TAIGA PLAIN ECOZONE

The Taiga Plain Ecozone is located mainly in the Mackenzie Valley of the Northwest Territories, northeastern British Columbia, and northern Alberta (Fig. 1). "Taiga" is a Russian word that is synonomous with subarctic and refers to the northern fringe of the boreal coniferous forest — the land of "little sticks" — that stretches from northern Labrador to Alaska and beyond to Siberia and Scandinavia. The Mackenzie River system and its many tributaries dominate the ecozone. The ecozone is represented in the Yukon by portions of three ecoregions, the Muskwa Plateau Ecoregion in the extreme southeast of Yukon and the Peel River Plateau and Fort McPherson Plain ecoregions in the northeast. Both of these areas essentially lie east of the main ranges of the Western Cordilleran and have climatic and physiographic conditions that are distinctly different from the rest of the Yukon.

Climate: The climate is marked by short, cool summers and long, cold winters. Cold arctic air influences the area for most of the year. The mean annual temperature ranges between –10°C in the Mackenzie Delta to –1°C in Alberta and British Columbia. From north to south, the mean summer temperature ranges from 6.5 to 14°C. The mean winter temperature ranges from –26°C in the north to –15°C in the south of the ecozone. Snow and freshwater ice persist for six to eight months of the year. The mean annual precipitation is low, ranging between 250 and 500 mm.

Hydrology: The northern and southern portions of this ecozone exhibit significantly differing hydrologic

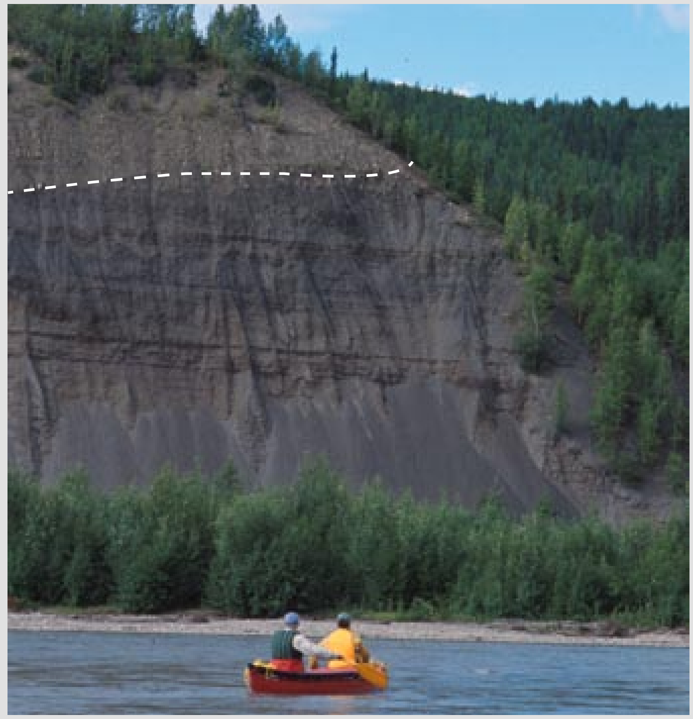
J. Meikle, Yukon Government

The northward flowing (left to right) Peel River near its confluence with the Caribou River. The river forms the boundary between the Peel River Plateau Ecoregion (foreground) and the Fort McPherson Plain Ecoregion in the distance.

response. Northern portions of the ecozone exhibit a similar streamflow response to that elsewhere in the Taiga Cordillera Ecozone to the west. Here, runoff volume is relatively large in comparison with more southern areas because of the underlying permafrost and lesser rates of evapotranspiration. Peak flows, which generally occur in June, are likewise greater relative to areas with less permafrost. Minimum flows throughout the ecozone generally occur in March and tend to be lower than the southern ecozones because of the effect of lower winter temperatures on groundwater flow. Small streams frequently experience zero flows, while some intermediate-sized streams may occasionally experience zero winter flows. Low flows within the Muskwa Plateau Ecoregion in the southern portion of the ecozone are slightly greater than those in the rest of the ecozone.

Vegetation: An open, generally slow-growing, conifer-dominated forest of predominantly black spruce characterizes the ecozone. The shrub component is usually well developed and includes dwarf birch, Labrador tea, and willow. Bearberry, mosses, and sedges are dominant understory species. Upland and foothill areas and southerly locales tend to have better drained and warmer soil, and may support mixed forests characterized by white and black spruce, lodgepole pine, tamarack, paper birch, trembling aspen, and balsam poplar. Along the nutrient-rich alluvial flats of the larger rivers, white spruce and balsam poplar grow to sizes comparable with those in the Boreal Plains Ecozone to the south.

Landforms and soils: The ecozone represents the northern extension of the Interior Plains of North America and lies contiguously with the Prairie and Boreal Plains Ecozones to the south. The subdued topography consists of broad lowlands and occasional plateaus, the largest having relief differences of several hundred metres. Underlain by sedimentary rock — limestone, shale and sandstone — the nearly level to gently rolling plain is covered with organic deposits and, to a lesser degree, moraine and lacustrine deposits. Alluvial deposits are common as terraces and braided floodplains along the major river systems of the ecozone. Wetlands (primarily peatlands) are a common feature and cover an estimated 25 to 50% of the ecozone. Most of the ecozone is underlain by permafrost, which acts to perch the surface water table and promote a regional overland seepage system. When combined with low-angle slopes, this creates a landscape dominated by soils that are seasonally waterlogged over large areas. Patterned ground features are common. The region's widespread permafrost and poor drainage create favourable conditions for Cryosolic, Gleysolic, and Organic soils.


J. Meikle, Yukon Government

The lowermost Snake River occupies the pre-Laurentide Peel River Channel. Above the bedrock surface (dashed line) is a blanket of glacial drift.

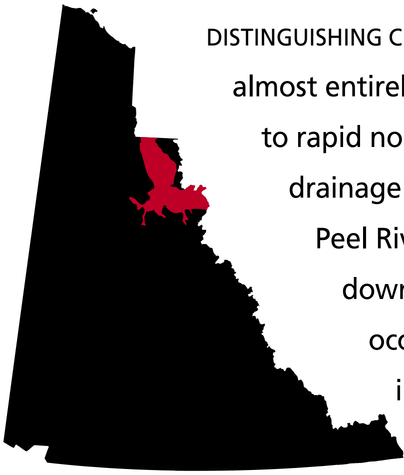
Wildlife: Characteristic mammals include moose, woodland caribou, wood bison, wolf, black bear, marten, lynx, and arctic ground squirrel. Barren-ground caribou overwinter in the northwest corner of the ecozone. Common bird species include Common Redpoll, Gray Jay, Common Raven, Red-throated Loon, Northern Shrike, Sharp-tailed Grouse, and Fox Sparrow. Fish-eating raptors include Bald Eagle and Osprey. The Mackenzie Valley forms one of North America's most traveled migratory corridors for waterfowl — ducks, geese, and swans — breeding along the Arctic coast.

Human activities: The population of 21,400 is approximately 60% aboriginal. The major communities include Fort Nelson, Inuvik, Hay River, Fort Smith and Fort Simpson. There are no communities within the Yukon portion of this ecozone but hunting, trapping, and fishing are the primary activities in the local economy. Mining, oil and gas extraction, and some forestry and eco-tourism are the main industrial activities in the ecozone.

Peel River Plateau

Taiga Plain Ecozone

ECOREGION 51



DISTINGUISHING CHARACTERISTICS: This is the only ecoregion in the Yukon with landscapes almost entirely shaped as the result of Laurentide glaciation. Several canyons testify to rapid northward draining of pro-glacial lakes about 10,500 years ago. Regional drainage was rerouted northward by Laurentide Ice, in response to which Peel River tributaries, such as the Snake, Caribou, Trail and Road rivers have downcut into the plateau (Fig 51-1). Most species of large Yukon mammals occur, but only the polar representatives of most small mammal genera inhabit the ecoregion. The extensive wetlands and the broad Peel River valley support considerable bird life.

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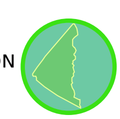
Figure 51-1. The northern portion of the ecoregion is deeply incised by the Caribou, Trail, Road (above; entering the Peel) and Vittrekwa rivers, which flow eastward from the Richardson Mountains (background). Numerous wetland complexes are perched on the plateau.

