Yukon Plateau-Central

Boreal Cordillera Ecozone

ECOREGION 175

DISTINGUISHING CHARACTERISTICS: The western portions of the ecoregion are very dry with annual precipitation amounts of only 250 to 275 mm. The south-facing slopes that support extensive grassland communities are a notable feature of this ecoregion. The wetlands associated with the Tintina Trench flyway, such as Reid Lakes and the Needle Rock complex, provide important migratory and nesting habitat for waterfowl. Deeply weathered soils associated with early Pleistocene glacial deposits are unique within Canada. Very frequent forest fires maintain vast areas of relatively young aspen and lodgepole pine forests (Fig. 175-1).

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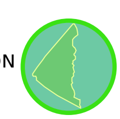
Figure 175-1. Broad valleys in Yukon Plateau–Central Ecoregion were conduits for outwash during Cordilleran glaciations. Numerous lakes occupy potholes and hollows, with esker ridges forming long narrow points and shallows (lighter shades of blue represent shallows underlain by marl). A mixed forest of lodgepole pine with white spruce and aspen is kept at early successional stages by periodic forest fires. Islands may escape fire and be cloaked in old-growth spruce, their shores providing nesting sites for loons. Pictured are the Twin Lakes and Klondike Highway south of Carmacks.

APPROXIMATE LAND COVER
boreal/subalpine coniferous forest, 65%
alpine tundra, 30%
lakes and wetlands, 5%

TOTAL AREA OF ECOREGION IN CANADA
26,803 km^2



TOTAL AREA OF ECOREGION IN THE YUKON
26,803 km^2

ECOREGION AREA AS A PROPORTION OF THE YUKON
6%

ELEVATIONAL RANGE
490–1,860 m asl
mean elevation 860 m asl

CORRELATION TO OTHER ECOLOGICAL REGIONS: Equivalent to **Pelly River Ecoregion** and the northern portion of **Lake Laberge Ecoregion** (Oswald and Senyk, 1977) • Portion of **Cordillera Boreal Region** (CEC, 1997) • Northern portion of **Yukon Interior Dry Forests** (Ricketts et al., 1999)

PHYSIOGRAPHY

The Yukon Plateau–Central Ecoregion incorporates part of the Yukon Plateau physiographic unit, an area of glaciated, rounded and rolling hills, plateaus and broad valleys and surrounded by higher mountain ranges. The Lewes Plateau and the northern portion of the Teslin Plateau (Mathews, 1986) are the major physiographic subdivisions of the ecoregion (Fig. 4).

Numerous lakes and smaller streams fill the network of broad valleys that characterize this ecoregion. Valleys trend northwest–southeast along faults and folds of the bedrock. The Yukon River bisects the ecoregion from south to north, from Lake Laberge and the mouth of the Teslin River to the confluence of the Pelly and Yukon rivers. The Tintina Trench forms the northern boundary of the ecoregion; the Pleistocene glacial limit forms the western and northwestern boundaries.

The base elevations of the Yukon and Stewart river valleys are less than 500 m asl. The Tatchun Hills and several peaks within the eastern portion of the Dawson Range are between 1,750 and 1,850 m asl and comprise the highest elevations in the ecoregion. Other high peaks include Mount Freegold in the Dawson Range, and Rough Top and Flat Top northwest of Pelly Crossing.

BEDROCK GEOLOGY

The Yukon Plateau–Central Ecoregion lies mostly within the Yukon–Tanana terrane with a triangular area of Stikinia extending north from Lake Laberge. The southeast corner of the ecoregion includes the Teslin structural zone, which is composed of steeply dipping, highly deformed rocks. The regional geology mapping (Bostock, 1964; Campbell, 1967; Tempelman-Kluit, 1974, 1984) differs in quality and a contemporary interpretation of rock assemblages is depicted by Gordey and Makepeace (compilers, 2000).

