Regional Ecosystems of West-Central Yukon

PART 1: ECOSYSTEM DESCRIPTIONS

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Prepared for Environment Yukon

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Summary

The West-Central Ecosystem Mapping project describes and maps the regional ecosystems of an 85,081 km^2 project area in west-central Yukon. It builds on work completed for the *North Yukon Regional Land Use Plan* in 2006, the Peel River watershed land use plan in 2008 and the recent mapping of McKenna et al. (2010).

In this report, regional ecosystems are defined as bioclimate zones and broad ecosystems. They are both extensive in area and provide generalized descriptions of ecological conditions. Bioclimate zones have similar macroclimatic processes that influence the type and pattern of vegetation that occurs within an area. Broad ecosystems describe the different generalized vegetation conditions occurring on different landforms. Broad ecosystems are intended to provide basic ecosystem information for regional land-use planning, wildlife management and environmental assessment across large geographic areas.

Due to the large size of the project area, a predictive ecosystem mapping (PEM) approach was used to map the regional ecosystems. PEM combines existing spatial information such as landcover mapping, surficial material mapping and topographic base feature mapping in a GIS environment, with knowledge of ecosystems, to model, or predict, which ecosystems are likely to occur at a specific location. As such, PEM is highly dependent on the availability and quality of the input information. Regional PEM does not replace the need for local mapping in detailed planning and assessment activities.

Detailed technical methods and an assessment of data sources used in the PEM process are described in a companion document to this report, *Regional Ecosystems of West-Central Yukon, Part 2: Methods and Assessment of Data Sources*.

While this exercise was initiated to provide ecosystem information in support of the Dawson Regional Land Use Plan, the project area extends much beyond the Dawson planning region. Results can be utilized for many different purposes, including the following:

- Baseline ecosystem description and mapping for environmental and socio-economic assessment;
- Inputs to cumulative effects modelling and assessment;
- Inputs to habitat and biodiversity modelling; and,
- Inputs for a range of planning applications (sensitive ecosystems, habitat targets, ecosystem representation, etc.).

1. Overview of Regional Ecology

Key features of the regional ecology of west-central Yukon:

- **Subarctic Continental climate** with long cold winters and warm summers.
- **Physiography and Geology** is diverse, including the Klondike Plateau to the south and Oglivie Mountains to the north, generally divided along the Tintina Trench.
- **Rivers** flow from and through the region in a largely northward direction, and include two major drainages: the Yukon and Mackenzie;
- Much of the region was **unglaciated** during the last 3 million years. Unglaciated landscapes are relatively old and are therefore characterized by: broad rounded uplands with tors (erosional bedrock knobs), convex slopes, V-shaped valleys, and Beringian flora and fauna, particularly in the northern part of area. Surficial materials in unglaciated regions dominantly

consist of weathered bedrock, colluvium, retransported loess (wind-blown silt), organic and fluvial deposits (some rich in gold). The lack of glacial deposits and valley scouring have resulted in few natural impoundments and a limited number of lakes.

- **Permafrost is widespread throughout the region**, which straddles the transition between the continuous and extensive discontinuous permafrost zones. As a result, periglacial landforms are common, including: palsas, pingos, thermokarst ponds, ice-wedge polygons, solifluction lobes, cryoplanation terraces, and extensive bogs over gentle slopes and plains. Cool (north- facing) slopes and valley bottoms are generally underlain by permafrost.

- **Forests** are transitional between northern boreal forests and subarctic forests, referred to in Canada as Taiga; and
- **An active fire regime** on the Klondike and Yukon Plateau resulting in extensive areas of young, post-fire regenerating shrub, deciduous and mixed-wood forests.

2. Regional Ecosystem Mapping Results

2.1 Bioclimate Zones

Six bioclimate zones are represented in west-central Yukon (Table S1). The Boreal Low (BOL), Boreal High (BOH) and Subalpine (SUB) bioclimate zones occur in the southern portion, or the Boreal Cordillera, of the project area. The Taiga Wooded (TAW) and Taiga Shrub (TAS) are located in the Taiga Cordillera. The Alpine (ALP) bioclimate zone occurs at the highest elevations of both the boreal and taiga.

Table S1. West-central Yukon bioclimate zone summary table.

Bioclimate Zone	Code	Description	Elevation Range (m)	Area (km^2)	Area (%)
Boreal Low	**BOL**	BOL is limited to the major river valleys (Yukon, Stewart, Pelly and White) and low-lying wetland ecosystems within the project area. This is the most productive area of the region.	<450 m	3,223 km^2	4%
Boreal High	**BOH**	BOH is the largest bioclimate zone in the project area, occurring in all mountain valleys and plateaus of the Boreal Cordillera. Large areas of shrub and deciduous forest result from frequent wildfires.	450 – 1,100 m	33,697 km^2	40%
Subalpine	**SUB**	SUB occurs at high elevations of the Boreal Cordillera (southern) portion of project area. Sparse coniferous forests and shrub vegetation characterize the SUB	1,100 – 1,500 m	5,707 km^2	7%
Taiga Wooded	**TAW**	TAW covers the low and middle elevations of the Taiga Cordillera. Extensive shrub areas may also occur as a result of wildfire or cold air drainage/frost pockets/poor drainage.	<800 m	23,817 km^2	28%
Taiga Shrub	**TAS**	TAS covers the high elevation shrub and sparsely forested areas in the mountains and plateaus of the Taiga Cordillera.	880 – 1,200 m	13,988 km^2	16%
Alpine	**ALP**	The non-forested ALP is found throughout the highest elevations of the project area, but is most prominent in the Ogilvie Mountains.	>1,500 m (Boreal) >1,200 m (Taiga)	4,649 km^2	5%

2.2 Broad Ecosystems

Eleven broad ecosystem types and 44 phases were identified in west-central Yukon (Table S2). The broad ecosystem types are organized into three general moisture groups—dry, moist and wet. The ecological relationship between each broad ecosystem type can be displayed through the use of a generalized edatopic grid (Figure S1).

Broad ecosystems are intended to be interpreted within the context of bioclimate zones. Each Broad Ecosystem Unit (BEU) type may occur in more than one bioclimate zone, and each type may have different phases, based on the current general vegetation condition. This system allows new units and concepts to be adapted and changed over time, as information improves.

Some vegetation phases are considered successional, while others may be relatively stable. Most successional types occur in low-mid elevation bioclimate zones (BOL, BOH and TAW), where wildfires affect large areas.

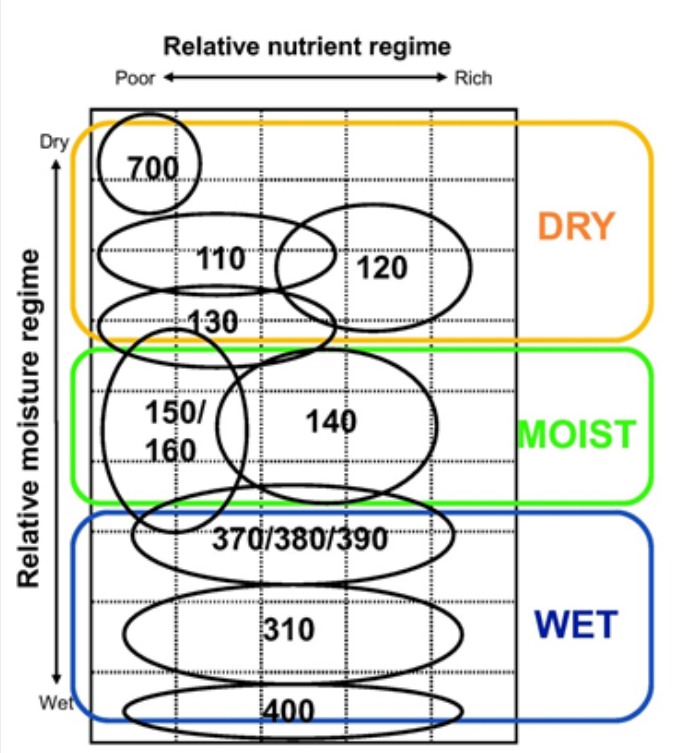

Figure S1. West-central Yukon BEU types organized within an edatopic grid. See Table S2 for BEU type codes.

Table S2. Broad ecosystems of west-central Yukon.

Group		Type *	Phase *
DRY	**UPLAND Ecosystems (100)**	Rock (700)	Not applicable
		Ridge (110)	Ridge – Herb-Bryoid (111) Ridge – Shrub (112) Ridge – Deciduous (113) Ridge – Mixedwood (114) Ridge – Coniferous (115)
		Steep South-Facing Slope (120)	Steep South-Facing Slope – Herb-Bryoid (121) Steep South-Facing Slope – Shrub (122) Steep South-Facing Slope – Deciduous (123) Steep South-Facing Slope – Mixedwood (124) Steep South-Facing Slope – Coniferous (125)
		Upper Slope (130)	Upper Slope – Herb-Bryoid (131) Upper Slope – Shrub (132) Upper Slope – Deciduous (133) Upper Slope – Mixed-wood (134) Upper Slope – Coniferous (135)
MOIST		Gentle Slope and Plain (140)	Gentle Slope – Herb-Bryoid (141) Gentle Slope – Shrub (142) Gentle Slope – Deciduous (143) Gentle Slope – Mixedwood (144) Gentle Slope – Coniferous (145)
		Steep North-Facing Slope (150)	Steep North-Facing Slope – Herb-Bryoid (151) Steep North-Facing Slope – Shrub (152) Steep North-Facing Slope – Deciduous (153) Steep North-Facing Slope – Mixedwood (154) Steep North-Facing Slope – Coniferous (155)
WET		Drainage and Depression (160)	Drainage and Depression – Herb-Bryoid (161) Drainage and Depression – Shrub (162) Drainage and Depression – Deciduous (163) Drainage and Depression – Mixedwood (164) Drainage and Depression – Coniferous (165)
	WETLAND Ecosystems (300)	Wetland (310)	Wetland – Herb-Bryoid (311) Wetland – Shrub (312) Wetland – Treed (315)
		Floodplain (370/380/390)	<u>High Flood Frequency (370)</u>: • Floodplain – Gravel Bar-Herb-Bryoid (371) • Floodplain – Shrub (372) <u>Moderate Flood Frequency (380)</u>: • Floodplain – Deciduous (383) • Floodplain – Mixedwood (384) <u>Low Flood Frequency (390)</u>: • Floodplain – Coniferous (395)
	WATER and ICE (400)		Water (401) Ice (Glacier) (403)
OTHER	**DISTURBANCE (500)**		Natural Disturbances (501) Anthropogenic Disturbances (502) Minesite Disturbances (503)

* Note: each Broad Ecosystem Unit (BEU) type and phase may occur in different bioclimate zones. At this time, unique codes for each BEU within different bioclimate zones have not been developed.

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1. OVERVIEW

1.1 INTRODUCTION

This project describes and maps the regional ecosystems of west-central Yukon. Describing and mapping the biophysical properties of landscapes is an important activity that benefits planning, environmental assessment and integrated resource management. Ecosystem classification and mapping refers to an integrated approach to land survey in which areas or units of land are classified and mapped according to their ecological similarity (Rowe 1979). The aims of ecosystem classification and mapping are to provide primary information on the biological and physical characteristics of various landscape components in order to facilitate a range of interpretations and assist in sustainable management (Rowe and Sheard 1981).

Ecosystems are formed through the interplay between climate, terrain, soil, vegetation and fauna, and can be described at a range of spatial scales (Bailey, 2009). In this project, regional ecosystems are defined as bioclimate zones and broad scale ecosystems. They are both extensive in area and provide generalized descriptions of ecological conditions.

Bioclimate zones are areas with similar climate and elevation characteristics that influence the type and pattern of vegetation that occurs. In mountainous terrain like that found in much of west-central Yukon, bioclimate zones are visible as changes in general vegetation communities or species, and are organized along gradients of elevation and latitude. Broad scale ecosystems describe generalized vegetation conditions occurring on different landforms. Broad ecosystems are intended to provide basic ecosystem information for regional land-use planning, wildlife management and environmental assessment across large geographic areas.

Ecosystem descriptions and mapping completed through this project are built on the work of many other individuals and projects. Due to the large size of the project area, a predictive ecosystem mapping (PEM) approach was used to map the regional ecosystems. PEM combines existing spatial information such as landcover mapping, surficial material mapping and topographic base feature mapping in a GIS environment, with knowledge of ecosystems, to model, or predict, which ecosystems are likely to occur at a specific location. As such, it is highly dependent on the availability and quality of the input information. Detailed technical methods and an assessment of data sources used in the PEM process are described in a companion document to this report, *Regional Ecosystems of West-Central Yukon, Part 2: Methods and Assessment of Data Sources*.

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1.2 PROJECT AREA OVERVIEW

1.2.1 Setting

The 85,081 km^2 project area is shown in Figure 1. The community of Dawson City is the only major permanent settlement and is centred within the 45,288 km^2 Dawson Planning Region. The project area spans approximately five degrees latitude, and is generally contained within the Northern Ogilvie Mountains, Southern Ogilvie Mountains and the Klondike Plateau physiographic regions, as described by Matthews (1986). The southern portion extends into the Wellesley Depression while the northern boundary reaches the Keele and David Lord ranges, and the Eagle Lowland. The eastern extent includes portions of the Wernecke Ranges and Stewart Plateau. The Tintina Trench bisects the project area, running in a northwest-southeasterly direction. The Alaska-Yukon border forms the western boundary.

Elevation ranges from a low of 280 m where the Yukon River flows into Alaska, to over 2,300 m in the mountain ranges northwest of Dawson (Figure 2). In the rolling terrain of the Klondike Plateau, elevation generally ranges between 400 m and 1,200 m.

Most of the project area is within the Yukon River watershed, with only the northeast portion in the Mackenzie River watershed. Most rivers flow in a northward direction. The White River, laden with silt from the St. Elias icefields, joins the Yukon River main stem approximately 100 km upstream of Dawson City. Between the mouth of the White River and Dawson City the Stewart and Klondike rivers flow into the Yukon River from the east. The Yukon River exits the project area, and Yukon, by flowing northwest into Alaska through the ramparts.

In the north, the east slopes of the North Ogilvie Mountains drain into the Porcupine River. The Porcupine River is a major tributary of the Yukon River that flows into the Yukon River at Fort Yukon, Alaska. The major tributaries of the Porcupine River include the Miner, Whitestone and Fishing Branch rivers.

The north central portion of the project area is part of the Mackenzie River watershed. Here, the Ogilvie and Blackstone rivers flow east and northeast, respectively, becoming the Peel River at their confluence. The Hart River joins the Peel further downstream enroute to the Mackenzie River.

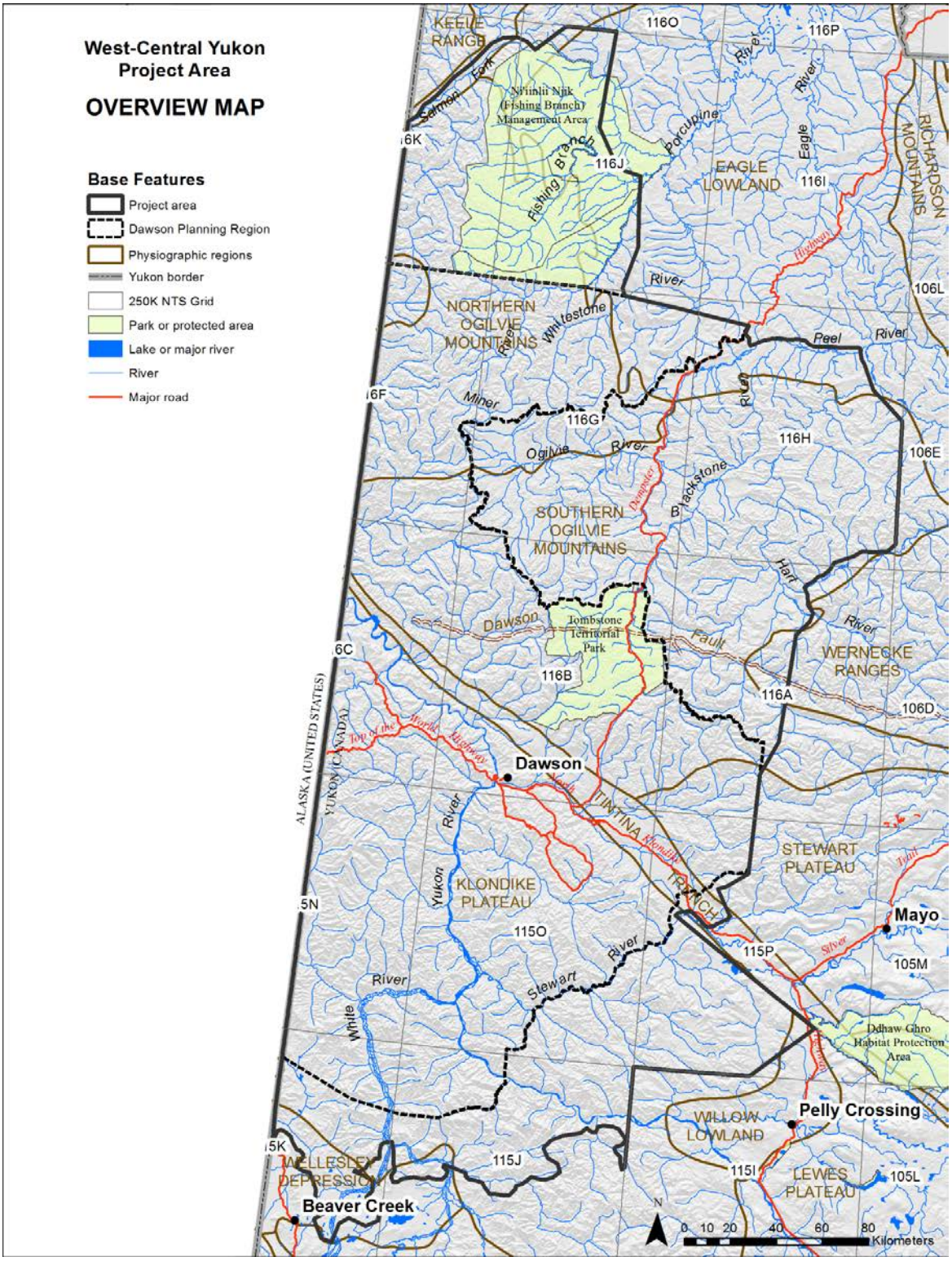


Figure 1. West-central Yukon regional ecosystem mapping project area.

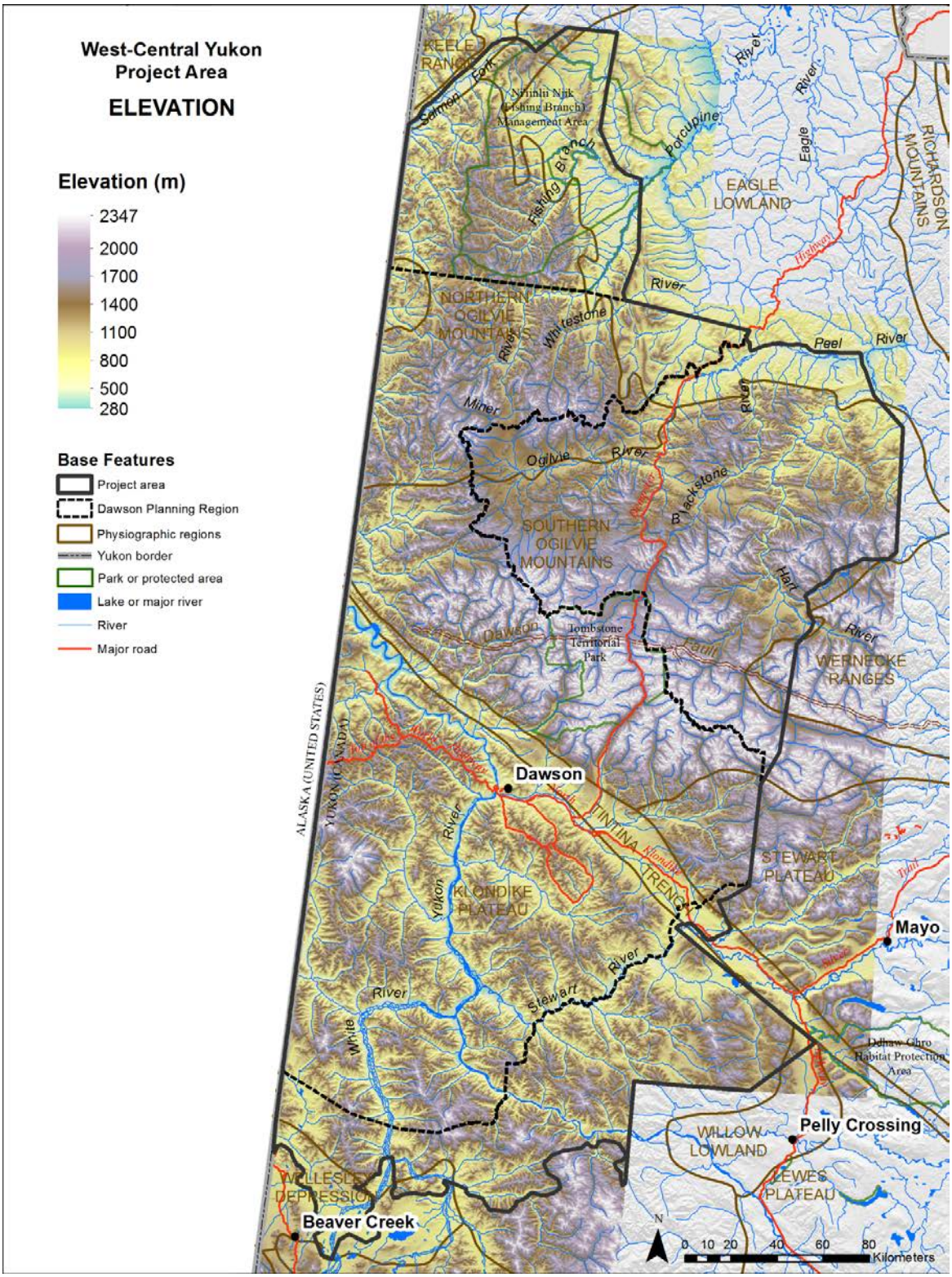


Figure 2. Elevation range of the west-central Yukon project area.

1.2.2 Climate

The climate of the region is continental, meaning there are very cold winters and relatively warm summers, with little temperature moderation by oceans (Wahl 2004). The coldest month is January, with mean monthly temperatures as low as -32°C. The warmest month is July with mean monthly temperatures reaching 15°C. The Klondike Plateau portion of the project area experiences an extreme annual temperature range, from recorded lows of -60°C to summer highs of 35°C.

Most of the annual precipitation comes in the form of summer rains from June to August. The driest months are February to April. Elevation has a major effect on precipitation patterns. The high portion of the Klondike Plateau, along the Yukon – Alaska border, to the west and southwest of Dawson City, is the wettest part of the project area. While not quite as wet, the South Ogilvie Mountains produce a similar orographic effect, with higher elevations generally receiving more snow and rain (Wahl 2004).

1.2.3 Geology

The project area has a diversity of geological conditions. The Dawson Fault runs east-west through the South Ogilvie Mountains, crossing the Dempster Highway just south of Two Moose Lake (Figure 1). Mackenzie Platform sedimentary rocks that formed in an ancient ocean on the western margin of North America are present north of the Dawson Fault. The carbonate rocks support limited near-surface soil moisture conditions, which restrict vegetation growth. While relatively poor in terms of the biomass they support, these dolomite and limestone mountains host many insects and plants that are unique to Beringia. In portions of this region, the carbonate rocks overlie shales that weather to produce acidic and metaliferous substrate making for poor forest growth (Pyle et. al. 2007).

The South Ogilvie Mountains and Stewart Plateau, extending between the Dawson Fault and Tintina Trench, are part of the Selwyn Basin which is dominated by sedimentary rocks such as shales, slate, sandstone and chert. Volcanic rocks, including basalt flows and breccia, and intrusive rocks such as diorite and syenite are also common. Thrust faults and intrusions have placed rocks of varying weathering characteristics and stability on top of or adjacent to each other, producing the area's rugged topography. The resulting terrain is rich in biodiversity; for example good sheep forage is found on eroding shales, close to steep escape terrain, while rubbly colluvium or talus found at the base of intrusive slopes provides shelter for marmot and pika communities.

The Tintina Trench bisects the project area in a northwest-southeast direction. Rocks south of the trench have been added on, or accreted, to the North American craton as terranes that rafted onto the continental margin hundreds of millions of years ago. South of the Tintina Trench, the project area is primarily comprised of Yukon-Tanana Terrane rocks, which largely consist of older metamorphosed sedimentary rocks, and younger volcanics and intrusives (see Smith et. al, 2004). A variety of mineral occurrences are found in this area, which includes White Gold/Dawson Range district southwest of Dawson City.

1.2.4 Glacial History and Geomorphology

Much of the project area is part of the former Beringia, the land mass spanning from Siberia across the Bering Strait into Alaska and Yukon that remained largely unglaciated during the last ice age. Most of the Klondike Plateau and much of the North Ogilvie Mountains has remained ice-free for over three million years (Figure 3) (Duk Rodkin 1999). This extended unglaciated period has had a major influence on the landforms and ecology of the region.

The glacial limits, or maximum extents, of three main glacial periods are found in the project area (Figure 3). The oldest and most extensive of these is known as the pre-Reid, which refers to a series of ancient Cordilleran glaciations that occurred between three million and 780,000 years ago. The pre-Reid glaciations extended as far west as Dawson and covered parts of the North and South Ogilvie Mountains.

