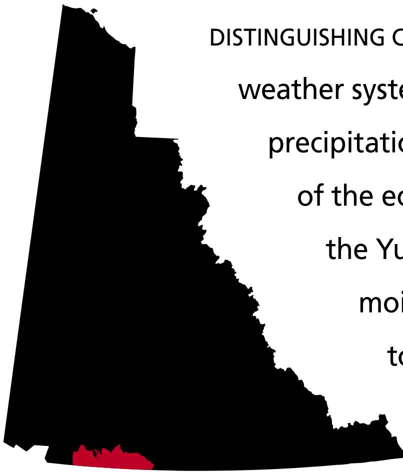
Yukon Stikine Highlands

Boreal Cordillera Ecozone

ECOREGION 179



DISTINGUISHING CHARACTERISTICS: The ecoregion is heavily influenced by Pacific maritime weather systems, producing relatively moderate temperatures and enough precipitation to support scattered alpine glaciers. In the British Columbia portion of the ecoregion, a tributary stream to the Atlin River is deemed the source of the Yukon River. Forest vegetation does not experience the temperature and moisture stresses common elsewhere in southwestern Yukon. Adapted to steep terrain and high snowfall, mountain goats reach their highest Yukon population densities here.

C. Kennedy, Yukon Government

Figure 179-1. In the Boundary Ranges along the British Columbia–Yukon border, high precipitation, mild winters and lots of snow produce robust forests below 850 m elevation. Tree line shown here near Rainy Hollow along the Haines Road is at 1200 m elevation. These ranges support alpine glaciers.

APPROXIMATE LAND COVER
boreal/subalpine coniferous forest, 35%
boreal mixed forest, 10%
alpine tundra, 35%
alpine rockland and glaciers, 15%
lakes, 5%

TOTAL AREA OF ECOREGION IN CANADA
24,250 km^2

TOTAL AREA OF ECOREGION IN THE YUKON
7,028 km^2

ECOREGION AREA AS A PROPORTION OF THE YUKON
1%

Metres above sea level

ELEVATIONAL RANGE
460–2,700 m asl
mean elevation 1,270 m asl

CORRELATION TO OTHER ECOLOGICAL REGIONS: Equivalent to **Coast Mountains Ecoregion** (Oswald and Senyk, 1977) • Portion of **Cordillera Boreal Region** (CEC, 1997) • Northwestern portion of **Northern Cordilleran Forests** (Ricketts et al., 1999)

PHYSIOGRAPHY

The Yukon Stikine Highlands Ecoregion is part of a larger ecoregion that extends south into British Columbia. In the Yukon, it consists of the Boundary Ranges (Coast Mountains) and the Alsek Ranges (St. Elias Mountains) (Mathews, 1986; Bostock, 1948; Hughes, 1987b). The boundary of the ecoregion conforms approximately to the northern boundary of the Coast Mountains. This boundary varies from map to map due to the broad transition area from mountains to plateau.

These rugged mountain ranges support glaciers at higher elevations and are dissected by deep valleys. The relief is usually 900 to 1200 m between the broad summit areas and the valley floors lying between 760 and 900 m asl. The Tatshenshini River valley (Fig. 179-1), the lowest elevation in the southern Yukon, lies less than 450 m asl where it crosses into northern British Columbia. The highest point in the ecoregion, 2,700 m asl, is in the Alsek Ranges between the Alsek River and the upper reaches of the Tatshenshini River. The highest mountain in the Boundary Ranges, 2,522 m asl, is east of Kusawa Lake. Numerous other peaks are greater than 2,100 m asl.

Most of the Boundary Ranges drain via the Takhini, Watson and Wheaton rivers of the Yukon River system. Kusawa and Bennett lakes are the largest in the ecoregion. Other lakes include Rose and Primrose lakes. In the Alsek area, which drains via the Tatshenshini and Alsek rivers to the Pacific, Mush and Bates lakes are the only large waterbodies in this portion of the ecoregion.