APPROXIMATE LAND COVER
subarctic coniferous and mixed forest, 75%
forest–tundra transition, 10%
alpine tundra, 10%
lakes and wetlands, 5%

TOTAL AREA OF ECOREGION IN CANADA
59,970 km^2



TOTAL AREA OF ECOREGION IN THE YUKON
14,810 km^2

ECOREGION AREA AS A PROPORTION OF THE YUKON
3%

ELEVATIONAL RANGE
45–1,470 m asl
mean elevation 455 m asl

CORRELATION TO OTHER ECOLOGICAL REGIONS: Largely equivalent to **Peel River Ecoregion** (Oswald and Senyk, 1977) • Portion of **Taiga Plains Region** (CEC, 1997) • Portion of the **Northwest Territories Taiga Ecoregion** (Ricketts *et al.*, 1999)

PHYSIOGRAPHY

The Peel River Plateau Ecoregion is very large, and stretches from the Beaufort Sea, along the eastern foothills of the Richardson, Mackenzie and Franklin mountains, almost to the Nahanni River (Fig. 2). A relatively small portion of it is in the Yukon.

The Yukon portion of this ecoregion incorporates the Peel Plateau and the Bonnet Plume Depression physiographic units (Mathews, 1986; Hughes, 1987b). The Peel Plateau lies between the Richardson Mountains to the west and the Wernecke Mountains to the south. It is bounded to the east by a scarp descending to the Mackenzie River valley bottom. The Bonnet Plume Depression, a lowland in the southwest corner of the ecoregion, was included in the Porcupine Plateau by Bostock (1948).

The lowest elevations in the ecoregion — less than 100 m asl — fall within the physiographic unit of the Bonnet Plume Depression, whereas higher elevations in the ecoregion are associated with the Peel Plateau, which covers the foothills and eastern flanks of the Richardson Mountains. Several ridges extend into the ecoregion northward from the Wernecke Mountains. Ridges and hills are commonly 760 m asl, but along the edge of the Wernecke Mountains elevations reach between 1,000 and 1,400 m asl. The plateau surface and higher terrace levels described by Bostock (1948) are probably evidence of Late Tertiary easterly drainage at much higher elevations than the present drainage (Mathews, 1991). Numerous small lakes are scattered over the plateau.

BEDROCK GEOLOGY

This ecoregion has little rock exposed, except for sandstone in the valleys of the Bonnet Plume and Snake rivers, and the Trevor Range. The regional bedrock distribution, largely covered by surficial deposits, is shown by Norris (1981g,h; 1982c), and the lithostratigraphy is described by Morrow (1999). The youngest rocks are Cretaceous, described by Norris and Hopkins (1977) and Yorath and Cook (1981).

The eastern part of the ecoregion is part of the Northern Interior Platform which consists of Proterozoic sedimentary rocks unconformably overlain by a Devonian to Carboniferous succession 1,900 m thick, in turn unconformably overlain by the Cretaceous strata. The Trevor Fault bisects the ecoregion from north to south. On the east, the uppermost rock is the Cretaceous Arctic Red Formation consisting of concretionary marine shale, siltstone, and lesser sandstone with small, convoluted bedding and vertical burrows. In a few places it is overlain by the Martin House Formation of glauconitic siltstone and shale.

The western side of Trevor Fault has been uplifted, likely in Middle Tertiary time. Lower Carboniferous dark grey shale, silty conglomerate, Mississippian light grey sandstone and dark grey shale are exposed in Noisy Creek and around the Trevor Range, a pop-up anticline whose core exposes the lower Paleozoic Bouvette Formation dolostone. The Cretaceous Trevor Formation consists of horizontal, broken-surface sandstone that tends to form plateaus, and locally contains beds of clay ironstone. The southwestern corner of the ecoregion is a complex of vertical and strike-slip faults of the Knorr–Richardson array; this low-lying area preserved the Cretaceous through Tertiary Bonnet Plume Formation consisting of non-marine conglomerate, sandstone and shale, with lignite seams.

Martin House Formation locally contains concretions in which ammonites may be found, as well as pale-green to pale-yellow bentonite clay seams several centimetres thick. Coal exploration leases cover the Bonnet Plume Basin, and lignite float is reported along the Peel River at 66°28'N 133°59'W. Devonian sandstone incised by the Snake River near the southern edge of the ecoregion may contain fish fossils (S. Cumba and J. Storer, pers. comm., 1997).

SURFICIAL GEOLOGY AND GEOMORPHOLOGY

Surficial deposits within this ecoregion are 80% glacial in origin — moraine, glaciolacustrine and glaciofluvial. Moraine derived from the Laurentide Ice Sheet blankets most valleys and subdued uplands. Postglacial colluvium and alluvium comprise the remaining deposits (Duk-Rodkin and Hughes, 1992a,b). Glaciofluvial terraces extend along the main rivers, except for the Peel River within the Bonnet Plume Depression, which is incised in bedrock. Colluvial deposits occupy foothills, slopes and valley sides, usually in conjunction with patches of exposed bedrock.

Alluvial plains are present along major streams (Fig. 51-2).

Modern processes are dominantly related to permafrost. Thermokarst and periglacial landforms, including occasional open system pingo development, are common in the lower Bonnet Plume and Wind rivers. On slopes, active mass wasting features include rotational slides, debris flows and retrogressive thaw flow slides along the sides of deeply incised tributaries to the Peel River. Slope instability is related to postglacial downcutting, which has been as much as 400 m in parts of the lower Peel River. Retrogressive thaw flow slides are common where ground ice has been exposed in glaciolacustrine deposits by forest fire, debris flows and regressive erosion. Thermokarst processes are widespread on these silty and clayey glaciolacustrine landforms.

J. Meikle, Yukon Government

Figure 51-2. The Wind, Bonnet Plume (above) and Snake rivers begin in the Mackenzie Mountains. The Bonnet Plume and Wind rivers have extremely braided channels across the Bonnet Plume Basin. The lower Snake, by contrast, is incised deeply in the Plateau. It was diverted by Laurentide glaciation and subsequently captured by the Peel River.

Sloping terrain has the characteristic runnel drainage pattern — fine, feather-like and parallel — that is common in high latitude frozen mineral soils. Terracing, solifluction and earth stripes are common on moderate slopes at upper elevations. On gently sloped upland surfaces, sorted circles, stone nets, or polygons are often present.

GLACIAL HISTORY

This ecoregion was affected by the Late Wisconsinan Laurentide Ice Sheet in the southern Bonnet Plume Depression, and by two glaciers in the Wind and Bonnet Plume valleys. There are three well-defined Laurentide glacial limits within this ecoregion: the maximum (ca. 30 ka; Hughes *et al.*, 1981; Schweger and Matthews, 1991); the Katherine Creek Phase (ca. 22 ka; Duk-Rodkin and Hughes, 1991; 1995); and the Tutsieta Lake Phase (ca. 13 ka; Hughes, 1987a). At its maximum, the ice sheet bordered the west, south and east edge of Bonnet Plume Depression (Fig. 51-3). Drainages exiting the mountains — the Snake River, Arctic Red River, and their tributaries — were diverted through Rapitan Creek-Bonnet Plume Valley, and other minor meltwater channels and valleys that drained into the depression. Damming of the Bonnet Plume, Wind and tributary rivers in the southern Bonnet Plume Depression directed drainage westward along Hungry Creek and the lower Hart River into pro-glacial Lake Hughes (Fig. 15), which formed on the middle Peel River Valley (Duk-Rodkin and Hughes, 1995). The main outlet of Lake Hughes was the Eagle River discharge channel, which today is occupied by Canyon Creek and the headwaters of Eagle River.