The intermediate Reid Glaciation reached its maximum extent about 200,000 years ago. Within the project area, Reid moraines and till are evident throughout the South Ogilvie Mountains. The most recent glacial period, known as the McConnell, reached its maximum extent about 20,000 years ago. While the McConnell glaciation covered most of southern Yukon, its influence within the project area is limited to localized areas in the South Ogilvie Mountains and the Wellesley Basin.

Although the Klondike Plateau portion of the project area remained ice-free during the last three glacial periods, meltwater draining the glaciers deposited glaciofluvial gravels along major river valleys. In the South Ogilvie Mountains, the successive glaciers carved U-shaped valleys and created the dramatic alpine cirques, tarns and moraines that characterize the rugged Tombstone range.

The topography of the unglaciated portion of the project area is characterized by V-shaped valleys, convex slopes and rolling broad ridges with erosional bedrock knobs (tors). Unlike most of the glaciated southern Yukon, there are no deeply cut U-shaped valleys and glacial deposits to impound large lakes. Drainage and soil moisture is strongly controlled by permafrost presence and active layer thickness. Surficial materials in unglaciated regions consist largely of weathered bedrock, colluvium, retransported loess (wind-blown silt), organic and fluvial deposits (Bond & Lipovsky 2011).

1.2.5 Permafrost

The portion of the project area north of Tombstone Territorial Park lies in the continuous permafrost zone (Heginbottom 1995) where greater than 90% of the landscape is underlain by permafrost. To the south lies the extensive discontinuous permafrost zone (Heginbottom 1995) where 50-90% of the landscape is underlain by permafrost; within this zone permafrost is generally found in valley bottoms, on most gentle slopes and ridge tops, and on nearly all north-facing slopes; steep south-facing slopes are commonly permafrost-free. Periglacial landforms, which develop as a result of permafrost and freeze-thaw processes, occur throughout the project area (Lipovsky & Bond, 2011). Open-system pingos, (ice-cored conical mounds), palsas (peat-covered frozen mounds), ice-wedge polygons, and thermokarst ponds (where disturbance of surface vegetation causes thaw of ice-rich permafrost) are common in valley bottoms and moist ecosystems. In mountainous and alpine terrain, periglacial landforms include cryoplanation terraces, stone stripes, frost boils and solifluction lobes.

Active-layer thickness (depth of seasonal thaw at the ground surface) is generally less than 1 m, but varies from as little as 20 cm beneath thick organic mats, to >2 m in well-drained soils with little organic cover (Lipovsky & Bond, 2011). Soils underlain by permafrost generally have higher soil moisture conditions and cooler temperatures than those in similar permafrost-free landscape positions; they are commonly saturated and have slower decomposition rates and lower levels of nutrient availability. On steep slopes, ridge tops and active floodplains, soils are often coarser-grained which promotes better drainage and greater productivity.

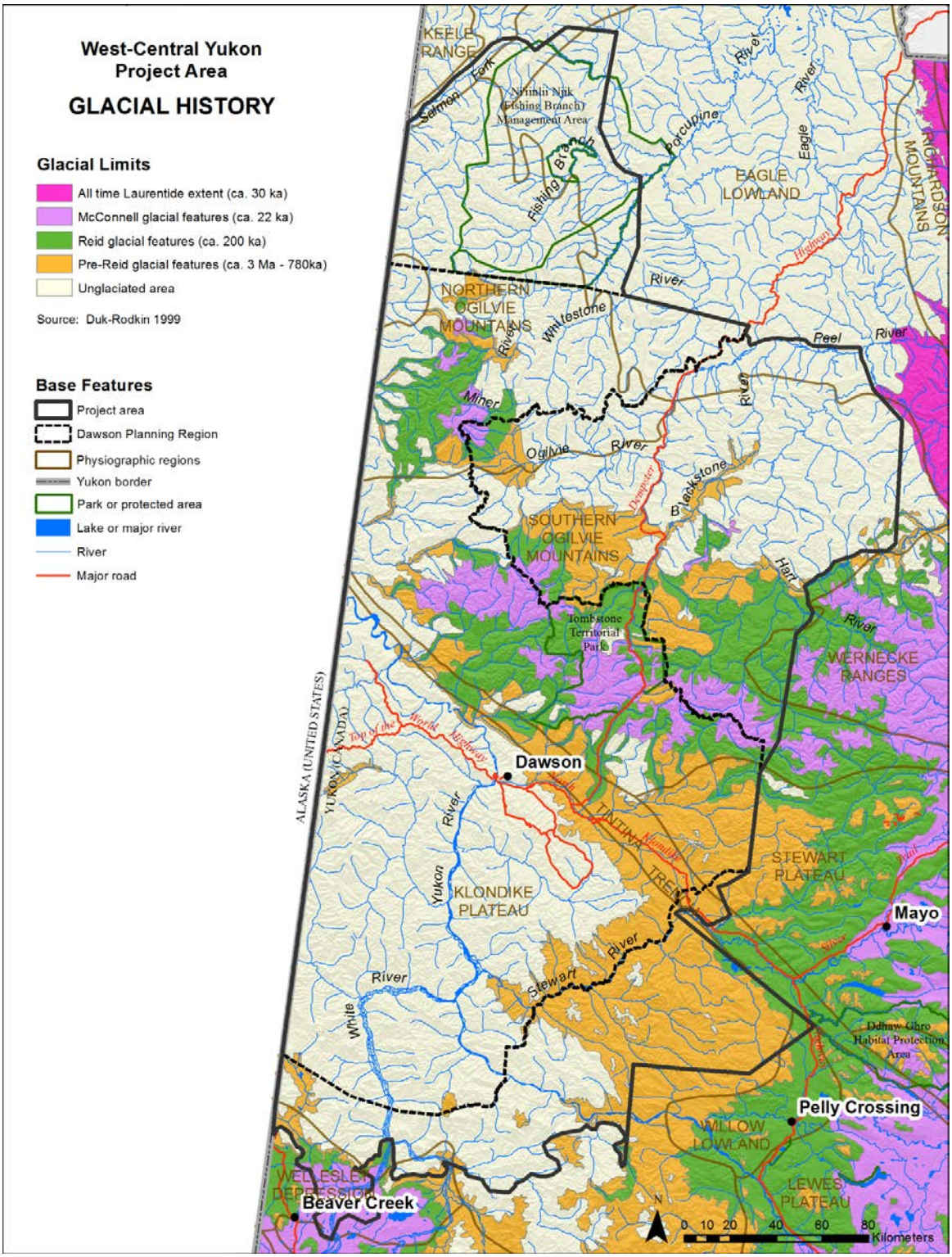


Figure 3. Glacial limits of the west-central Yukon project area.

Periglacial features, those landforms associated with permafrost, occur throughout the project area. Open system pingos, comprised of ice and silt to gravel, along with palsas, with a core of ice and organic material, are common in wetland and moist ecosystems. In shrub and tussock tundra wetland ecosystems to the north, ice-wedge polygons have developed. Disturbance of surface vegetation causes the degradation of the permafrost and the development of thermokarst ponds. In mountainous terrain, periglacial features include extensive cryoplanation terraces, often supporting moist to wet herb ecosystems, stone stripes on high gravelly ridges, and solifluction lobes on cool aspects.

1.2.6 Ecology

The project area straddles two terrestrial ecozones (Figure 4). The southern and central portion of the project area is within the Boreal Cordillera while the northern part is in the Taiga Cordillera (ESWG 1996). The Taiga Cordillera is underlain by near continuous permafrost, while in this project area, the Boreal Cordillera is underlain by extensive discontinuous permafrost.

Nested within the ecozones, the project area contains parts of six ecoregions. Portions of the North Ogilvie Mountains, Eagle Plains and Mackenzie Mountain ecoregions occur within the Taiga Cordillera. The Boreal Cordillera contains portions of the Yukon Plateau North, Klondike Plateau and Yukon Plateau Central ecoregions (Figure 4). Most of the project area is within the Klondike Plateau and North Ogilvie Mountains. Ecoregions are described in *Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes*, by Smith et al. (2004). A further subdivision of ecoregions (ecodistricts) is presented in *Bioclimate, Ecodistrict and Ecologically Significant Features Mapping for the Dawson Planning Region, Yukon* by McKenna et al. (2010).

The forests of this region are near the northern extent of Canada's boreal forest. White spruce (*Picea glauca*) and aspen (*Populus tremuloides*) forests dominate level to warm, south-facing aspects that are typically free of near surface permafrost. Black spruce (*Picea mariana*) and birch (*Betula neoalaskana*) dominate the cooler, north-facing permafrost affected slopes in the plateau regions and dominate most treed landscape positions in the northern portion of the project area where continuous permafrost is found. While limited in distribution, grasslands occur on steep south-facing slopes.

The most productive forests in the region are found along major river valleys with large, active floodplains. These riparian forests are comprised of tall white spruce and balsam poplar (*Populus balsamifera*), and can reach great heights, owing to the lack of permafrost, available moisture and relatively lower frequency of fire.

Poor drainage over permafrost creates conditions suitable for wetland complexes that include various forms of bogs and fens. Most of the shallow water wetlands and shore fens are found within low terraces adjacent to active streams and large rivers.

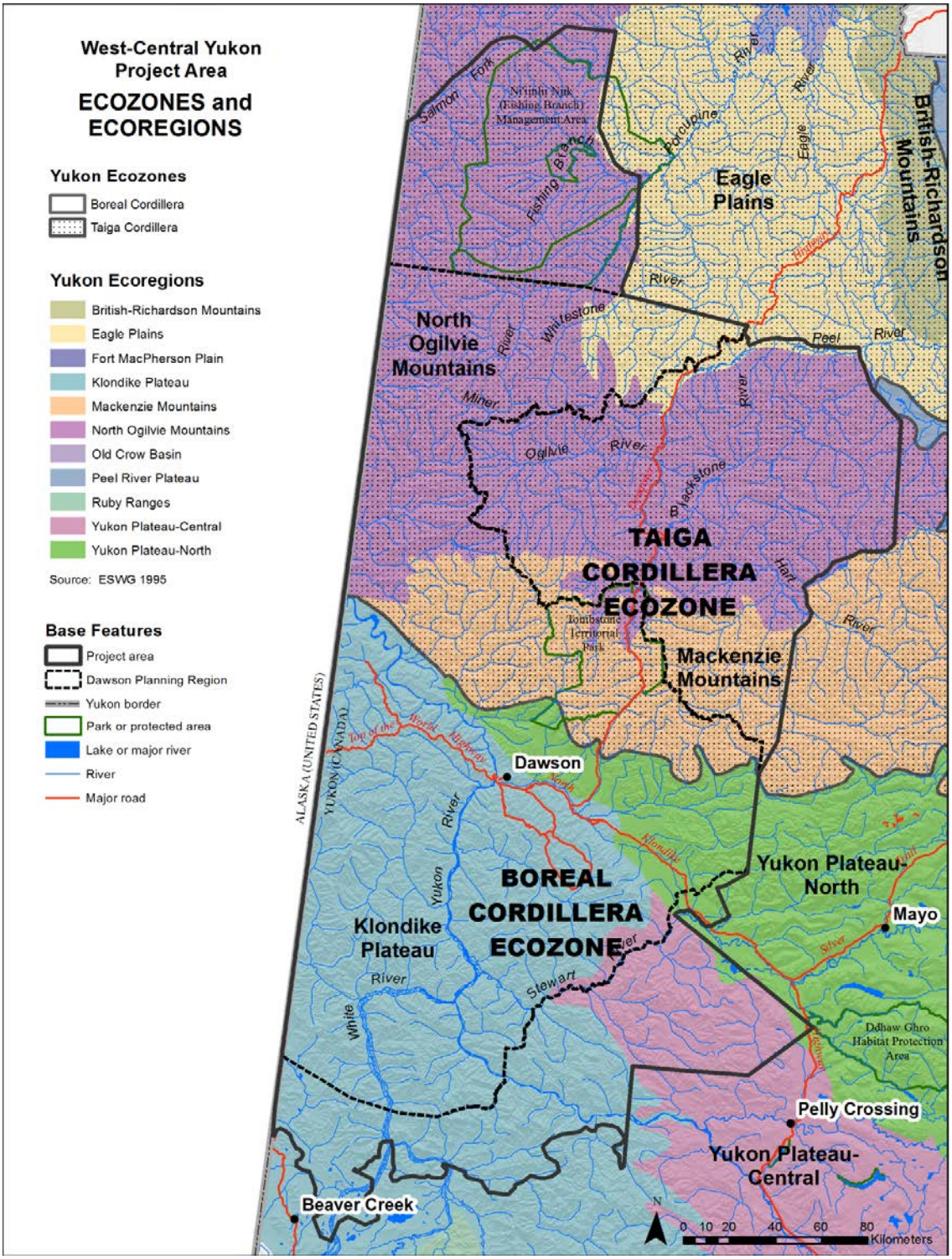


Figure 4. Ecozones and ecoregions of the west-central Yukon project area.

A key influence on the forest ecology of the southern portion of the project area is wildfire. The Klondike Plateau has some of the highest levels of fire activity in Yukon, with an average fire cycle of approximately 100 years (Yukon Fire Management, unpublished data) (Figure 5). While most precipitation falls during the summer, it results principally from thunderstorms that also bring a relatively high density of lightning strikes. The rolling, forested terrain on plateau portions of the study area presents few topographic barriers to fires. This, combined with warm summer temperatures, means that upland forests experience extensive and frequent burns, resulting in large areas of early-successional shrub and deciduous forest. In extreme fire years, such as 2004, 10 to 20% of the plateau can be affected by fire in a single season. In contrast, wildfire occurs much less frequently in the Ogilvie Mountains, and is generally limited to forested valley bottoms.

2. YUKON ECOSYSTEM AND LANDSCAPE CLASSIFICATION FRAMEWORK

The Yukon Ecosystem and Landscape Classification Framework (Yukon ELC Framework) provides an ecological framework for classifying and mapping the ecological diversity of Yukon's landscapes and vegetation communities (www.env.gov.yk.ca/elc).

A central concept of the Framework is the climatic control of ecosystem types and distribution. Similar to the biogeoclimatic ecosystem classification of British Columbia (Pojar et al. 1987), the Yukon framework recognizes different bioclimate zones and regions throughout the territory. Each bioclimate zone is characterized by a general vegetation type on a reference site. Within the Yukon ELC Framework, ecosystems are organized along a spatial hierarchy with bioclimate regions being the largest geographic areas and ecosites being the most localized (Table 1).

The existing National Ecological Framework terrestrial ecozones and ecoregions of Yukon (Smith et al. 2004) are not a formal part of the Yukon ELC Framework, but is a parallel, and complementary system. Ecozones and ecoregions will continue to be used in national reporting and other management applications, and provide additional ecological context for interpreting bioclimate zones and broad ecosystems.

This project is focused on identifying and mapping the bioclimate zones and broad ecosystems of west-central Yukon, both of which are considered regional ecosystems. Ecozones are used to delineate the southern (boreal) and northern (taiga) portions of the study area. In the Dawson region the only bioclimate zone boundary that is delineated by ecoregions is the taiga/boreal boundary, which is already captured at the ecozone level. As such, ecoregions provide a geographic and physiographic context for climate and elevation differences between bioclimate zones in different parts of the project area.

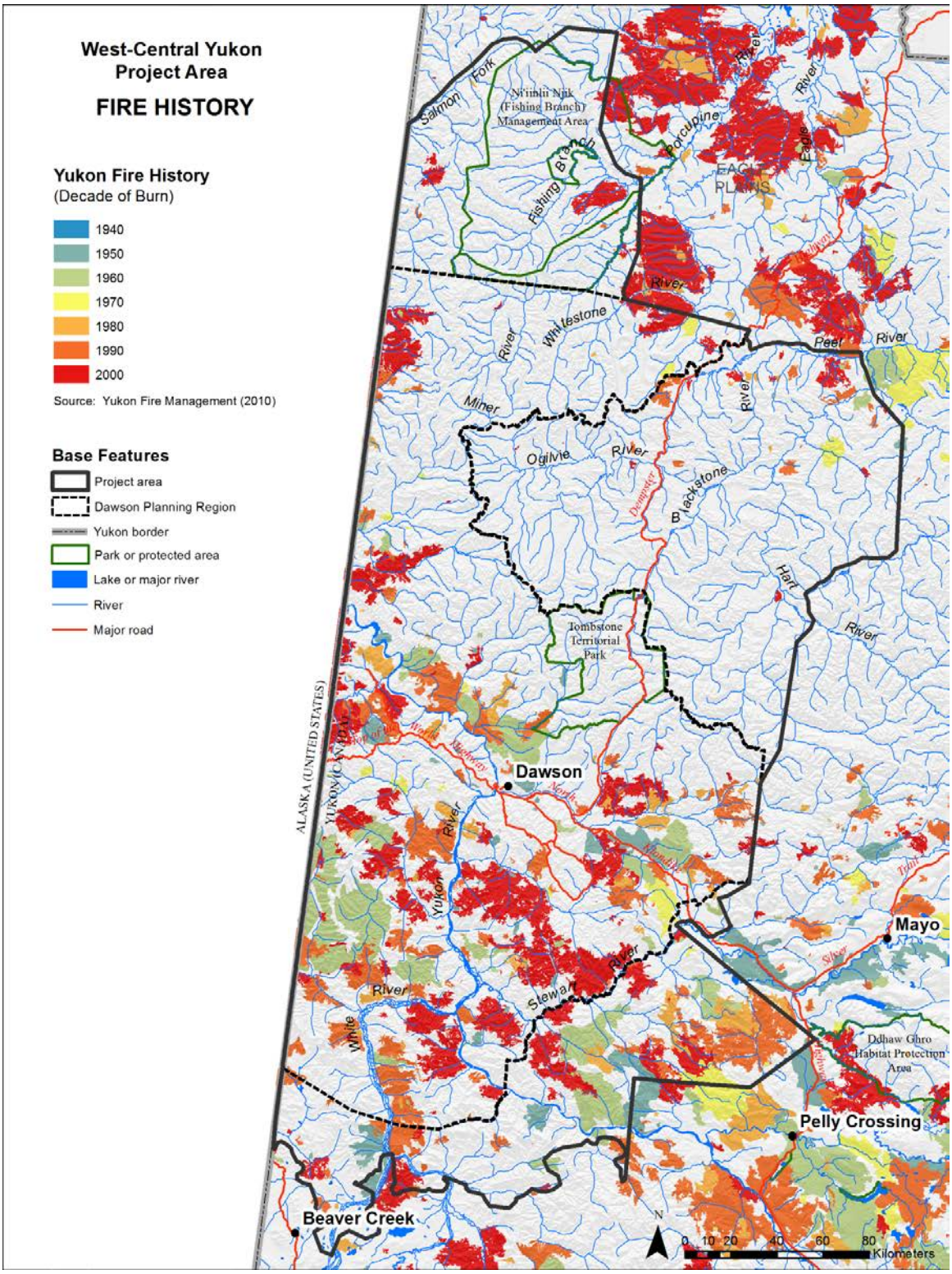


Figure 5. Fire history of the west-central Yukon project area.

Table 1. Levels of Yukon ELC Framework, showing an example of three broad ecosystem units and phases nested within the Boreal High bioclimate zone. Ecosites, not described in this project, are a more detailed level of the Yukon ELC Framework.

Yukon ELC Level	Description					
Bioclimate Zone	Boreal High (BOH)					
Bioclimate Subzone	Boreal High, Wellesley Basin					
Broad Ecosystem (BEU)	Steep South Slope		Ridge		Floodplain	
Broad Ecosystem Phase	Shrub	Herb	Shrub	Coniferous	Shrub	Mixedwood
Ecosite	Willow/Sage	Fescue	Willow-Shrub Birch	White Spruce/Lichen	Willow-Alder/Horsetail	Riparian Poplar-White Spruce/Horsetail
Ecosite Phase	3b (tall shrub)	2a (gramminoid)	3b (tall shrub)	7 (old forest)	3b (tall shrub)	7 (old forest)

2.1 YUKON BIOCLIMATE ZONES

Bioclimate zones are areas that are relatively uniform in its macro climatic processes resulting in characteristic plant communities. Each bioclimate zone is characterized by the predominant vegetation community on reference sites where regional climate is the primary controlling factor of vegetation potential and ecosystem distribution, and other influences such as soils and terrain are secondary. Seven bioclimate zones are currently recognized in Yukon (Table 2).

Bioclimate zones result primarily from changes in elevation and/or latitude. Within each area of Yukon, a bioclimate zone has a characteristic range in elevation and corresponding temperature and precipitation conditions. In mountainous areas, bioclimate zone boundaries may be visible as relatively abrupt changes in general vegetation communities or species, and are organized along a gradient of elevation. In lower elevation or rolling terrain, bioclimate zone boundaries may be subtle and transitional. The boundary between two bioclimate zones occurs at lower elevations as latitude increases.

Table 2. Yukon bioclimate zones.

Bioclimate Zone	Code	Description
Boreal Bioclimate Zones (Southern and Central Yukon)		
Boreal Low	BOL	Forested areas at low to middle elevations, below the BOH of all mountain valley and plateau ecoregions of southern and central Yukon. Landscapes are generally wide valleys. Most major rivers and floodplains in southern and central Yukon are contained within the BOL. Fire disturbances are common.
Boreal High	BOH	Middle to upper elevations of forested areas in all mountain valley and plateau ecoregions of southern and central Yukon. Found above the BOL in large valleys. Characterized by steep slopes in the mountains of southern and gentle rolling plateaus in central Yukon. Fire disturbances are common.
Subalpine	SUB	Sparsely forested areas at middle to high elevations on steep slopes and rolling plateaus above the BOH. Subalpine areas form a transitional zone between forested Boreal and the higher elevation non-forested, Alpine bioclimate zones. Open canopy conifer forests (tree cover < 20%) and tall shrub communities are characteristic vegetation conditions. Subalpine fir or white spruce are the predominant tree species.
Taiga and Tundra Bioclimate Zones (Northern Yukon)		
Taiga Wooded	TAW	Coniferous or mixedwood forested areas with an open canopy in northern Yukon in areas of near continuous permafrost. TAW occurs in valley bottoms and lower slopes of mountain valleys, and in plateaus and plains. Slope position, aspect and the distribution and depth of permafrost are major influences on vegetation distribution and dynamics. Extensive areas of shrub in mountain valleys are common, and fire disturbances affect large areas.
Taiga Shrub	TAS	High elevation TAS replaces the term 'Subalpine' in northern Yukon. These areas are tall or low shrub-dominated, with sparse or sporadic tree cover. Plateaus and gentle ridges may contain extensive herb and dwarf shrub. TAS occurs at middle to high elevations in northern mountain systems.
Tundra	TUN	High latitude arctic tundra in northern Yukon above the arctic tree line in areas of continuous permafrost. Dwarf shrubs, tussock tundra, herb/cryptograms and low-growing scattered krummholtz coniferous trees are the predominant vegetation condition.
Alpine Bioclimate Zone (all of Yukon)		
Alpine	ALP	High elevations of all mountain ranges throughout Yukon. Dwarf shrubs, herb/cryptograms and low-growing and scattered krummholtz trees are the predominant vegetation condition. In very high elevation areas, bare rock, colluvium or ice/snow may be the dominant conditions.

2.2 BROAD ECOSYSTEMS

Broad ecosystems are intended to provide basic ecosystem information for regional land-use planning, wildlife management and environmental assessment. This level of the Yukon ELC Framework combines broad vegetation classes (formation level of Canadian National Vegetation Classification), generalized landforms, and bioclimate zones or subzones.

Broad ecosystems are designed to be mapped and interpreted at scales of 1:100,000 to 1:250,000. The broad ecosystem classification system is strongly linked to mapping considerations that can rapidly provide Yukon resource managers with useful products for large geographic areas. Broad ecosystems are typically mapped using predictive methods (predictive

ecosystem mapping—PEM) through the use of GIS, remotely sensed earthcover imagery and DEM analysis.

Broad ecosystem units (BEUs) are derived from combinations of earthcover, landform (topographic position index), and special feature/surficial materials mapping. Topographic position and special features/surficial materials are used to infer relative moisture regime (e.g., dry, moist and wet). Through the use of an edatopic grid, BEUs may be organized along a relative moisture gradient. Organizing broad ecosystems within an edatopic grid also provides a strong and ecologically-meaningful link to the more detailed and local-scale ecosite classification, allowing specific ecosites to be positioned within the broad ecosystem units.

While a standard suite of broad ecosystems exists for all of Yukon (i.e., a BEU may occur in more than one bioclimate zone), the bioclimate context in which a BEU occurs is required for accurate ecological interpretation. When broad ecosystems are located within a given bioclimate zone or subzone, they can be described with more certainty and within a narrower range of species/ecological conditions.

2.3 PREDICTIVE ECOSYSTEM MAPPING

Predictive Ecosystem Mapping (PEM) is a computer model-based approach to ecosystem mapping. Current mapping technologies make PEMs cost effective relative to manual interpretation, mapping and data capture. There will remain a need for larger scale manual mapping for many uses, such as project assessment or forestry site planning. However, for the purposes of regional planning, strategic environmental assessment, wildlife management, and other management applications that occur across broad geographic areas, large scale manual mapping is often too detailed and costly. For certain applications, a regional PEM is therefore a more appropriate ecological base map. It is also possible to map large areas using PEM methods, creating a single, consistent coverage at one point in time and at a uniform map scale—something that is often not possible with large-scale manual mapping.

While PEMs can be cost effective and efficient, it is important to recognize that PEM relies heavily on the availability and quality of input biophysical information. Important data sets utilized in this PEM project were:

- 16m digital elevation model (Environment Yukon);
- 1:50,000 scale CanVec base feature mapping (Natural Resources Canada, GeoGratis);
- 25m earthcover mapping derived from classified LANDSAT satellite imagery (Environment Yukon and Canadian Forest Service, EOSD);
- 1:50,000 scale Yukon Vegetation Inventory (Yukon Energy, Mines and Resources);
- Yukon Fire History maps (Yukon Wildfire Management); and
- various surficial geology mapping.

