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Abstract

Fifty-six forested plant communities in the Lake Laberge Ecoregion, Yukon Territory, are described in terms of appearance, characteristic and associated species, landform, soils, successional status, and productivity. A primary objective was to describe the communities so that forest and land managers, land-use planners, environmental impact assessors, and landscape architects could identify the communities in the field. Wildfire has played a prominent role in stand development, and virtually all current stands are in some successional stage. It is impracticable to describe every assemblage of seral species, consequently those of infrequent occurrence are grouped with those occurring over a large area or in several places. Forest productivity is influenced mostly by site conditions within a regional climate, but stand history, age, and associated vegetation must be considered in tree growth measurements. Productivity ratings are relative only within the Yukon; the best sites attain a Canada Land Inventory rating of Class 4. In general, the most productive sites occur on low elevation, medium to fine textured, well-drained soils with a moist moisture regime lacking prolonged seasonal frost. A dominance of ***Alnus*** spp. or *Vaccinium* vitis-idaea in the understory is indicative of high productivity; the *Salix/Calamagrostis* stand indicated as having the highest productivity is considered anomalous due to young age and seral development.

Résumé

Les auteurs décrivent 56 communautés végétales forestières du point de vue de l'apparence, des caractéristiques et des essences associées, du relief, du sol, du stade de ia succession et de ia productivité, surtout pour permettre aux gestionnaires des forêts et des terres, aux évaluateurs des incidences environnementales et aux architectes paysagistes de reconnaître ces communautés sur le terrain. Les feux de friches ont joué un rôle important dans le développement des peuplements, et presque tous les peupiements actuels sont à un certain stade de ia succession. Comme il est impossible de décrire chaque assemblage d'essences sériales, ceux qu'on recontre rarement sont regroupés avec ceux qu'on trouve sur une grande superficie ou en plusieurs endroits. La productivite forestière depend surtout des conditions de la station dans un climat regional, mais on doit tenir compte de l'histoire du peuplement, de son âge et de la vegetation associée lorsqu'on mesure la croissance des arbres. Les cotes de productivite sont relatives seulement au Yukon: dans les meilleures stations, les sols sont de classe 4, selon ies critères utilisés dans l'Inventaire des terres du Canada. En général, les stations les plus productives se trouvent à faible elevation: les sois ont une texture de moyenne à fine, ils sont bien drainés, humides, et la saison du gel ne se proionge pas. La predominance d'*Alnus* spp. ou de Vaccinium vitis-idaea dans le sous-étage indique une forte productivitb; la productivite ia plus élevée constatée pour le peuplement de Saiix et de Calamagrostis est considérée comme une anomalie. vu son jeune age et son développement serial.

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Introduction

Forest vegetation, succession, and productivity assessments have been on going since the advent of forest resource surveys in Yukon Territory by the Pacific Forest Research Centre in 1975. The initial survey had a broad scope in order to gain an appreciation of the forest resource over the entire Territory. Combining vegetation, climatic and geomorphologic data in an ecological context led to defining ecoregions (Oswald and Senyk 1977). Recognition of the ecoregion concept provided a framework within which more detailed surveys could be structured. An apparent difference in vegetation communities and forest productivity among the ecoregions was observed during the surveys. Current work is aimed at documenting the differences, if any, in vegetation and tree growth among the ecoregions.

in analyzing forested terrain for identification of potentially productive ecosystems, it is necessary to view existing forest stands in relation to their productivity and stability. Fires have played a prominent role in Vegetation development throughout most of southern Yukon, and the existing vegetation largely reflects the frequency and extent of fires. Because of this, most stands are in some successional stage dependent on the time since the last fire, the severity and Size of the fire, and site conditions. Some sites have the ability of rebounding after a fire much quicker than others. However, restocking with commercially desirable tree species may not occur even on the most easily revegetated sites for a decade or more following the fire. Information on such factors as stand conditions prior to burning, fire timing, size, and severity, and climatic conditions following the fire, in addition to site conditions, is necessary to make predictions on regeneration success.

This report deals with the plant communities, succession and productivity in the Lake Laberge Ecoregion (Fig. 1). Several surveys have been conducted in parts of the area (Spartan Aero Ltd. 1970; Oswald 1979; Oswald and King 1980; Stanek 1980; Davies *et al.* 1983; Oswald et *al.* 1983), which contributed to the recognition of plant communities. Appendix E contains a glossary of technical terms.