BEDROCK GEOLOGY

Unlike the elongated British Columbia portion of this ecoregion, which generally coincides with the metasandstone of Nisling subterrane of Yukon–Tanana Terrane, the Yukon portion extends westward across four northwest-trending terranes. The rock types, age range, and origin contrast greatly between the terranes; only the adjacent Yukon Southern Lakes Ecoregion displays as great a diversity of rocks and structures.

The regional distribution of rock types are shown on 1:250,000 scale maps by Wheeler (1961), Kindle (1953) and Campbell and Dodds (1982b). More detailed maps exist for certain areas (referenced below) and a compilation by Gordey and Makepeace (compilers, 2001) shows updated interpretations. The Cordilleran context of the terranes is discussed in Gabrielse and Yorath (editors, 1991) and in the “Geologic Framework” introductory section of this report.

Granitic intrusions are exposed over about 60% of the ecoregion, chiefly in the Coast Plutonic Complex. In the east lies Stikinia and pendants of Nisling subterrane of Yukon–Tanana, while the Gravina–Nutzotin belt, a sliver of Wrangell terrane (Wrangellia), and eastern Alexander terrane form the western quarter. The rocks are summarized below in similar order.

Stikinia, between Carcross and the Primrose River, contains three sub-circular volcanic cauldron complexes that underlie highlands on Montana Mountain (Hart and Radloff, 1990), around the West Arm of Bennett Lake (Lambert, 1974), and Mount Skukum (Pride, 1985). Each contains cliff bands and pinnacles of dark, fine-grained andesite and dacite flows and breccia. Steep faults separate the volcanics from older sandstone, conglomerate of Jurassic Laberge Group, and augite porphyritic basalt and limestone of Upper Triassic Lewes River Group, which define Stikinia.

From Primrose River westward to the Tatshenshini River, bare rock and rubble-strewn mountains consist of grey, coarsely crystalline biotite granodiorite of the Coast Plutonic Complex (Fig. 179-2). Approximately 20% of the area is quartz–mica schist and micaceous quartzite of Yukon–Tanana Terrane, in what are termed pendants, surrounded by granitic rocks. The largest pendants lie east of Kusawa and Dezadeash lakes. Their margins are typically rusty and thermally hardened. Large expanses of plutonic rock are criss-crossed by lineaments and slots where joints formed by cooling have been preferentially plucked by glacial and fluvial erosion.

West of the Haines Highway, the Auriol and Dalton ranges are underlain by conglomerate, shale, sandstone, chert and minor coal seams of the Lower Cretaceous Dezadeash Formation, an overlap assemblage in Gravina–Nutzotin belt. The Shorty Creek pluton consists of granodiorite that is 106 million years old (Dodds and Campbell, 1988).

Between the Dalton, a south extension of the Denali or Shakwak system, and Duke River faults,

Figure 179-2. Alpine tundra and rockland make up approximately half the area of the ecoregion and are subjected to strong winds and cloud cover. Black leaf lichen *(Umilicaria sp.)* thrives on the silica-rich bedrock. North-facing cliffs result from plucking by alpine glaciers as recently as the Little Ice Age. Blond, lichen-free areas indicate recession of semi-permanent snow patches during the last century.

which are both in wide, north-trending valleys, is a 15 km wide strip of Wrangellia terrane containing weakly metamorphosed volcanic and sedimentary rocks, the Carboniferous to Permian Kaskawulsh Group, intruded by the elongate Mount Beaton quartz–diorite pluton. Southwest of Bates Lake is a significant accumulation of sandstone, conglomerate and mudstone of Upper Oligocene Amphitheatre Formation (Ridgeway *et al.*, 1992). Northeast of Mush Lake are basalt and andesite flows of the Miocene Wrangell lavas (Souther and Stanciu, 1975).

At the west edge of the ecoregion, in the Alsek Ranges and on Goatherd Mountain, are amphibolite, siliceous and micaceous schist of the Carboniferous to Permian Kaskawulsh Group (Campbell and Dodds, 1978). These rocks are part of Alexander Terrane. They are intruded by the Alsek and Shaft Creek plutons which are 130 Ma (Dodds and Campbell, 1988).

