

## Northern Boreal Woodland



### General Description

The *Northern Boreal Woodland* zone covers an area of approximately 1,165,000 km<sup>2</sup> in a band of varying width that extends for over 4700 km from the Alaska border to the Labrador coast. This zone represents the northern extent of a largely treed landscape, with trees generally becoming smaller and more widely spaced northward. Landcover on upland sites is dominated by woodlands, but extensive peatlands (often with active permafrost features) and numerous water bodies occupy much of the overall landscape.

### Vegetation

Upland sites are typified by woodlands with short, small-crowned trees and open understories with continuous lichen ground cover. Vegetative layering of tree species often creates dense patches of trees in a generally open woodland mosaic. Groves of closed forest occur on warm aspects and moist, wind-sheltered sites (e.g., river valleys). Woodland canopies mostly comprise evergreen coniferous species, although some cold-deciduous broad-leaved and deciduous coniferous species are present. Understory structure is typically patchy, depending on site and canopy conditions, and is usually dominated by cold-deciduous broad-leaved shrubs, conifer regeneration and lichens or bryophytes. A light-coloured carpet of lichens between widely spaced trees is a striking visual characteristic of these northern woodlands.

Frequent stand-replacing fires create a diverse landscape mosaic. Individual woodland stands are seldom over 100 years old, and are typically even-aged with a simple structure. The cold environment and short growing season result in slow vegetation growth and disturbances are evident on the landscape for decades. Fires are not actively suppressed across much of the area, and young stands are common. Anthropogenic disturbance is uncommon, except near settlements.

The dominant tree species are black spruce (*Picea mariana*) and white spruce (*P. glauca*). Black spruce is the main species on the Shield, and on raised peat formations, while white spruce is more often prevalent in the western portion of the zone. Paper birch (*Betula papyrifera*) and/or Alaska paper birch (*B. neoalaskana*) are common associates. Balsam poplar (*Populus balsamifera*) occurs on nutrient-rich, often moist, sites. Tamarack (*Larix laricina*) occurs throughout the zone, but is most common in the east. In the east-central portion of the zone, jack pine (*Pinus banksiana*) recolonizes sites following wildfire. In eastern areas, balsam fir (*Abies balsamea*) is found on fire-protected sites. In the Caribou Hills and Cameron Mountains of northern Alberta and southern Northwest Territories (NWT), hybrid Murraybanks' pine (*Pinus xmurraybanksiana*) occurs. Alluvial forests dominated by white spruce and balsam poplar occur on stable floodplain terraces throughout the zone. In eastern areas, black ash (*Fraxinus nigra*), eastern white cedar (*Thuja*

*occidentalis*), balsam fir and white elm (*Ulmus americana*) are also found on floodplains.

The understory shrub layer can be well-developed under an open canopy. Common understory species throughout the zone include shrub birches (mainly arctic dwarf birch [*Betula nana*] and glandular birch [*B. glandulosa*]), green alder (*Alnus viridis*), black crowberry (*Empetrum nigrum*), common Labrador tea (*Rhododendron groenlandicum*), bog bilberry (*Vaccinium uliginosum*), dwarf bilberry (*V. cespitosum*), mountain cranberry (*V. vitis-idaea*) and fireweed (*Chamaenerion angustifolium*). In west-central areas, willows (e.g., grey-leaved willow [*Salix glauca*]), northern Labrador tea (*R. tomentosum*) and common bearberry (*Arctostaphylos uva-ursi*) are often present. In the east, early lowbush blueberry (*V. angustifolium*), creeping snowberry (*Gaultheria hispidula*) and bunchberry (*Cornus canadensis*) are common. West of the Cordillera, Lapland rosebay (*R. lapponicum*), red bearberry (*Arctous rubra*), entire-leaved mountain avens (*Dryas integrifolia*), Alaska mountain avens (*D. alaskana*) and alpine hedysarum (*Hedysarum americanum*) are prominent understory species. Lichen species diversity is high, but the most common mat-forming species are reindeer lichens (*Cladina* spp.), especially in eastern Canada, and foam lichens (*Stereocaulon* spp.). Feathermosses, usually red-stemmed feathermoss (*Pleurozium schreberi*) or staircase moss (*Hylocomium splendens*), can dominate ground cover when tree canopies are closed. On raised peat formations, peat mosses (*Sphagnum* spp.) are present in the ground layer.