At least three-quarters of the ecoregion consists of igneous bedrock. Granitic batholiths, the biggest being Tatchun, Tatlmain, Glenlyon and Ice Chest, underlie one-fifth of the area. In the southwestern third of the ecoregion are volcanic breccia and augite porphyry of the Triassic Povoas Formation and Early Jurassic granitic rocks of the Big Creek, Granite Mountain and Minto batholiths aged between 192 and 188 Ma. These are covered by brown basalt of the Cretaceous Carmacks Group and intruded by the mid-Cretaceous Dawson Range batholith from 110 Ma. A remnant of the much younger Selkirk volcanics lies north and south of the mouth of the Pelly River. These lava flows are between 5,000 and 10,000 years old (Jackson and Stevens, 1992).

Northwest-trending valleys, occupied by the Nordenskiold and Big Salmon rivers, the Frenchman Lakes, and the Yukon River downstream of Minto, coincide with inactive fault zones that separate terranes and truncate rock formations. The Whitehorse Trough, which from Late Triassic to Early Cretaceous time accumulated mafic volcanic flows, alluvial fans and lagoon sediments, is folded and faulted, tapering northward from 40 km wide at Lake Laberge to its truncation by faults at Minto. Within the Trough, gritty feldspathic sandstone with minor granite–pebble conglomerate, the Tanglefoot Formation of the Jurassic Laberge Group, is the predominant rock unit. However, a reddish chert–pebble conglomerate (Fig. 175-2) and dark silty shale are typical cliff- and valley-forming rock types, respectively. Red-brown weathering volcanic flows known as Nordenskiold Dacite and white-weathering, thick-bedded limestone are prominent rock types.

Northeast of the Whitehorse Trough is a 15 km wide zone of steeply dipping mylonitic, the Teslin Suture of Tempelman-Kluit (1979). This is the western boundary of the Yukon–Tanana Terrane, an assemblage of muscovite-quartz schist with lesser amounts of quartzite, marble, amphibolite and augen gneiss. These rocks are irregularly exposed through thick glacial drift in subdued topography, except for the resistant basalt, limestone, chert and slate in the Semenof Hills.

The Dawson Range, on the western side of the ecoregion, contains over 150 mineral occurrences, primarily copper–gold with molybdenum porphyries with epithermal gold veins. Among those with calculated reserves are Minto, Cash, Mount Freegold–Antoniak, Laforma, and Williams Creek, the last with a large oxidized cap amenable to heap-leach and electrode precipitation of copper. The Carmacks basalts commonly contain traces of copper. Coal at Tantalus Butte near Carmacks has been mined and larger deposits of bituminous coal occur to the southwest, in particular at Division Mountain where the combined seams are up to 21 m thick (Carne and Gish, 1996).

Figure 175-2. South- and west-facing slopes are very dry, with grasses and sage colonizing the alkaline soil (Melanic Brunisols). Bluffs of reddish conglomerate are of the Cretaceous Tantalus Formation.

SURFICIAL GEOLOGY AND GEOMORPHOLOGY

This ecoregion is outlined to the west by the limit of Cordilleran Pleistocene glaciation (Hughes *et al.*, 1969, Duk-Rodkin, 1999). Evidence for glaciation includes disrupted drainage patterns, stream capture, streamlined hills, outwash terraces and underfit streams. The digitate western margin of the ecoregion corresponds to tongues of valley glaciers that extended along major valleys and tributary streams. Glacial drift of various ages dominates lower slopes and valley bottoms throughout. Colluvium blankets steep slopes and uplands. The higher elevations were nunataks (ridges and domes above the limit of ice) near the limit of Reid glaciation (Fig. 175-3).

GLACIAL HISTORY

This ecoregion comprises the central Yukon Plateau south of the Tintina Trench, including the eastern slopes of the Dawson Range. The present day Yukon River crosses this ecoregion from southeast to northwest. In pre-glacial times, this ecoregion was drained by the middle course of the paleo-Yukon River. The trunk stream of this ancient drainage system flowed from north to south exiting in the Gulf of Alaska (Tempelman-Kluit, 1980; Duk-Rodkin, 1997; Jackson, in press). This drainage was diverted northwestward by the first Cordilleran glaciation that occurred around 3 million years ago and covered this ecoregion almost completely (Duk-Rodkin and Barendregt, 1997). During the Reid Glaciation, the ice reached its maximum in the western part of this ecoregion, with well-defined glacial limits marked by subdued moraines and meltwater channels. The McConnell glacial maximum is traceable along the eastern part of this ecoregion (Bostock, 1966; Jackson, 1997a,b), where it reached its maximum extent approximately 24,000 years ago (Jackson and Harington, 1991). Very sharp-edged glacial features occur along this former ice frontal position, as well as around nunataks further east. The central Yukon Plateau