The eastern quarter of the ecoregion has significant mineral potential. Quartz veins containing gold, silver and antimony mineralization have been mined at Mount Skukum (MacDonald, 1990) and Montana Mountain (Roots, 1981). The Wheaton River area also contains many metallic mineral showings that are detailed in Hart and Radloff (1990). In contrast, the Coast Mountains have few mineral occurrences. The Station Creek volcanics in Wrangellia host copper, zinc and lead in quartz veins, and picrolite asbestos is found on islands in Bates Lake. Placer gold has been mined from Squaw (Dollis), Beloud, Sugden and Shorty creeks, and native copper nuggets, probably derived from Wrangell lavas, are found in Beloud Creek.

SURFICIAL GEOLOGY AND GLACIAL HISTORY

This ecoregion has been extensively glaciated, and its west-central portion supports modern glaciers. Clusters of cirques, often occupied by modern glaciers, are found in the Boundary Ranges and in Kluane National Park. Neoglacial and Little Ice Age moraines are only a short distance from the cirques in most valleys.

Most of the surficial materials and morphology were produced by glaciers emanating from the St. Elias Mountains, eastern Coast Ranges and the Cassiar lobe of the Cordilleran Ice Sheet (Jackson *et al.*, 1991) during the McConnell Glaciation, about 23 ka (Klassen, 1987; Jackson and Harington, 1991). These glaciers moved generally north–northwestward, and crossed Dezadeash Valley to cover most of the Aishihik area. Extensive glacial lakes were formed during deglaciation.

The southern shores of Glacial Lake Champagne (Kindle, 1953) impinged the north side of this ecoregion. This lake, formed when the glaciers had retreated to the intermontane valley between Kluane and Ruby ranges, extended along the Shakwak Trench to the southeast, and may have extended east to the Takhini River and south of Whitehorse (Wheeler, 1961). Well-defined shorelines along the Dezadeash and Takhini rivers and tributaries reach up to 1,280 m in elevation. A spectacular ice contact delta complex was deposited at the same elevation at the north end of Kusawa Lake. Glacial Lake Champagne occupied the areas of what is now Kusawa Lake valley. Minor and major deltas are found on the western side at the mouth of Bear Creek, on the south side on Tatshenshini, Klukshu and Takhanne rivers, and at the mouths of Primrose and Takhini rivers to the east.

Continued glaciation led to impoundment of Glacial Lake Carcross (Wheeler, 1961) by glaciers to the south of the Yukon–British Columbia border and by glaciers occupying the upper Wheaton and Watson valleys to the west. Shorelines located up to 760 m asl can be found along Bennett Lake, as well as along the Wheaton, Watson and nearby valleys (Wheeler, 1961; Morison and Klassen, 1991). Other minor glacial lakes were also formed as the glaciers retreated from the area.

CLIMATE

This ecoregion consists of four major south–north valleys that affect movement of weather systems: the Alsek River, the Haines Road Corridor, Kusawa Lake and the Bennett–Tutshi Lakes. The main orographic lift of maritime air and resultant heavy precipitation occurs to the south of this ecoregion in British Columbia and southeast Alaska.

This ecoregion is near enough to the Pacific Ocean to receive moderate amounts of precipitation with annual amounts of 300 to 500 mm. This precipitation is lightest from February through May and heaviest in the fall and early winter. This precipitation is generally snow from October to May, as well as at elevations above 2,000 m throughout most of the year (Fig. 179-1).

Mean annual temperatures are near –2.5°C, although seasonal temperatures show the effects of elevation. During January, the mean temperatures are near –25°C in the lower valley floors as compared with nearly –18°C over higher elevations. Short midwinter thaws can occur in the lower valleys. By July, usually the warmest month, the lower valleys have mean temperatures near 12°C decreasing to 5°C over the higher terrain. Extreme temperatures can range from –45 to 35°C in the lower valleys and from –30 to 15°C over higher terrain. Frost can occur at any time of the year but is least frequent in July.

