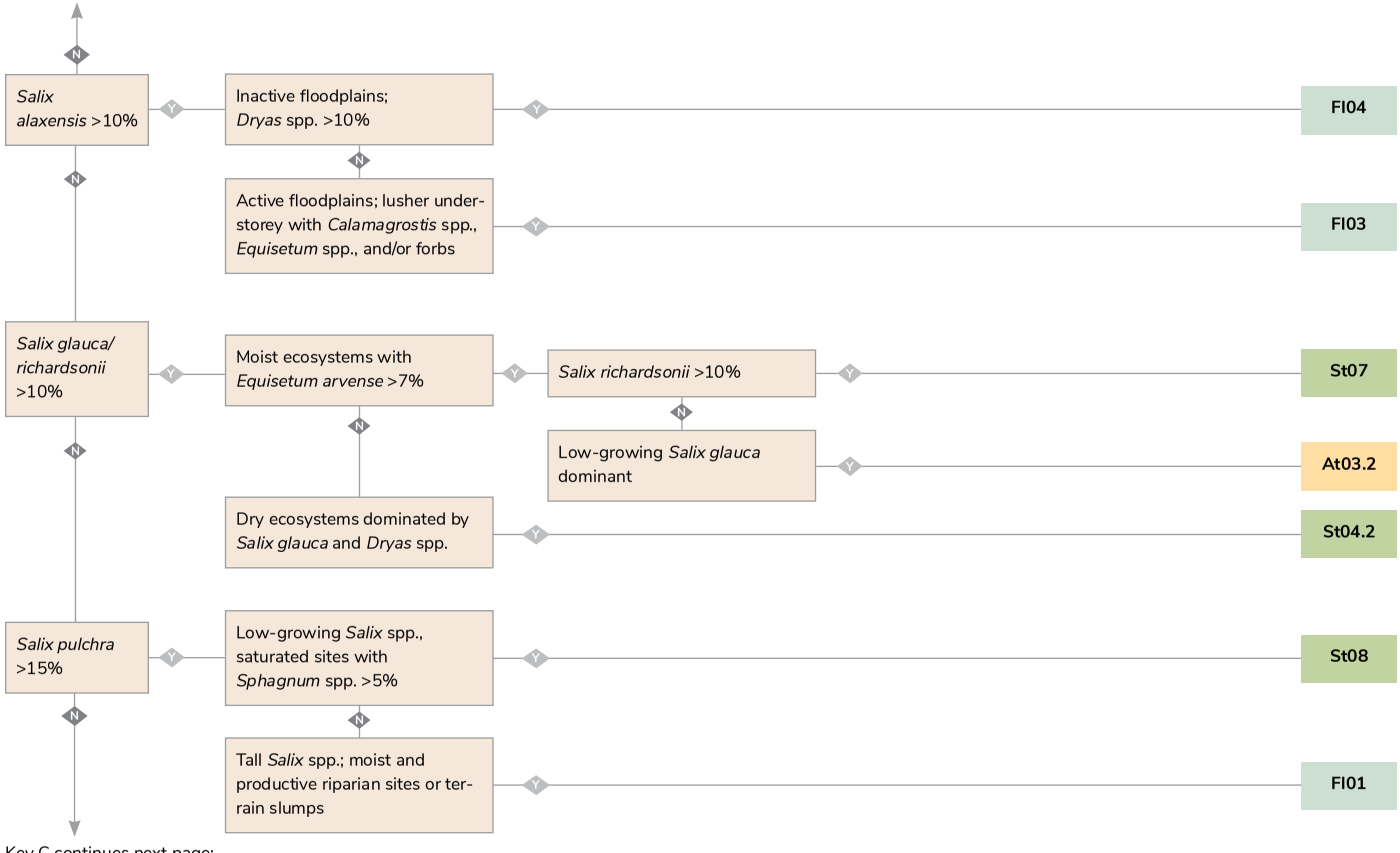
Ecosite Key B (continued). **Lush graminoid-dominated ecosystems: Fens, Marshes, Meadows**