Wetlands are common, and often extensive. Bogs and fens are the predominant wetland classes, commonly forming intricate peatland mosaics on the landscape. With low relief and impermeable frozen soils, many plains have distinctive “string” and “net” bog – fen complexes; this is especially the case on the Hudson Bay Lowland. Permafrost dynamics often result in peat formations that are raised above the water table, permitting bog islands to develop within a wetter fen matrix.

Bogs and nutrient-poor fens are usually dominated by low or dwarf shrub species such as common Labrador tea, leatherleaf (*Chamaedaphne calyculata*), mountain cranberry, small cranberry (*Vaccinium oxycoccus*), cloudberry (*Rubus*

*chamaemorus*), pale bog laurel (*Kalmia polifolia*), black crowberry, bog bilberry and, in eastern Canada, early lowbush blueberry. On slightly richer sites, shrub birches (e.g., glandular birch, arctic dwarf birch, bog birch [*Betula pumila*]), willows (e.g., tea-leaved willow [*Salix planifolia*], diamond-leaved willow [*S. pulchra*]) and tussock cottongrass (*Eriophorum vaginatum*) are often abundant. Black spruce and tamarack (*Larix laricina*) are the main tree species, occurring in stunted form on the poorest sites. Peat mosses dominate the moss layer, with red-stemmed feathermoss, staircase moss or lichens (especially reindeer lichens) on the tops of hummocks. Permafrost is usually present in peatlands.

Treed swamps are usually dominated by tamarack, black spruce or white spruce. Shrub swamps and annually active floodplains typically include grey alder (*Alnus incana*), green alder, willows (e.g. Barclay’s willow [*Salix barclayi*], tea-leaved willow, satiny willow [*S. pellita*], coyote willow [*S. exigua*]), shrub birches (e.g., arctic dwarf birch, bog birch, water birch [*Betula occidentalis*]) and bluejoint reedgrass (*Calamagrostis canadensis*).

Shallow marshes and wetter fens are dominated by sedges (e.g., water sedge [*Carex aquatilis*], northern beaked sedge [*C. utriculata*], woolly-fruit sedge [*C. lasiocarpa*], creeping sedge [*C. chordorrhiza*]), tufted clubrush (*Trichophorum cespitosum*), water horsetail (*Equisetum fluviatile*), tussock cottongrass, pendant grass (*Arctophila fulva*), bluejoint reedgrass or northern reedgrass (*Calamagrostis stricta* ssp. *inexpansa*). Where water tables fluctuate and some root zone drying occurs during the growing season, fens include shrub birches (e.g., arctic dwarf birch, bog birch), willows (e.g., bog willow [*Salix pedicellaris*]), shrubby cinquefoil (*Dasiphora fruticosa*), sweet gale (*Myrica gale*) and stunted tamarack. Brown mosses such as ribbed bog moss (*Aulacomnium palustre*), golden fuzzy fen moss (*Tomentypnum nitens*) and hook mosses (*Drepanocladus* spp.) usually dominate between *Sphagnum* hummocks.

Upland shrublands are common on raised peat formations, dry shallow mineral soils, exposed bedrock and following fire. On most sites with some winter snow cover, vegetation is usually dominated by shrub birches (especially glandular birch or arctic dwarf birch) and bog bilberry. Shrub height varies

with wind exposure and average snow depth. On sites with acidic substrates (e.g., Shield-derived till), Labrador teas (common and northern), black crowberry, mountain cranberry and, in the east, early lowbush blueberry characterize the vegetation. On substrates with higher pH, entire-leaved mountain avens is ubiquitous, often with dwarf willows (e.g., net-veined willow [*Salix reticulata*]). Four-angled mountain heather (*Cassiope tetragona*) is found on sites with late-melting snowbeds. On exposed rock surfaces or snow-scoured sites (e.g., bedrock, boulders, peat hummocks), lichens characterize the vegetation. Species include those found in the woodlands as well as rocktripe lichens (*Umbilicaria* spp.), map lichens (*Rhizocarpon* spp.), clad lichens (*Cladonia* spp.), arctic kidney lichen (*Nephroma arcticum*), snow lichens (*Flavocetraria* spp.) and whiteworm lichens (*Thamnolia* spp.).