Winds are moderate to light, but can frequently reach gale force strengths in north–south oriented valleys. These gale force winds are most common from the fall through spring and occasionally reach destructive speeds, particularly from a southwesterly direction.

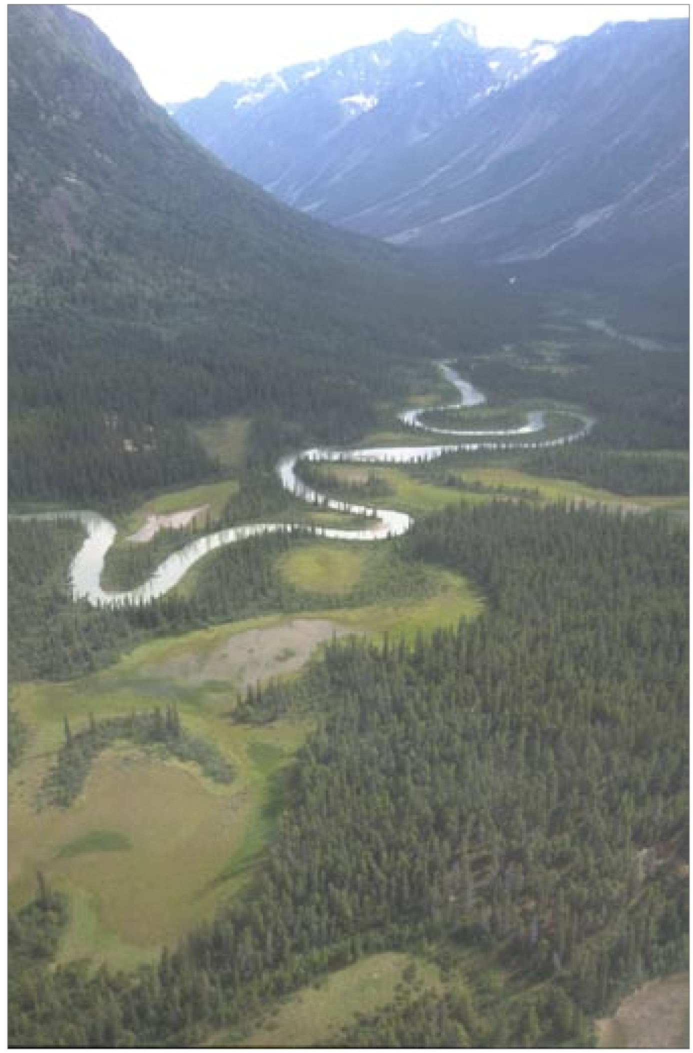
A representative climate station at lower elevations is Carcross, but this site receives less precipitation than most areas in this region. Precipitation amounts are more similar to those indicated at Dezadeash, Yukon, and Mule Creek, British Columbia Precipitation amounts may be up to 50% greater over higher terrain.

HYDROLOGY

The ecoregion drains the northern- and eastern-facing slopes of the Coast Mountains (Boundary Ranges). Because the ecoregion is a high altitude source region, and because of its relatively small size, there are no large representative streams within its boundaries, though a short reach of the Alsek River forms the western border. At the western limit, the ecoregion straddles the divide between the Alsek and Yukon river drainages. Major intermediate and smaller streams within the Alsek drainage include the Tatshenshini, Klukshu and Bates rivers. Major intermediate and smaller streams within the Yukon drainage include the upper Takhini, Primrose, Wheaton and Watson rivers.

Although glacier coverage of the Yukon portion of the ecoregion is small at 1.42% of the total area, the hydrologic response is dominated by glacier melt contributions. Glacier coverage, including the Llewellyn Glacier, is significantly greater within the British Columbia portion of the ecoregion. Also within the ecoregion is a small, unnamed tributary of the Atlin River, originating at the base of the Llewellyn Glacier, which has been identified as the source of the Yukon River (Parfit, 1998). The source is defined as the longest tributary of the Yukon River upstream of its confluence with the Teslin. The ecoregion has relatively high lake coverage at 4.5%. Major lakes include Bennett and Kusawa, while smaller ones are Primrose, Rose, Takhini, Mush and Bates. Wetland coverage is relatively small at 0.32% of the total Yukon area (Fig. 179-3).