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Figure 175-3 White Mountain, near the centre of the Yukon Plateau Ecoregion, was a nunatak during the Pre-Reid glaciations. Lower elevations are underlain by a thick blanket of glacial outwash and loess deposited when this area was ice-free during the Reid and McConnell glaciations. The foreground hills are covered in willow thickets and a reddish sphagnum bog occupies a broad level area in mid-distance.

has an extensive record of at least four Pleistocene glaciations (Bostock, 1966; Jackson *et al.*, 1996).

The Diversion Creek paleosol (Smith *et al.*, 1986) developed during the non-glacial interval between Reid and McConnell glaciations, whereas the Wounded Moose paleosol (Smith *et al.*, 1986) developed between the younger of the pre-Reid glaciations. Reid deposits (more than 200 ka) are commonly buried beneath dune sand and loess deposited by katabatic winds off the Cordilleran Ice Sheet during the McConnell Glaciation. Pre-Reid deposits in this ecoregion are 0.75 to 1.5 Ma or older, typically buried beneath colluvium. In the Fort Selkirk area, extensive volcanic eruptions occurred during the last pre-Reid glaciation (Jackson *et al.*, 1996). Volcano Mountain, north of Fort Selkirk, erupted as recently as 5,000 to 10,000 years ago (Jackson and Stevens, 1992).

CLIMATE

The orientation of the landscape is primarily south–southeast to north–northwest and lies just northeast of the main rain shadow of the St. Elias–Coast mountains. Precipitation is relatively light, ranging from 250 to 300 mm, two-thirds of which falls during the summer. Snow cover generally exists from mid-October to mid-April in the valley floors and a month longer over the higher terrain.

Mean annual temperatures are near –4°C. Mean January temperatures vary from –30°C in the lowest valleys to a more moderate –20°C over the higher terrain due to inversions. Mean July temperatures range from near 15°C in the valleys to 10°C over the heights. The most extreme daily temperatures occur in the lowest valley floors and can range from extreme minimums of –60 to –65°C, to extreme maximums near 35°C. The period with mean daily temperatures above 0°C is from late April to mid-October, although frost can occur at any time of the year. Winds are generally light, but can also be moderate to strong in association with individual storm situations.

Climatic information is available for Carmacks and Fort Selkirk with limited data from Braeburn. The annual climate graph for Carmacks is shown in Figure 175-4, a schematic cross-section that depicts the major landscape elements that make up the ecoregion.