During the maximum extent of the Laurentide Ice Sheet, all drainage from the Mackenzie and Wernecke mountains exited via the Eagle River discharge channel into Lake Old Crow the proglacial lake occupying the Bell–Old Crow–Bluefish Basin (Fig. 16). During the Katherine Creek Phase, the ice sheet re-advanced to a position marked by a discontinuous meltwater channel along the middle reaches of Caribou, Trail, Road and Vittrekwa rivers; Stony Creek and Barrier River; and extending north along Peel Plateau. The Katherine Creek Phase reached Bonnet Plume Basin about 35 km west of the confluence of the Peel and Snake rivers

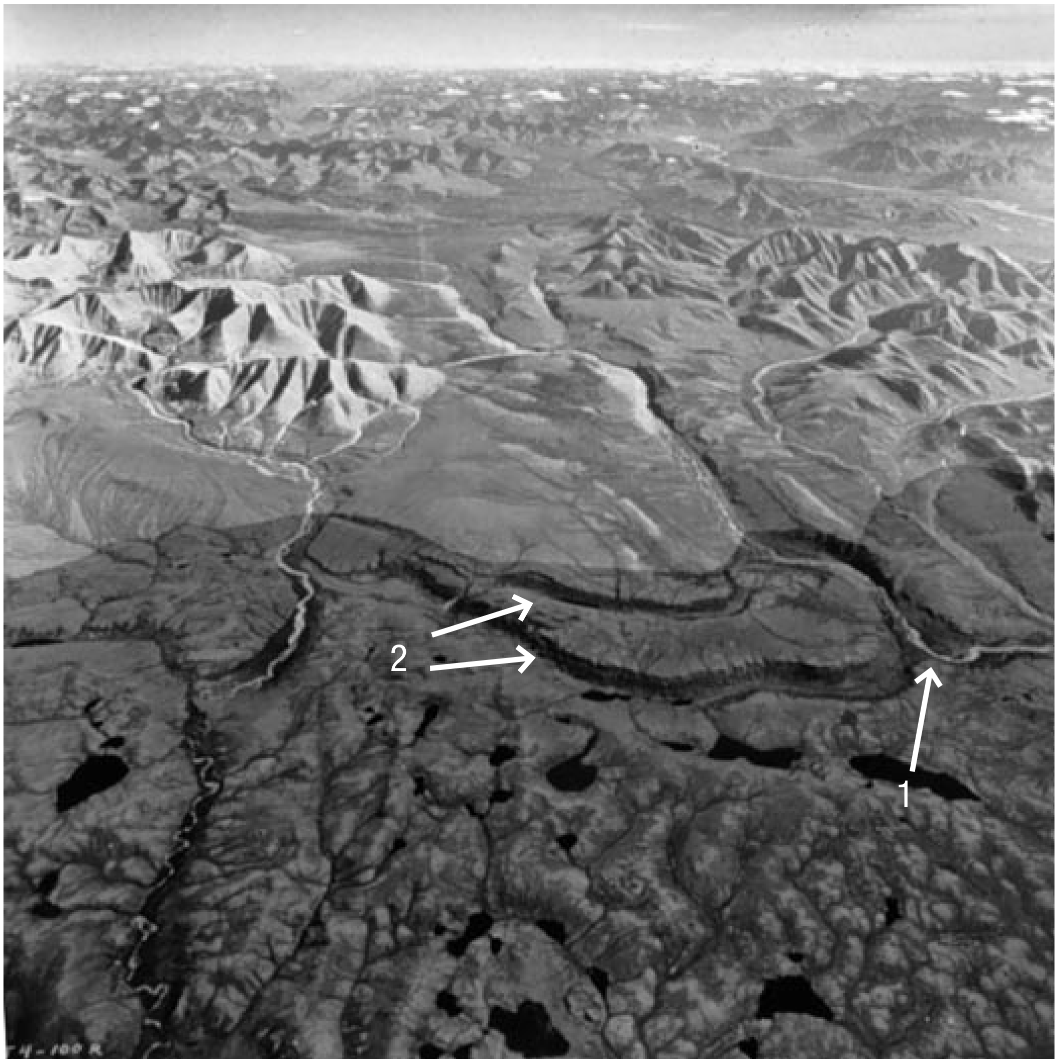


Figure 51-3. This oblique aerial photograph over the Bonnet Plume Basin, with a view southward into the Wernecke Mountains, has been shaded to show the extent of Laurentide glaciation (foreground). Noisy Creek (centre of photo) has been diverted westward where it flows out of the Knorr Range (1). Note the abandoned meltwater channels formed parallel to the glacial front (2).

A. Duk-Rodkin, Geological Survey of Canada

and extended eastward, parallel to the mountain front a few kilometres south of the Snake River. At this time, meltwater drained into the Arctic Ocean through a system of interconnected channels via Bonnet Plume Depression. The next eastward position of the Laurentide Ice Sheet, the Tutsieta Lake Phase, impinged on the eastern edge of the ecoregion, as marked by a meltwater channel occupied by the Peel River.

CLIMATE

From within the ecoregion, little or no climate data are available. The ecoregion is east of the continental divide and, therefore, climatic controls are different from those for the rest of the Yukon. Winters are relatively long, October to late May, with frequent intrusions of Arctic air into the Mackenzie Valley. Summers are short but fairly warm, in part due to the influence of continental air masses from the interior plains to the south. Precipitation is light to moderate, enhanced by the redevelopment of Pacific storms in the Mackenzie Valley.

Mean annual temperatures are near –8°C. Average February temperatures range from –25 to –30°C. Extreme minimum temperatures are near –55°C, somewhat less cold than the interior of the Yukon. Although not common, above freezing temperatures can occur in any winter month. May temperatures are variable, ranging from –25 to 30°C. July is the warmest month, with mean temperatures near 15°C, mean minimums near 10°C, and mean maximums near 20 to 25°C. Frost can be expected at any time, however, even during summer.

Precipitation is light to moderate with annual amounts near 300 mm. July and August are the wettest months, with mean monthly amounts near 40 mm, although over 100 mm can occur in these months. The driest period is November through May, but generally 15 to 20 cm of snow can be expected each month. Winds are expected to be light to moderate at 10 to 15 km/hr with prevailing directions probably from the northwest and south.

No climate stations occur within the ecoregion but relevant data from Fort McPherson, Fort Good Hope and Norman Wells can be used to characterize the climate of the ecoregion. The most applicable data to infer Yukon conditions is from the Fort McPherson station.

HYDROLOGY

Encompassing the eastern slopes of the Richardson and Mackenzie mountains, the drainage from this ecoregion is diverse. It extends from the Mackenzie Delta in the north, through the Peel River basin, to tributaries that feed directly into the Mackenzie River. The Peel River lies near the eastern boundary of the Yukon portion of the ecoregion. This lower reach of the Peel River is unique in that it flows parallel to the Richardson Mountains, having been formed along the front of the receding Laurentide Ice Sheet (Duk-Rodkin and Hughes, 1995). The Peel River has cut a deep canyon more than 30 m below the plateau surface downstream from the mouth of the Wind River. Tributaries include the eastern flowing Vittrekwa, Road, Trail and Caribou rivers, with these largely representative of ecoregion streamflow response.

There are no large lakes within the ecoregion, while most intermediate-sized lakes are associated with wetland complexes (Chappie Lake complex, see Fig. 28). These include Hungry, Margaret, Turner, Hogan and Chappie lakes, while Lusk Lake is a higher elevation subalpine lake. Wetlands and lakes are estimated to cover about 5% of the Yukon portion of the ecoregion. The most significant wetlands are the Turner and Hogan Lakes complexes, which are on the plateau adjacent the Peel River. Smaller complexes are located in the Bonnet Plume and Vittrekwa River valleys.

There are no representative hydrometric station records for the ecoregion. Selected hydrometric stations with similar topography from nearby ecoregions were chosen to represent Peel River Plateau streamflow characteristics. Because of the relatively low relief, runoff is relatively low. Annual streamflow is characterized by an increase in discharge in early May due to snowmelt, rising to a peak later in the month within most ecosystem streams. Summer rain events do produce secondary peaks, and sometimes the annual stream flow peak, in July or August. Smaller streams are known to experience peak rainfall events more frequently than larger ones. The mean annual runoff is estimated to be 192 mm, while mean seasonal and summer flows are estimated to be 12.6×10^{-3} and 9.4×10^{-3} $m^3/s/km^2$, respectively. The mean annual flood and mean maximum summer flow are estimated to be 108×10^{-3} and 36×10^{-3} $m^3/s/km^2$, respectively. The minimum annual and summer flows are estimated to be 0.11×10^{-3} and $1.6. \times 10^{-3}$ $m^3/s/km^2$ respectively. Minimum streamflow generally occurs during March or earlier, with the magnitude among the lowest of all Yukon ecoregions, due to the increasing role of winter temperatures and permafrost on streamflow. The majority of small and some intermediate streams experience zero winter flows relatively frequently.

PERMAFROST

The continuous permafrost zone underlies the Peel River Plateau Ecoregion. Permafrost thickness of up to 625 m has been inferred from geophysical data collected near the Yukon–Northwest Territories border, but at lower elevations the depth to the base of ice-bearing permafrost appears closer to 300 m (Geological Survey of Canada, unpubl. data).