Ecosite Key C. Ecosystems with high shrub cover: Shrub tundra, Floodplains, Bogs

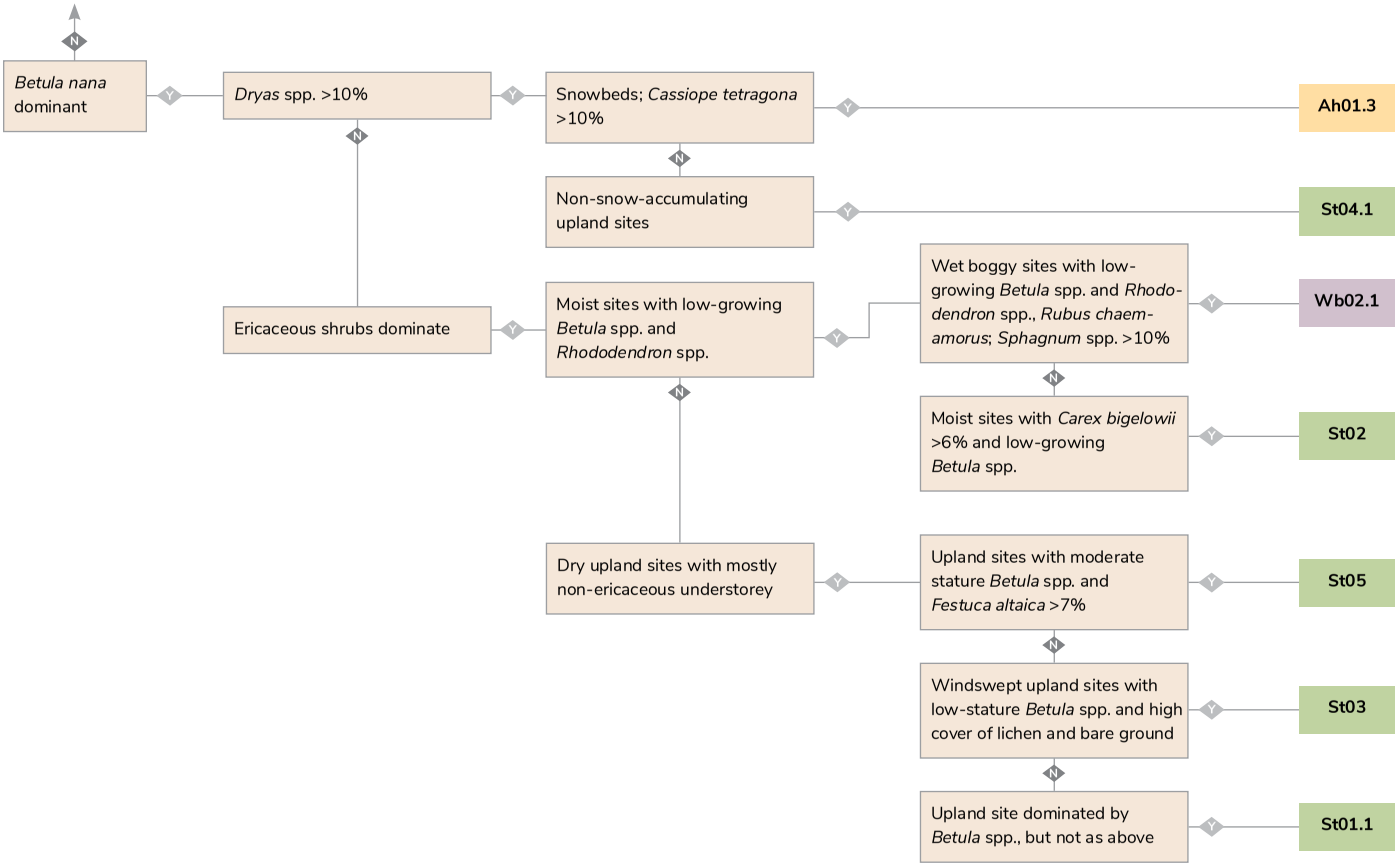


Ecosite Key C (continued)**. Ecosystems with high shrub cover: Shrub tundra, Floodplains, Bogs**