The resultant mapping from this PEM exercise is a 30m raster map, where each pixel, or cell, contains a code representing the predicted BEU (units are described in Section 4.2). A polygon coverage of bioclimate zones has also been created, based on a modified version of the bioclimate mapping completed by McKenna et al. (2010). Please refer to *Part 2: Methods and Assessment of Data Sources* of this report for detailed bioclimate and broad ecosystem mapping methods.

2.3.1 Methods

The general methods used in this PEM are described below. Figure 6 shows a generalized flow chart illustrating how broad ecosystem units were modeled as part of the PEM process. Detailed methods and inputs are described in *Part 2: Methods and Assessment of Data Sources* of this report.

1. Characterize regional landforms using a topographic position index based on the digital elevation model (Figure 7).
2. Create a regional earthcover map from classified LANDSAT imagery, Yukon Vegetation Inventory, Yukon Fire History mapping, and manually interpreted earthcover for missing data areas.
3. Create bioclimate and broad ecosystem classification concepts and rule sets for PEM model.
4. Create required slope and aspect models from digital elevation model.
5. Utilize surficial geology mapping, slope models and water features to identify floodplains.
6. Iteratively identify broad ecosystem units based on PEM methods.

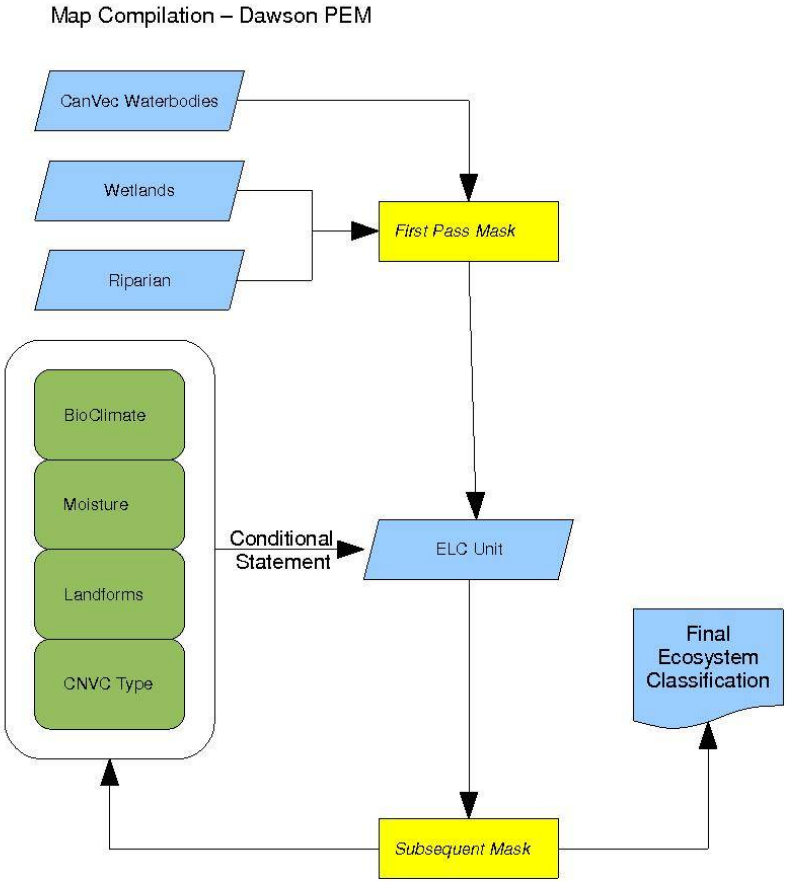


Figure 6. Generalized PEM methodology used for the Dawson region /west-central Yukon project.

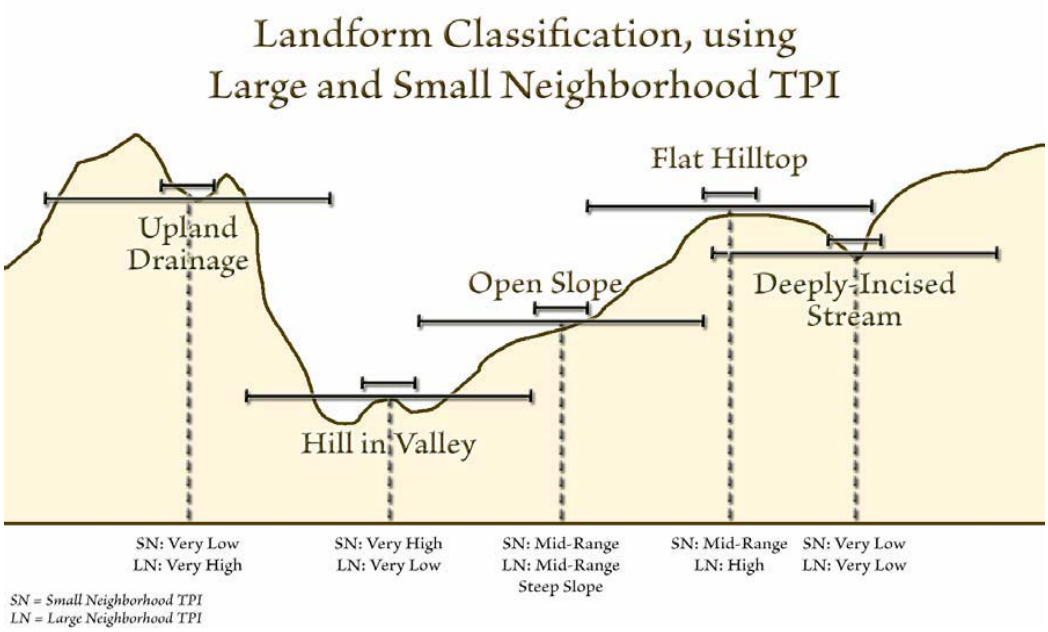


Figure 7. Landform classification using a large and small neighbourhood Topographic Positional Index (TPI). Source: Jenness (2006).

3. REGIONAL ECOSYSTEMS OF WEST-CENTRAL YUKON

3.1 BIOCLIMATE ZONES

West-central Yukon contains six of Yukon's bioclimate zones—only arctic tundra is not represented. Below is a table of a high-level summary of the six bioclimate zones (Table 3). The distribution and extent of bioclimate zones delineated for this project is shown in Figure 8 - a full description of each bioclimate zone follows.

Table 3. Bioclimate zone summary table for west-central Yukon project area.

Bioclimate Zone	Code	Description	Elevation Range (m)	Area (km^2)	Area (%)
Boreal Low	**BOL**	BOL is limited to the major river valleys (Yukon, Stewart, Pelly and White) and low-lying wetland ecosystems within the project area. This is the most productive area of the region.	<450 m	3,223 km^2	4%
Boreal High	**BOH**	BOH is the largest bioclimate zone in the project area, occurring in all mountain valleys and plateaus of the Boreal Cordillera. Large areas of shrub and deciduous forest result from frequent wildfires.	450 – 1,100 m	33,697 km^2	40%
Subalpine	**SUB**	SUB occurs at high elevations of the Boreal Cordillera (southern) portion of project area. Sparse coniferous forests and shrub vegetation characterize the SUB	1,100 – 1,500 m	5,707 km^2	7%
Taiga Wooded	**TAW**	TAW covers the low and middle elevations of the Taiga Cordillera. Extensive shrub areas may also occur as a result of wildfire or cold air drainage/frost pockets/poor drainage.	<800 m	23,817 km^2	28%
Taiga Shrub	**TAS**	TAS covers the high elevation shrub and sparsely forested areas in the mountains and plateaus of the Taiga Cordillera.	880 – 1,200 m	13,988 km^2	16%
Alpine	**ALP**	The non-forested ALP is found throughout the highest elevations of the project area, but is most prominent in the Ogilvie Mountains.	>1,500 m (Boreal) >1,200 m (Taiga)	4,649 km^2	5%

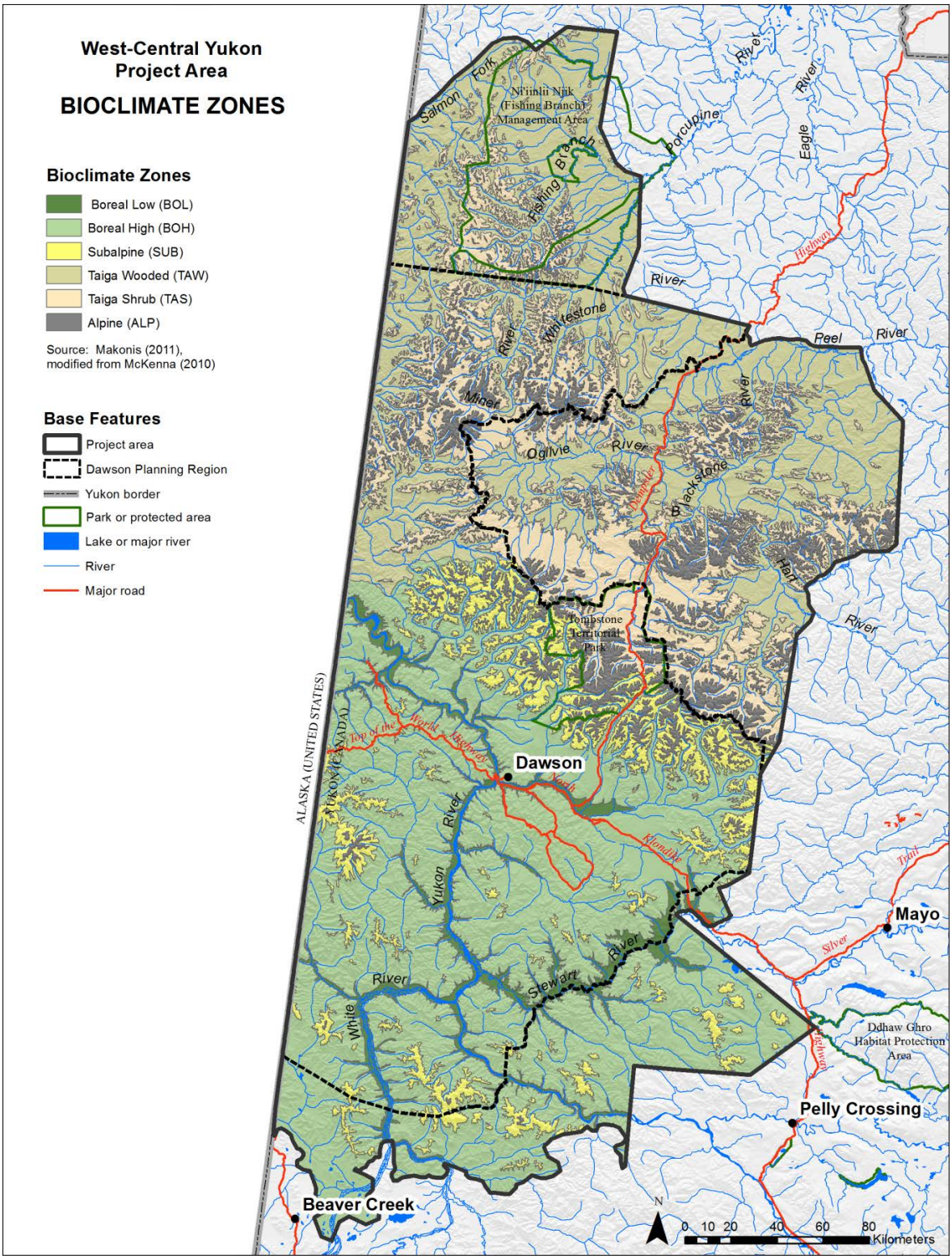


Figure 8. Distribution of bioclimate zones in west-central Yukon project area.

3.1.1 Boreal Low (BOL)

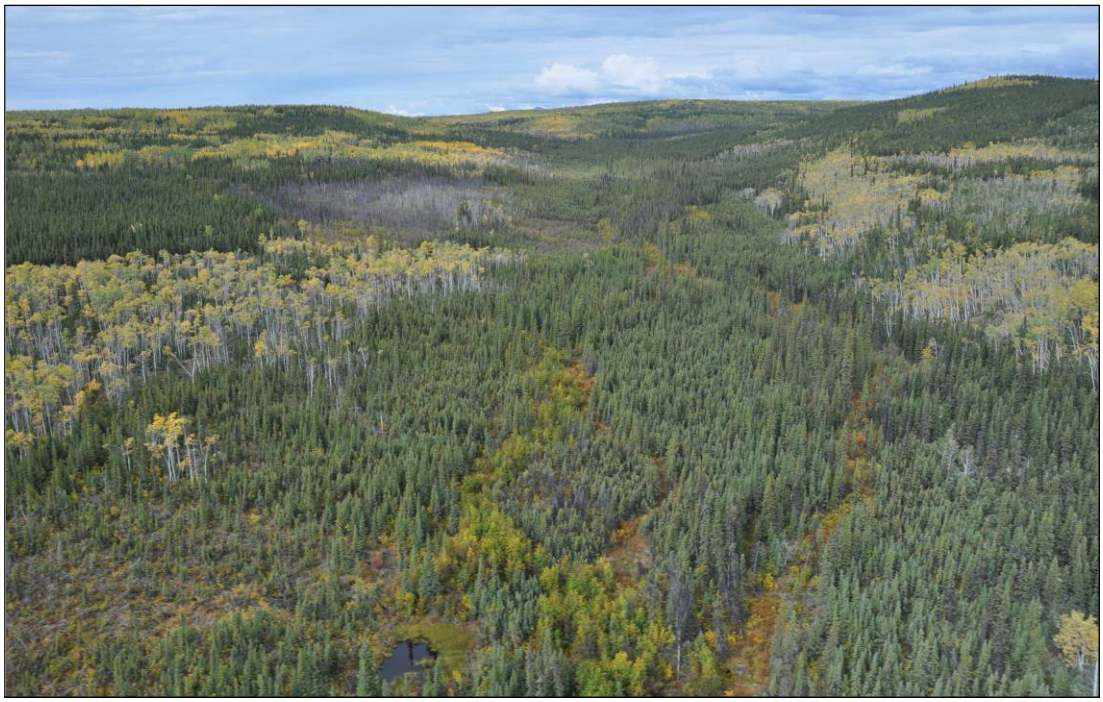
Description

The BOL covers 4% (322,309 ha) of the total project area. It is confined to a narrow elevation band below 450 m along the valley bottoms and lower slopes of major river corridors in the southern (Boreal Cordillera) portion of the project area (Figure 8). Lower slopes and riparian ecosystems, such as those pictured above, along the Sixty Mile River in the Klondike Plateau Ecoregion, characterise the BOL in west-central Yukon. This bioclimate zone contains the most productive forests in the project area. Wetlands in the floodplain and on adjacent lower slopes are common.

Riparian and upland forests are composed of typical boreal tree species. White spruce (*Picea glauca*) is dominant, found on both floodplain and upland sites. Black spruce (*Picea mariana*) is found in flat, poorly drained areas and in wetlands. Deciduous species include aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), and birch (*Betula neoalaskana*), with aspen generally restricted to drier sites, often in association with steeply sloping, warm aspect grasslands occurring on steep river banks. On moist upland sites, balsam poplar may be successional to white spruce. Lodgepole pine (*Pinus contorta*) is generally absent or only occurs infrequently in the southeastern corner of the project area, usually as mid-successional species to white spruce.

Fire frequency is generally lower in the BOL than the surrounding BOH bioclimate zones, resulting in a higher proportion of mature coniferous forest. This, associated with the generally higher productivity of the floodplain forests and surrounding upland sites, results in this zone being an important area for many wildlife species.

3.1.2 Boreal High (BOH)



Description

Within west-central Yukon, the BOH is the most extensive bioclimate zone, accounting for 40% (3,369,748 ha) of the total project area. The BOH is found between the BOL and the SUB ranging from 450 m – 1,100 m in the southern (Boreal Cordillera) portion of the project area. Most of the BOH is within the Klondike Plateau Ecoregion (Figure 8). The Ogilvie Mountains, in the vicinity of Tombstone Territorial Park, form the northern extent of the BOH. As pictured above, the BOH is characterised by upland rolling terrain dissected by wet drainages with wetlands at the base of slopes.

Given the very long time most of the BOH has remained unglaciated, the rolling plateau country is dissected by numerous small streams with thick deposits of gravels and sediments in valley bottoms. Extensive permafrost creates poor drainage on most gently sloping and level sites, and on north-facing aspects. In the dissected terrain, a pattern of alternating south-facing and north-facing slopes is readily visible, with south-facing slopes being warmer, permafrost-free and better drained, supporting a higher proportion of deciduous forests. Some of these deciduous forests may remain relatively stable (i.e. not succeed to conifer). On steep south-facing slopes, grasslands interspersed with aspen (*Populus tremuloides*) groves are common. This pattern is especially evident on the Klondike Plateau.

White spruce (*Picea glauca*) is the dominant tree species on moist to dry sites, with extensive areas of post-burn shrub, aspen and mixedwood forests. Black spruce (*Picea mariana*) is common in wetter areas. Lodgepole pine (*Pinus contorta*) is generally absent or only occurs infrequently in the southeastern corner of the project area (Yukon Plateau-Central) and is usually an early or mid-successional species to white spruce.

The BOH bioclimate zone has the highest fire return interval in the west-central Yukon project area, and some of the highest recorded levels of historical fire activity in Yukon (Figure 5). Since the 1950s, approximate 50% (1,690,000 ha) of the BOH has been affected by fire. In the 2004 fire season alone, almost 15% of the Klondike Plateau was burned. This high level of fire activity has resulted in extensive areas of shrub, deciduous and young coniferous forests throughout the BOH.

3.1.3 Subalpine (SUB)

Description

The SUB is a transitional bioclimate zone occurring at high elevations above the BOH and below the ALP bioclimate zones in the southern (Boreal Cordillera) portion of the project area. In west-central Yukon, the SUB ranges between 1,100 m and 1,500 m in elevation. The SUB bioclimate zone covers 7% (570,721 ha) of west-central Yukon, and is most extensive in the South Ogilvie Mountains around Tombstone Territorial Park. Smaller areas occur on the peaks of low, rolling mountains and plateaus of the Klondike Plateau (Figure 8).

The SUB is characterised by medium to tall shrub communities of willows (*Salix spp*.) and shrub birch, *Betula glandulos*a with some water birth (*B. occidentalis*), exposed rock and scree, and low shrub and herb communities with scattered coniferous trees. At this latitude, white spruce (*Picea glauca*) replaces subalpine fir (*Abies lasiocarpa*) as the high elevation tree species. Deciduous trees are generally absent from the SUB.

Unlike the lower elevation forested bioclimate zones of west-central Yukon, fire is not a major driver of the ecology of the SUB. High elevations, steep topography and the limited extent of forests, combined with moist conditions, limit major fire activity.

3.1.4 Taiga Wooded (TAW)

Description

The TAW bioclimate zone occurs in the lowest elevations (below 880 m) of the northern portion (Taiga Cordillera) of the project area. In this area, the TAW covers the river valleys, side slopes and broad plateaus of the North Ogilvie Mountains Ecoregion (Figure 8). Covering 28% (2,381,662 ha), the TAW is the second largest bioclimate zone in the project area.

Taiga forests are the northernmost extent of the boreal forest, differing from the more southern BOH by being in the continuous permafrost zone. Taiga forests are dominated by black spruce (*Picea mariana*), although better drained sites and riparian areas contain white spruce (*Picea glauca*). Tamarack (*Larix laricina*) occurs on wet sites in the northeast of the project area. On level or gently sloping sites with very poor drainage, or in frost pockets and valleys with cold air drainage, extensive areas of wet herb and shrub are common, creating almost arctic tundra-like conditions.

Based on historical fire mapping (Figure 5), fire does not appear to be as important a driver of the ecology of the TAW bioclimate zone in the Ogilvie Mountains, as compared to the southern BOH bioclimate zone. The mountainous terrain and moist conditions are not conducive to large fires, unlike the largely forested conditions and rolling topography of Eagle Plains. In the Eagle Plains ecoregion, also in the TAW bioclimate zone, approximately 0.5 million ha burnt in the 2004 fire season alone.

3.1.5 Taiga Shrub (TAS)

Description

The TAS bioclimate zone occurs at high elevations (880 m – 1,200 m) in the northern portion (Taiga Cordillera) of the project area. The TAS is a broad transition zone between the lower elevation TAW and higher elevation ALP. It occurs on steep side slopes of mountains and across high elevation, broad gently-sloping plateaus in the North Ogilvie Mountains ecoregion (Figure 8). The TAS is the third largest bioclimate zone in the west-central project area, covering 16% (1,398,794 ha).

This subarctic bioclimate zone is characterised by sparse black spruce (*Picea mariana*) and white spruce (*Picea glauca*) forests at lower elevations, transitioning to tall and medium shrub communities dominated by shrub birch (*Betula glandulosa*) and willow (*Salix spp*.) at higher elevations. Sparsely vegetated and low shrub-herb communities are common on ridges and steep slopes with shallow soils and colluvium. Bedrock exposures are common.

Much of TAS in the Southern Ogilvie Mountains was affected by Cordilleran glaciations over the past 3 million years, including the most recent McConnell glaciation (Figure 3). In areas that have remained unglaciated for long periods of time (Pre-Reid glacial phase or older), tors and spires along mountain ridges and steep slopes are common, as pictured above. Throughout the TAS, particularly on calcareous soils, plants such as hairy scorpion weed (*Phacelia molis*) are found which have distributions related to Beringia.

Given the high elevations and rugged topography, fire is not a major driver of the ecology of the TAS, although fires in the lower elevation TAW do burn into the TAS. Only 167 ha of direct human footprint has been mapped within the TAS portion of west-central Yukon.

3.1.6 Alpine (ALP)

Description

The ALP bioclimate zone is found at the highest elevations throughout west-central Yukon. In the southern portion (Boreal Cordillera) of the project area the ALP occurs above elevations of 1,500 m, while in the northern portion (Taiga Cordillera) ALP generally occurs above 1,200 m. The ALP bioclimate zone covers 5% (464,864 ha) of the west-central project area, but is most extensive in the Northern and Southern Ogilvie Mountains (Figure 8), where it is characterised by considerable bare rock, exposed colluvium and sparse low stature shrubs and forbs. In lower elevation areas, and in more subdued relief, as pictured above on the Klondike Plateau, ridges and steep slopes covered with lichen and alpine shrubs and forbs are common.

Alpine plants common throughout the high elevations of Yukon are found here, as are rare plants endemic to the area, such as Ogilvie Range Draba (*Draba ogilviensis*) and Yukon podistera (*Podistera yukonensis*) (Kennedy and Smith 1999). Moist and wet sites account for less than 20% of the total ALP bioclimate zone, and are restricted to steep gulleys, small depressions in bedrock and steep north-facing slopes. On all moist and wet sites, herb and low shrub vegetation phases are dominant. Late-lying snow patches and small cirque lakes (tarns) are also associated with moist and wet sites. Scattered krummholz spruce trees (*Picea glauca*) may also be associated with moist draws in sheltered areas.

Open water (BEU type 400) covers almost 3% (12,335 ha) of the ALP, generally as isolated cirque lakes. Wetlands (BEU type 310) and floodplains (BEU types 370/380/390) are generally absent from the ALP bioclimate zone.

3.2 BROAD ECOSYSTEM UNITS

Eleven broad ecosystem types are recognized in west-central Yukon. Broad ecosystem units are organized by group, type and phase (Table 4). BEU types are described by landform and/or topographic position (Figure 9), and represent the stable sites upon which vegetation grows. BEU phase describes the general vegetation condition occurring on a BEU type, either herb-bryoid, shrub, deciduous, mixedwood or coniferous. BEU types are grouped into three relative soil moisture groups—dry, moist or wet—and may be organized within an edaptopic grid according to relative soil moisture and nutrient regime conditions (Figure 10). The use of an edatopic grid illustrates the ecological position of BEU types relative to other units—it does not infer absolute soil moisture or nutrient regime status.

BEU mapping, themed by BEU type and BEU phase, is shown in Figure 11 and Figure 12, respectively. Each unit is described in Section 3.2.2, below.

Table 4. Broad ecosystems of west-central Yukon.

Group		Type *	Phase *
DRY	**UPLAND Ecosystems (100)**	Rock (700)	Not applicable
		Ridge (110)	Ridge – Herb-Bryoid (111) Ridge – Shrub (112) Ridge – Deciduous (113) Ridge – Mixedwood (114) Ridge – Coniferous (115)
		Steep South-Facing Slope (120)	Steep South-Facing Slope – Herb-Bryoid (121) Steep South-Facing Slope – Shrub (122) Steep South-Facing Slope – Deciduous (123) Steep South-Facing Slope – Mixedwood (124) Steep South-Facing Slope – Coniferous (125)
		Upper Slope (130)	Upper Slope – Herb-Bryoid (131) Upper Slope – Shrub (132) Upper Slope – Deciduous (133) Upper Slope – Mixed-wood (134) Upper Slope – Coniferous (135)
MOIST		Gentle Slope and Plain (140)	Gentle Slope – Herb-Bryoid (141) Gentle Slope – Shrub (142) Gentle Slope – Deciduous (143) Gentle Slope – Mixedwood (144) Gentle Slope – Coniferous (145)
		Steep North-Facing Slope (150)	Steep North-Facing Slope – Herb-Bryoid (151) Steep North-Facing Slope – Shrub (152) Steep North-Facing Slope – Deciduous (153) Steep North-Facing Slope – Mixedwood (154) Steep North-Facing Slope – Coniferous (155)
WET		Drainage and Depression (160)	Drainage and Depression – Herb-Bryoid (161) Drainage and Depression – Shrub (162) Drainage and Depression – Deciduous (163) Drainage and Depression – Mixedwood (164) Drainage and Depression – Coniferous (165)
	WETLAND Ecosystems (300)	Wetland (310)	Wetland – Herb-Bryoid (311) Wetland – Shrub (312) Wetland – Treed (315)
		Floodplain (370/380/390)	<u>High Flood Frequency (370)</u>: • Floodplain – Gravel Bar-Herb-Bryoid (371) • Floodplain – Shrub (372) <u>Moderate Flood Frequency (380)</u>: • Floodplain – Deciduous (383) • Floodplain – Mixedwood (384) <u>Low Flood Frequency (390)</u>: • Floodplain – Coniferous (395)
	WATER and ICE (400)		Water (401) Ice (Glacier) (403)
OTHER	**DISTURBANCE (500)**		Natural Disturbances (501) Anthropogenic Disturbances (502) Minesite Disturbances (503)

* Note: each BEU type and phase may occur in different bioclimate zones. At this time, unique codes for each BEU within different bioclimate zones have not been developed.