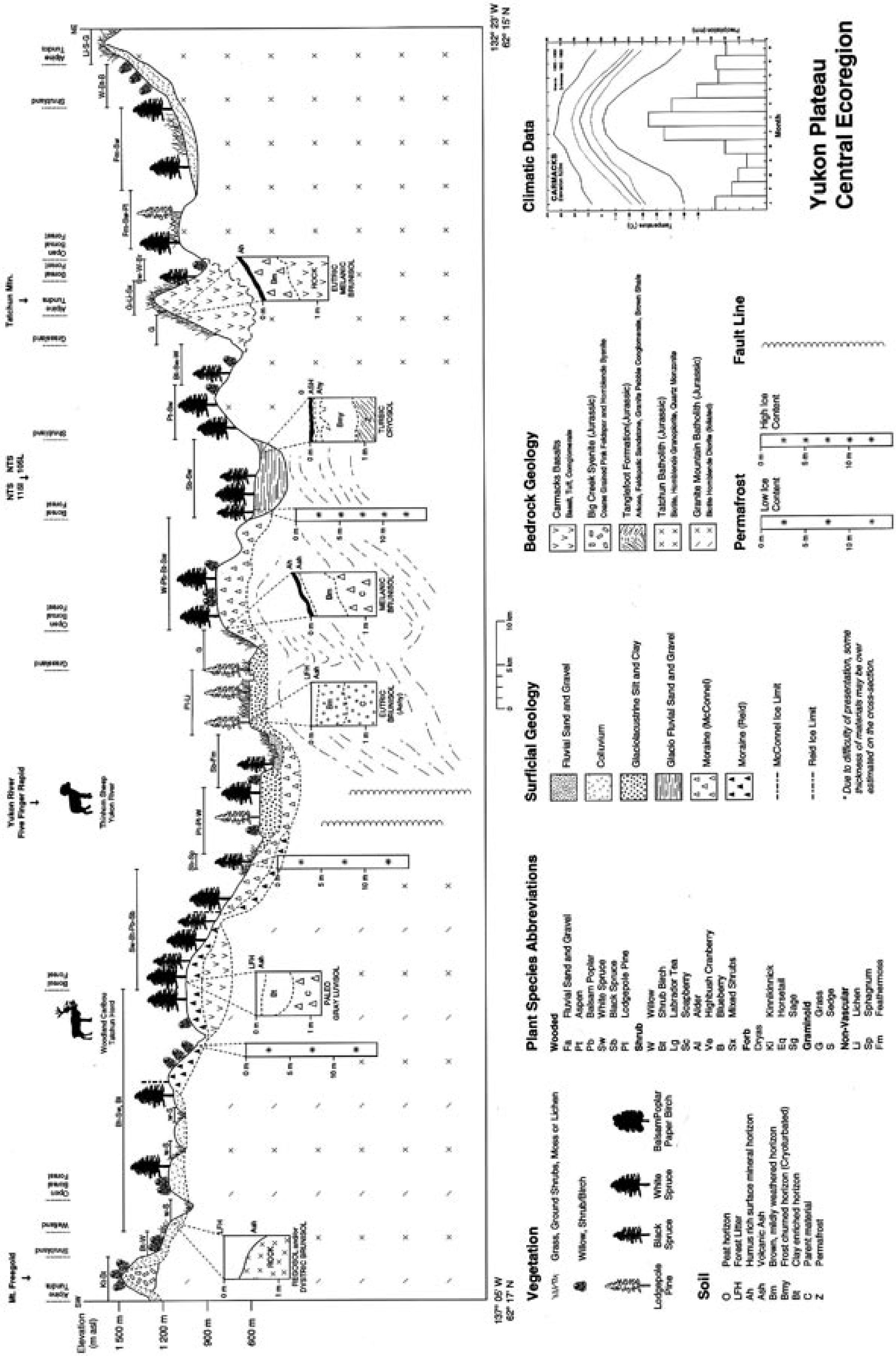

Figure 175-4. Schematic cross-section of the Yukon Plateau–Central Ecoregion at approximately 62° N latitude. Due to the scale of presentation, some vertical thicknesses of materials may be out of proportion.

HYDROLOGY

The Yukon Plateau–Central ecoregion is situated exclusively within the Interior Hydrologic region (Fig. 8). With a total area of approximately 27,000 km^2, drainage of the largely undulating plateau complex with little significant relief is primarily from the south and east. Several large river valleys traverse the ecoregion including the Yukon, Stewart, Pelly (Fig. 175-5) and Teslin rivers. The most representative intermediate stream is the Nordenskiold River. Tatlmain Lake is the largest lake in the ecoregion. There are numerous smaller lakes, which include Tatchun, Frenchman, Diamain, and von Wilczek. Wetlands are an important component of the landscape, including Needlerock wetlands, the largest wetland complex on the Yukon Plateau, and the Nordenskiold wetland (Fig. 28) complex, both of which have been recently designated as Habitat Protected areas.

There are two active representative hydrometric stations: Nordenskiold River and Big Creek. Annual streamflow is characterized by a rapid increase in snowmelt discharge to a peak in May or June. On smaller streams, approximately 40% of the annual maximum flows are due to intense summer rainstorm events. The nearby Big Salmon River and Nisling River hydrometric data were used to augment available data for streamflow characterization purposes. The mean annual runoff based on the available hydrometric record is low, with values ranging from 76 to 139 mm with an extremely low ecosystem average value of 107 mm. Mean seasonal and summer flows are likewise low, with values of 6.1×10^{-3} and 5.7×10^{-3} $m^3/s/km^2$, respectively. The mean annual flood and mean maximum summer flow are also low, with values of 36×10^{-3} and 17×10^{-3} $m^3/s/km^2$, respectively. Minimum streamflow generally occurs during February or March, with relatively low values due to low winter temperatures. The minimum annual and summer flows are also low, with values of 0.25×10^{-3} and 1.2×10^{-3} $m^3/s/km^2$, respectively.