## Climate

The climate of the *Northern Boreal Woodland* zone is generally characterized by very long, cold winters and short, cool to moderately warm summers. Mean annual temperatures vary from approximately -10°C in Inuvik, NWT to -4°C in Labrador and the southern Hudson Bay Lowland. Growing degree days above 5°C average approximately 600 across the zone. Mean annual precipitation generally follows a west to east gradient, increasing from <300 mm in the west to approximately 800 mm in Labrador.

## Physiography, Geology, Topography, Soils and Land Cover

In western Canada, this zone occurs in portions of the Cordilleran, Arctic Coastal Plain and Interior Plains physiographic regions. The majority of the zone lies on the Precambrian Shield (Kazan, Hudson, James, Laurentian, Davis regions).

In Yukon and western NWT, the zone occurs on a series of low elevation plains and plateaux underlain by Paleozoic, Mesozoic and late Proterozoic sedimentary rocks. The topography is generally rolling or undulating with low relief, although there are some low elevation ridge and hill systems. In the MacKenzie and Franklin Mountains, the North Ogilvie region and the Old Crow Range, this zone occurs below 800 – 1200 mASL; in the Richardson

Mountains, it occurs below approximately 600 mASL. The *Northern Boreal Woodland* zone also occupies the majority of the Mackenzie Delta.

On the Precambrian Shield in eastern NWT, Nunavut, Saskatchewan, Manitoba, Ontario, Quebec and Labrador, elevations are generally <600 mASL, except in parts of central Quebec and western Labrador where a series of higher plateaux have elevations up to 1100 mASL. Here, areas approximately >800 mASL are in the *Eastern Alpine Tundra* zone. Most of the Shield landscapes are characterized by broad expanses of rolling terrain containing numerous wetlands and lakes with local relief rarely exceeding 100 m. The geology comprises Precambrian sedimentary and crystalline rocks. On the Hudson Bay Lowland, Paleozoic carbonate-rich strata overlie the Precambrian rocks creating a level plain with low relief and extensive wetlands.

The majority of the zone was affected by late Pleistocene glaciation, with the exception of northern Yukon which remained unglaciated during this period (Beringia). In most glaciated areas, surficial landscape expression is dominated by glacial features and bedrock-controlled terrain. In the unglaciated areas of northern Yukon, surficial materials consist of fine to coarse-textured colluvium from weathering of ancient bedrock, or glaciofluvial or glaciolacustrine deposits created by water released from glaciers outside the area. The Mackenzie Delta comprises recent and ancient fluvial and fluvial-marine sediments. On the Shield and raised plateaux of the Interior Plains, shallow till veneers often overlie bedrock on upland sites, while deeper deposits of glacial drift fill landscape depressions. On the Hudson Bay Lowland, raised sandy beach ridges from post-glacial isostatic recovery are interspersed with marine clays and silts, often covered by peat. Mineral soils are typically Brunisols and Luvisols, with Gleysols and Cryosols in poorly drained locations. Peatlands dominated by Organic Cryosols are common and often extensive in poorly drained areas; peat depths can be >2 m. Numerous water bodies are a characteristic of the landscape.

Permafrost is a characteristic of peatlands throughout the zone, with continuous permafrost occurring in fine-textured soils at more northerly

latitudes. In these areas, active permafrost features (e.g., earth hummocks, cryoturbated surface soil horizons, palsas, peat plateaux and ice wedge polygons) are common; in southern parts of the zone, these features occur only sporadically. Depth to permafrost affects the temperature of the active substrate layer and thus, the effective growing season for vegetation. Elevated permafrost features sometimes raise peat surfaces above the surrounding water table.

## Notes

In Labrador, Quebec and northeastern Ontario, the *Northern Boreal Woodland* zone is bounded to the south by the *Eastern Boreal Forest*. In northwestern Ontario, Manitoba, Saskatchewan and east-central NWT, its southern boundary is the *West-Central Boreal Forest*. In Yukon and western NWT, this zone lies to the north of, or at lower elevations to, the *Subarctic Alpine Tundra*. To the north, this zone mostly transitions into the *Subarctic Woodland-Tundra*, except in northern Yukon, where it borders directly on the *Low Arctic Shrub Tundra* zone, and a

small section in Quebec where it extends to the coast of Hudson Bay. The islands in James Bay are included in this zone. In northern Alberta, the *Northern Boreal Woodland* occurs at the highest elevations of the Cameron Hills and Caribou Mountains, surrounded by the *West-Central Boreal Forest*.

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