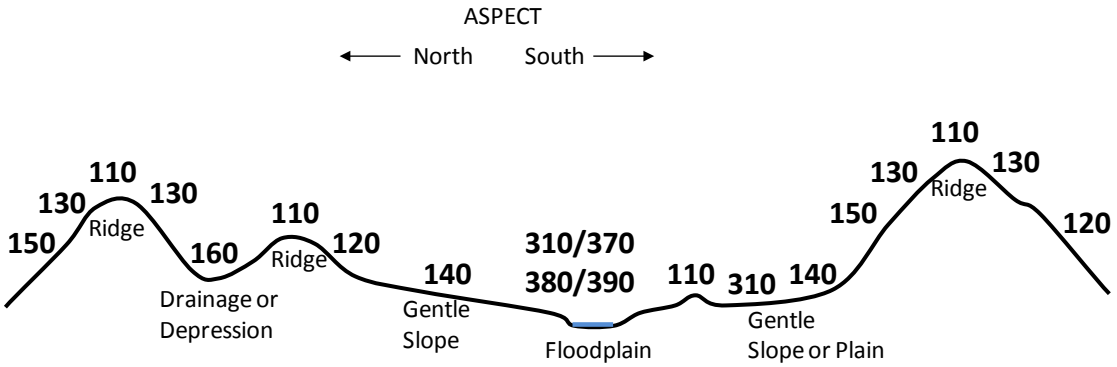


Figure 9. General topographic positions for broad ecosystem unit types of west-central Yukon. See Table 4 for BEU type codes.

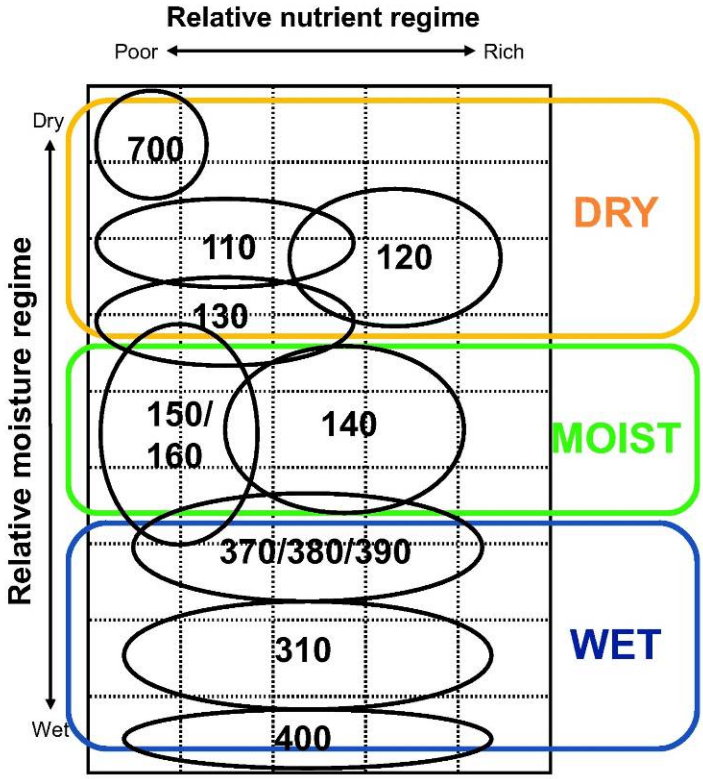


Figure 10. West-central Yukon BEU types organized within an edatopic grid. See Table 4 for BEU type codes.

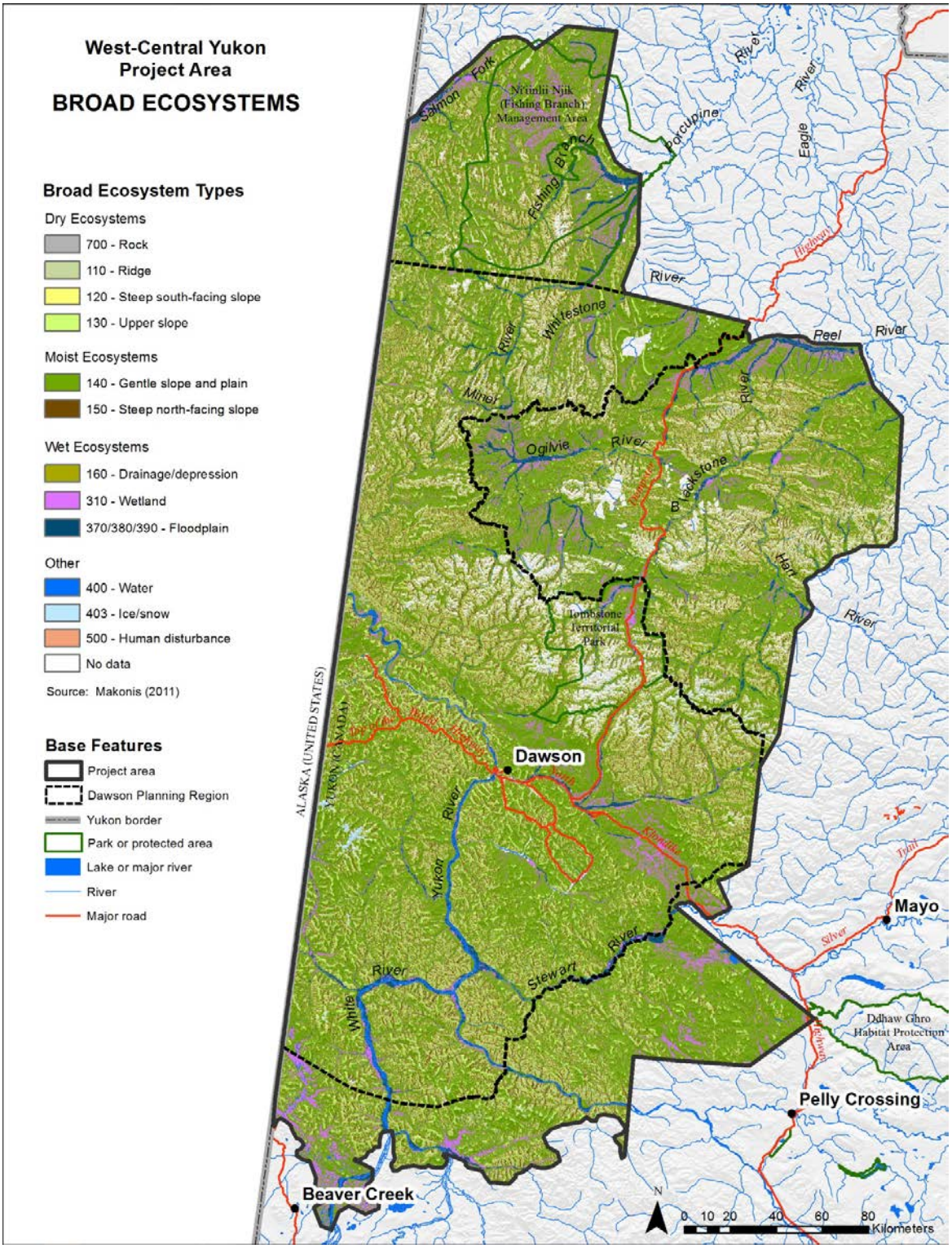


Figure 11. Distribution of BEU types, organized by moisture group, in west-central Yukon.

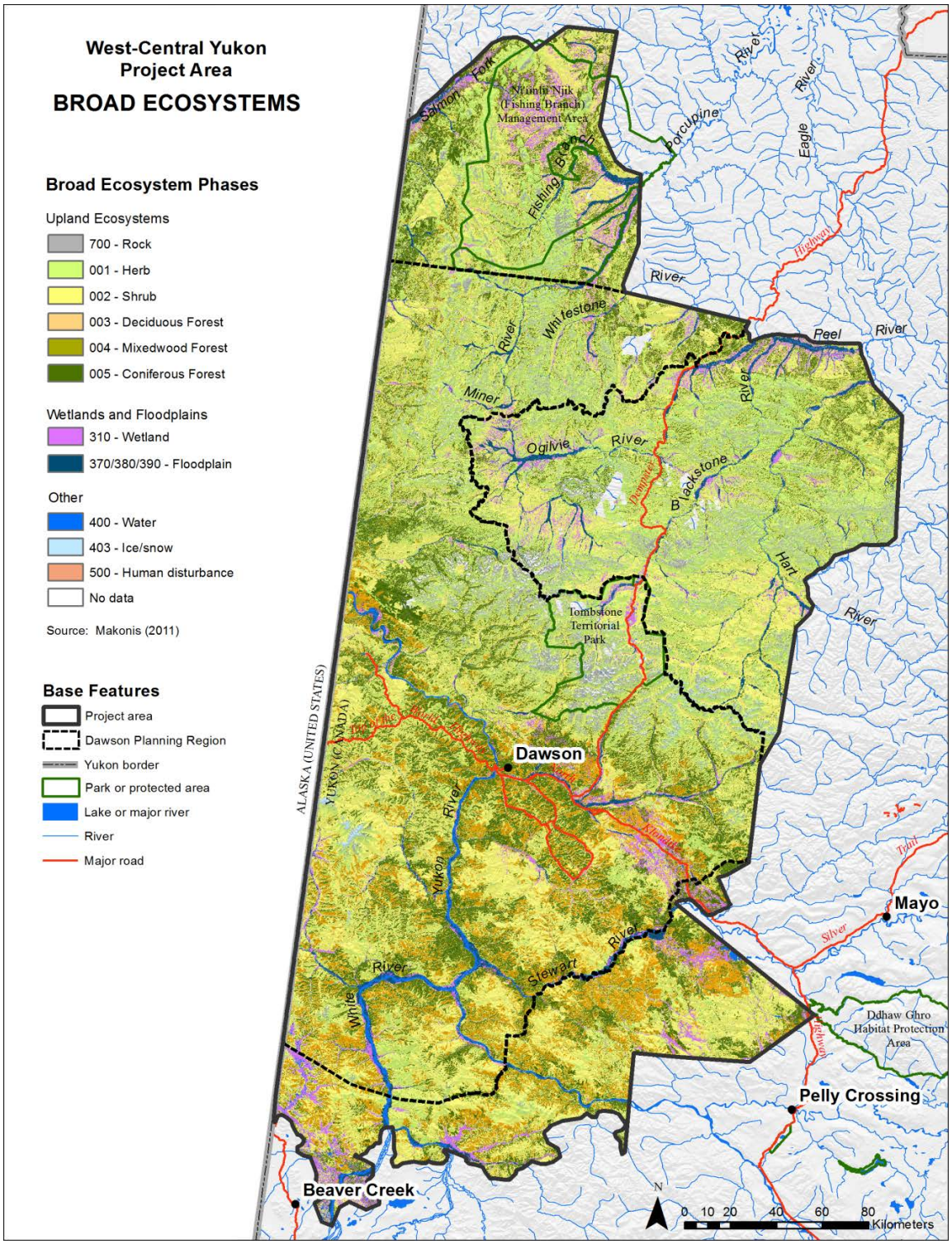


Figure 12. Distribution of west-central Yukon BEU phases, organized by upland, wetland/floodplain, and other.

3.2.1 Broad Ecosystem Units and Bioclimate Zones

Broad ecosystems are intended to be interpreted within the context of bioclimate zones. Each BEU type may occur in more than one bioclimate zone, and each type may have different phases, based on the current general vegetation condition. Some vegetation phases are considered successional, while others may be relatively stable.

This system allows new units and concepts to be adapted and changed over time, as information improves. However, such a system can also result in a very large number of BEU and bioclimate zone combinations (e.g. BEU 145 may occur in any of the BOL, BOH, TAW, SUB or TAS bioclimate zones).

Given the predictive methods and regional nature of this project, at this time unique codes for BEUs occurring in different bioclimate zones have not been developed. If required, unique codes can be generated by combining the bioclimate zone and broad ecosystem PEM mapping through GIS methods. In the unit descriptions, where ecological differences are known to occur between bioclimate zones, BEUs have been organized based on 'high elevation' and 'low-middle elevation' concepts. Generally, 'high elevation' units occur in the ALP, SUB or TAS bioclimate zones, while low-middle elevation units occur in BOL, BOH and TAW.

In the low-middle elevation bioclimate zones (BOH, BOL and TAW), following a forest disturbance such as wildfire, moist sites generally trend towards a forested condition. Herbaceous, shrub, deciduous, mixedwood and coniferous forest vegetation may all be present on a BEU type. These different 'phases' of vegetation may therefore represent general stages of vegetation succession on relatively stable site conditions. However, permafrost, cold air drainage and other conditions may change this pattern, with herb or shrub phases becoming relatively stable—a common condition in the Ogilvie Mountains. BEU phases occurring in high elevation bioclimate zones (ALP, SUB and TAS) tend to be more stable successionally.

The typical broad ecosystem units encountered in each of the bioclimate zones are described below.

3.2.1.1 Broad Ecosystem Units of the Boreal Low (BOL) Bioclimate Zone

Much of the open water, floodplains and wetlands within the west-central project area occur in the BOL bioclimate zone. River floodplains composed of gravel bars and herb (BEU 371), shrub (BEU 372) and deciduous, mixedwood and coniferous forests (BEUs 383, 384 and 395, respectively) together account for 15% (47,875 ha) of the BOL. Wetlands, both within and outside of the floodplain, cover an additional 13% (40,200 ha). Open water, primarily as large rivers, covers an additional 17% (51,050 ha) of the BOL.

While broad river floodplains and river channels cover much of the BOL, shrub (16%), deciduous forest (6%) and coniferous forest (17%) on moist upland sites (BEU type 140 - gentle slopes and plains) combine to cover 42% (135,181 ha) of the BOL. Approximately 2% (5,600 ha) of the BOL is affected by direct human footprint (BEU type 500).

3.2.1.2 Broad Ecosystem Units of the Boreal High (BOH) Bioclimate Zone

The most commonly occurring broad ecosystems type is BEU type 140 - gentle slopes and plains, which covers 53% (1,784,604 ha) of the BOH. Shrub (BEU 142) is found on approximately half of these sites (871,837 ha). Given the vigorous fire regime of the Klondike Plateau, most of these shrub areas are assumed to be post-fire successional phases of coniferous forest. Coniferous forest (BEU 145) is found on 25% of the moist sites, with deciduous forest (BEU 143) adding an additional 17%.

Ridges (BEU type 110), common features in the unglaciated terrain of the Klondike Plateau, are the next most common broad ecosystem, covering 11% (375,128 ha) of the BOH. All vegetation phases are present on ridges. Steep north-facing slopes (BEU type 150) are also well represented, covering an additional 9% (318,184 ha). Steep south-facing slopes (BEU type 120) and upper slopes (BEU type 130) account for most of the remaining BOH. On these sites, with the exception of steep north-facing slopes, where coniferous forest (BEU 155) is dominant, shrub is the most commonly occurring vegetation phase.

Wetlands (BEU type 310) cover 146,808 ha of the BOH, a much larger area than contained in the BOL. Proportionally, however, this represents only 4% of this large bioclimate zone. Floodplains (BEU types 370/380/390) cover less than 1% (30,895 ha) of the BOH, a smaller area than contained within the BOL. Less than 1% (10,702 ha) of the BOH is directly affected by human footprint (BEU type 500), an area approximately twice as large as in the BOL. Most human features are mine and transportation footprints.

3.2.1.3 Broad Ecosystem Units of the Subalpine (SUB) Bioclimate Zone

The dominant broad ecosystem phases are herb (BEU 141, 9% or 51,314 ha) and shrub (BEU 142, 18% or 101,289 ha) occurring on moist gentle slopes (BEU type 140). At 3% (16,093 ha), the highest proportion of conifer forest (BEU 145) in the SUB also occurs on these moist sites.

High elevation, mountainous terrain results in dry ecosystems forming a major component of the SUB. Ridges (BEU type 110, 17% or 98,081 ha), steep south-facing slopes (BEU type 120, 9% or 52,146 ha) and upper slopes (BEU type 130, 15% or 84,644 ha) combined cover 41% of the SUB. On these three dry ecosystem units, herb and shrub are the dominant vegetation phases. Rock (BEU 700) contributes an additional 9% (53,075 ha) to the dry ecosystem group. Combined, dry ecosystems comprise 50% of the SUB.

Moist - wet sites occurring on steep north-facing slopes (BEU type 150) and in drainages and depressions (BEU type 160) account for 10% (56,418 ha) and 6% (36,807 ha) of the SUB, respectively. While herb and shrub vegetation phases are also the dominant vegetation on these sites, a high proportion (16,032 ha) of the conifer forests in the SUB occur on steep north-facing slopes (BEU 155).

Wetlands (BEU type 310), floodplains (BEU types 370/380/390) and open water (BEU type 400) are not major broad ecosystems within the SUB. Most water features are high gradient ephemeral streams or moist seeps that form headwaters for lower elevation rivers. Open water accounts for 4,000 ha (less than 1%) of the SUB.

3.2.1.4 Broad Ecosystem Units of the Taiga Wooded (TAW) Bioclimate Zone

Gentle slopes and plains (BEU type 140) is the dominant broad ecosystem in the TAW bioclimate zone. In the broad plateaus and valley bottoms of the North Ogilvie Mountains, BEU type 140 covers 59% (1,412,251 ha) of the TAW, with herb (BEU 141), at 12% (305,340 ha), shrub (BEU 142) at 32% (759,373 ha) and coniferous (BEU 145) at 14% (339,078 ha) comprising the vegetation phases of the unit. Given that most of the TAW within the project area has not experienced extensive burns in the past 50 years (Figure 5), many of the moist herb (BEU 141) and moist shrub (142) communities may be relatively stable vegetation communities (i.e. are not successional to coniferous forest).

Dry ecosystems cover 15% of the TAW, with ridges (BEU type 110) and steep south-facing slopes having the largest area (7% (160,568 ha) and 5% (122,010 ha), respectively). For both types, herb and shrub vegetation phases are the most common.

Floodplain ecosystems are an important component of the TAW bioclimate zone in west-central Yukon. Several major rivers flow through the TAW, including the Whitestone, Miner, Fishing Branch, Salmon Fork, Ogilvie, Blackstone, and Hart. Given this, a large portion of the TAW is covered with wetlands (BEU type 310) (8%, 184,428 ha) and floodplain ecosystems (BEU types 370/380/390) (5%, 130,385 ha). The TAW contains a similar area of wetlands as the BOH, but more than four times the area of floodplains as contained in either the BOH or BOL.

3.2.1.5 Broad Ecosystem Units of the Taiga Shrub (TAS) Bioclimate Zone

The dominant broad ecosystem type within the TAS is moist gently-sloping sites (BEU type 140) which cover 38% (534,913 ha) of the bioclimate zone. On these sites, herb (BEU 141) and shrub (142) are the primary vegetation phases, occurring on 95% of the BEU type 140 sites. Moist herb (BEU 141) covers 17% (240,581 ha) of the total project area, with moist shrub (BEU 142) accounting for an additional 19% (261,463 ha). These sites also have the highest amount (30,190 ha) of coniferous forest in the TAS, accounting for 40% of total treed area.

In steep, rugged terrain, dry ecosystems also comprise a large proportion of the total TAS bioclimate zone. Ridges, steep south-facing slopes and upper slopes cover 28% (403,218 ha) of the TAS. On these dry sites, herb and shrub vegetation phases cover most of the area. At 142,878 ha, the ridge herb unit (BEU 111) is the dominant dry ecosystem, representing 10% of the TAS. Steep south-slope herb (BEU 121) and upper slope herb (BEU 131) cover an additional 10% of the bioclimate zone. On vegetated dry ecosystems, most shrub communities are of low to medium stature. Rock (BEU 700) covers 9% (131,916 ha) of the TAS.

Wetter sites, steep north-facing slopes (BEU type 150) along with drainages and depressions (BEU type 160), account for 18% (245,903 ha) of the TAS. These wetter sites occur in steep gulleys and depressions between drier slopes and ridges. Herb and shrub communities cover the majority of the area on both sites, with a large component of the total treed area occurring on north-facing slopes. Late-lying snow patches and ephemeral wet areas are common, resulting in distinct herb and shrub vegetation communities when compared with dry ecosystems.

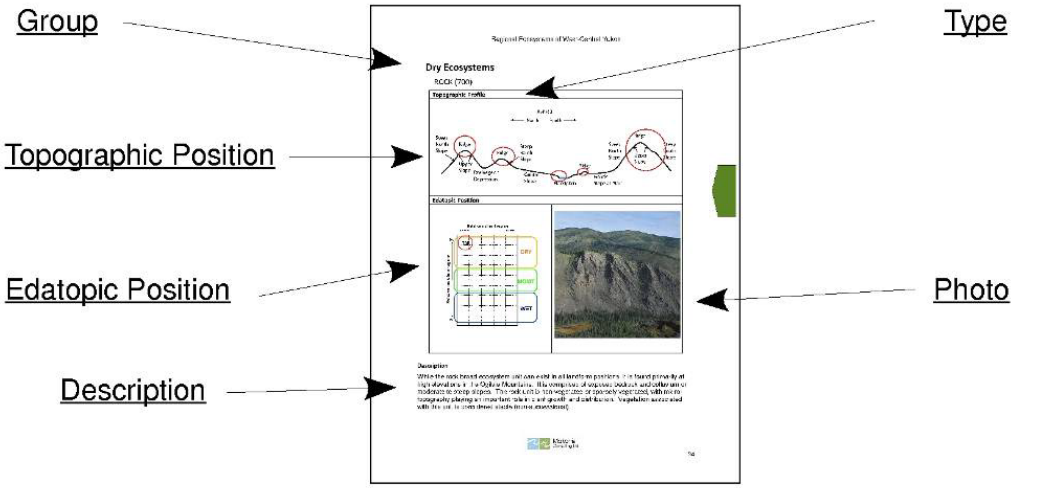
Wet ecosystems are a small but important part of the ecology of the TAS bioclimate zone. On broad, gently-sloping and level areas, scattered wetlands (BEU type 310) are relatively common, accounting for 3% (39,226 ha) of the total TAS. Herb and shrub wetlands (BEU 311 and 312, respectively), are the dominant wetland phases, with tussock vegetation common. Shrub and herb floodplains (BEUs 371 and 372, respectively) cover approximately 1% of the total TAS. As with wetlands, these systems occur on gently-sloping or level areas. Open water accounts for less than 1% of the TAS.

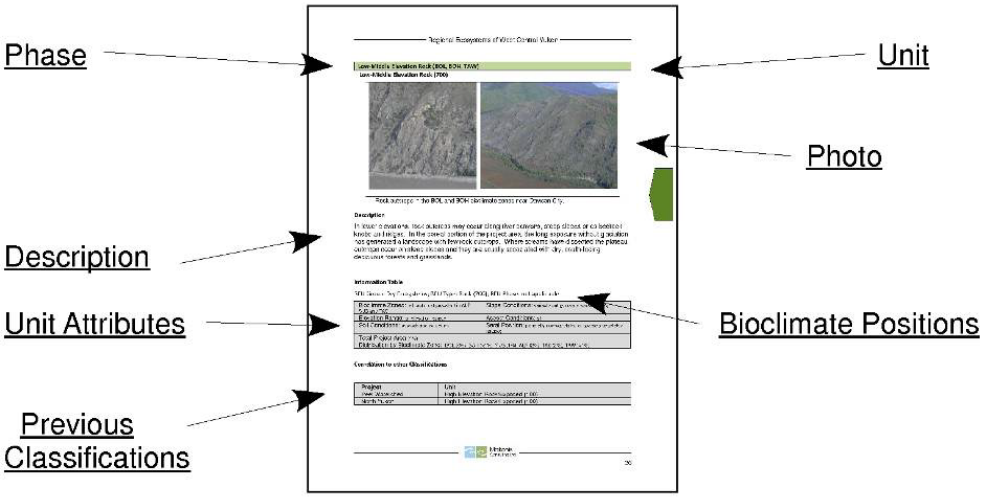
3.2.1.6 Broad Ecoosystem Units of the Alpine (ALP) Bioclimate Zone

Dry ecosystems (rock, ridges, upper slopes, and steep south-facing slopes) are the dominant broad ecosystems within the ALP. Rock (BEU 700) accounts for 33% (151,271 ha) of the total ALP area, with herb ridges (BEU 111) covering an additional 23% (106,232). The ALP of the Taiga Cordillera contains a higher proportion of exposed rock than the Boreal Cordillera ALP. Steep south-facing slope herb (BEU 121) and upper slope herb (BEU 131) cover an additional 5% (25,332 ha) and 11% (48,844 ha), respectively, of the ALP.

3.2.2 Unit Descriptions

Broad ecosystem unit descriptions are displayed in the following manner. With the exception of water and disturbed areas, most BEUs are organized based on the concept of high elevation units, which generally correspond to the ALP, SUB and TAS bioclimate zones, and low-middle elevation units, which occur in the BOL, BOH and TAW bioclimate zones. At this time, unique codes for BEUs occurring in different bioclimate zones have not been developed. In some situations, similar units have been described together (e.g., gentle slope – deciduous (BEU 143) and gentle slope – mixedwood (BEU 144) are described on the same page). However, without additional field verification, each BEU phase should be considered a unique unit, as listed in Table 4.