PERMAFROST

The Yukon Plateau–Central Ecoregion spans both widespread and sporadic discontinuous permafrost zones. A large portion of the ecoregion lies west of the limits of McConnell glaciation, so the surficial deposits are coarse and dry, and largely free of ground ice. However, fine-grained and moist sediments in valleys are prone to perennial freezing and occurrence of ground ice. Permafrost was recorded in two of three instrument holes at Rink Rapids, north of Carmacks, with a maximum thickness greater than 18.3 m, and temperatures at 9 m ranging between –0.9 and 3.2°C (Burgess *et al.*, 1982). The plateau surfaces in the ecoregion are too low to support alpine permafrost and most ice-rich ground is in valleys. In northern portions, permafrost is found in various terrain types, even in relatively dry till under deciduous forest near Pelly Crossing (Klohn Leonoff, 1988). Hughes (1969a) mapped many open-system pingos in the northern valleys, where surficial deposits permit downslope groundwater movement yet valley bottoms may be very cold in winter.

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Figure 175-5. The valley of the Pelly River occupies the Tintina Trench through much of its course in the Yukon Plateau–Central Ecoregion. Note the wide floodplain and meander scars in the foreground. Dark patches of spruce represent older stands that have escaped recent fire.

The importance of soil moisture and organic accumulation on the specific location of permafrost develops southward. No permafrost has been reported during excavations in relatively coarse materials near Carmacks (e.g. EBA, 1990c) and there is little along the Robert Campbell Highway in the ecoregion (Hoggan, 1992a). However, in the Nordenskiold Valley to the south, moist glaciolacustrine sediments are ice-rich. Occasionally, ground ice forms in slopes that are prone to slumping when the ice is disturbed, as along the Klondike Highway at Tatchun Creek and near Fox Lake (Brown, 1967; Paine, 1984).

SOILS

The ecoregion generally consists of undulating plateau landscapes with a few isolated mountain summits. The climate is strongly continental and semi-arid with warm summers, developing large soil moisture deficits early in the growing season. Soils have been mapped in detail only in the major valley bottoms near Carmacks and Pelly Crossing (Rostad *et al.*, 1977). The south-facing slopes that support extensive grassland communities are a notable feature of this ecoregion. These are common on low elevation sidehills in the Yukon River and Nordenskiold River Valleys around Carmacks. While such grasslands exist throughout the southern Yukon, they are best expressed here. A second notable feature is the layer of tephra up to 35 cm thick that blankets most of the soils of the ecoregion (Fig. 25). While the maximum thickness of the ash is less than that found in the Ruby Ranges Ecoregion to the west, the ash is most ubiquitous throughout.

Mildly weathered, alkaline soils form on a variety of calcareous glacial parent materials. Open meadows on south-facing slopes have soils with dark A horizons typical of grasslands. Soils are classified as Melanic Brunisols (Figs. 175-2, 175-4). Surrounding aspen stands have thick moder humus forms with alkaline forest soils classified as Eutric Brunisols. Northern and eastern aspects support mixed forests underlain by Eutric Brunisols with mor humus forms. Wetlands are associated with thermokarst of large ice masses in the silty alluvial deposits of major floodplains where Organic Cryosols and Gleysolic Turbic Cryosols form. Higher elevation uplands and north-facing slopes may also lie on permafrost. These are most commonly Orthic Turbic Cryosols, occasionally with patterned ground features in alpine areas.

Some soils in this ecoregion formed with unique features. In association with various ages of Pleistocene glacial drift, a series of paleosols exhibit deep soil development and strong reddish colours that relate to long periods of weathering under interglacial climatic conditions in the central Yukon (Smith *et al.*, 1986; Tarnocai, 1987a). These paleosols are also formed in glacial deposits in the adjacent Klondike Plateau and Yukon Plateau–North ecoregions. There are no other soils like them in Canada (Fig. 175-6).