There are four representative (active and historical, continuous and seasonal) hydrometric stations within the ecoregion: Tatshenshini, Takhanne, Wheaton and Watson rivers. Though glaciers are not present throughout, hydrologic response within the ecoregion is dominated by characteristics typical of a glacierized system. Annual streamflow within these systems is characterized by a rapid increase in discharge in May due to snowmelt at lower elevations, rising to a peak in July or August due to high elevation snowfield and glacier melt. In non-glacierized systems, peak flows occur in June as a result of snowmelt inputs. Because most stream channels are steep and relatively short, streamflow response tends to be rapid and flashy. On smaller streams approximately 40% of the annual maximum flows are due to intense summer rainstorm events. Some small steep streams are susceptible to mudflows triggered by these summer rainstorms. Mean annual runoff is moderately high and variable with values ranging from 130 mm in some non-glaciated basins to 500 mm in glaciated basins with an ecosystem mean of 317 mm. Mean seasonal and summer flows are moderately high with values of 21 X 10^{-3} and 17 X 10^{-3} $m^3/s/km^2$, respectively. The mean annual flood and mean maximum summer flow are moderately low and moderate with values of 63 X 10^{-3} and 42 X 10^{-3} $m^3/s/km^2$, respectively. Minimum streamflow generally occurs during March or earlier with the relative magnitude higher than many other ecoregions due to higher winter temperatures and subsequently greater groundwater contributions.



J. Meikle, Yukon Government

Figure 179-3. The Hendon River meanders across its floodplain, indicating less sediment transport than in braided streams, such as the nearby Kusawa and Primrose rivers. Former oxbows are now sedge fens. Nearby ridges support white spruce and dwarf birch. Mature white spruce cloaks the lower slopes. Avalanche tracks are visible up valley.

The mean annual minimum and mean summer minimum flows are relatively high with values of 1.7 X 10^{-3} and 6.9 X 10^{-3} $m^3/s/km^2$, respectively.

PERMAFROST

Permafrost is sporadic in the valleys of the Yukon Stikine Highlands Ecoregion, though it occurs regularly at high elevations. Valleys that act as conduits for the passage of maritime air often receive abundant snowfall in winter. Permafrost is rarely encountered under such conditions. Brown (1967) did not find frozen ground along the Haines Road and it is rare along the Klondike Highway south of Carcross (Public Works Commission, 1986). Valleys in the rain shadow of the Coast Mountains are dry and sufficiently warm in summer to prevent permafrost development at most sites (EBA, 1988b). Localized perennially frozen ground has been reported in moist locations (Horel, 1988b).

At higher elevations in the ecoregion, a full suite of alpine periglacial features occur, with well-developed solifluction lobes on hills, frost-shattered bedrock outcrops, patterned ground, and stone nets and stripes on flatter terrain. There are few reports on ground ice in the Yukon portions of this ecoregion, including those for road construction and maintenance, however, rock, debris-covered, and cirque glaciers are found on some north-facing aspects, and perennial snowbanks in places.

SOILS

Soil development reflects the relatively mild, humid climatic conditions of the ecoregion and its steep, rugged topography. Most of the soils are developed on mixed colluvium and moraine materials within steep mountain valley systems. Precipitation and topographic relief tend to increase southward toward the British Columbia border. Eutric and Dystric Brunisols are the predominant soils. In alpine environments, Sombric Brunisols with well-developed Ah horizons can be found.