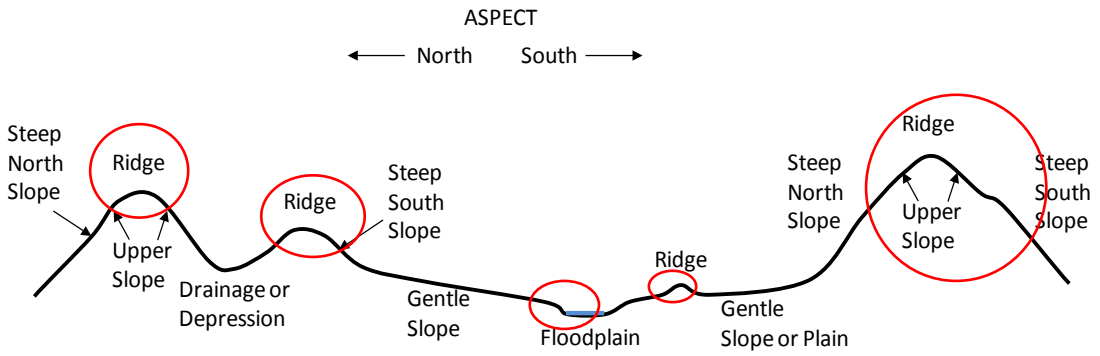




Dry Ecosystems

ROCK (700)

Topographic Profile



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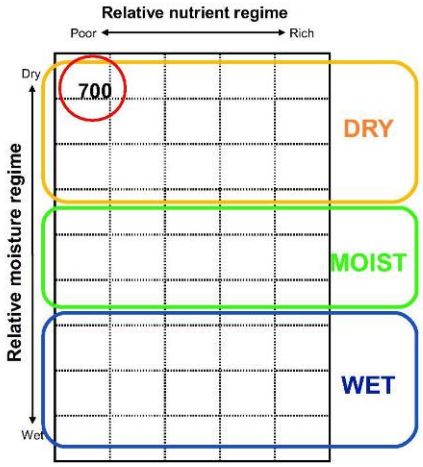


Description

While the rock broad ecosystem unit can exist in all landform positions, it is found primarily at high elevations in the Ogilvie Mountains. It is comprised of exposed bedrock and colluvium on moderate to steep slopes. The rock unit is non-vegetated or sparsely vegetated, with micro-topography and bedrock geology playing an important role in plant growth and distribution. Vegetation associated with this unit is considered stable (non-successional).

High Elevation Rock (ALP, SUB, TAS)

High Elevation Rock (700)

Syenite bedrock in the ALP bioclimate zone in the Tombstone Range.

Description

This unit is most common in the Ogilvie Mountains, and includes granitic rocks, such as the syenite of Antimony Mountain in the Tombstone Range (as shown above); tors, rock outcrops formed by erosion of less resistant surrounding rocks on Rake and Angelcomb mountains in the South Ogilvie Mountains; and extensive exposure of sedimentary rock in the North Ogilvie Mountains. Plants, including *Silene acaulis*, *Draba corymbosa*, a number of *Papaver* spp., and Beringian endemics, such as *Phlox alaskensis,* along with lichen and mosses, are found in moist pockets and seeps. Shales and mudstones weather to fine material that hold moisture and support growth of vegetation, so these rock types only tend to be exposed on steep slopes.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Rock (700); BEU Phase: not applicable

Bioclimate Zones: most prevalent in ALP and TAS	Slope Conditions: variable but generally steep (>35%)
Elevation Range: all elevation ranges	Aspect Conditions: all
Soil Conditions: bedrock and colluvium	Seral Position: generally non-vegetated or sparsely vegetated (stable)
Total Project Area: 3% Distribution by Bioclimate Zone: SUB (1%), ALP (2%), TAS (2%)	

Correlation to other Classifications

Project	Unit
Peel Watershed	High Elevation Rock/Exposed (100)
North Yukon	High Elevation Rock/Exposed (100)

Low-Middle Elevation Rock (BOL, BOH, TAW)

Low-Middle Elevation Rock (700)

Rock outcrop along the Yukon River in the BOL bioclimate zone near Dawson City.

Description

In lower elevations, rock outcrops occur along river canyons, steep slopes or as bedrock knobs and ridges. In the boreal portion of the project area, the long exposure without glaciation has generated a landscape with relatively few rock outcrops. Where streams have dissected the plateau, outcrops occur on steep slopes and they are usually associated with dry, south-facing slopes dominated by deciduous forests and grasslands.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Rock (700); BEU Phase: not applicable

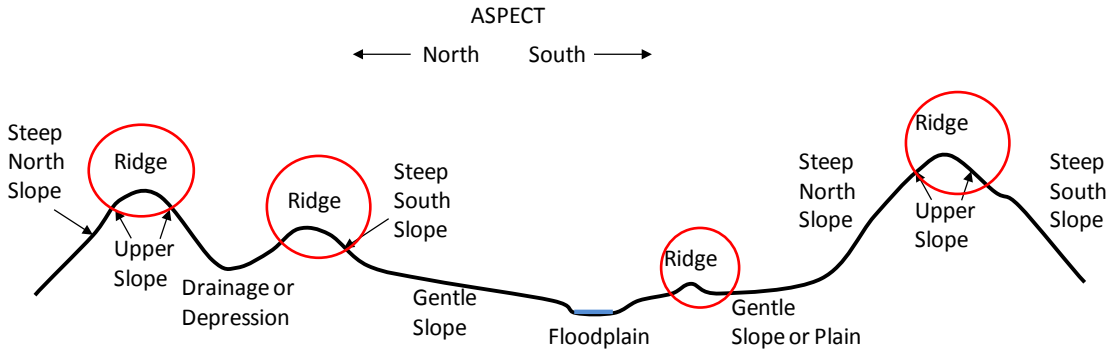
Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: variable but generally steep (>35%)
Elevation Range: all elevation ranges	Aspect Conditions: all
Soil Conditions: bedrock and colluvium	Seral Position: generally non-vegetated or sparsely vegetated (stable)
Total Project Area: 1% Distribution by Bioclimate Zone: BOL (0%), BOH (<1%), TAW (<1%)	

Correlation to other Classifications

Project	Unit
Peel Watershed	High Elevation Rock/Exposed (100)
North Yukon	High Elevation Rock/Exposed (100)

RIDGE (110)

Topographic Profile



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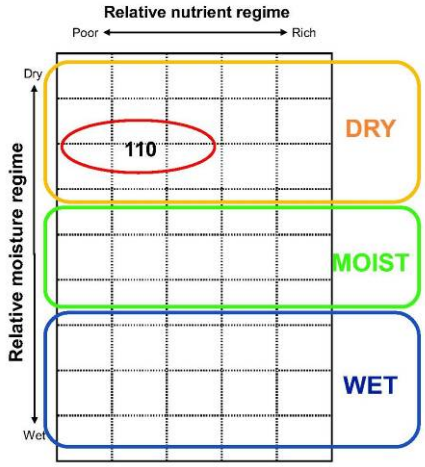
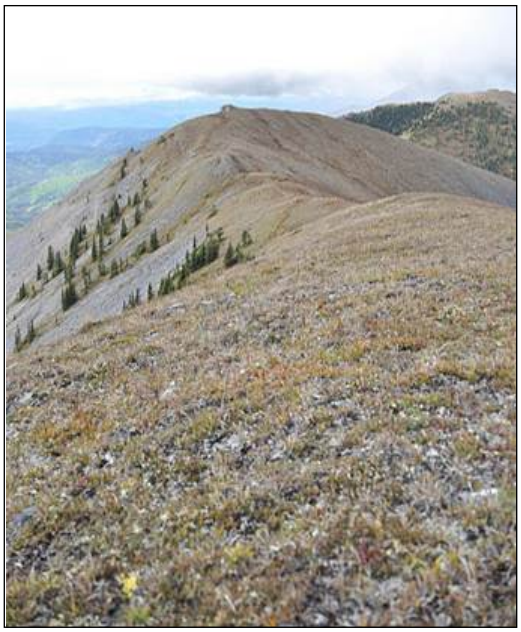


Description

Ridge ecosystems occur in all bioclimate zones of west-central Yukon but are most prevalent at high elevations. Ridges include all crest landforms including hill, mountain tops and crest positions running downslope. Small hills in valley bottoms are also considered localized ridges. High elevation ridge landforms are generally dry and exposed to wind with less productive and lower stature vegetation than other upland landforms. All vegetation phases may be present on ridges—herb-bryoid, shrub, deciduous, mixedwood and coniferous. Treed phases are generally restricted to BOL, BOH, and TAW bioclimate zones. Ridge positions with herb-bryoid vegetation cover large areas of the ALP, SUB and TAS.

High Elevation Ridge (ALP, SUB, TAS)

Ridge – Herb-Bryoid (111)



Description

This unit is common at higher elevations in the mountainous portions of the project area. Sites are very dry to submesic with limited soil development. Dry sites can be dominated by *Dryas* spp. and lichens, but may also include ground shrubs such as *Salix polaris* and other *Salix* spp. Forbs can include *Tephroseris lindstroemii* and in the South Ogilvie Mountains, Beringian endemics such as *Synthyris borealis*.

Localized moist or wet conditions may occur on some ridges where rock types and/or permafrost create poor drainage. In these wet areas, different vegetation communities dominated by *Carex* spp. may occur with forbs such as *Lagotis glauca* and *Polygonum bistorta* being common.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Ridge (110); BEU Phase: Herb-Bryoid (111)

Bioclimate Zones: ALP, SUB and TAS	Slope Conditions: crest
Elevation Range: 1034 - 2240m	Aspect Conditions: all
Soil Conditions: regosols and cryosols	Seral Position: stable
Total Project Area: 3% Distribution by Bioclimate Zone: ALP (23%), SUB (7%), TAS (10%)	

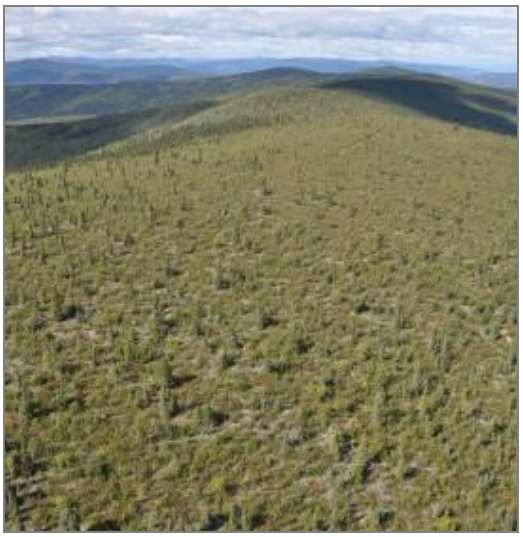
Correlation to other Classifications

Project	Unit(s)
Peel Watershed	High Elevation Dry Sparse Herb (102)
North Yukon	High Elevation Sparsely Vegetated (110)

Low-Middle Elevation Ridge (BOL, BOH, TAW)

Ridge – Herb-Bryoid (111) and Shrub (112)

Early-successional Ridge-Shrub in BOL-BOH.



Stable Ridge-Shrub in upper BOH.

Description

In lower elevations of the BOL, BOH and TAW bioclimate zones, these units are usually an early successional phase of forested ecosystems. They are dominated by *Salix* spp. but may also contain young *Populus tremuloides* or *Betula neoalaskana*. The herb phase (111) may exist for a brief period following burns but usually regenerates to shrub within 5-10 years.

In the upper elevations of BOH and TAW bioclimate zones these units can be stable and dominated by shrubs including *Betula glandulosa*, *Alnus viridis*, *Salix* spp, *Shepherdia canadensis*, and *Ledum* spp., with understory species including *Vaccinium vitis-idaea*, *Empetrum nigrum* and *Arctostaphylos alpina*. Scattered coniferous trees (*Picea glauca* or *P. mariana*, or *Abies lasiocarpa* in the southeast of the project area) may be present.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Ridge (110); BEU Phase: Herb-Bryoid (111) and Shrub (112)

Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: crest
Elevation Range: 341 – 1391m	Aspect Conditions: all
Soil Conditions: regosols or cryosols	Seral Position: early-seral in BOL and lower-BOH/TAW; stable in upper-BOH/TAW
Total Project Area: 8% Distribution by Bioclimate Zone: BOL (<1%), BOH (6%), TAW (4%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Dry Shrub (231), Subalpine Shrub (112)
North Yukon	Mesic Shrub (231), High Elevation Shrub (112)

Low-Middle Elevation Ridge (BOL, BOH, TAW)

Ridge – Deciduous (113) and Mixedwood (114)

Description

These units are most commonly mid-seral following burns on forested ridges within the BOL, BOH and TAW bioclimate zones. The only marked difference between the deciduous and mixedwood units is the mixed nature of the coniferous and deciduous forest canopy (neither account for greater than 75% of total stand composition in mixedwood). The boreal portion of the study area is dominated by *Populus tremuloides* and/or *Picea glauca*, with a shrub understory including *Salix* spp., *Sheperdia canadensis*, and *Rosa acicularis*. *Betula neoalaskana* may also be present. In the taiga portion of the study area, *Betula neoalaskana* is often the leading deciduous tree species.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Ridge (110); BEU Phase: Deciduous (113) and Mixedwood (114)

Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: crest
Elevation Range: 283 – 1239 m	Aspect Conditions: all
Soil Conditions: brunisols, regosols, cryosols	Seral Position: mid-seral
Total Project Area: 2% Distribution by Bioclimate Zone: BOL (1%), BOH (6%), TAW (1%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Dry Mixedwood/Broadleaf Forest (232)
North Yukon	Mesic Mixedwood Forest (232)

Low-Middle Elevation Ridge (BOL, BOH, TAW)

Ridge – Coniferous (115)

Description

Open to sparse *Picea glauca* forests occur on ridges throughout the BOL and BOH of the southern portion of the study area. In the TAW bioclimate zone, *Picea mariana* may also be present. These dry, open canopy late successional forests may have a significant lichen component, as pictured above. A variety of shrubs, including *Shepherdia canadensis*, *Salix* spp. and *Betula glandulosa*, are common.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Ridge (110); BEU Phase: Coniferous (115)

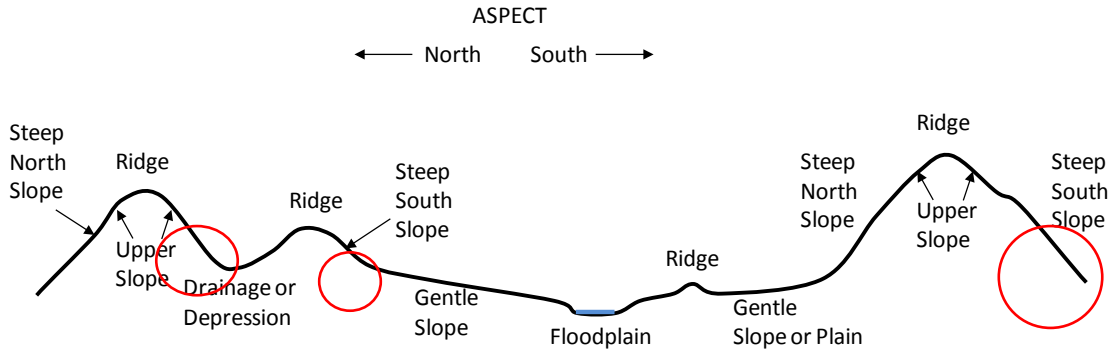
Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: crest
Elevation Range: 332 – 1380 m	Aspect Conditions: all
Soil Conditions: brunisols, regosols and cryosols	Seral Position: late seral
Total Project Area: 2% Distribution by Bioclimate Zone: BOL (<1%), BOH (3%), TAW (2%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Dry Coniferous Forest (233)
North Yukon	Mesic Coniferous Forest (233)

STEEP SOUTH-FACING SLOPE (120)

Topographic Profile



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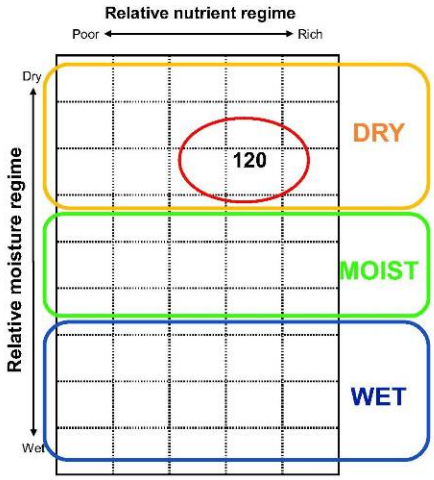


Description

Steep south-facing slopes are present in all bioclimate zones but broad ecosystems occurring on these landforms are most conspicuous in the boreal portion of the study area. Warm summer temperatures combined with steep, south-facing slopes create dry soil conditions that limit the development of forest cover and permafrost. On slopes with thick surficial materials, well–developed brunisolic soils may be present that support grasslands or sparse deciduous forests.

At higher elevations, including the ALP, steep south-facing slopes support a variety of grasses, ground shrubs and dry-tolerant forbs, with *Dryas* spp. being dominant.

High Elevation Steep South-Facing Slope (ALP, SUB, TAS)

Steep South-Facing Slope – Herb-Bryoid (121)

Description

In the ALP, SUB and TAS bioclimate zones, this unit is common on steep south-facing mountain slopes. Soils are dry and poorly developed, with exposed rock and colluvium being present. Sites can be lichen rich with dry-tolerant forbs, such as *Parrya nudicaulis*, *Draba* spp., *Oxytropis nigrescens, Potentilla* spp and *Minuartia* spp., grasses and ground shrubs, including, *Rhododendron lapponicum.*. *Dryas* spp. are dominant. Tall shrub cover is usually absent or restricted to moist draws.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Steep South-facing Slope (120); BEU Phase: Herb-Bryoid (121)

Bioclimate Zones: ALP, SUB, TAS	Slope Conditions: >35%
Elevation Range: 766 – 1922 m	Aspect Conditions: south and westerly-facing
Soil Conditions: regosols or cryosols	Seral Position: stable
Total Project Area: 2% Distribution by Bioclimate Zone: ALP (5%), SUB (5%), TAS (6%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	High Elevation Dry Sparse Herb (102); Mid-Low Elevation Dry Herb (230)
North Yukon	Mesic Herb (230)

Low-Middle Elevation Steep South-Facing Slope (BOL, BOH, TAW)

Steep South-Facing Slope – Herb-Bryoid (121)

Description

This unit includes grasslands and sparse deciduous forests in the BOL, BOH and TAW bioclimate zones. In the boreal, herbs include *Artemesia frigida*, *Solidago simplex*, *Anemone patens*, *Achillea millefolium*, *Erigeron caespitosus* and *Galium boreale*; with a variety of grasses, including *Poa glauca*; and crustose lichen species. Units may be associated with exposed rock outcrops. Sites may include a minor component of *Populus tremuloides*, *Rosa acicularis, Juniperus communis* and ground shrubs such as *Arctostaphylos uva-ursi*.

Where forests are found in association with grasslands, they are typically located on upper or lower slope positions that have lower slope angles, or in small gullies and moisture receiving sites. Steep south-facing slopes in the TAW tend to have a higher shrub component and than the boreal units, and a lack of brunisolic soil development.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Steep South-facing Slope (120); BEU Phase: Herb-Bryoid (121)

Bioclimate Zones: BOL, BOH and TAW	Slope Conditions: >35%
Elevation Range: 314 - 1194m	Aspect Conditions: south and southwest (warm)
Soil Conditions: brunisols and regosols	Seral Position: stable
Total Project Area: 0.5% Distribution by Bioclimate Zone: BOH (1%), BOL (1%), TAW (2%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Dry Herb (230)
North Yukon	Mesic Herb (230)

Low-Middle Elevation Steep South-Facing Slope (BOL, BOH, TAW)

Steep South-Facing Slope – Shrub (122), Deciduous (123), Mixedwood (124) and Coniferous (125)

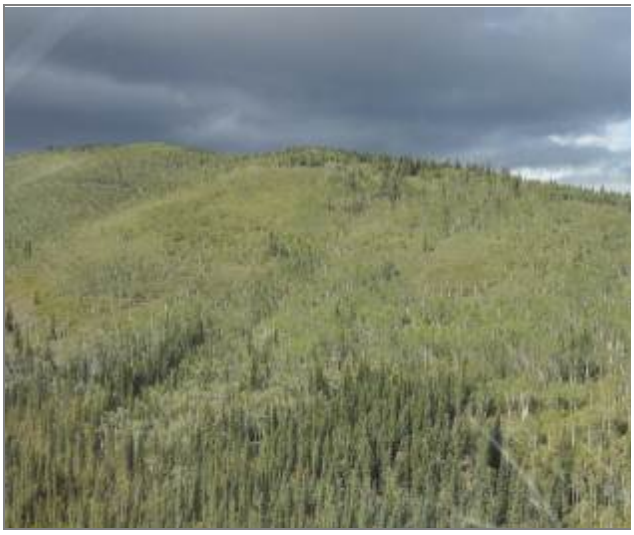
Description

Shrub and forest conditions are found throughout the region at low to mid-elevations on south-facing open slopes. While still relatively steep, slope angles are less than those of grassland units (BEU 121). South-facing shrub and forested units form readily observable, alternating patterns with steep north-facing slopes (BEU type 150) in the dissected terrain of the Klondike Plateau.

In the BOL and BOH, this unit is dominated by *Populus tremuloides*, with an open understory of *Rosa acicularis*, *Shepherdia canadensis*, and *Salix* spp. Although the shrub (BEU 122), deciduous (123) and mixed-wood (124) phases are often regenerating stands following fire, drier sites may be relatively stable, and may not readily trend towards coniferous forests, due to moisture limiting conditions.

The only notable difference between the deciduous (BEU 123) and mixedwood (BEU 124) units is the ratio of coniferous and deciduous trees in the forest canopy (neither account for greater than 75% of total stand composition). Coniferous (BEU 125) is generally restricted to small moist draws and drainages, or on cool aspects within the broader south-facing slope; at more detailed map scales, these would be considered as separate ecosites.

In the TAW, sparse shrub (BEU 122) tends to occur on similar slope conditions as boreal grasslands (BEU 121).




Steep south-facing slope-deciduous (BEU 123) in the BOH near Dawson (left). Aspen is the main tree species. Forests have open understories and high amounts of leaf litter are common (right).

Information Table

BEU Group: Dry Ecosystems; BEU Type: Steep South-facing Slope (120), BEU Phase(s): Shrub (122), Deciduous (123), Mixedwood (124) and Coniferous (125)

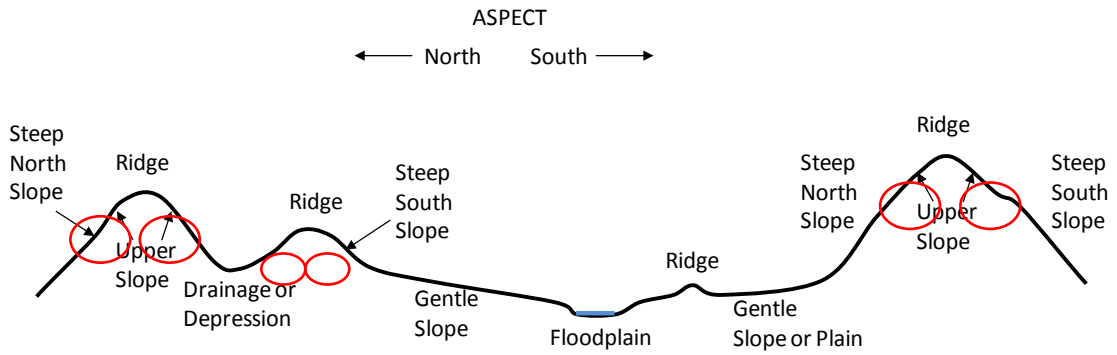
Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: 25-35%
Elevation Range: 283 - 1171 m	Aspect Conditions: south and southwest (warm)
Soil Conditions: brunisols and regosols	Seral Position: variable
Total Project Area: 3% Distribution by Bioclimate Zone: BOL (3%), BOH (6%), TAW (3%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Dry Mixedwood/Broadleaf Forest (232)
North Yukon	Mesic Mixedwood Forest (232)

UPPER SLOPE (130)

Topographic Profile



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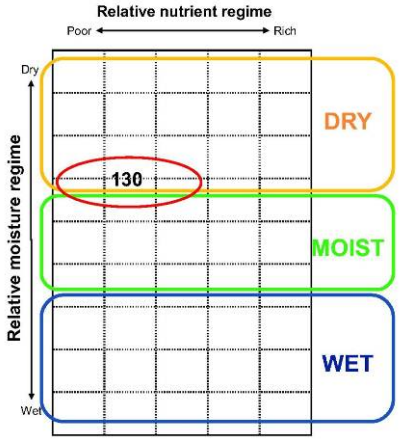


Description

Topographically, upper slopes occur below ridges and above open slopes. These areas are slightly moister than ridges but drier than neutral aspect open slopes, on account of the limited upslope catchment area. Similar to ridges, they are exposed to wind and drying conditions. Vegetation conditions are not markedly different than vegetation found on open slopes, but shrub and forest cover tends to be of lower density. In high elevations, as pictured above, scree and bedrock are often present. Shallow, well drained soils are typical.