Ice-rich zones in the near-surface layers of permafrost are common; the uppermost 18.3 m of permafrost was delineated as such during geotechnical drilling at Midway Lake in a contiguous part of the ecoregion across the territorial border (EBA, 1990a). Ice wedges and lenses are regularly reported in the pediment slope grading down from the Richardson Mountains (Geocon, 1986; EBA, 1987a). On the pediment slope, these are developed into polygons, but the networks are not as extensive in glaciated terrain. About 75% of the area may be underlain by ice-rich ground (Geocon, 1986).

SOILS

Much of the ecoregion was subjected to Laurentide glaciation which produced a variety of soil parent materials derived both from local rock and from shield bedrock to the east. There have been few regional studies of the soils in the Yukon portion of this ecoregion. Sites along the Dempster Highway in the Northwest Territories portion of the ecoregion have been described by Tarnocai *et al.* (1993).

Most of the ecoregion is covered by open forests of black spruce and larch, or by extensive shrublands. Earth hummocks are associated with this forest cover and are considered to be the product of intense frost churning in these soils (Zoltai and Tarnocai, 1975). The resultant soils are classified as either Orthic or Brunisolic Turbic Cryosols. Soils derived from moraine are generally gravelly sandy-loam texture. Finer glaciolacustrine parent materials exist in association with former glacial lakes (Fig. 51-4) in the Bonnet Plume Depression. These soils tend to be wetter, support shrub or tussock vegetation along with black spruce, and have Gleysolic or Orthic Turbic Cryosol development.

Soils on the gravelly glaciofluvial deposits of the major rivers of the ecoregion tend not to contain permafrost, and support Orthic Eutric Brunisols formed under closed white spruce forest. On active, braided floodplains under shrub vegetation (Fig. 51-2), soils are typically Orthic Regosols and may be sandy, silty or gravelly in texture. Wetland soils are common in the Bonnet Plume Depression and scattered elsewhere in the ecoregion. Fibric Organic Cryosols are commonly associated with peat plateau and palsa landforms where peat accumulation of 2 to 3 m in thickness is typical (Zoltai *et al.*, 1988).

J. Meikle, Yukon Government

Figure 51-4. Typical of the region is a retrogressive thaw slump on glaciolacustrine parent material. Thaw slumps are triggered by a disturbance of ice-rich sediments which then melt and produce an arcuate scar as shown in the foreground. With the exception of the small stand of spruce along the lakeshore (centre, foreground), the entire area was recently burned by a forest fire, the probable trigger of the slump.

VEGETATION

The vegetation of the Peel River Plateau Ecoregion is dominated by open stands of stunted black spruce and larch. Shrub-dominated communities occur at higher elevations. Much of the area has been burned, resulting in many mixed and deciduous communities. White spruce forests are restricted to fluvial terraces and some slopes along the major rivers.

The black spruce and black spruce–larch communities that dominate the Peel Plateau are underlain by medium to fine-textured Turbic Cryosolic soils, often gleyed, and derived from glacial parent materials. Labrador tea, shrub birch, ground shrubs such as lowbush cranberry and cloudberry, and mosses and lichens dominate the understory (LGL, 1981). Their micro-distribution is determined by earth hummocks (Zoltai and Pettapiece, 1973; Stanek *et al.*, 1981). Ericaceous shrubs dominate the tops and sphagnum mosses the inter-hummock troughs. Trees usually grow on, and often lean away from, the sides of the hummocks.

On shallow, poorly drained slopes, sedge tussocks and low ericaceous shrubs provide groundcover (Hettinger *et al.*, 1973; Stanek *et al.*, 1981; MacHutcheon, 1997). Tree density appears to be related to the time interval since the area was burned (Hettinger *et al.*, 1973). Initially, after a fire the tree density increases, but gradually the canopy thins out.

In old burns on drier sites, mixed forests of balsam poplar, paper birch, white spruce, green alder and willow have an understory of Labrador tea, lowbush cranberry and cloudberry (Hettinger *et al.*, 1973; Kennedy, 1992; MacHutcheon, 1997).

Along the lower portions of the Peel and Wind rivers, closed white spruce alluvial forests are found on well to imperfectly drained Eutric Brunisols. These sites typically host a shrub understory of mountain alder, willow and rose with a groundcover of horsetail, mustard and moss. On less stable sites along major rivers, mixed balsam poplar floodplain communities are more common. These are successional to the white spruce communities and dominated by balsam poplar, white spruce, mountain alder, and horsetail.

Numerous wetland complexes, dominated by small lakes and peat plateau bogs, are scattered on the plateau surface (Fig. 51-5). Sparse stunted black spruce with *Cladinia* lichen understory, shrubs, lichen, and moss dominate veneer bogs, common in the Bonnet Plume Basin (LGL, 1981).

J. Meikle, Yukon Government

Figure 51-5. View westward toward the Richardson Mountains. Wetlands, including peat plateau bogs, fens and shallow water, occur throughout the ecoregion.

Because this ecoregion is in the continuous permafrost zone, sparse black spruce and larch bogs dominate even alluvial terraces, such as are found along the Bonnet Plume River. Understory vegetation consists of shrub birch, willow, Labrador tea and other ericaceous shrubs (Hettinger, 1973; Stanek *et al.*, 1981; C.E Kennedy, writ. comm., 1992). Sites subject to frequent flooding have become tall willow or willow–alder swamps. Floodplain marshes along riverbanks are colonized by horsetail. Fens are dominated by *Carex aquatilis*.

Shrub-dominated communities are common at higher elevations on gently sloping south and southwest facing slopes. These low shrub communities with scattered alder clumps, shrub birch, Labrador tea, cloudberry, alpine blueberry, lowbush cranberry, and sedges, mosses and lichen, are associated with earth hummocks and Turbic Cryosols (Stanek *et al.*, 1981).

WILDLIFE

Mammals

Many of the taiga and alpine mammals of the Yukon occur in the Peel River Plateau including grizzly bears, wolves and wolverines. The ranges of two small populations of Dall sheep, occurring in the Richardson Mountains, extend into the Peel River Plateau at key mineral licks (Barichello *et al.*, 1987). Barren-ground caribou from the Porcupine herd occasionally winter here, east of the principal winter range (Fancy *et al.*, 1994). Moose occupy suitable habitats along river drainages.

Collared pika, arctic ground squirrel, singing vole and chestnut-cheeked vole are common. A list of mammal species known or expected to occur in this ecoregion is given in Table 4. Many of the rodent and ungulate species found in the southern Yukon are absent, resulting in relatively low diversity. There is little known of the small mammal populations of the area.

Birds

There is limited documented information on the bird life of the Yukon portion of the Peel River Plateau (Dennington, 1985; Frisch, 1987). There is speculation that Harris's Sparrow, a species not yet documented in the Yukon, may occur, along with Gray-headed Chickadee, which has not been confirmed breeding in the territory.

The wetlands of Chappie Lakes are used by staging Sandhill Crane, and staging and nesting Tundra Swan, Greater and Lesser Scaups, Surf Scoter, Red-necked Grebe, and Canada Goose (Dennington, 1985; Hawkings, 1994). Another wetland complex of potential importance is Hungry Lake, found in the extreme western portion of this ecoregion, where Tundra Swan and Bald Eagle occur in summer (Frisch, 1975; Peepre and Associates, 1993). Sandhill Cranes nest in the Northwest Territories portion of this ecoregion (Frisch, 1987), and Lesser Yellowlegs, Solitary and Upland Sandpipers, and Common Snipe occur in wetlands and open areas (Frisch, 1987).

The Peel River itself supports breeding Common Merganser, Canada Goose, Semipalmated Plover, Spotted Sandpiper, Herring Gull, and Belted Kingfisher. The Peel River, lower Wind River and their tributaries also support nesting Peregrine Falcon, Gyrfalcon, Bald Eagle, and a few Osprey (Yukon Wildlife Branch, 1977; Peepre and Associates, 1993).

Forested areas of the Northwest Territories section of this ecoregion are known to provide breeding habitat for Red-tailed Hawk, Merlin, American Kestrel, Olive-sided Flycatcher, Gray-cheeked and Varied Thrushes, Yellow, Yellow-rumped, Blackpoll, and Wilson's Warblers, Dark-eyed Junco, Chipping Sparrow, Rusty Blackbird, Pine Grosbeak, and Common Redpoll (Frisch, 1987). Year-round forest residents probably include Gray Jay, Common Raven, and Boreal Chickadee (Frisch, 1987).