In an ecological survey along the northern extent of the ecoregion, Oswald *et al.* (1981) reported Eutric Brunisols on a variety of parent materials under predominantly boreal forest vegetation. In adjacent British Columbia, Luttmerdig *et al.* (1995) described slightly more humid conditions and the development of Dystric Brunisols and sporadic Humo–Ferric Podzols. These later soils are not known to occur in the Yukon portion of the ecoregion, except for isolated localities on granitic bedrock in alpine environments near the headwaters of the Takhini River.

Permafrost is sporadic in the ecoregion and Cryosols are not common except in poorly drained portions of alpine environments where patterned ground is common. Generally, soil temperatures remain relatively warm through the winter under heavy snow pack conditions. Although there are a few small alpine glaciers in the ecoregion, these are not associated with extensive permafrost. Where permafrost does occur, active layers are often too thick for the soils to be classified as Cryosols.

Wetlands are not a dominant feature of the ecoregion, being confined to some of the alluvial landforms along the Takhini, Primrose, Tatshenshini and Alsek river valleys. Most of the soils are classified as Humic Gleysols or occasionally as Typic and Terric Mesisols in fen wetlands with over 2 m of peat accumulation (Fig. 179-3).

VEGETATION

The vegetation of the Yukon Stikine Highlands Ecoregion reflects the great variation between alpine summits and moist forested valley floors. Much of the area lies above treeline (around 1,200 m asl). Because of the coastal influence — greater winter snowfalls, more moderate winter temperatures, and lack of permafrost in the valleys — the vegetation does not suffer the moisture stress of the ecoregion to the east. Coniferous and some mixed forests dominate the valley bottoms (Fig. 179-1), grading to shrubs in the subalpine and dwarf shrub and lichen tundra above 1,350 m asl (Fig. 179-2).

White spruce is the dominant tree species in the lowlands, often with an understory of feathermoss and some upland surfaces (Oswald *et al.*, 1981). Labrador tea and willow are common shrubs. On warmer sites, white spruce is often mixed with trembling aspen. These sites are dominated by a shrub understory of lingonberry, kinnikinnick, and twinflower and lichens. Taller shrubs include soapberry, rose, willow, and high-bush cranberry. Balsam poplar is common on margins of lakes and streams, and along roadsides. It is often mixed with white spruce on floodplains. Lodgepole pine often occurs on burned areas in the eastern part of the ecoregion. Paper birch is occasionally found in mixed stands on moister sites.

In the subalpine, white spruce and sometimes subalpine fir are found with shrub birch and willow. Fir is found in the subalpine, but is restricted to eastern portions of the ecoregion. Subalpine valleys subject to cold air drainage often have spruce or fir along the valley walls while the valley floor and upper slopes are dominated by shrub birch and willow associated with ericaceous shrubs, graminoids, moss, herbs and lichen.

Alpine areas cored by granitic rocks are sparsely vegetated by lichen, ericaceous shrubs, and prostrate willows.

WILDLIFE

Mammals

The ecoregion exhibits a coastal climatic influence on flora and fauna. The highest densities of mountain goats in the Yukon are found here (Barichello *et al.*, 1989b). The Ibex woodland caribou herd inhabits the eastern section of the ecoregion (Fig. 30). It is small and fragmented, numbering about 450. The herd is exposed to predation by a large number of wolf packs (R. Farnell, pers. comm., 2002). Moose, Dall sheep, wolves, wolverine and black bear are all common (Fig. 179-4). Grizzly bear reach their highest density in the Yukon, estimated at one bear per 45 km^2. Isolated populations of marten occur in climax forests, being most common at higher elevations.

The tundra shrew, once believed to be restricted to the northern Yukon, has been found within the ecoregion in British Columbia (Nagorsen, 1996) and therefore, probably occurs in the Yukon portion of the ecoregion. Bats have received little attention in the Yukon, and species other than the little brown myotis may yet be found. Bat species found near the Yukon include the long-legged myotis, Keen's long-eared myotis, the silver-haired bat and the big brown bat. Mammal species known or expected to occur in this ecoregion are listed in Table 4.

The known northern limit of the Columbian spotted frog occurs in this ecoregion (Fig. 179-5).