High Elevation Upper Slope (ALP, SUB, TAS)

Upper Slope – Herb-Bryoid (131) and Shrub (132)

Description

Upper slope herbaceous sites are similar to, or grade into, ridge units (BEU 111). Upper slope herb-bryoid and shrub are common throughout all mountainous areas of west-central Yukon. Shrubby sites are dominated by *Salix* spp. and *Betula glandulosa*, growing in low-lying clumps, along with *Vaccinium uliginosum*, *Empetrum nigrum*, *Dryas* spp., and other ground shrubs. Steeper sites can include a considerable portion of bedrock or colluvium and tend to be drier.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Upper Slope (130), BEU Phase: Herb-Bryoid (131) and Shrub (132)

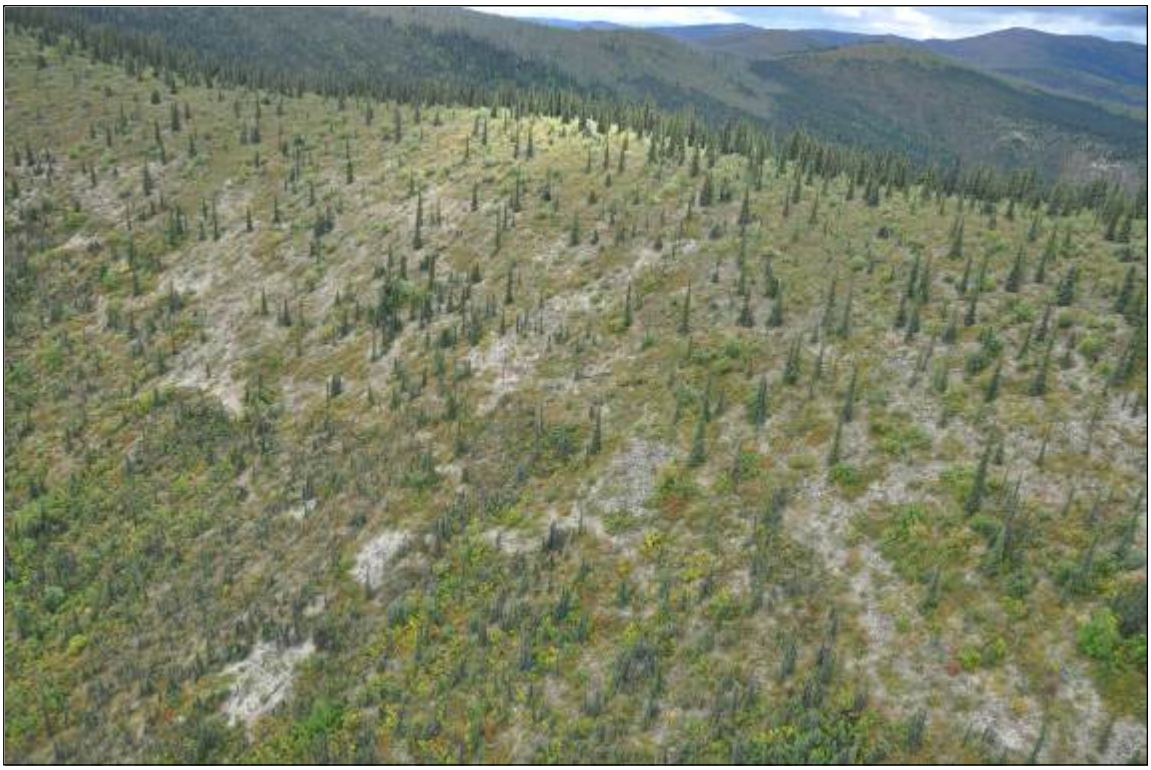
Bioclimate Zones: ALP, SUB, TAS	Slope Conditions: variable but generally >25%
Elevation Range: 880 – 2125 m	Aspect Conditions: variable
Soil Conditions: regosols or cryosols	Seral Position: stable
Total Project Area: 2% Distribution by Bioclimate Zone: ALP (12%), SUB (13%), TAS (5%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	High Elevation Dry Sparse Herb (102); Subalpine Shrub (112)
North Yukon	High Elevation Sparsely Vegetated (110)

Low-Middle Elevation Upper Slope (BOL, BOH, TAW)

Upper Slope – Herb-Bryoid (131) and Shrub (132)



Description

This unit is characterized by shallow soils occurring below ridge crests. In lower elevations, herb (131) and shrub (132) are early-successional following fire disturbances. In the upper BOH, as pictured above, herb and shrub may be relatively stable. In these situations, herb and shrub vegetation generally occur within a complex of exposed soils and colluvium.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Upper Slope (130); BEU Phase: Herb-Bryoid (131) and Shrub (132)

Bioclimate Zones: BOL, BOH and TAW	Slope Conditions: variable but generally >25%
Elevation Range: 436 – 1352 m	Aspect Conditions: variable
Soil Conditions: regosols, cryosols and brunisols	Seral Position: variable
Total Project Area: 2% Distribution by Bioclimate Zone: BOL (<0.1%), BOH (4%), TAW (2%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	High Elevation Dry Sparse Herb (102)
North Yukon	High Elevation Sparsely Vegetated (110)

Low-Middle Elevation Upper Slope (BOL, BOH, TAW)

Upper Slope – Deciduous (133) and Mixed-wood (134)

Description

Early to mid-successional deciduous and mixedwood forests occur on upper slopes of low hills throughout the BOL and lower BOH and TAW bioclimate zones. Vegetation on warm aspect, south-facing upper slopes in the boreal may remain in a relatively stable condition. These southerly exposures often occur in the upper slope positions above steep south-facing slope grasslands (BEU 121).

Information Table

BEU Group: Dry Ecosystems; BEU Type: Upper Slope (130); BEU Phases: Deciduous (133) and Mixedwood (134)

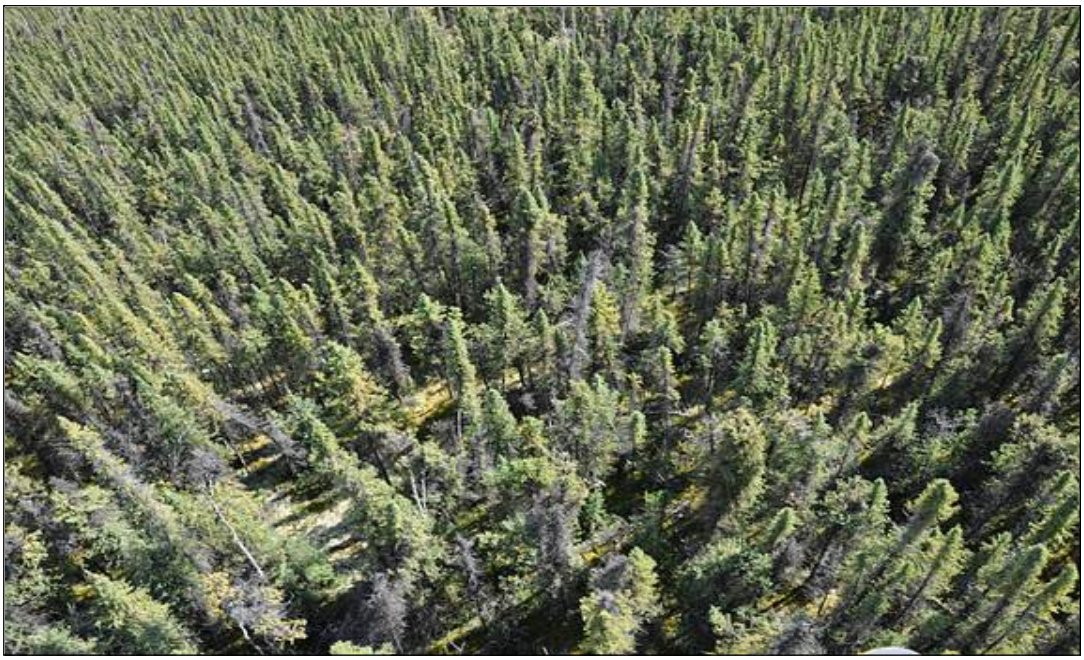
Bioclimate Zones: BOL, BOH and TAW	Slope Conditions: variable but generally >25%
Elevation Range: 515 – 1194 m	Aspect Conditions: variable
Soil Conditions: brunisols, regosols and cryosols	Seral Position: mid-seral to stable (south aspects)
Total Project Area: 0.5% Distribution by Bioclimate Zone: BOL (0%), BOH (1%), TAW (0%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Dry Mixedwood/Broadleaf Forest (232)
North Yukon	Mesic Mixedwood Forest (232)

Low-Middle Elevation Upper Slope (BOL, BOH, TAW)

Upper Slope – Coniferous (135)



Description

Open canopy *Picea glauca* forests occur on upper slopes throughout the BOL and BOH of the southern portion of the project area. These forests are closely associated with the ridge coniferous unit (BEU 115). In the TAW bioclimate zone, upper slope coniferous forests may have a significant lichen understory component. The reindeer lichens, (formerly known as *Cladina) Cladonia stellaris*, *C. arbuscula ssp. mitis*, and *C. rangiferina* are characteristic of drier sites while moister, cooler aspects support more moss groundcover. A sparse to moderately developed shrub layer usually includes *Betula glandulosa*, *Ledum groenlandicum*, *Vaccinium uliginosum, Empetrum nigrum* and *V. vitis idaea*.

Information Table

BEU Group: Dry Ecosystems; BEU Type: Upper Slopes (130); BEU Phase: Conifer (135)

Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: variable
Elevation Range: 437 – 1330 m	Aspect Conditions: variable but most frequent on north aspects (south aspects have higher deciduous component)
Soil Conditions: brunisols, regosols and cryosols	Seral Position: late seral
Total Project Area: <1% Distribution by Bioclimate Zone: BOL (0%), BOH (2%), TAW (0%)	

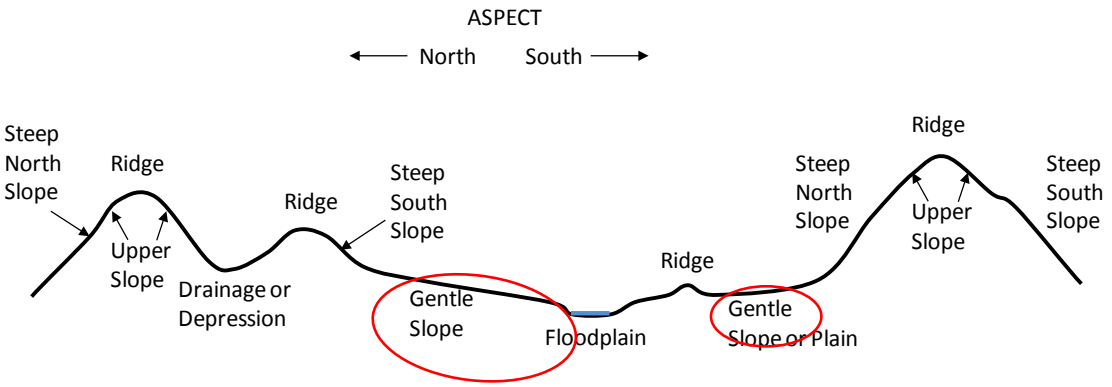
Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Dry Coniferous Forest (233)
North Yukon	Mesic Coniferous Forest (233)

Moist Ecosystems

GENTLE SLOPE AND PLAIN (140)

Topographic Profile



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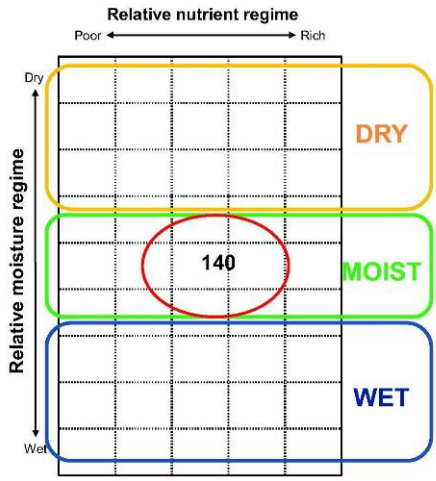


Description

This broad ecosystem type occurs on gentle slopes where aspect is not a significant factor, and on relatively level areas not influenced by fluvial processes. Much of the project area is covered by BEU type 140. This unit represents the 'average' condition, in terms of moisture, and may be considered a reference site. Presence of near-surface permafrost on level sites create wet, cold soil conditions dominated by herb and shrub vegetation—prominent features of the taiga landscape. Regenerating early and mid-successional shrub, deciduous and mixedwood forest is extensive throughout the boreal, reflecting the high fire return interval of the region. Late successional coniferous forest occurs on gentle slopes that have not been burned for 80-100 years.

High Elevation Gentle Slope and Plain (ALP, SUB, TAS)

Gentle Slope – Herb-Bryoid (141)

Description

This ecosystem type is found throughout the ALP, SUB and TAS bioclimate zones of the Ogilvie Mountains. It occurs on level to gentle slopes with mesic moisture conditions. Fine scale topographic differences can produce very different communities within the general unit. Drier sites are dominated by *Dryas* spp, with *Salix arctica, S. reticulata* and various alpine tundra forbs. Moister sites can be sedge dominated, with low shrubs such as *Cassiope tetragona* and moisture tolerant forbs such as *Polygonum bistorta*.

Information Table

BEU Group: Moist Ecosystems; BEU Type: Gentle Slopes (140); BEU Phase: Herb-Bryoid (141)

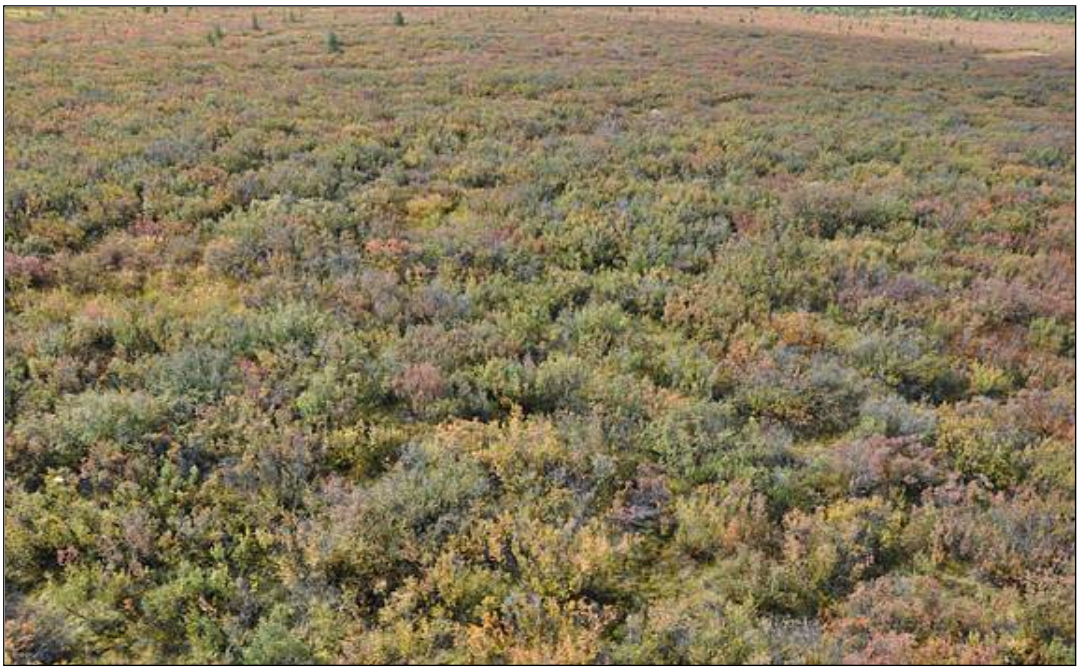
Bioclimate Zones: ALP, SUB and TAS	Slope Conditions: <35%
Elevation Range: 758 - 1851 m	Aspect Conditions: no significant aspect
Soil Conditions: regosols and cryosols	Seral Position: stable
Total Project Area: 9% Distribution by Bioclimate Zone: ALP (3%), SUB (9%), TAS (17%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Bryoid (110); Dryas/Dwarf Shrub (111)
North Yukon	High Elevation Sparsely Vegetated (110) and Herb (111)

High Elevation Gentle Slope and Plain (ALP, SUB, TAS)

Gentle Slope – Shrub (142)



Description

These units are located at the upper edge of treeline and into the lower alpine. High elevation shrub covers extensive areas in the mountainous portion of the project area and in the higher elevations of the Klondike Plateau west of Dawson City. *Betula glandulosa* is generally the dominant shrub, with willow (*Salix* spp.) also important. *Alnus incana* is prominent on moister sites. Ericaceous shrubs *Vaccinium uliginosum, V. vitis idaea, Empetrum nigrum and Ledum groenlandicum* are common understory species. Scattered conifers may be present.

Fine scale differences in topography create moist and dry conditions. Reindeer lichens (*Cladoniaa stellaris, C. arbuscula ssp. mitis, C. rangiferina*) and juniper haircap moss (*Polytrichum juniperinum*) are common on drier mounds and shallow soils. Moister and cooler sites generally contain dense shrub thickets with moss groundcover.

Information Table

BEU Group: Moist Ecosystems; BEU Type: Gentle Slopes (140); BEU Phase: Shrub (142)

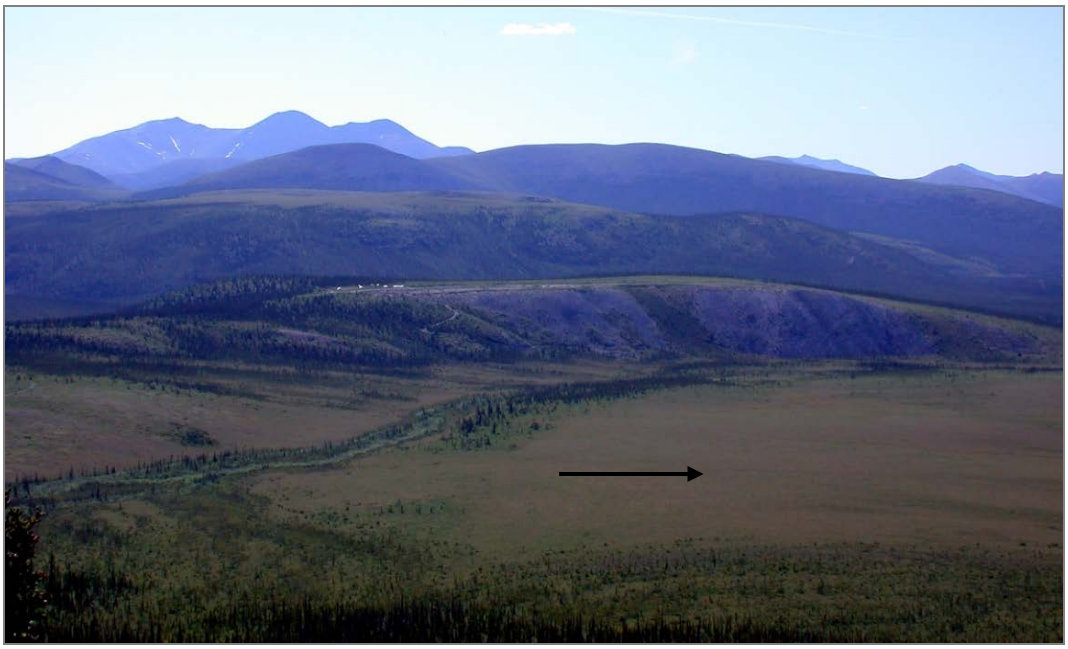
Bioclimate Zones: ALP, SUB and TAS	Slope Conditions: <35%
Elevation Range: 756 - 1814 m	Aspect Conditions: no significant aspect
Soil Conditions: regosols and cryosols	Seral Position: stable
Total Project Area: 4% Distribution by Bioclimate Zone: ALP (1%), SUB (18%), TAS (19%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Subalpine Shrub (112)
North Yukon	High Elevation Shrub (112)

Low-Middle Elevation Gentle Slope and Plain (BOL, BOH, TAW)

Gentle Slope – Herb-Bryoid (141)



Description

Gentle slope – herb occurs in both the boreal and taiga portions of west-central Yukon. In the boreal, this unit may occur as either a brief post-fire regenerating herb community, or be relatively stable in wet, level sites, with many similarities to wetland herb vegetation (BEU 311). The post-fire herb phase usually succeeds to shrub within 5-10 years.

In the northern portion of the project area, gentle-slope herb covers extensive areas of the low elevation landscape, as pictured above. On level to gently-sloping sites, often within broad mountain valleys with cold air drainage and permafrost affected soils, this unit is relatively stable and composed of wet tussock herbaceous vegetation.

Information Table

BEU Group: Moist Ecosystems; BEU Type: Gentle Slopes (140); BEU Phase: Herb (141)

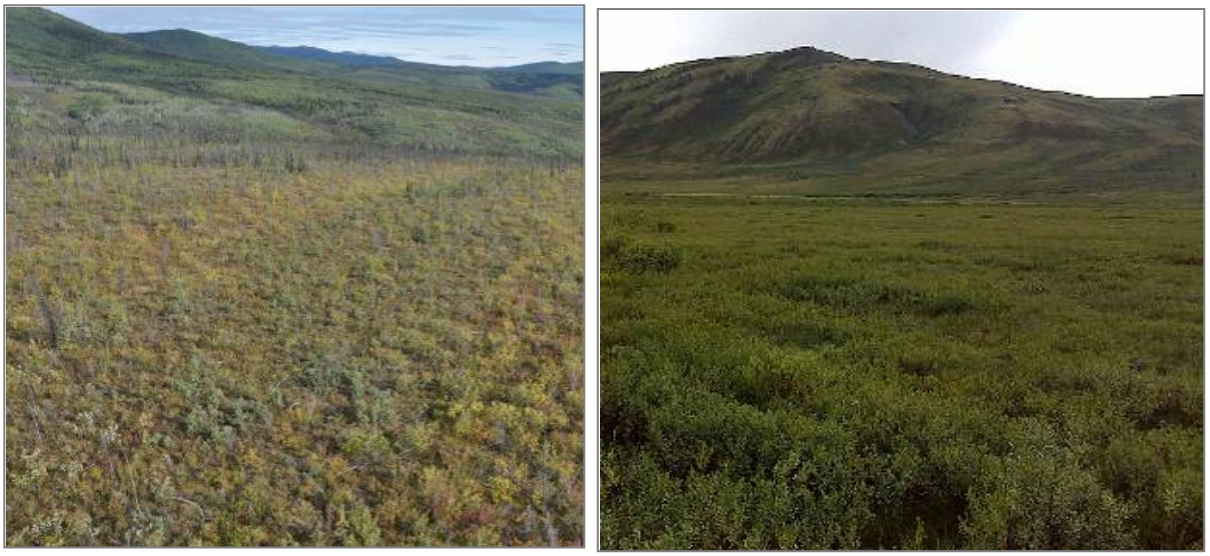
Bioclimate Zones: BOL, BOH and TAW (dominant)	Slope Conditions: <35%
Elevation Range: 280 - 1177 m	Aspect Conditions: no significant aspect
Soil Conditions: cryosols	Seral Position: early seral on drier sites (BOL and BOH); stable on level wet sites (TAW)
Total Project Area: 9% Distribution by Bioclimate Zone: BOL (<1%), BOH (2%), TAW (35%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Low-Mid Elevation Wet Herb (210); Low-Mid Elevation Moist Herb (220)
North Yukon	Wet Herb (210); Moist Herb (220)

Low-Middle Elevation Gentle Slope and Plain (BOL, BOH, TAW)

Gentle Slope – Shrub (142)



Early successional shrub on gentle slopes in BOH near Dawson City (left). Stable shrub on gentle slopes of the TAW and TAS bioclimate zones in Blackstone Uplands.

Description

Gentle slope shrub is the most extensive broad ecosystem in west-central Yukon. In the boreal, this unit is commonly an early successional post-burn community. However, in the taiga portion of the project area, very large areas of shrub occurring on level sites in broad valleys may be relatively stable due to cold air drainage and wet soils caused by near-surface permafrost. On permafrost sites, following a fire event some areas may become wet for extended periods, slowing revegetation. Common shrub species include *Salix* spp., *Betula glandulosa*, and *Alnus incana.*

Information Table

BEU Group: Moist Ecosystems; BEU Type: Gentle Slopes (140); BEU Phase: Shrub (142)

Bioclimate Zones: BOL, BOH and TAW	Slope Conditions: <35%
Elevation Range: 280 - 1177 m	Aspect Conditions: no significant aspect
Soil Conditions: cryosols	Seral Position: stable in much of TAW; early seral on forested sites (BOL, BOH)
Total Project Area: 16% Distribution by Bioclimate Zone: BOL (19%), BOH (29%), TAW (45%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Moist Shrub (221)
North Yukon	Moist Shrub (221)

Low-Middle Elevation Gentle Slope and Plain (BOL, BOH, TAW)

Gentle Slope – Deciduous (143) and Mixedwood (144)

Description

These units are mid-successional post-burn deciduous and mixedwood forests occurring on gentle slopes and plains. BEU 143 is a dominant ecosystem of the plateau ecoregions, where extensive burns are major features. The forest canopy of the deciduous phase (BEU 143) is dominated by mature *Populus tremuloides*. Understory shrubs include *Rosa acicularis*, *Shepherdia canadensis*, and various *Salix* spp. In the taiga portion of the study area, and on slightly cooler aspects/moist sites in the boreal, *Betula neoalaskana* can be the dominant tree species.

The mixedwood phase (BEU 144), as mapped, is uncommon within the project area. *Picea glauca* and *Populus tremuloides* co-dominate the forest canopy. Understory shrubs include *Betula glandulosa*, *B. occidentalis*, *Ledum decumbens*, and various *Salix* spp. The forest floor is dominated by bryoids, such as *Hylocomium splendens*, and a range of lichens including *Peltigera* spp., *Cladonia* spp. and the *Cladina* types.