Shrubby tundra areas near treeline support Northern Shrike, American Robin and American Tree and Savannah Sparrows (Frisch, 1987). Willow Ptarmigan inhabit this shrub tundra zone and adjacent subalpine forests throughout the year (Brown, 1979; Frisch, 1987).

Fort McPherson Plain

Taiga Plain Ecozone

ECOREGION 53

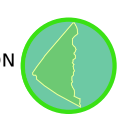
DISTINGUISHING CHARACTERISTICS: Only a small portion of this low relief, low elevation ecoregion occurs within the Yukon Territory. It includes the only part of the territory that lies on the floor of the Mackenzie Valley. Perennially frozen peatlands are extensive, covering over 25% of the ecoregion. The mean annual runoff is extremely low because of the very low relief (Fig. 53-1). The mean seasonal and summer stream flows of rivers are the lowest per unit area among all the Yukon ecoregions.

C.D. Eckert, Yukon Government

Figure 53-1. A view of the nearly level topography of the Fort McPherson Plain. The light coloured areas are covered in lichens that grow on the relatively dry surface of elevated peatlands called peat plateaus.

APPROXIMATE LAND COVER
subarctic coniferous and mixed forest, 85%
small lakes and non-treed wetlands, 15%

TOTAL AREA OF ECOREGION IN CANADA
30,180 km^2



TOTAL AREA OF ECOREGION IN THE YUKON
2,840 km^2

ECOREGION AREA AS A PROPORTION OF THE YUKON
1%

ELEVATIONAL RANGE
35–440 m asl
mean elevation 150 m asl

CORRELATION TO OTHER ECOLOGICAL REGIONS: Northwestern portion of **Peel River Ecoregion** (Oswald and Senyk, 1977) • Portion of **Taiga Plains Region** (CEC, 1997) • Portion of the **Northwest Territories Taiga Ecoregion** (Ricketts *et al.*, 1999)

PHYSIOGRAPHY

The northern half of the Fort McPherson Plain Ecoregion corresponds to the Peel Plain physiographic unit though the ecoregion also includes part of the Peel Plateau (Mathews, 1986; Hughes, 1987b; Bostock, 1948) (Fig. 2). The plain is an extensive level surface with little or no exposed rock. The ecoregion begins on the east bank of the Peel River and extends to the east and southeast into the Northwest Territories along the Mackenzie River Valley. Only the western margin of the ecoregion lies within the Yukon Territory.

The ecoregion slopes generally in a northeasterly fashion from an elevation of just over 440 m asl in the south to approximately 35 m asl in the north along the Peel River.

BEDROCK GEOLOGY

This area lacks exposed bedrock, but is part of the Northern Interior Platform succession (Norris, 1981h; Morrow, in press). Beneath the veneer of surficial deposits is the horizontal Cretaceous Arctic Red Formation of shale and sandstone, which is 350 to 400 m thick (Dixon, 1992). An unconformity separates the Cretaceous rock from underlying Devonian to Carboniferous sandstone and shale. Several exploratory gas wells have been drilled along the lower Trail River.

SURFICIAL GEOLOGY

Surficial deposits are dominantly moraine with small patches of discontinuous glaciolacustrine sediments (Duk-Rodkin and Hughes, 1992b,c). The remaining 10% of the area is comprised of colluvium, alluvium and organic deposits. Peatlands are most commonly developed on lacustrine deposits and moraine (Fig. 53-2).

Modern processes include rotational slides, debris flows, mudflows and retrogressive thaw flow slides along valley sides due to slope instability related to postglacial downcutting. Retrogressive thaw flow slides are also common where ground ice has been exposed by forest fire, debris flows and regressive erosion. Debris flows are most commonly triggered

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Figure 53-2. Wetland complexes composed of shallow water, basin fens and peat plateau bogs occur throughout the ecoregion. During dry summers, the taiga forest and shrublands can become dry enough to support forest fires. The resultant burns (dark area surrounding the light-coloured fen) can be extensive.

by summer storms that expose the active layer and eventually develop into retrogressive thaw flow slides. Thermokarst processes are widespread on glacial lacustrine and morainel pediments.

GLACIAL HISTORY

The ecoregion was completely covered by the Late Wisconsinan Laurentide Ice Sheet, which blocked drainage and formed temporary lakes between glacier ice and mountain slopes. The rivers that border this ecoregion to the south and west formed part of a meltwater system that marked the western margin of the Tutsieta Lake Phase of the Laurentide Ice Sheet (ca. 13 ka; Hughes, 1987a; Duk-Rodkin and Hughes, 1995). At this time, the Mackenzie and Wernecke Mountain drainages and meltwater flowed to the Arctic Ocean via the Peel River. This flow established the present courses of the Snake and Peel rivers. The Cranswick and Arctic Red rivers were established following continued eastward retreat of the ice margin about 12,000 years ago. When the margin of the Laurentide Ice Sheet retreated from the uplands in the southern Anderson Plains east of the Mackenzie Valley, forming a large glacial lake. The outlet of this lake was west into the Mackenzie Delta area (Duk-Rodkin and Hughes, 1995), which is thought to have established the Mackenzie River in its present location.

CLIMATE

Little or no climate data are available from within the ecoregion. This ecoregion is east of the continental divide and, therefore, climatic controls are different from those for the rest of the Yukon. Winters are relatively long, October to late May, with frequent intrusions of arctic air up the Mackenzie Valley. Summers are short but fairly warm, in part due to the influence of continental air masses from interior plains to the south. Precipitation is light to moderate, enhanced by the redevelopment of Pacific storms in the Mackenzie Valley.

Mean annual temperatures are near –8°C. Average February temperatures range from –25 to –30°C. Extreme minimum temperatures are near –55°C, somewhat less cold than the interior of the Yukon. Although not common, above freezing temperatures can occur in any winter month. May temperatures are variable, ranging from –25 to 30°C. July is the warmest month with mean temperatures near 15°C, mean minimums near 10°C and mean maximums near 20 to 25°C. Frost can be expected at any time, however, even during summer.

Precipitation is light to moderate with annual amounts near 300 mm. July and August are the wettest months with mean monthly amounts near 40 mm, although over 100 mm in these months can occur. The driest period is November through May, but generally 15 to 20 cm of snow can be expected each month. Winds are expected to be light to moderate with mean values from 10 to 15 km/hr, with prevailing directions probably from the northwest and south.

No climate stations occur within the Yukon portion of this ecoregion but relevant data from Fort McPherson, Northwest Territories characterize the climate of this part of the Mackenzie Valley.

HYDROLOGY

Drainage from this very flat, low-lying ecoregion is into the Peel River. On the eastern side, the low divide between the Peel and Arctic Red River drainage basins makes up the political boundary with the Northwest Territories. Other than the Peel River, which forms the western boundary of the ecoregion, there are no large or intermediate-sized streams within the Yukon portion of the ecoregion. Smaller representative streams include the Satah River and Brown Bear and Georges creeks, all flowing into the Peel River. While there are no intermediate or large lakes, the ecoregion contains numerous small pothole lakes and ponds. The largest lakes are the Tabor Lakes, and the Seguin and Chi Itree complex.

Two historical representative hydrometric stations, Weldon and Jackfish Creek, are both within the Northwest Territories portion of the ecoregion. Monitored streams with similar characteristics were selected from adjacent ecoregions to supplement the available data to characterize the hydrologic response. Annual streamflow has an increase in discharge in May due to snowmelt, rising to a peak towards the latter part of the month. Summer rain events will occasionally produce secondary peaks on some streams, and infrequently the annual stream flow peak. Fall (September) streamflow is often higher than post-freshet summer levels. Because of the very low relief, mean annual runoff is extremely low with an estimated ecoregion average of 99 mm, while mean seasonal and summer flows are the lowest of all ecoregions (on a unit-area basis) with values of 5 X 10^{-3} and 2.7 X 10^{-3} $m^3/s/km^2$. The mean annual flood is moderately high, while the mean maximum summer flow is extremely low with values of 73 X 10^{-3} and 9.2 X 10^{-3} $m^3/s/km^2$, respectively. The minimum annual and summer flows are near 0, and 0.28 X 10^{-3} $m^3/s/km^2$, respectively. Due to the dominant role of winter temperatures and permafrost on streamflow, all ecoregion streams experience zero winter flows from December to April most years.

