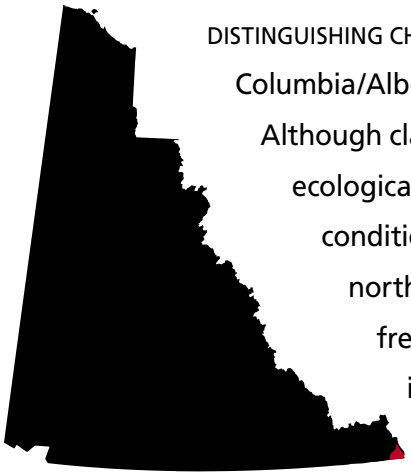
Muskwa Plateau

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.

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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: Southeastern 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

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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

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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 *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.

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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.

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.