Information Table

BEU Group: Moist Ecosystems; BEU Type: Gentle Slopes (140); BEU Phases: Deciduous (143) and Mixedwood (144)

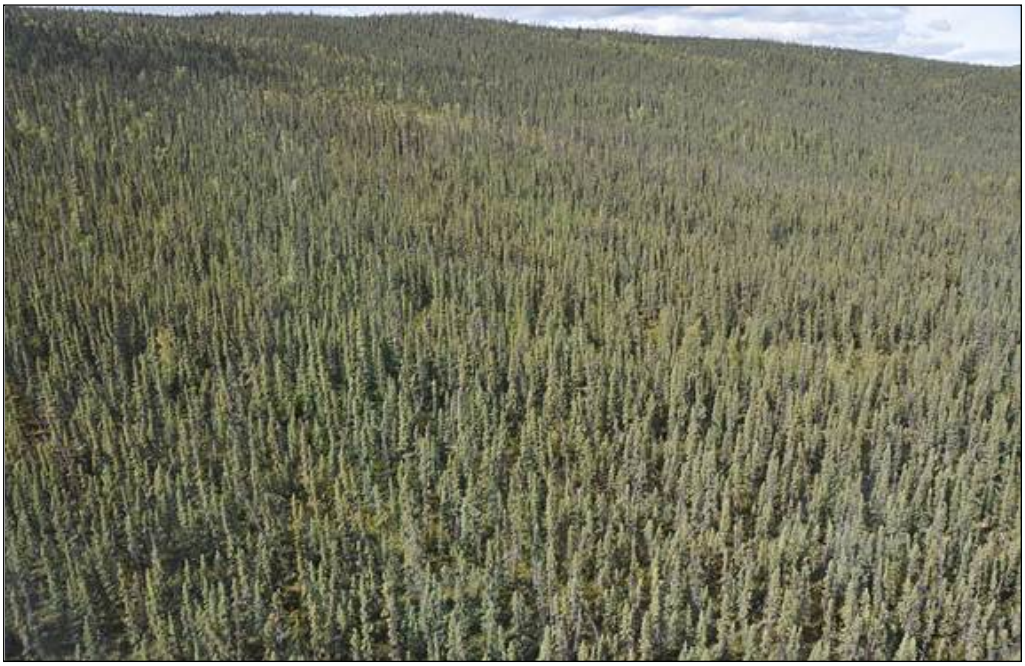
Bioclimate Zones: BOL, BOH and TAW	Slope Conditions: generally < 30%
Elevation Range: 280 - 1125 m	Aspect Conditions: no significant aspect
Soil Conditions: cryosols, regosols and brunisols	Seral Position: mid-seral
Total Project Area: 4% Distribution by Bioclimate Zone: BOL (7%), BOH (9%), TAW (0%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Moist Mixedwood/Broadleaf Forest (222)
North Yukon	Moist Mixedwood Forest (222)

Low-Middle Elevation Gentle Slope and Plain (BOL, BOH, TAW)

Gentle Slope – Coniferous (145)



Description

This unit is common throughout the study area. Late-successional *Picea glauca* forests, often with tall willows comprising a significant component of the community, is the typical vegetation. Understory shrubs include *Betula glandulosa*, *B. occidentalis*, *Ledum spp.*, and various *Salix* spp. The forest floor is dominated by bryoids, such as *Hylocomium splendens*, and a range of lichens including *Peltigera*, *Cladonia* spp.and the *Cladina* types.

Information Table

BEU Group: Moist Ecosystems; BEU Type: Gentle Slopes (140); BEU Phase: Coniferous (145)

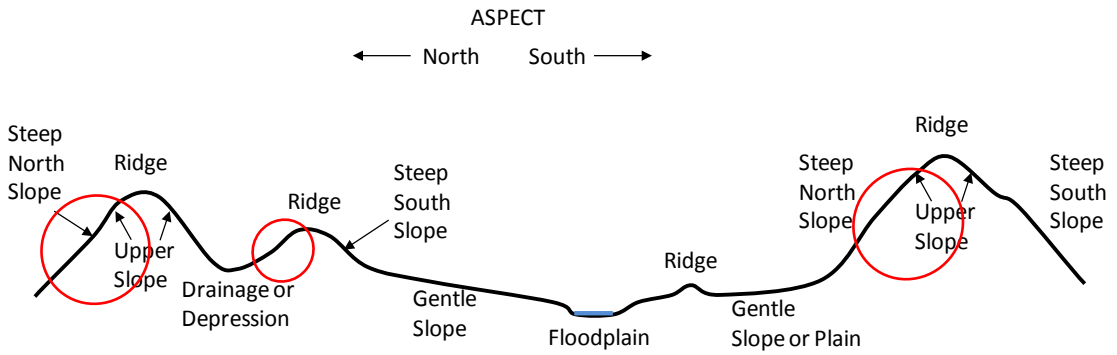
Bioclimate Zones: BOL, BOH and TAW	Slope Conditions: < 35 %
Elevation Range: 280 - 1188 m	Aspect Conditions: no significant aspect
Soil Conditions: cryosols, brunisols and regosols	Seral Position: late-seral
Total Project Area: 10% Distribution by Bioclimate Zone: BOL (17%), BOH (15%), TAW (14%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Moist Coniferous Forest (223)
North Yukon	Moist Coniferous Forest (223)

STEEP NORTH-FACING SLOPE (150)

Topographic Profile



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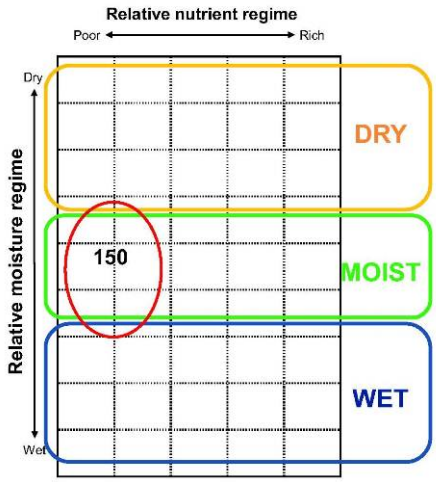


Description

Steep north-facing slopes are characterized by cold soils and poor drainage due to near-surface permafrost or bedrock. BEU type 150 occurs in all bioclimate zones. In the BOL, BOH and TAW, steep north-facing slopes with near-surface permafrost create wet soil conditions forming 'inclined bogs' with a similar vegetation composition as shrub or treed wetlands (BEUs 312 and 315). BEU type 150 is most prominent in the unglaciated, dissected terrain of the Klondike Plateau, where it forms highly visible alternating patterns with warm aspect, steep south-facing slopes (BEU type 120) or gentle slopes (BEU type 140). In higher elevation non-forested areas, solifluction is a common slope process.

High Elevation Steep North-Facing Slope (ALP, SUB, TAS)

Steep North-Facing Slope – Herb-Bryoid (151) and Shrub (152)

Description

Herb-bryoid and shrub is common on high elevation north-facing slopes in the Ogilvie Mountains. BEU 151 (herb-bryoid) and 152 (shrub) occur on colluvium affected by permafrost. Soils are mesic to wet and solifluction lobes are a common feature. Vegetation includes ground shrubs such as *Cassiope tetragona* and *Dryas* spp. Forbs include various *Pedicularis* spp., including *P. lapponica*, *Dodecatheon frigidum*, *Lagotis glauca*, and *Geum rossii*. Semi-permanent snow patches may occur in low-lying areas and depressions. Wet seeps are common.

Information Table

BEU Group: Moist Ecosystems; BEU Type: Steep North-Facing Slope (150); BEU Phase: Herb-Bryoid (151), Shrub (152)

Bioclimate Zones: ALP, SUB, TAS	Slope Conditions: >25 %
Elevation Range: 776 - 1903 m	Aspect Conditions: north and north-east facing (cool)
Soil Conditions: regosols and cryosols	Seral Position: stable
Total Project Area: 1% Distribution by Bioclimate Zone: ALP (4%), SUB (3%), TAS (5%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Dyras/Dwarf Shrub (111)
North Yukon	High Elevation Sparsely Vegetated (110) and Herb (111)

Low-Middle Elevation Steep North-Facing Slope (BOL, BOH, TAW)

Steep North-Facing Slope – Shrub (152), Deciduous (153) and Mixedwood (154)

Description

In the boreal, shrub (BEU 152), deciduous (BEU 153) and mixedwood (BEU 154) are generally early to mid successional post-burn phases of the north-facing slope coniferous (BEU 155) unit. *Betula neoalaskana* is the dominant deciduous tree on most north-facing slopes, along with *Picea mariana*. *Populus tremuloides* and *Picea glauca* may occur in the absence of near-surface permafrost, where drainage is adequate. Within the project area, the deciduous and mixedwood phases are not extensive.

In the taiga, steep north-facing slopes with shrub (BEU 152) are considered to be stable communities.

Information Table

BEU Group: Moist Ecosystems; BEU Type: Steep North-Facing Slope (150); BEU Phases: Shrub (152), Deciduous (153) and Mixedwood (154)

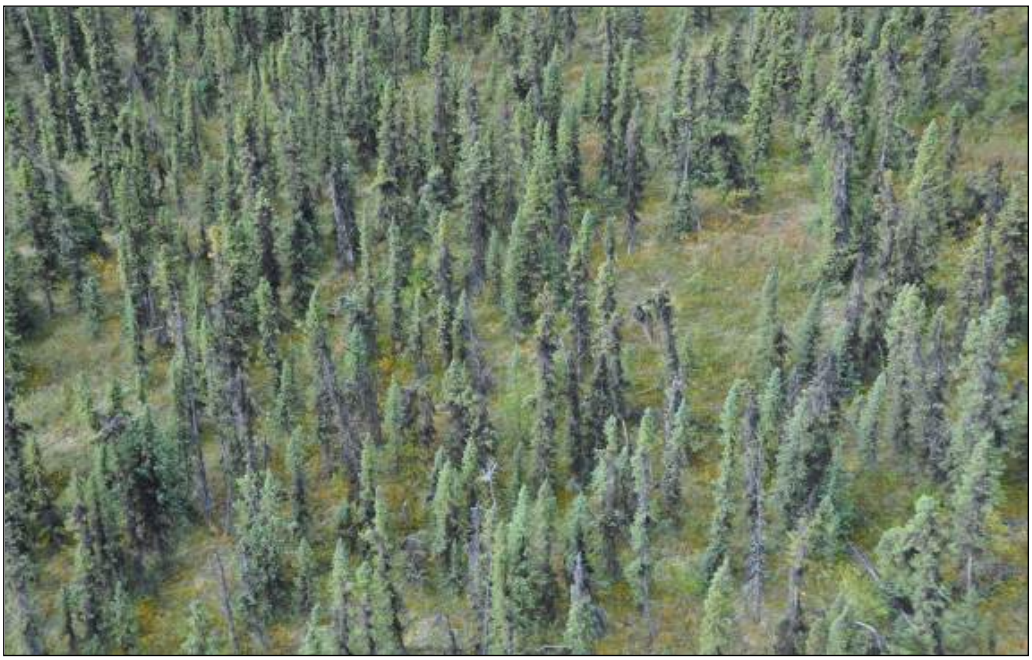
Bioclimate Zones: BOL, BOH and TAW	Slope Conditions: > 25%
Elevation Range: 287 - 1189 m	Aspect Conditions: north and north-east facing (cool)
Soil Conditions: cryosols and regosols	Seral Position: early-mid seral (BOL and BOH), stable (TAW)
Total Project Area: 3% Distribution by Bioclimate Zone: BOL (2%), BOH (4%), TAW (2%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Moist Shrub (221) and Mixedwood/Broadleaf Forest (222)
North Yukon	Moist Shrub (221) and Mixedwood Forest (222)

Low-Middle Elevation Steep North-Facing Slope (BOL, BOH, TAW)

Steep North-Facing Slope – Coniferous (155)



Description

BEU 155 is the late-successional phase of the steep north-facing slope unit. It is characterized by cold, poorly drained soils with near-surface permafrost and coniferous forests dominated by open to sparse *Picea mariana*. Extensive lichen and moss groundcover is common; a thick mat of feathermoss, dominated by *Pleurozium schreberi* and *Hylocomnium splendens,* and occasionally *Sphagnum spp*., is usually present. Understory shrubs include *Ledum groenlandicum*, *Betula glandulosa* and *Salix* spp. In some situations, these wet *P. mariana* forests tend to resemble 'inclined treed bogs' (BEU 315, treed wetland).

Information Table

BEU Group: Moist Ecosystems; BEU Type: Steep North-Facing Slope (150); BEU Phase: Coniferous (155)

Bioclimate Zones: BOL, BOH and TAW	Slope Conditions: >25%
Elevation Range: 287 – 1189 m	Aspect Conditions: north and north-east facing (cool)
Soil Conditions: cryosols	Seral Position: late seral
Total Project Area: 2.5% Distribution by Bioclimate Zone: BOL (2%), BOH (4%), TAW (2%)	

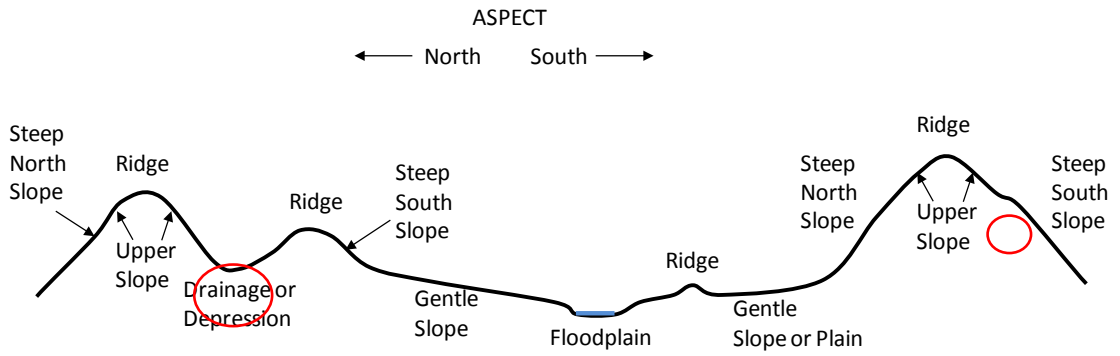
Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Moist Coniferous Forest (223)
North Yukon	Moist Coniferous Forest (223)

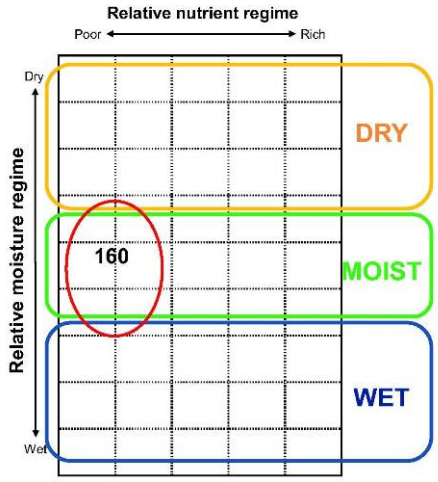
Wet Ecosystems

DRAINAGE AND DEPRESSION (160)

Topographic Profile



Edatopic Position



Description

These ecosystems are upland drainages, characterized by wet, poorly drained areas at the base of draws or catchments and along ephemeral streams, including their surrounding lower moderate to steep slopes. In low gradient catchments, near-surface permafrost or bedrock creates poor drainage, resulting in vegetation conditions similar to wetland and stream-side vegetation. In high elevation mountain areas, BEU type 160 often occurs at the head of steep cirque valleys, forming the headwaters of lower elevation streams and rivers. In these environments, bedrock, scree, coarse textured soils and permafrost create a mosaic of moisture conditions ranging from wet to dry, as pictured above.

High Elevation Drainage and Depression (ALP, SUB, TAS)

Drainage and Depression – Herb-Bryoid (161) and Shrub (162)

Description

These units are similar to herb (BEU 311) and shrub (BEU 312) wetlands. BEU 161 and 162 occur in all upland draws and drainages on permafrost affected soils, on gentle to steep slopes. In the wet draw, sedge tussocks dominate, with low/ground shrubs such as *Ledum groenlandicum*, *Vaccinium uliginosum*, *Empetrum nigrum*, *Vaccinium vitis-idaea*, and *Arctostaphylos rubra*. Between tussocks, mosses dominate with ground shrubs and forbs such as *Rubus chamaemorus*, *Oxycoccus microcarpus*, *Petasites sagittatus*, and *Polygonum bistorta*. Taller shrubs, primarily *Salix* spp., may occur along the bottom of the wet drainage. Side slopes may have a range of conditions, but are typically drier.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Drainage/Depression (160); BEU Phases: Herb-Bryoid (161), Shrub (162)

Bioclimate Zones: ALP, SUB, TAS	Slope Conditions: variable
Elevation Range: 780 - 2045 m	Aspect Conditions: variable
Soil Conditions: cryosols and regosols	Seral Position: stable
Total Project Area: 1% Distribution by Bioclimate Zone: ALP (6%), SUB (3%), TAS (5%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Wet Herb (210); Mid-Low Elevation Moist Shrub (221)
North Yukon	Wet Herb (210); Moist Shrub (221)

Low-Middle Elevation Drainage and Depression (BOL, BOH, TAW)

Drainage and Depression – Herb-Bryoid (161) and Shrub (162)

Description

These units are similar to herb (BEU 311) and shrub (BEU 312) wetlands. The herb phase (BEU 161) occurs along wet, low gradient drainages throughout the study area on permafrost affected soils. Sedge tussocks dominate, with low/ground shrubs such as *Ledum groenlandicum*, *Vaccinium uliginosum*, *Empetrum nigrum*, *Vaccinium vitis-idaea*, and *Arctostaphylos rubra* on tussocks. Between tussocks, mosses dominate with ground shrubs and forbs occurring such as *Rubus chamaemorus*, *Oxycoccus microcarpus*, *Petasites sagittatus*, and *Polygonum bistorta*. The shrub phase (162) occurs on slightly drier sites, with medium-tall shrubs dominated by *Salix* spp.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Drainage/Depression (160); BEU Phase: Herb-Bryoid (161), Shrub (162)

Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: gentle (<25%)
Elevation Range: 281 - 1125 m	Aspect Conditions: variable
Soil Conditions: organic, cryosols	Seral Position: stable
Total Project Area: 1% Distribution by Bioclimate Zone: BOL (1%), BOH (2%), TAW (3%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Wet Herb (210)
North Yukon	Wet Herb (210)

Low-Middle Elevation Drainage and Depression (BOL, BOH, TAW)

Drainage and Depression – Deciduous (163) and Mixedwood (164)

Description

These open to sparse deciduous and mixedwood forest units occur at low elevations of the project area in moist draws and depressions at the base of surrounding catchments. Soils are strongly affected by permafrost. The dominant tree species is *Betula neoalaskana*, but *Populus balsamifera* may also occur. These units may be successional to coniferous, but are limited in distribution. Low shrubs and ground shrubs include *Ledum groenlandicum*, *Betula glandulosa*, *Empetrum nigrum*, *Vaccinium vitis-idaea* and *Oxycoccus microcarpus*. *Rubus chamaemorus* is a common forb. Sedge tussock patches can occur within, and be intermixed with, this unit. On drier, south-facing side slopes, *P. tremuloides* is the dominant deciduous tree species, and may be intermixed with *Picea glauca*.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Drainage/Depression (160); BEU Phases: Deciduous (163) and Mixedwood (164)

Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: gentle (<25%)
Elevation Range: 280 - 1110 m	Aspect Conditions: variable
Soil Conditions: cryosols	Seral Position: potentially mid-seral
Total Project Area: <1% Distribution by Bioclimate Zone: BOL (0%), BOH (1%), TAW (0%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Wet Mixedwood/Broadleaf Forest (212)
North Yukon	Moist Mixedwood Forest (222)

Low-Middle Elevation Drainage and Depression (BOL, BOH, TAW)

Drainage and Depression – Coniferous (165)

Description

This open to sparse forested unit occurs throughout the study area in moist draws and depressions at the base of surrounding catchments. BEU 165 is similar to the forested wetland unit (BEU 315). Soils are strongly affected by permafrost. The dominant tree species is *Picea mariana*, but *P. glauca* may also occur. In the northeast of the project area *Larix laricina* is also prominent. Medium to low shrubs and ground shrubs include *Ledum groenlandicum*, *Betula glandulosa*, *Empetrum nigrum*, *Vaccinium vitis-idaea*, and *Oxycoccus microcarpus*. *Rubus chamaemorus* is a common forb. Sedge tussock patches can occur within, and be intermixed with, this unit. Drier ecosystems may occur on adjacent lower slopes with better drainage.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Drainage/Depression (160); BEU Phase: Coniferous (165)

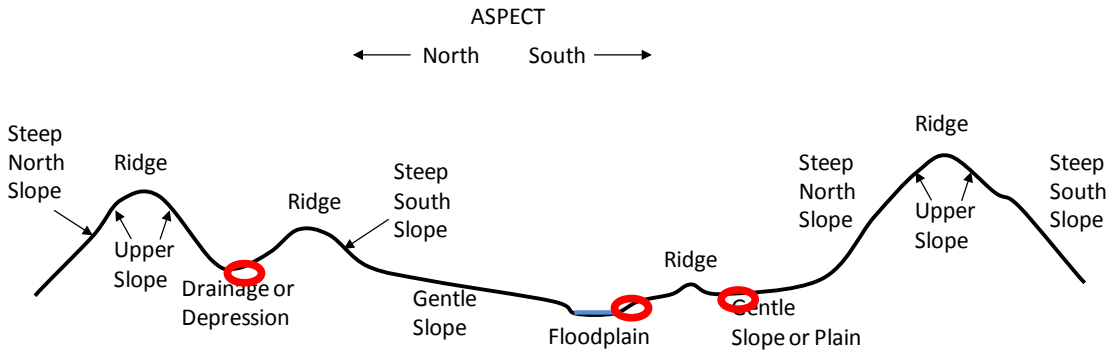
Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: gentle (<25%)
Elevation Range: 281 - 1163 m	Aspect Conditions: none
Soil Conditions: organics and cryosols	Seral Position: late seral
Total Project Area: <1% Distribution by Bioclimate Zone: BOL (1%), BOH (1%), TAW (1%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Mid-Low Elevation Coniferous Forest (213)
North Yukon	Wet Coniferous Forest (213)

WETLAND (310)

Topographic Profile



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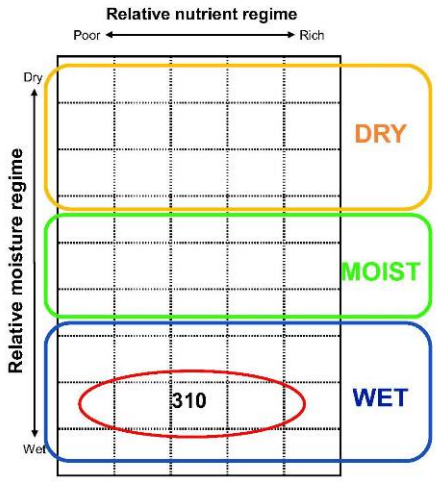
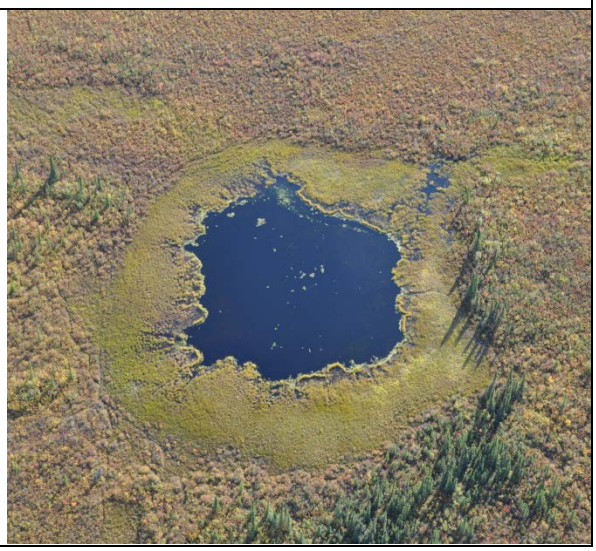




Description

Following the Canadian Wetland Classification System (CWCS), a wetland is defined as a portion of the landscape where saturation of water through time influences soil development resulting in distinct vegetation assemblages (Warner 1997), and biological activity that is adapted to a wet environment. Based on the dominant vegetation form, three types of wetland broad ecosystems are defined: herb-bryoid, shrub and treed. At a finer level of classification, each of these wetland ecosystems would include several classes, forms and types as per the CWCS.

Wetland ecosystems are common in all lower elevation areas of west-central Yukon. They are associated with plains, gentle slopes and lower slope landforms, and often occur adjacent to floodplains and along the fringe of waterbodies. Due to the influence of permafrost on soil drainage, some wetlands are closely related to other moist-wet BEUs, such as drainage and depression herb-bryoid (BEU 161) and shrub (BEU 162). Floodplains (BEU types 370/380/390) are considered to be a special class of wetlands.

Wetland (BOL, BOH, TAW, TAS)

Wetland – Herb-Bryoid (311)

Description

This unit includes shore fens and bogs throughout the region, and tussock tundra fens overlying permafrost in subarctic ecosystems of the taiga. Shore fens typically grade from an edge dominated by shrubs, including *Salix planifolia* and *Myrica gale*, to standing water with *Menyanthes trifoliata, Potentilla palustris*, and dominated by *Carex aquatilis*. Between the shrubs and standing water, species include: *Galium trifidum, Hippuris vulgaris, Carex diandra*, *C. utriculata* ,and *Eriophrum angustifolium*, and can include extensive bryophyte cover and leaf litter.