PERMAFROST

The Fort McPherson Plain Ecoregion is in the continuous permafrost zone. Geophysical data indicate the permafrost thickness may be up to 320 m, although temperature records from near Fort McPherson suggest the base of permafrost lies between 90 and 150 m from the surface (Geological Survey of Canada, unpubl. data).

Ground ice is found in all terrain units within the ecoregion, but ice wedges and thick accumulations of ice lenses are especially frequent in the moraine that blankets parts of the ecoregion (Geocon, 1986). There are numerous thermokarst lakes in these deposits (Harris *et al.*, 1983a). The ground surface in such terrain is usually hummocky and underlain by aggradational ice lenses (see Mackay, 1983).

SOILS

The soils of this ecoregion have formed on level to gently undulating topography composed of various glacial and organic parent materials. This is the only ecoregion in the territory that lies completely outside of the Cordilleran environment. As the ecoregion is within the zone of continuous permafrost, Cryosols dominate the landscape. Upland soils typically show earth hummock formations that underlie open forests of black spruce. These soils are classified as either Orthic or Brunisolic Turbic Cryosols (Pettapiece *et al.*, 1978). A surface of mossy peat up to 40 cm thick may be present. The permafrost table undulates beneath the surface producing an active layer 30 to 80 cm thick. The mossy forest floor materials tend to be acidic. Well-drained upland soils, particularly coarse-textured soils and shallow soils associated with bedrock outcrops, may be without near-surface permafrost, and are classified as Eutric Brunisols. Forest fires affect the thickness of the active layer and may result in a temporary drop of the permafrost table to a depth below 2 m, in which case the soils are classified as Brunisols rather than Cryosols.

Organic soils developed on peat materials are common in the Mackenzie Valley (Zoltai and Tarnocai, 1975) and particularly so in this ecoregion. For the most part these are Fibric Organic Cryosols that are associated with peat plateaus and palsa peatlands. These features develop mainly from moderately decomposed woody, sphagnum or sedge peat (Tarnocai *et al.*, 1993). It is estimated that a quarter of the ecoregion has a veneer of peat less than 1 m thick, most of which has some open subarctic forest cover.

VEGETATION

Open black spruce–lichen forests growing on imperfectly drained Turbic Cryosols, developed on earth hummocks, dominate the Fort McPherson Plain Ecoregion. Tamarack frequently accompanies the black spruce. Trees are usually less than 10 m tall (Zoltai and Pettapiece, 1973). Common shrubs include blueberry, Labrador tea, and lingonberry Reid and Calder, 1977; (Ritchie, 1984). The plain is dissected by drainages dominated by shallow open water and sedge fens. Stunted tamarack is sometimes associated with the fens.

Extensive areas of peat plateau bogs support stunted black spruce subarctic woodlands, where the tree height is usually 2 to 5 m. The understory is rich in shrubs including Labrador tea, shrub birch, blueberry, willow, lingonberry, cloudberry and bog cranberries, and in mosses dominated by *Aulacomnium* and *Sphagnum*, as well as *Cladina* lichens (Zoltai and Pettapiece, 1973; Reid and Calder, 1977; Ritchie, 1984).

String fens are also typical of the ecoregion and usually associated with Organic Mesisol or Fibrisol soils, though permafrost is present under the larger strings (Zoltai *et al.*, 1988). These fens are dominated by *Carex aquatilis*, often with willow and sparse tamaracks (Reid and Calder, 1977).

On the slightly better drained Peel Plateau portion of the ecoregion, white spruce and paper birch are probably mixed with the black spruce. The warmest sites may sustain some aspen and balsam poplar as well. The deciduous trees are likely successional post-fire or other disturbance species and will gradually be replaced by spruce in the canopy (Zoltai and Pettapiece, 1973; Ritchie, 1984).

WILDLIFE

Mammals

The Fort McPherson Plain contains essentially the same mammals as are found in the Peel River Plateau Ecoregion. Taiga forest dwellers such as lynx, marten, and wolverine are common. The only ungulate species represented are moose, wintering barren-ground caribou, and a small disparate year-round caribou population (Fig. 53-3).

A list of mammal species known or expected to occur in this ecoregion is given in Table 4. Many of the rodents and ungulates found in the southern Yukon are absent, resulting in a relatively low diversity. There is little known of the mammal populations of the area.

Birds

While the bird life of Fort McPherson Plain is poorly understood, initial investigations show that the area hosts unique and productive bird communities. Eckert *et al.* (2003) recorded a total of 66 species during surveys at Tabor Lakes and the headwaters of Jackfish Creek in late June and early July, 1999.

The most common and widely distributed passerines are American Tree Sparrow, Savannah Sparrow, Yellow-rumped Warbler, Dark-eyed Junco, and Rusty Blackbird. Less common but widely distributed species include Gray Jay, American Robin, Alder Flycatcher, Yellow Warbler, Blackpoll Warbler, Orange-crowned Warbler, White-crowned Sparrow, and Common Redpoll. Gray-cheeked Thrush and Lincoln's Sparrow are restricted in distribution but relatively common in suitable habitat.

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Figure 53-3. The Fort McPherson Plain Ecoregion provides year-round habitat to a disparate caribou population. The range, population size and relationship to other caribou herds is poorly understood. This photo, taken in late June along a wetland margin, illustrates one of the recent burns in the region.

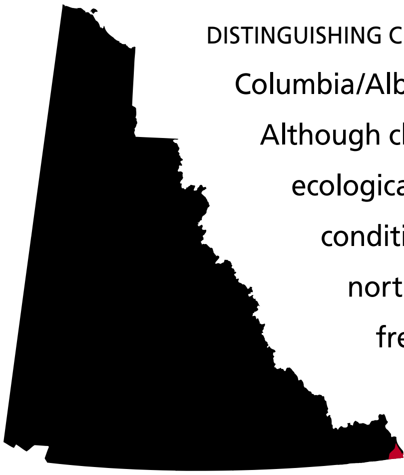
At Tabor Lakes, Swainson's Thrush inhabits the pockets of older white spruce, and Common Yellowthroat occurs at the very edge of its breeding range. Jackfish Creek headwaters hosts breeding Least Sandpipers, along with relatively high densities of Sandhill Cranes (Fig. 32). Open water habitats are productive throughout the region. At Jackfish Creek headwaters, Eckert *et al.* (2003) recorded 14 species of waterbirds (loons, grebes, and waterfowl), and two species of gulls; at Tabor Lakes, they recorded 17 species of waterbirds (loons, grebes, and waterfowl), and an amazing six species of gulls.

Other notable species in the area include both Trumpeter and Tundra swans, Peregrine Falcon, Sharp-tailed Grouse, Short-eared Owl, and the Yukon's first record of Palm Warbler at Tabor Lakes. Further, the Fort McPherson Plain appears to be an interesting place for vagrant birds; Eckert *et al.* (2003) recorded an impressive variety of rarities including Sabine's Gull, Glaucous-winged Gull, Glaucous Gull, Ring-billed Gull, and Eastern Kingbird.

Muskwa Plateau

Taiga Plain Ecozone

ECOREGION 66



DISTINGUISHING CHARACTERISTICS: This rolling plateau, centred in northern British Columbia/Alberta, extends into the extreme southeast corner of the Yukon. Although classified as part of the Taiga Plains Ecozone, the ecoregion is ecologically more representative of boreal rather than taiga (subarctic) conditions. The ecoregion is the only representation in the Yukon of northern boreal conditions east of the Cordillera (Fig. 66-1). A low frequency of forest fires results in a distinctive forest composition. This is augmented by the meeting of four major vegetation domains, resulting in a unique assemblage of plant species.

J. Meikle, Yukon Government

Figure 66-1. Closed stands of paper birch *(Betula papyrifera)*, balsam poplar *(Populus balsamifera)* and trembling aspen *(Populus tremuloides)* extend to the edge of the Beaver River. Coniferous forests in this ecoregion have a significant deciduous component (birch, aspen) and a tall shrub understory. There is little elevational stratification of forest communities or distinction between riparian and upland forests.