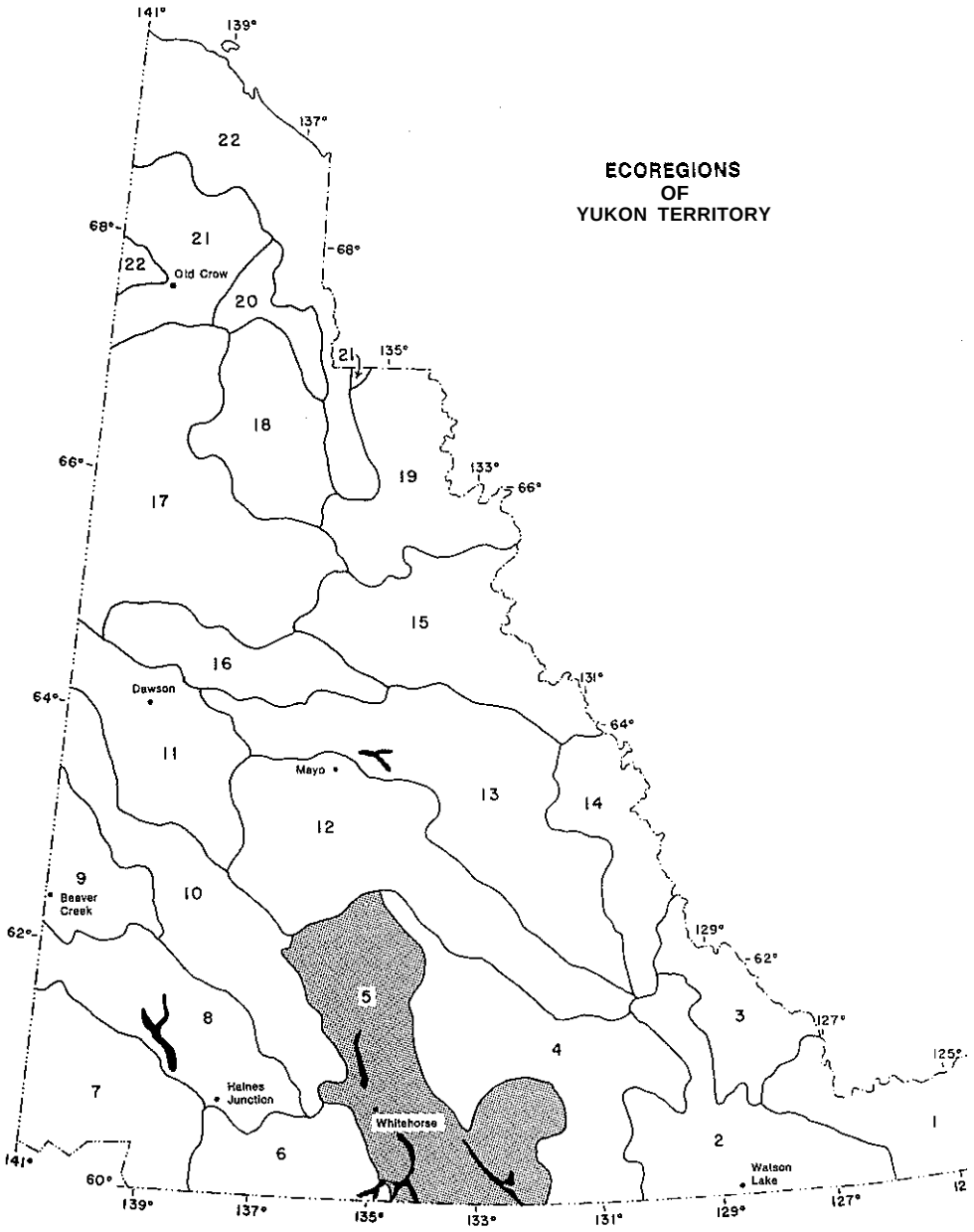

Fig. 1. Location of Lake Laberge Region

Description of study area

Location and physiography

The Lake Laberge Ecoregion contains approximately 34 180 km² lying in south-central Yukon from 60°00′ to about 62°30′N. latitude and extending diagonally from about 131°30′ to 136°30′W. longitude. It consists of the Teslin Plateau, parts of the Lewes and Nisutlin plateaux, and the southern part of the Big Salmon Range physiographic subdivisions of Bostock (1965), consisting generally of relatively low elevation terrain lying between 600 m and 1500 m above sea level (a.s.l.). Some peaks rise to as much as 2084 m a.s.l. The ecoregion is bordered on the east side by the Pelly and Cassiar mountains, on the south side by the British Columbia-Yukon border, on the west side by the Coast Mountains and the Kiuane and Klondike plateaux, and on the north side by a climatic gradient separating two ecoregions.

The Yukon River, originating just south of the Yukon border and flowing through Alaska to the Pacific Ocean, dissects the ecoregion from south to north nearly through the middle. Other major rivers, all tributaries of the Yukon River, include the Nisutlin, Teslin. and Nordenskiold which have their major parts in the ecoregion, and the termini of the Takhini, Big Salmon, and Little Salmon rivers. The larger lakes include Tagish, Marsh, Little Atlin, Teslin, Wolf, Laberge, Little Salmon and Drury lakes. Many smaller lakes are scattered throughout.

More than half the total population of the Yukon (approximately 25,000 people) live within this ecoregion. Whitehorse, the capital, is the largest town. The towns of Teslin, Carcross, and Carmacks. along with a relatively large rural population, add to the total. These communities are serviced by the Alaska, Klondike, and Robert Campbell highways plus the triangular Carcross Road with extentions to Atlin, British Columbia and Skagway, Alaska. An international airport is located in Whitehorse. The only railroad in the Yukon, which is currently closed, extends from Whitehorse through Carcross to Skagway.

Climate