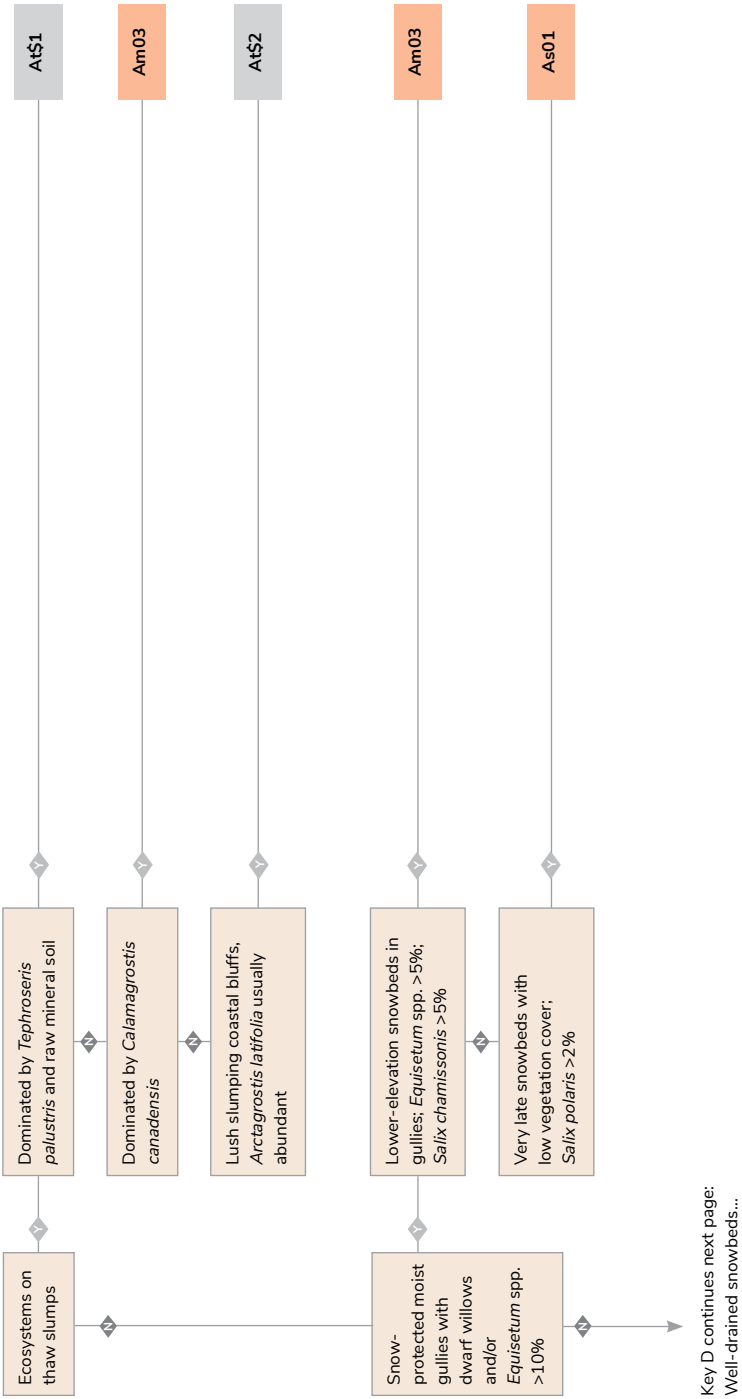


Key C continues next page: *Betula nana*...

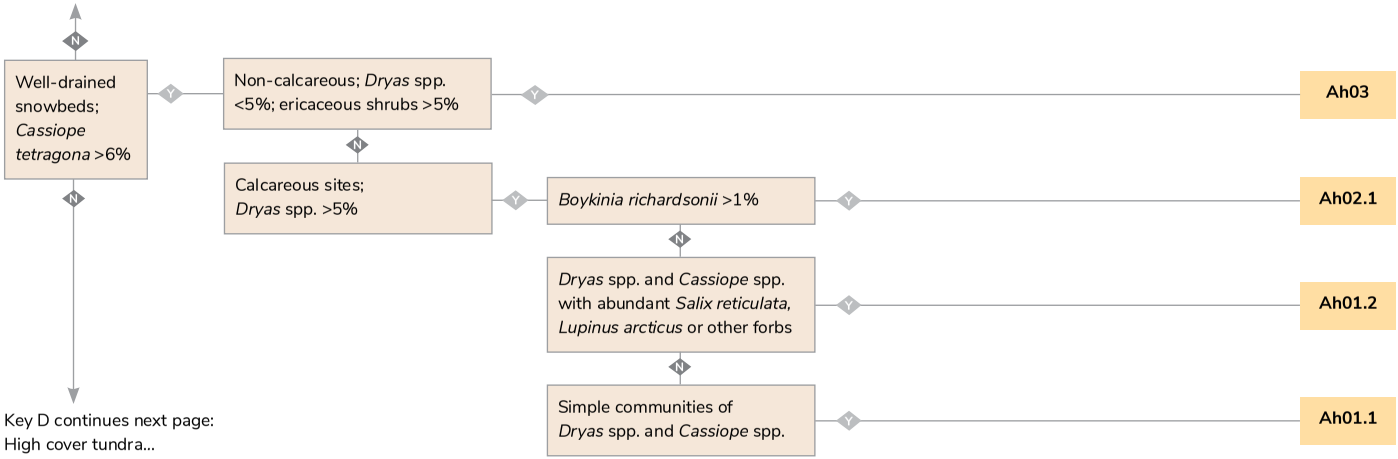
Ecosite Key C (continued)**. Ecosystems with high shrub cover: Shrub tundra, Floodplains, Bogs**