S. Smith, Agriculture and Agri-Food Canada

Figure 175-6. Relict soils are found in the Yukon Plateau–Central Ecoregion on glaciofluvial terraces that have been relatively undisturbed since early pre-Reid glaciations. One of these soils associated with the oldest drift surfaces is the Wounded Moose Paleosol. The involutions of sand (sand wedges) outlined on the photo are thought to have formed during the last glacial interval when this soil was exposed to polar desert-like conditions that existed in unglaciated regions near to the ice front.

VEGETATION

The montane boreal forest dominates the Yukon Plateau–Central Ecoregion below 1,200 m asl. Above 1,200 m asl is the subalpine zone. Treeline near 1,370 m asl separates the subalpine from the alpine (Oswald and Senyk, 1977).

The boreal zone contains many plant communities because of the diverse habitats provided by mixed glacial landforms and fire (Oswald *et al.*, 1983). Fires are frequent and large due to the high incidence of thunderstorms concentrated along the north part of the Tintina Trench and the generally dry summer conditions. Most forest stands are less than 100 years old (Fig. 175-1, 175-5). The dominant community on undisturbed moraine soils, which blanket lower slopes of the ecoregion, is white spruce and feathermoss with few shrubs or herbs. On recent alluvial floodplains, the white spruce–feathermoss forest typically contains rose, horsetail, willow and alder. A mixture of kinnikinnick, grass and lichen replaces the feathermoss understory vegetation on coarse outwash deposits, which are extensive on the valley floor. Succession is also important on fluvial deposits. The first species to colonize recent floodplains is horsetail, which is followed by willow and then balsam poplar.

Due to the frequency of fire, lodgepole pine and trembling aspen are prevalent at low elevations. Pine is more common on better-drained, warmer, coarse soils; aspen grows on sites with finer soil and on steep south-facing slopes. On drier sites, the understory is predominantly lichen, kinnikinnick and grass. The moister sites commonly contain more shrubs, such as alder, willow, lingonberry and soapberry, as well as moss. White spruce slowly invades these post-fire communities. Paper birch is a successional species usually found colonizing moister sites in the ecoregion.

On undisturbed, colder, north-facing lower slopes and alluvial floodplain sites, white spruce–feathermoss forests are slowly invaded by black spruce and permafrost as the dominance of brown mosses increases on the forest floor. Grasslands are an important feature of this ecoregion. They occur on steep south- and west-facing slopes throughout the ecoregion and sometimes extend from the valley floor to the alpine. Sagewort, rose, juniper and kinnikinnick are typical species of these grasslands. Willows and aspens invade moister sites, such as the bases of slopes.

Wetlands are significant in the ecoregion. Shallow open water with *Carex aquatilis* and aquatic plants and shore marshes dominated by graminoid species are common along the shores of lakes and ponds. Willows with shrub birch, Labrador tea and shrubby cinquefoil, with a moss and sedge groundcover, commonly occur in bogs through the ecoregion.

Subalpine trees include subalpine fir, white spruce and sometimes stunted lodgepole pine. Shrub birch and willow dominate the subalpine, commonly with mountain blueberry and crowberry; on moister sites, they are underlain by moss and Labrador tea, and on drier sites by lichen (Oswald *et al.*, 1983; Oswald and Brown, 1986).

Figure 175-4 illustrates the vegetation, soil and terrain relations in the ecoregion.

G. Mowat, Yukon Government

Figure 175-7. The combination of relatively dry summers and a high incidence of lightning strikes results in both frequent and extensive forest fires. One result is consistently good habitat for snowshoe hare and its main predator, lynx.

WILDLIFE

Mammals

The Yukon Plateau–Central supports moderate densities of moose and woodland caribou in the Aishihik, Tatchun, and Klaza herds (Markel and Larsen, 1988; Farnell *et al.*, 1991). The Aishihik herd was intensively managed in the 1990s, primarily through wolf reduction (Carey *et al.*, 1994), and has increased to 1,500. In 2000, the Tatchun and Klaza herds were estimated at 500 and less than 600, respectively.