Birds

In early spring, open water at the outlet of Bennett Lake provides a staging area for swans, diving ducks, and some dabbling ducks (Theberge *et al.* [editors], 1979). Large lakes such as Bennett and Kusawa provide breeding and staging habitat for Pacific and Common Loons, Common Merganser, Bonaparte's, Mew, Herring Gulls, and Arctic Tern, (Godfrey, 1951; Soper, 1954; Department of Public Works and U.S. Department of Transportation, 1977). Belted Kingfisher and Bank Swallow nest in the mud banks of these lakes. Shallower lakes and wetlands support Mallard, Northern Pintail, and Green-winged Teal (Soper, 1954).


W.J. Schick

Figure 179-4. Some of Yukon's best habitat for Dall sheep *(Ovis dalli dalli)* occurs at the northern or lee edge of this ecoregion. In the steeper terrain to the south where snowfall is greater is the highest density of mountain goats *(Oreamnos americanus)* in Yukon.


L. Mennell

Figure 179-5. The Columbia spotted frog *(Rana luteiventris)* has been observed at two locations along the West Arm of Bennett Lake. It is isolated from other populations to the south and is at its northern limit in the Yukon portion of this ecoregion.

Salmon spawning streams, such as the Takhanne River, attract breeding pairs of Bald Eagle with especially high numbers in the autumn (Department of Public Works and U.S. Department of Transportation, 1977). Swift mountain streams provide habitat for Harlequin Duck and American Dipper (Department of Public Works and U.S. Department of Transportation, 1977). Wandering Tattler breed at the heads of these mountain streams while Semipalmated Plover breed on the sparsely vegetated alluvium of larger drainages (Department of Public Works and U.S. Department of Transportation, 1977). Orange-crowned Warbler, Yellow Warbler, Common Yellowthroat, Wilson's Warbler, Fox Sparrow, and Lincoln's Sparrow breed in thickets bordering streams, bogs, and moist meadows (Godfrey, 1951).

Low elevation coniferous forests support year-round residents such as Northern Goshawk, Spruce Grouse, Great Horned Owl, Northern Hawk Owl, Three-toed Woodpecker, Gray Jay, Common Raven, and Boreal Chickadee (Godfrey, 1951; Department of Public Works and U.S. Department of Transportation, 1977). These are joined in the breeding season by Sharp-shinned Hawk, Merlin, Olive-sided Flycatcher, Western Wood-Pewee, Golden-crowned and Ruby-crowned Kinglets, Swainson's Thrush, Varied Thrush, and Yellow-rumped and Blackpoll Warblers (Godfrey, 1951). Scattered pockets of deciduous forest provide breeding habitat for Ruffed Grouse and Northern Flicker (Godfrey, 1951). Say's Phoebe, American Robin, and Chipping Sparrow (Theberge, 1974) use forest openings. Rufous Hummingbirds, rare visitors to the southern Yukon (Eckert *et al.*, 1998), also use openings, especially those with suitable flowering plants (Godfrey, 1951).

High densities of breeding Golden Eagle inhabit alpine and subalpine areas, and some overwinter in years of high prey abundance (Hayes and Mossop, 1983). Peregrine Falcon nest in localized areas of rock outcrops and cliffs, usually near wetlands (Theberge, 1974). The Coast Mountains represent the southern limit of nesting Gyrfalcon in North America; Willow, Rock, and White-tailed Ptarmigan provide their main prey base (Hayes and Mossop, 1983). Species that breed in subalpine shrubs include American Kestrel; Willow Ptarmigan; Wilson's Warbler; Brewer's, American Tree and Golden-crowned Sparrow; Dark-eyed Junco (Canadian Wildlife Service, unpubl.); Dusky Flycatcher; Townsend's Solitaire; and Common Redpoll (Godfrey, 1951; CWS, Birds of the Yukon Database). American Pipit, Savannah Sparrow and Horned Lark breed in tussock tundra of the extensive alpine plateaus along exposed ridges.