Bogs include low/ground shrubs such as *Ledum groenlandicum, Arctostaphylos rubra, Oxycoccus microcarpus*, with forbs including *Rubus chamaemorus* and *Petasites sagittatus*. They can be dominated by mosses, especially *Sphagnum spp.*, and lichens such as *Cladonia arbuscula ssp. mitis* and other *Cladonia* species

Tussock tundra fens are dominated by *Eriophorum vaginatum* with low shrubs such as *Vaccinium uliginosum, Empetrum nigrum, Salix* spp. such as *S. myrtillifolia* and *S. planifolia*, along with forbs, such as *Polygonum bistorta* on tussocks, with the area between tussocks dominated by bryophytes.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Wetland; BEU Phase: Wetland – Herb (311)

Bioclimate Zones: BOL, BOH, TAW, TAS	Slope Conditions: level
Elevation Range: 280 – 1590 m	Aspect Conditions: none
Soil Conditions: organic	Seral Position: stable
Total Project Area: 1% Distribution by Bioclimate Zone: BOL (2%), BOH (1%), TAW (2%), TAS (1%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Wetland Herb (400)
North Yukon	Wetland Herb (400), Riparian Wetland (320)

Wetland (BOL, BOH, TAW, TAS)

Wetland – Shrub (312)

Description

Shrub wetlands occur throughout the project area, but are most prominent in the plateau regions. BEU 312 is found on poorly drained organic soils, fluvial deposits and along drainage channels between better drained landforms. It includes shrub wetlands marginal to lakes, fens and bogs. In shrubby fens, dominant shrubs include *Salix planifolia, Potentilla fruticosa, Vaccinium uliginosum* and *Ledum groenlandicum*. Sedge species include *Carex lugens* and *Eriophorum brachyantherum*; herbs include *Petasites sagittatus*, and there are numerous bryophytes.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Wetland (300); BEU Phase: Wetland – Shrub (312)

Bioclimate Zones: BOL, BOH, TAW, TAS	Slope Conditions: level
Elevation Range: 280 – 1560 m	Aspect Conditions: none
Soil Conditions: organics, cryosols	Seral Position: stable
Total Project Area: 3% Distribution by Bioclimate Zone: BOL (7%), BOH (3%), TAW (4%), TAS (1%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Wetland Shrub (401)
North Yukon	Wetland Shrub (401)

Wetland (BOL, BOH, TAW, TAS)

Wetland – Treed (315)

Description

Treed wetlands are most common in the plateau ecoregions, occurring on lacustrine material in the southeast of the project area and on permafrost affected organic soils in depressions of the Klondike Plateau and northwestern Yukon Plateau North ecoregions. The tree canopy is dominated by sparse *Picea mariana* and *P. glauca*. Tall and medium shrubs include *Salix planifolia, S. glauca* and *Betula glandulosa*, with low shrubs, including *Ledum groenlandicum*, *Potentilla fruticosa*, *Chamaedaphne calyculata,* and *Rosa acicularis*. Ground shrubs and forbs include *Vaccinium vitis-idaea, Arctostaphylos rubra, Petasites sagittatus*, *Mertensia paniculata*, *Orthilia secunda* and sedges such as *Carex lugens*. A thick mat of *Hylocomium splendens* and other mosses and lichens are prevalent.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Wetland (300); BEU Phase: Wetland – Treed (315)

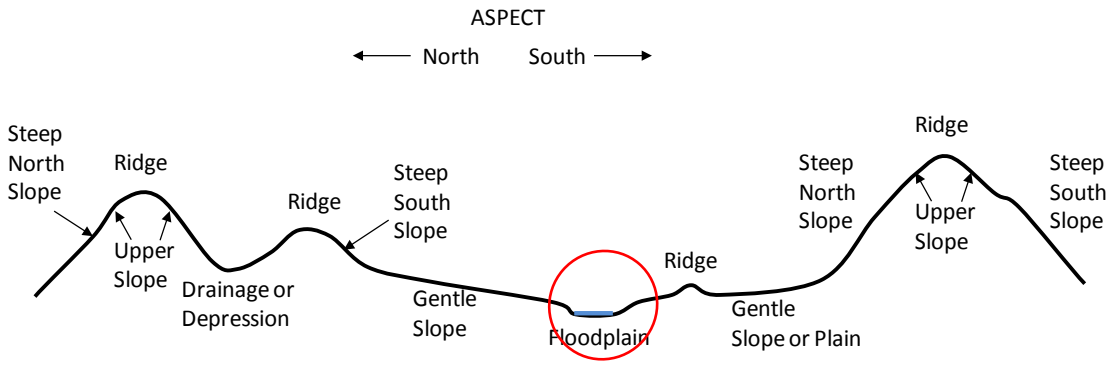
Bioclimate Zones: BOL, BOH, TAW, TAS	Slope Conditions: level
Elevation Range: 280 – 1550 m	Aspect Conditions: none
Soil Conditions: organics, cryosols	Seral Position: stable
Total Project Area: <1% Distribution by Bioclimate Zone: BOL (4%), BOH (1%), TAW (1%), TAS (0%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Wetland Forested (402)
North Yukon	Wetland Forested (402)

FLOODPLAIN (370/380/390)

Topographic Profile



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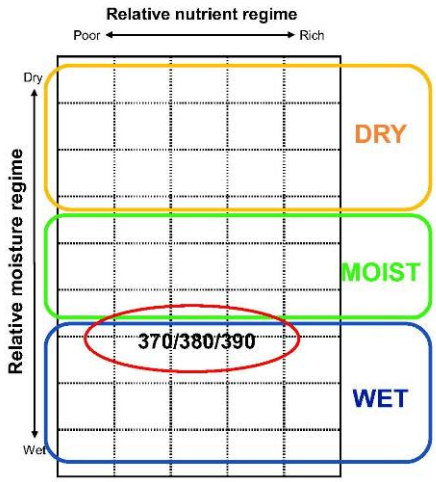


Description

Floodplains are a type of wetland feature associated with fluvial processes (deposition and erosion by flowing water). As they are periodically flooded, soils are inundated for some portion of the year or years. Floodplains occur as a series of terraces, or benches, along the stream or river. Generally, the lower elevation the bench, the greater the annual flooding potential, and the earlier the vegetation successional stage. Three broad ecosystem floodplain environments are recognized: low bench (annual flood frequency), middle bench (1-10 year flood frequency), and high bench (>10 year flood frequency). Floodplain units may contain other wetland types (BEU 310), as described above.

Wetlands (BOL, BOH, TAW, TAS)

Floodplain – Gravel Bar–Herb-Bryoid (371)

Description

BEU 371 is a low bench unit that is flooded annually; it is the earliest successional unit in the riparian floodplain. Exposed soil texture varies from silt-dominated, such as along the White River, to sand and gravel in other river channels. Early plant colonizers include grasses, and forbs such as *Epilobium latifolium*, *Hedysarum alpinum*, and various species of *Equisetum* and *Dryas* spp. The floodplain gravel bar-herb-bryoid unit includes shore marshes dominated by *Carex utriculata*, with *Equisetum fluviatile*, *Rumex occidentalis* and other forbs.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Wetland (300); BEU Phase: Gravel Bar – Herb-Bryoid (371)

Bioclimate Zones: BOL, BOH, TAW, TAS	Slope Conditions: level
Elevation Range: 280 – 1500 m	Aspect Conditions: none
Soil Conditions: regosols	Seral Position: early seral
Total Project Area: <1% Distribution by Bioclimate Zone: BOL (1%), BOH (0%), TAW (1%), TAS (0%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Gravel/Sand Bars (300), Riparian Herb (310)
North Yukon	Riparian Exposed (300), Riparian Herb (310)

Wetland (BOL, BOH, TAW, TAS)

Floodplain – Shrub (372)

Description

BEU 372 is a common unit throughout the project area in most riparian zones. Shrub is the first woody successional stage on floodplains, dominated by *Alnus incana*, *Salix* spp, and young, low *Populus balsamifera*. The understory may include grasses, forbs such as *Epilobium angustifolium*, *Equisetum* spp., and shrubs including *Rosa acicularis* and *Shepherdia canadensis*. This is a low bench unit that is flooded frequently.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Wetland (300); BEU Phase: Floodplain – Shrub (372)

Bioclimate Zones: BOL, BOH, TAW, TAS	Slope Conditions: level
Elevation Range: 280 – 1500 m	Aspect Conditions: none
Soil Conditions: regosols	Seral Position: early successional
Total Project Area: 1% Distribution by Bioclimate Zone: BOL (5%), BOH (0%), TAW (3%), TAS (0%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Riparian Shrub (311)
North Yukon	Riparian Shrub (311)

Wetland (BOL, BOH, TAW)

Floodplain – Deciduous (383)

Description

BEU 383 is found on most, low gradient middle bench floodplains in the project area. Floodplain - deciduous is a mid-successional unit following floodplain – shrub (BEU 372). It occurs on well-drained regosols on terraces within or along stream channels with moderate flood frequency. Forests are dominated by large *Populus balsamifera* and tall *Salix* spp. Understory shrubs include *Alnus incana*, *Rosa acicularis*, and various *Salix* spp., such as *S. planifolia*. Bare ground and leaf litter can be extensive, with the beginning of moss development. In the northern portion of the project area, this unit can extend into the SUB or TAS bioclimate zones.

Information Table

BEU Group: Wet Ecosystems; Wetland (300); BEU Phase: Floodplain – Deciduous (383)

Bioclimate Zones: BOL, BOH, TAW, minor SUB/TAW	Slope Conditions: level
Elevation Range: 280 – 1100 m	Aspect Conditions: none
Soil Conditions: regosols	Seral Position: mid successional
Total Project Area: <1% Distribution by Bioclimate Zone: BOL (2%), BOH (0%), TAW (0%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Riparian Mixedwood/Broadleaf Forest (312)
North Yukon	Riparian Mixedwood Forest (312)

Wetland (BOL, BOH, TAW)

Floodplain – Mixedwood (384)

Description

This mixedwood floodplain unit is a mid to late successional phase between the deciduous (BEU 383) and coniferous (BEU 395) floodplain units. BEU 384 occurs on well drained regosols on middle or high benches terraces within or along stream channels that are moderately or infrequently flooded, and is most prominent in the BOL, BOH and TAW bioclimate zones. Forests are dominated by large *Populus balsamifera*, and depending on the seral stage, a range of young and co-dominant mature *Picea glauca*. Understory shrubs include *Alnus incana, Rosa acicularis*, and various *Salix* spp., such as *S. planifolia*. Ground shrubs and forbs include *Vaccinium vitis-idaea, Linnaea borealis*, *Mertensia paniculata*, *Equisetum arvense* and E. *pratense*. Extensive moss carpets, dominated by *Hylocomium splendens*, are common.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Wetland (300); BEU Phase: Floodplain – Mixedwood (384)

Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: level
Elevation Range: 280 – 1100 m	Aspect Conditions: none
Soil Conditions: regosols	Seral Position: mid to late successional
Total Project Area: <1% Distribution by Bioclimate Zone: BOL (<1%), BOH (0%), TAW (0%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Riparian Mixedwood/Broadleaf Forest (312)
North Yukon	Riparian Mixedwood Forest (312)

Wetland (BOL, BOH, TAW)

Floodplain – Coniferous (395)

Description

The floodplain - coniferous unit occurs throughout the lower elevation floodplains of the project area. This high bench ecosystem is the final successional unit for floodplains. BEU 395 occurs on well-drained regosols on terraces within or along stream channels that are infrequently flooded. Forests are dominated by large *Picea glauca*, but may also have a *Populus balsamifera* component. Understory shrubs include *Alnus viridis, Rosa acicularis*, *Viburnum edule*, and *Salix planifolia*. Ground shrubs and forbs include *Vaccinium vitis-idaea, Linnaea borealis, Mertensia* paniculata, *Equisetum arvense* and *E. pratense*, with extensive moss carpets, typically dominated by *Hylocomium splendens*.

Some of the most notable occurrences of this unit are found along the Yukon River upstream of the White River confluence, and along the Klondike River, shown in the photo above.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Wetland (300); BEU Phase: Floodplain – Coniferous (395)

Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: level
Elevation Range: 280 – 1100 m	Aspect Conditions: none
Soil Conditions: regosols	Seral Position: stable
Total Project Area: <1% Distribution by Bioclimate Zone: BOL (6%), BOH (%), TAW (1%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Riparian Spruce Forest (313)
North Yukon	Riparian Coniferous Forest (313)

WATER AND ICE (400)

Water and Ice (all Bioclimate Zones)

Water (401)

Description

The water unit includes all open water features in the project area, including major rivers. Water features include shallow water wetlands, with aquatic vegetation such as *Nuphar polysepalum* and *Stuckenia* spp., thermokarst lakes on till in the South Ogilvie Mountains, and alpine lakes, or tarns, formed in cirques, such as Divide Lake in the uppermost North Klondike Valley, shown above. Large lakes are uncommon in west-central Yukon. In areas west and north of the glacial limits, the lack of valley "scouring" and glacial deposits result in few lakes relative to glaciated parts of Yukon. In unglaciated areas, lakes are generally limited to riparian terraces and thermokarst ponds.

Information Table

BEU Group: Wet Ecosystems; BEU Type: Water and Ice (400); BEU Phase: Water (401)

Bioclimate Zones: all (BOL, TAW dominant)	Slope Conditions: not applicable
Elevation Range: all	Aspect Conditions: not applicable
Soil Conditions: n/a	Seral Position: not applicable
Total Project Area: 1% Distribution by Bioclimate Zone: BOL (16%), BOH (0%), TAW (1%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Open Water (500); Flowing Water (501)
North Yukon	Open Water (500)

Water and Ice (ALP)

Ice (Glacier) (403)

Description

In west-central Yukon, permanent ice and snow is very limited in extent. Permanent ice is generally limited to small remnant glaciers in north-facing cirques in the Ogilvie Mountains. There is also a limited amount of late season ice called *aufeis* in valley bottoms where sufficient glacial till has been deposited to provide adequate winter water flow. Aufeis is known to occur in the South Ogilvie Mountains in the Chandindu, West Blackstone and North Klondike rivers. Perennial snow patches in mountainous area are included in BEU 403. Permanent ice and snow is not known to occur in the Klondike Plateau or Yukon Plateau North ecoregions of the southern project area.

Information Table

BEU Group: Wet Ecosystems, BEU Type: Water and Ice (400); BEU Phase: Ice (403)

Bioclimate Zones: ALP	Slope Conditions: variable (depressions)
Elevation Range: 1200 – 2310 m	Aspect Conditions: variable (north-facing)
Soil Conditions: n/a	Seral Position: not applicable
Total Project Area: <1% Distribution by Bioclimate Zone: ALP (3%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Snow and Ice (501)
North Yukon	n/a

Other Ecosystems

NATURAL AND HUMAN-CAUSED DISTURBANCE (500)

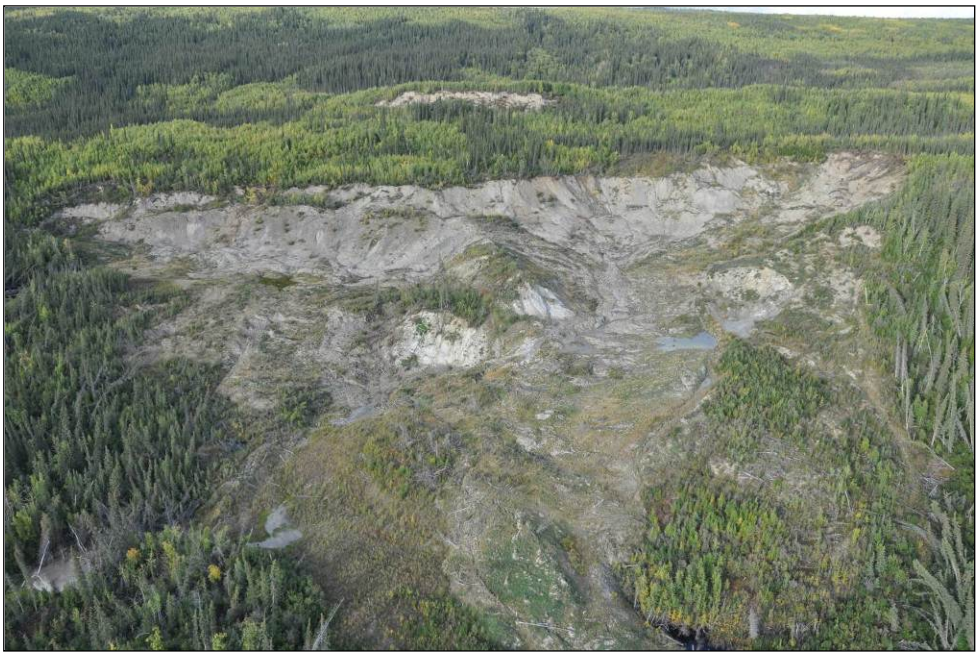
Disturbances are the physical alteration of natural ecosystems. Disturbances can be of two types, naturally-occurring such as landslides or slope failures, and human-caused such as settlements, transportation features, and mining activities. For this regional mapping project, only three conditions were considered: natural (does not include forest fires), urban/transportation (settlements, including agricultural clearings, and roads) and mining-related footprints.

Human-caused disturbances are only represented for the Dawson town site and surrounding areas. This layer was provided by Environment Yukon and incorporated into the broad ecosystem mapping. Human-caused disturbances in the northern and southern portions of the project area are not represented, but levels of human-caused disturbance in these regions are currently very low. It should also be noted that the human-caused disturbance mapping was generalized and then overlaid on the broad ecosystem mapping, masking underlying natural features.

While a category was provided for natural disturbances, none are currently represented in the broad ecosystem mapping.

Disturbance

Natural Disturbances (Landslides and Slope Failures) (501)



Description

Numerous small landslides and slope failures are found in the Ogilvie Mountains, creating large soil exposures and blocky boulder fields. On permafrost-affected slopes shallow active-layer detachment failures are common, resulting in small debris flows. Scars from past failures are easily recognized by narrow bands of early successional vegetation extending downslope. Large retrogressive thaw slumps are also found in permafrost areas (as pictured above) where massive ground ice is exposed on a slope due to river erosion or other disturbance. Due to the predictive nature of the regional ecosystem mapping, BEU 501 is not currently represented in the broad ecosystem map, but it should be recognized that these disturbance scars are present in the project area, and continue to occur.

Information Table

BEU Group: Other Ecosystems; BEU Type: Disturbance (500); BEU Phase: Natural Disturbance (501)

Bioclimate Zones: all	Slope Conditions: variable
Elevation Range: alll	Aspect Conditions: variable
Soil Conditions: bedrock and colluvium	Seral Position: not applicable
Total Project Area: unknown (none mapped) Distribution by Bioclimate Zone: unknown	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	Low-Mid Elevation Exposed/Rock/Rubble (200)
North Yukon	Low Elevation Exposed / Sparsely Vegetated (200)

Disturbance

Anthropogenic (Human-Caused) Disturbances (502)

Description

The direct footprint of residences, commercial properties and public utilities is limited to the Dawson townsite and immediate area. Small farms, country residential properties, roads and trails, and utility transmission corridors (powerlines) are the most common types of human-caused disturbances outside of the Dawson townsite. Overall, the direct non-mining related human footprint of the region is estimated to be less than 1%.

Information Table

BEU Group: Other Ecosystems; BEU Type: Disturbance (500); BEU Phase: Anthropogenic Disturbance (502)

Bioclimate Zones: BOL, BOH, TAW	Slope Conditions: variable
Elevation Range: 300 – 1200 m	Aspect Conditions: variable
Soil Conditions: all	Seral Position: not applicable
Total Project Area: <1% Distribution by Bioclimate Zone: BOL (0%), BOH (<1%), TAW (0%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	n/a
North Yukon	n/a

Disturbance

Mining Disturbances (503)

Description

The mining and mining-related footprint in the Dawson area includes numerous placer workings and a limited number of hardrock mine sites. If in an advanced stage of reclamation, some older placer tailings may be classified as shrub or deciduous forest phases of floodplain or gentle-slope and plain BEU types. The total mining-related footprint in the Dawson area is currently estimated to be approximately 13,000 ha.

Information Table

BEU Group: Other Ecosystems; BEU Type: Disturbance (500); BEU Phase: Minesite Disturbance (503)

Bioclimate Zones: potentially all	Slope Conditions: variable
Elevation Range: 300 – 1230 m	Aspect Conditions: variable
Soil Conditions: all	Seral Position: not applicable
Total Project Area: <1% Distribution by Bioclimate Zone: BOL (1%), BOH (0%), TAW (0%)	

Correlation to other Classifications

Project	Unit(s)
Peel Watershed	not applicable
North Yukon	not applicable

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APPENDIX I: PLANT SPECIES LIST

List of plants with life form class, latin name and common name used in this report.

Life Form	Latin Name	Common Name
Tree - coniferous	*Picea glauca*	White Spruce
	Picea mariana	Black Spruce
	Pinus contorta	Lodgepole Pine
	Abies lasiocarpa	Subalpine Fir
	Larix laricina	Tamarack/Larch
Tree – deciduous	*Populus tremuloides*	Trembling Aspen
	Populus balsamifera	Balsam Poplar/Cottonwood
	Betula neoalaskana	Alaska Paper Birch
Shrub	*Alnus incana*	Grey Alder
	Alnus viridis	Green Alder
	Betula glandulosa	Shrub Birch/Dwarf Birch
	Betula occidentalis	River Birch
	Cassiope tetragona	Arctic White Heather
	Chamaedaphne calyculata	Leatherleaf
	Juniperus communis	Common Juniper
	Ledum decumbens	Northern Labrador-Tea
	Ledum groenlandicum	Labrador-Tea
	Myrica gale	Sweet Gale/Sweet Bayberry
	Potentilla fruticosa	Shrubby Cinqufoil
	Rhododendron lapponicum	Lapland Rosebay
	Rosa acicularis	Prickly Rose
	Salix glauca	Blue-Green Willow
	Salix myrtillifolia	Blueberry Willow
	Salix planifolia	Tea-leaved Willow
	Salix spp.	Willow species
	Shepherdia canadensis	Soapberry
	Vaccinium uliginosum	Bog Bilberry

	Viburnum edule	Highbush Cranberry
Ground/Dwarf Shrubs	*Arctostaphylos alpina*	Alpine Bearberry
	Arctostaphylos rubra	Red Bearberry
	Arctostaphylos uva-ursi	Kinnikinick/Bearberry
	Dryas spp	(Mountain) Avens species
	Empetrum nigrum	Crowberry
	Linnaea borealis	Twinflower
	Oxycoccus microcarpus	Bog Cranberry
	Salix arctica	Arctic Dwarf Willow
	Salix polaris	Snow-Bed Willow
	Salix reticulata	Net-Veined Willow
	Vaccinium vitis-idaea	Lowbush Cranberry/Lingonberry
Forbs - Terrestrial	*Achillea millefolium*	Yarrow
	Anemone patens	Prairie Crocus
	Artemesia frigida	Prairie Sagewort
	Draba corymbosa	Flat-top Whitlow-grass
	Draba ogilviensis	Ogilvie Range Draba/Whitlow-grass
	Dodecatheon frigidum	Shootingstar
	Epilobium angustifolium	Fireweed
	Epilobium latifolium	River Beauty
	Equisetum spp.	Horsetail species
	Equisetum arvense	Field Horsetail
	Equisetum fluviatile	Water Horsetail
	Equisetum pratense	Meadow Horsetail
	Erigeron caespitosus	Caspitose Fleabane
	Galium boreale	Northern Bedstraw
	Galium trifidum	Small Bedstraw
	Geum rossii	Ross Avens
	Hedysarum alpinum	Liquorice-Root
	Lagotis glauca	Weasel Snout

	Mertensia paniculata	Tall Bluebells/Lungwort
	Minuartia spp	Sandwort/Siichwort species
	Orthilia secunda	One-sided Wintergreen
	Oxytropis nigrescens	Blackish Locoweed
	Papaver spp	Poppy species
	Parrya nudicaulis	Naked-stemmed Wallflower/Parry's Wallflower
	Pedicularis spp	Lousewort species
	Pedicularis lapponica	Northern/Lapland Lousewort
	Petasites sagittatus	Arrow-leaved Coltsfoot
	Phlox alaskensis	Alaskan Phlox
	Podistera yukonensis	Yukon Podistera
	Polygonum bistorta	Bistort
	Potentilla spp	Cinqufoil species
	Rubus chamaemorus	Cloudberry/Salmonberry
	Rumex occidentalis	Western Dock
	Silene acaulis	Moss Campion
	Solidago simplex	Mountain Goldenrod
	Synthyris borealis	Alaska Kitten-Tail
	Tephroseris lindstroemii	Twice-hairy Butterweed
Forbs – Wetland/Aquatic	*Hippuris vulgaris*	Common Mare's-Tail
	Menyanthes trifoliata	Buckbean
	Nuphar polysepalum	Yellow Pond-lily
	Potentilla palustris	Marsh Cinquefoil
	Stuckenia (Potamogeton) spp.	Pondweed species
Grasses/Sedges	*Carex aquatilis*	Water Sedge
	Carex diandra	Lesser Panicled Sedge
	Carex lugens	Spruce Muskeg Sedge
	Carex spp	Sedge species
	C. utriculata	Northern Beaked Sedge

	Eriophrum angustifolium	Narrow-leaved Cottongrass
	Eriophorum brachyantherum	Close-sheathed Cottongrass
	Eriophorum vaginatum	Tussock Cottongrass
	Poa glauca	Glaucous Bluegrass
Moss	*Polytrichum juniperinum*	Juniper Hair-Cap Moss
	Hylocomium splendens	Stair-step Feathermoss
	Pleurozium schreberei	Big Red Stem
	Sphagnum spp	Sphagnum (Peat Moss) species
Lichen	*Cladonia (Cladina) arbuscula ssp. mitis*	Yellow Reindeer Lichen
	Cladonia (Cladina) rangiferina	Grey Reindeer Lichen
	Cladonia (Cladina) stellaris	Star Reindeer Lichen
	Cladonia spp	Club Lichen species
	Peltigera spp	Pelt Leaf Lichen species