Grizzly bears and predators such as wolverine and marten are not as abundant as in surrounding ecoregions. River otter densities are probably highest along salmon-bearing streams in the Yukon River drainage. The area supports healthy populations of snowshoe hare and lynx (Fig. 175-7). The juxtaposition of suitable wetlands and fire-induced aspen and willow stands supports large numbers of beaver colonies locally (Slough and Jessup, 1984). The introduced herd of wood bison, now about 400 individuals, and Hutshi Lake elk, of at least 50 individuals, range from the Ruby Ranges Ecoregion into the upper Nordenskiold River drainage. Recently, range-expanding mule deer, more abundant following a succession of mild winters in the 1980s and 1990s, wander in small herds of 12 to 15 individuals. The occasional cougar is sighted near mule deer range; such sightings are unusual and not necessarily indicative of a self-sustaining population. Mammal species known or expected to occur in this ecoregion are listed in Table 4.

J. Meikle, Yukon Government

Figure 175-8. The Von Wilczek Lakes wetland south of Pelly Crossing consists of extensive emergent graminoids and open water, protected by a thick fringe of dense alder–willow thicket. One of the most biologically productive wetlands in Yukon Plateau–Central Ecoregion, this wetland is the northern extent of the range for the Ruddy Duck.

Birds

The northeast border of the Yukon Plateau–Central Ecoregion includes part of the Tintina Trench, which is the Yukon's major migration corridor for thousands of Sandhill Cranes that nest in Alaska. Important and productive wetlands include the Needlerock complex, the Willow Creek complex, the Nordenskiold River system, and Von Wilczek Lakes (Fig. 175-8). Loons, Horned and Red-necked Grebes, American Widgeon, Mallard, Green-winged Teal, scaup, scoters, Long-tailed Duck, Bufflehead, goldeneyes, and American Coot breed and moult in these wetlands (Dennington, 1985; Hawkings, 1994). Ruddy Duck breeds on some of these wetlands (Fig. 175-8) along with songbirds such as Red-winged and Rusty Blackbirds (Hawkings, 1994).

The Yukon River itself, running north through this ecoregion, contains limited nesting areas on bays and backwaters for Canada Goose while the north section of the river provides open flats and sandbars used as resting areas by Sandhill Crane during spring and fall migration through the Tintina Trench (Soper, 1954). Peregrine Falcon nest along steep banks of the Yukon, Stewart, and Pelly rivers (Stelfox, 1972; Mossop, 1978). Other raptors include Bald Eagle and Golden Eagle (Mossop, 1978). Rivers are also inhabited by breeding Common Merganser and Belted Kingfisher with Bank Swallow colonies in the riverbanks (Rand, 1946). Scattered marshes, lakes, and rivers support breeding shorebirds and gulls including Semipalmated Plover, Lesser Yellowlegs, Spotted Sandpiper, Red-necked

Phalarope, Bonaparte's Gull, and Mew Gull (Stelfox, 1972).

Sharp-tailed Grouse inhabit young deciduous forests throughout the region (Stelfox, 1972). Songbirds breeding in wetland shrubs include Alder Flycatcher, Orange-crowned Warbler, Yellow Warbler, Northern Waterthrush, Common Yellowthroat, and Savannah and Lincoln's Sparrows (Soper, 1954; Stelfox, 1972).

Year-round residents include Great Horned Owl, Three-toed Woodpecker, Gray Jay, Black-billed Magpie, Common Raven, and Boreal Chickadee (Godfrey, 1986). Coniferous forests provide breeding habitat for Sharp-shinned and Red-tailed Hawks, Olive-sided Flycatcher, Ruby-crowned Kinglet, Yellow-rumped Warbler, and White-winged Crossbill (Stelfox, 1972). Deciduous forests support breeding Ruffed Grouse, Northern Flicker and Least Flycatcher. Species such as American Kestrel, Common Nighthawk, Say's Phoebe, American Robin, White-crowned Sparrow, and Dark-eyed Junco inhabit open treed habitats (CWS, Birds of the Yukon Database).

There are few records of bird species for alpine areas, but breeders include Gyrfalcon, Horned Lark, and American Pipit. Subalpine areas provide habitat for resident Willow Ptarmigan, Townsend's Solitaire, Wilson's Warbler, and American Tree Sparrow.