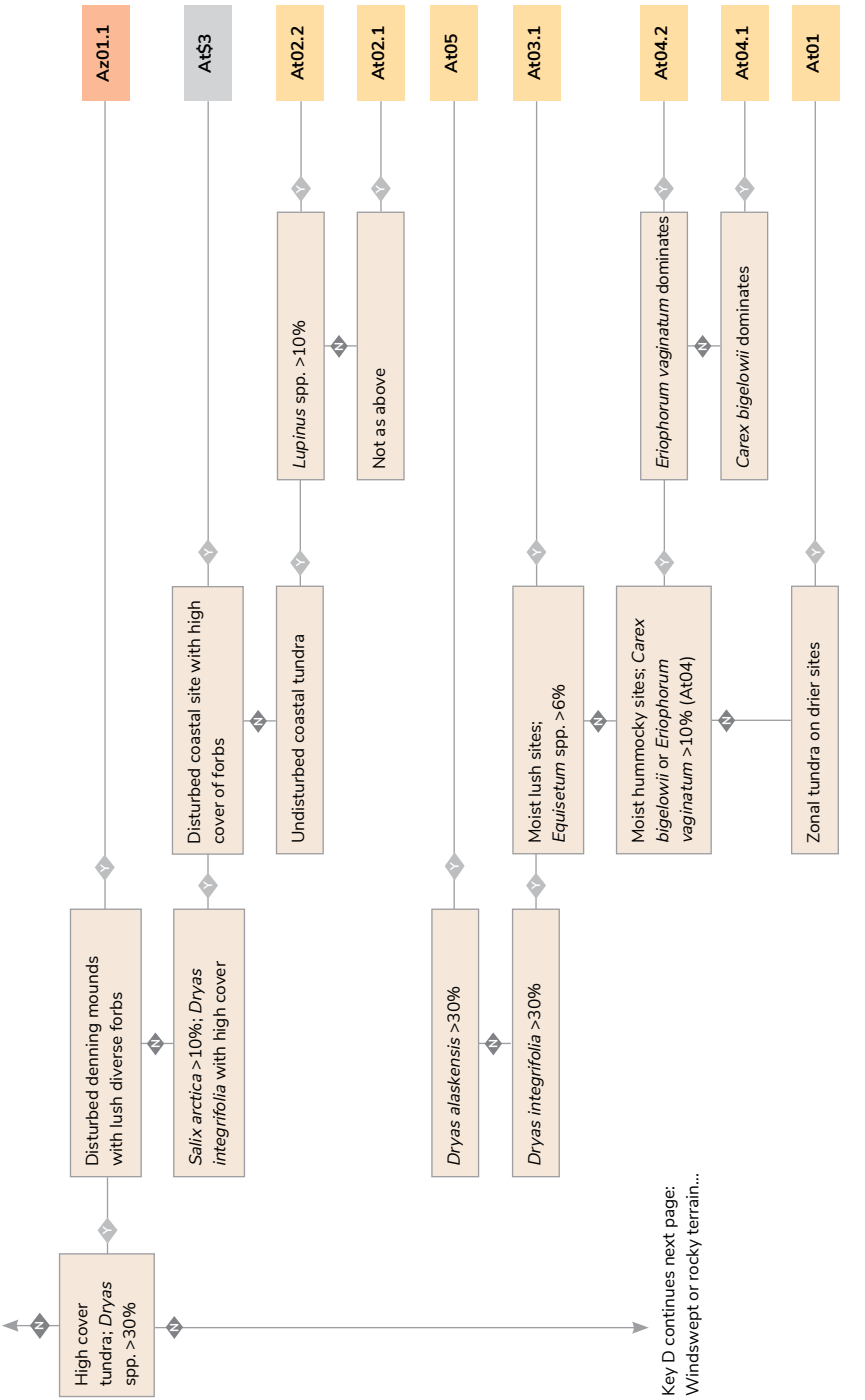
Ecosite Key D. Upland ecosystems with low shrub cover: Tundra, Fellfield, Heath (Meadows, Bogs)