APPROXIMATE LAND COVER
boreal coniferous and mixedwood forest, 85%
boreal deciduous forest ,10%
lakes and non-treed wetlands, 5%

TOTAL AREA OF ECOREGION IN CANADA
23,450 km^2

TOTAL AREA OF ECOREGION IN THE YUKON
730 km^2

ECOREGION AREA AS A PROPORTION OF THE YUKON
1%

ELEVATIONAL RANGE
255–1,115 m asl
mean elevation 570 m asl

CORRELATION TO OTHER ECOLOGICAL REGIONS: Southestern portion of **Beaver River Ecoregion** (Oswald and Senyk ,1977) • Portion of **Taiga Plains Region** (CEC, 1997) • Yukon portion of the **Muskwa/Slave Lake Forests Ecoregion** (Ricketts *et al*., 1999)

PHYSIOGRAPHY

The Muskwa Plateau Ecoregion is represented in the Yukon as a small triangle of land lying north and west of the Liard River in the extreme southeast of the territory. This small southeast corner of the Yukon is part of a larger ecoregion that extends south into British Columbia. This ecoregion is part of the Alberta–Great Slave Plain Physiographic Region (Mathews, 1986) or Interior Plains region of Bostock (1948), which lies east of the Western Cordillera.

The subdued topography slopes south and east toward the Liard River. The elevation ranges from over 1,100 m asl on the ridge south of Mount Martin, a southern extension of the Kotaneelee Range south of the La Biche River, to below 300 m on the plain of the Liard River. Local relief is about 450 m.

The La Biche and Beaver rivers, and their tributaries, follow the northeast–southwest trend of the bedrock before cutting through the ridges in a more easterly direction (Fig. 66-2).

BEDROCK GEOLOGY

Bedrock exposure is limited to the Kotaneelee River west of Mount Martin and along the Beaver River at 60°N. The surficial sediments elsewhere contain abundant glacially transported debris so that the underlying shale and sandstone are unlikely to influence overlying soil and vegetative cover.

The regional geology is shown by Douglas (1976); structural and stratigraphic information has been acquired by companies with oil and gas leases in the region. Beneath the surficial material, sedimentary rocks form broad folds that are the easternmost expression of the northern Rocky Mountains. The northern edge of the ecoregion is traced around an anticline that forms the Kotaneelee Range, and most of the ecoregion is underlain by the adjacent La Biche syncline. Rusty-weathering, concretion-bearing shale, with lesser grey-green sandstone and siltstone, comprises the Lower Cretaceous Fort Saint John Group. The units beneath them, only exposed on the flank of the syncline along the northwest

J. Meikle, Yukon Government

Figure 66-2. The Labiche River cuts through the southernmost Kootanelee Range, having been diverted eastward by the most recent glaciation. Physiography and climate combine in this ecoregion to produce a fire cycle that is longer than in most of the boreal. Windthrow and insects are the more common agents of forest disturbance.

edge of the ecoregion, are grey-banded chert and sandstone of the Permian Fantasque Formation and grey siltstone, limestone, and shale of the Carboniferous-to-Permian Mattson Formation.

Within the Yukon portion of this ecoregion are two established petroleum fields and a sizeable region with high potential (National Energy Board, 1994). The Beaver River gas field, which straddles the British Columbia border, was discovered in 1957 and produced from 1969 to 1978 before being closed by water influx, although new techniques may allow further production. The Kotaneelee field, discovered in 1964, has been producing since 1993. However, most of the natural gas wells lie in the adjacent Northwest Territories, in the Liard and Pointed Mountain fields, and adjacent British Columbia. The principal reservoir is the Manetoe facies of Devonian limestone (Morrow *et al.*, 1990) that lies 2,500 to 3,500 m beneath the surface.

SURFICIAL GEOLOGY AND GEOMORPHOLOGY

The ecoregion was glaciated and glacial deposits are the dominant surficial unconsolidated material. Despite widespread evidence of pro-glacial lakes in the eastern valleys as the continental ice receded, the valleys have been largely swept clean of Quaternary fill by postglacial rivers. These rivers eroded a series of peneplains into bedrock, leaving bouldery lag deposits in valley bottoms. The modern rivers are underfit for the valleys they occupy.

Postglacial downcutting has affected areas of abundant glaciolacustrine sediments, resulting in extensive landslides throughout the valley bottoms. About 20% of the Yukon portion of the ecoregion has undergone mass movement, and some are kilometres in extent. The movement continues today and represents a significant hazard to existing and future development (I.R. Smith, pers. comm., 2000).

Failure of the Mattson Formation sandstone along steeply dipping bedding planes is commonly triggered by undercutting of slopes by rivers and streams. Block sliding, rotational slumps and soil creep are typical results. The overlying thick, clay-rich glaciolacustrine sediment and local till accumulations are also mobilized. Some of these flows extend several kilometres and can block local drainages, leading to later failures of these temporary dams.

GLACIAL HISTORY

Although the area is dominated by glacial features of the Cordilleran Ice Sheet that flowed across the area from the southwest to the northeast about 23,000 years ago, it was also affected by the Laurentide Ice Sheet a few thousand years earlier (30 ka; Duk-Rodkin and Hughes, 1995; Lemmen *et al.*, 1995; Duk-Rodkin *et al.*, 1986). The Laurentide Ice Sheet moved westward across the Kotaneelee Range as far west as the confluence of the Whitefish and Beaver rivers. Deglaciation eroded a series of meltwater channels. Meltwater from the continental ice flowed west and north across the La Biche Range, depositing an outwash delta there. Etanda Lakes are located at the apex of the delta. The middle and northern reaches of the La Biche Range supported small valley glaciers during the last glaciation in the area.

Drainage of the La Biche and Kotaneelee rivers was glacially altered. Before the last glaciation, the Kotaneelee River drained south between the La Biche and Kotaneelee ranges and was probably a tributary to the Beaver River. The Laurentide Ice Sheet eroded a channel oriented east-west across the Kotaneelee Range (Fig. 66-2) and deposited enough drift in the southern part of the valley that the direction of the river changed from south to east following glaciation. Later, when the Cordilleran Ice Sheet approached the ranges, it cut a northward channel across the drift barrier. This allowed meltwater to drain into the now east-flowing Kotaneelee River. The Cordilleran Ice Sheet also changed the drainage of the La Biche River by diverting it eastward across the La Biche Range, and later across the Kotaneelee Range, thereby creating the present zigzag pattern of the river.

CLIMATE

No climate data are available for this ecoregion. The description of climate given for the Hyland Highland Ecoregion would apply in a general way for this ecoregion. As elevations in the Muskwa Plateau ecoregion are generally less than 1000 m asl, station data from Fort Liard, Northwest Territories, would be most applicable to the area covered by this ecoregion.

HYDROLOGY

The Muskwa Plateau ecoregion is located in the very southeastern corner of the Yukon within the Interior Hydrologic region. Outside of the Yukon, this long and very narrow ecoregion drains the eastern foothills of the Rocky Mountains of Northern British Columbia. Within the Yukon, drainage is to the southeast from the La Biche Range of the eastern Mackenzie Mountains. Because of its small size, there are no representative large or intermediate-sized streams within the Yukon portion of the ecoregion. Though the La Biche River forms the eastern boundary of the ecoregion, and the Beaver River flows through the southwestern corner, these streams are not representative of the entire ecoregion. There are no large lakes within the ecoregion. There are scattered wetlands within the ecoregion; one notable complex exists within the Ottertail Creek valley between the Mount Martin and Mount Merrill ridges.

Hydrometric stations with similar topography to that of the Yukon portion of the Muskwa Plateau Ecoregion were chosen to represent streamflow characteristics. Because of lower relief within the small Yukon portion of the ecoregion, it is not truly representative of the remainder of the British Columbia portion. Also because of the relatively low relief, runoff and peak flow events are relatively low. Annual streamflow is characterized by an increase in discharge in early May due to snowmelt, rising to a peak later in the month within most ecosystem streams. Summer rain events do produce secondary peaks, and sometimes the annual peak, in July or August. Smaller streams are known to experience peak rainfall events more frequently than larger ones. Mean annual runoff is estimated to be 169 mm, while mean seasonal and mean summer flow are estimated to be moderate at 9.4×10^{-3} and 8.7×10^{-3} $m^3/s/km^2$, respectively. The mean annual flood is estimated as relatively high at 131×10^{-3} $m^3/s/km^2$, while the mean maximum summer flow is estimated to be more moderate with a value of 46×10^{-3} $m^3/s/km^2$. The minimum annual and summer flows are estimated to be relatively low with values of 0.25×10^{-3} and 0.51×10^{-3} $m^3/s/km^2$, respectively. Minimum streamflow generally occurs during March or earlier. The majority of streams experience zero winter flows relatively frequently.

PERMAFROST

Muskwa Plateau is in the zone of sporadic discontinuous permafrost. The elevation is insufficient for alpine permafrost to form. Permafrost in the ecoregion is restricted to organic soils, and is likely less than 4 m thick. There are no published reports on permafrost from the Yukon portion of this ecoregion.

SOILS

Soils in this ecoregion have formed under a moist continental climate, somewhat milder and wetter than the adjacent Hyland Highland Ecoregion. Soil development reflects the mineralogy of the underlying Cretaceous calcareous shales and sandstones. Where soil parent materials are fine textured, such as clay loam moraine or glaciolacustrine materials, Brunisolic Gray Luvisols dominate the landscape. These Luvisols are highly productive forest soils found commonly throughout the Plains Ecozone. Eutric Brunisols are the common soils on coarse-textured, well-drained portions of the landscape (Zoladeski and Cowell, 1996). Orthic and Humic Gleysols occur in depressions on imperfectly and poorly drained mineral soils.

Wetlands are extensive, covering more than a quarter of the British Columbia part of this ecoregion, but are much less common in the Yukon portion. Organic Cryosols are common on peat plateau bogs and some veneer bogs (Zoltai *et al.*, 1988). Northern ribbed fens are common and lack permafrost. Fen soils are most commonly classified as Fibrisols or Mesosols.

VEGETATION

The vegetation cover is mixed boreal forest. The continental climate, with warmer, moister summers and relatively lower fire frequency than cordilleran ecoregions to the west, is reflected in the lush vegetation and high species diversity of this ecoregion. Fluvial sites in this area are the most productive in the Yukon. Trees on upland sites can reach more than 30 m in height (Applied Ecosystem Management, 1997b).

Though the region is dominated by northern boreal white and black spruce (Annas, 1977; Trowbridge *et al.*, 1983), occasional tall fern meadows and devil's club, typical of more southern forests, differentiate the Yukon part of this ecoregion from other parts of the Yukon and possibly other parts of the ecoregion. This area supports some plant species not found immediately south of the ecoregion.

As throughout the boreal forest, forest fires have a significant influence on forest composition. However, parts of this ecoregion show little evidence of fire over at least 250 years, the result in part of higher summer precipitation and a lower incidence of lightning. Forest composition and renewal on these sites appears to be controlled by the interactions between soil characteristics, insects and diseases. The resultant mixed forest canopy includes white spruce, black spruce, paper birch, trembling aspen and balsam poplar (Fig. 66-1).

White spruce–feathermoss forests form the dominant climax community found on moderately to rapidly drained fluvial deposits and moraine. Shrubs, such as highbush cranberry, rose, dwarf raspberry, red-osier dogwood, and green and gray alder, are common. Herbs include horsetail, bunchberry, mitrewort, bluebell and twinflower. As indicated above, ferns and devil's club are also present (Fig. 66-3).

Black spruce is more common on poorly drained sites usually with a Labrador tea and feathermoss understory. On moist and wet nutrient-rich sites, tamarack is occasionally found with black spruce. Subalpine fir is common at elevations over 750 m asl. Lodgepole pine does occur in one large burn in the Yukon portion of the ecoregion, but is not common elsewhere. Aspen also forms pure stands in this old burn.

Balsam poplar, paper birch and aspen frequently grow on disturbed sites, such as slumps found along the La Biche River. They are also found in mixed forest stands with white spruce. Graminoids with shrub birch and *Potentilla palustris* dominate the fens which border many of the lakes.

WILDLIFE

Mammals

Wood bison were historically present; the last one was shot in 1879 in British Columbia (Cowan *et al.*, 1973). A bison herd, re-established in British Columbia in the 1950s, occasionally ranges into the Yukon. Other species entering the Yukon near their northern limit of distribution here are mule deer and fisher. Black bears, moose and wolves are common.

Although this ecoregion is botanically productive, it does not provide suitable habitats for many of the rodent and ungulate species found in Boreal Cordillera ecoregions. Mammal species known or expected to occur in this ecoregion are listed in Table 4.

Several bat species, including the western long-eared myotis, northern long-eared myotis, long-legged myotis, big brown bat, and silver-haired bat, have recently been found in this ecoregion in British Columbia (Wilkinson *et al.*, 1995). Bats have

J. Meikle, Yukon Government

Figure 66-3. Devil's club *(Oplopanax horridus)* in the Lower Beaver River valley. The valley has a unique array of vascular plants derived from the overlap of Boreal Cordilleran, Boreal Plains and Beringian floral assemblages.

received little attention in the Yukon and additional species are expected to occur here.

Logging north and south of the 60th parallel may increase habitat suitability for ungulates well suited to early or mid-successional forests. Elk, mule deer, white-tailed deer and moose have all expanded their range and numbers following habitat change associated with development further south, and the same pattern may hold for the Muskwa Plateau. Climate warming may further increase the northward expansion of these species.

Birds

The Muskwa Plateau Ecoregion rivals the Yukon Coastal Plain for uniqueness within the Yukon, featuring many species that nest nowhere else in the territory or that reach their peak densities here. Remarkably, species that are at the edge of their range are abundant, such as Red-eyed Vireo at its northwestern limit and Hammond's Flycatcher at its northeastern limit.

Wetlands are not numerous, but support such rare Yukon species as Pied-billed Grebe, Marsh Wren, and Le Conte's Sparrow (Fig. 66-4), along with more widespread species such as Sora, American Coot, Solitary Sandpiper, Common Snipe, Alder Flycatcher, Common Yellowthroat, Lincoln's and Swamp Sparrows (Eckert *et al.*, 2003).

The rich and productive forests support an assemblage of forest birds that is unique in the Yukon. Philadelphia Vireo, and Black-and-white and Canada Warblers are found only in this ecoregion (Eckert

C.D. Eckert

Figure 66-4. The Le Conte's Sparrow is only known in the Yukon from the extreme southeast in the Hyland Highland and Muskwa Plateau ecoregions. It inhabits grassy wetlands with scattered low shrubs.

et al., 2003), while Ovenbird, Mourning Warbler, and Rose-breasted Grosbeak, which occur in low numbers in adjacent parts of the Hyland Highland Ecoregion, are common in the Muskwa Plateau (Eckert *et al.*, 2003). Cape May and Bay-breasted Warblers occur here and as far west as the edge of the Liard Basin Ecoregion (Sinclair, 1998). These, as well as a number of species that occur slightly farther west, reach their peak densities in this ecoregion, including Tennessee and Magnolia Warblers, Western Tanager, and White-throated Sparrow. Cedar Waxwing is most common in the Muskwa Plateau and Hyland Highland Ecoregions, although it occasionally occurs farther west in the Yukon (Eckert, 1995a; Eckert *et al.*, 2003). This is one of the few Yukon ecoregions where Pileated Woodpecker is known to occur.

Widespread forest bird species that are abundant in mixed forests include Yellow-bellied Sapsucker, Hammond's Flycatcher, Gray Jay, Swainson's Thrush, American Robin, Magnolia and Yellow-rumped Warblers, American Redstart, Chipping Sparrow, and Dark-eyed Junco (Eckert *et al.*, 2003). White spruce forests support an abundance of species, such as Three-toed and Black-backed Woodpeckers, Boreal Chickadee, Bay-breasted and Tennessee Warblers, Western Tanager, White-winged Crossbill and Evening Grosbeak. Red-eyed Vireos reach their peak densities in balsam poplar forests, while trembling aspen forests support high densities of Ruffed Grouse, Least Flycatcher, Warbling Vireo, and Ovenbird. Species occurring in riparian tall shrubs and young deciduous forests include Philadelphia Vireo, Alder Flycatcher, and Yellow Warbler. Eastern Phoebe is a specialty species that nests each year along the La Biche River (Eckert *et al.*, 2003).

The Yukon's only documented record for Broad-winged Hawk is from the lower La Biche River and, though its status is unclear, may be a rare breeder. Bald Eagles are seen along the La Biche and lower Beaver rivers, and may nest there, beside Spotted Sandpipers and Bank Swallows. Numerous owls inhabit the forests including Great Horned, Northern Hawk, Great Gray and Boreal Owls (Eckert *et al.*, 2003). Species known to occur in winter are Three-toed and Black-backed woodpeckers, Gray Jay, Common Raven, Boreal Chickadee, Red-breasted Nuthatch, and Common Redpoll (Sinclair *et al.* [editors], 2003).

Some species at the northern limits of their range now might well push farther north.