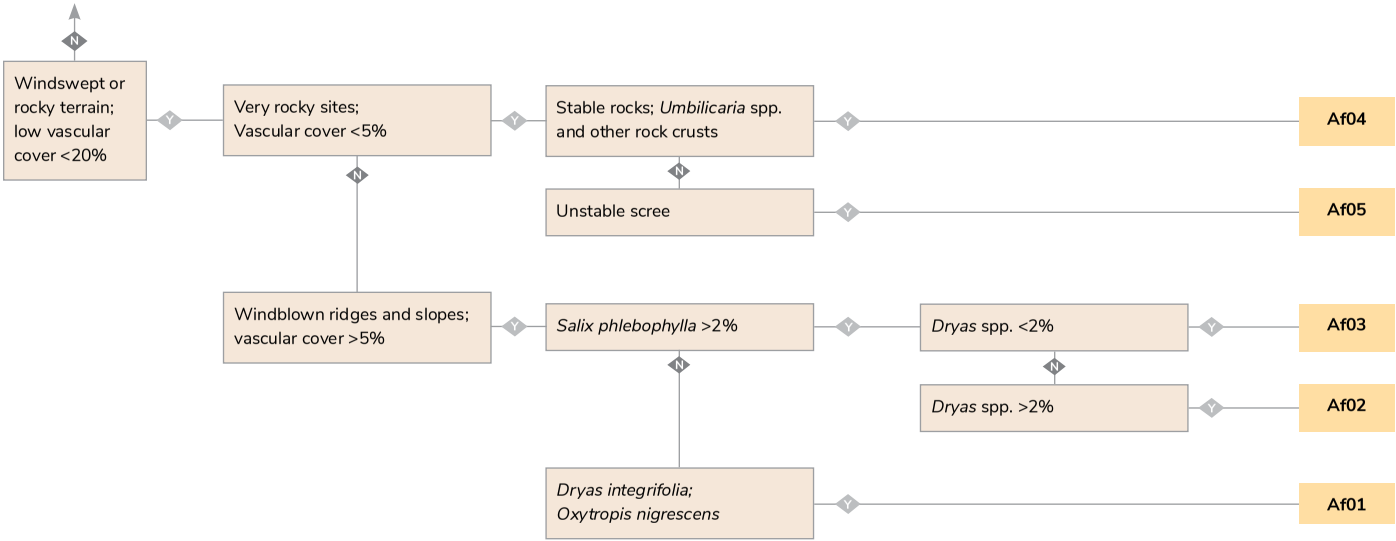
Ecosite Key D (continued)**. Upland ecosystems with low shrub cover: Tundra, Fellfield, Heath (Meadows, Bogs)**



Ecosite Key D (continued). **Upland ecosystems with low shrub cover: Tundra, Fellfield, Heath (Meadows, Bogs)**



Ecosite Key D (continued)**. Upland ecosystems with low shrub cover: Tundra, Fellfield, Heath (Meadows, Bogs)**



This field guide to ecosystems of the Yukon Arctic Region consolidates historic and contemporary work into a harmonized classification standard. The guide provides classification and identification information for ecosystems of the region. It organizes current understanding of the ecological relationships among vegetation communities, landscape position, soil and climate. The guide uses the Yukon Bioclimate Ecosystem Classification system, which is the foundation of the Yukon Ecological and Landscape Classification Program.

yukon.ca/elc