The ecoregion endures a cold continental climate modified slightly by marine influences from the Gulf of Alaska; however, the coastal moderation is often realized more at higher elevations than on

Table 1. Mean climatic data for eight Stations in the Lake Laberge Ecoregion plus Haines Junction located just outside the ecoregion. Monthly data are given in Appendix A.

Station	Lat.	Long.	Elev.(m)	Temperature (°C) annual	Jan.	July	Annual precip. (mm)	Growing degree days > 5°C.
Tesiin	60°10′	132'45'	701	−1.8	−21.6	13.4	326.5	791.2
Carcross	60'11'	134'34'	661	−1.4	−19.8	12.7	211.4	786.7
Johnson's Crossing	60'29	133°18′	690	−2.0	−22.3	13.1	353.8	780.1
Whitehorse Riverdale	60°42′	135°02′	641	−1.0	−20.9	14.5	261.7	959.6
Whitehorse Airport	60°43′	135'04'	694	−1.2	−20.7	14.1	261.2	897.2
Haines Junction	60'45'	137'35'	599	−3.2	−22.9	12.5	292.5	679.8
Braeburn	61'30'	135'45'	640	−3.5	−25.1	13.7	259.6	811.0
Carmacks	62°06′	136°18′	521	−3.8	−28.2	14.5	254.3	911.6
Drury Creek	62°12′	134°23′	609	−2.5	−23.7	14.3	349.4	NA

valley floors (Wahl, unpublished). Summers are short. with long day lengths and relatively warm temperatures, while winters are long, with very short day lengths and cold temperatures. Data available from meteorological stations (Table 1), all of which are located at lower elevations, indicate annual mean daily temperatures ranging from –1.0°C to –3.8°C, with July being the warmest month (mean daily temperature 12.5 to 14.5°C) and January the coldest (mean daily temperature −19.8 to –28.2°C) (Fig. 2, Appendix A). Hours of potential sunshine range from about 19 hours per day on June 21 to less than 6 hours per day on December 21.

Precipitation is relatively low at valley floor locations, ranging from an annual mean of 211 mm at Carcross to 354 mm at Johnson's Crossing. The period June to September receives the highest monthly precipitation (Fig. 2) except at Carcross where the monthly precipitation is more uniform throughout the year (Appendix A). Most precipitation from October to April comes as snow, though some stations report minor amounts of rain nearly every month. At Braeburn snow is reported for every month except July.

The mountainous topography of southern Yukon causes a great deal of variation in climate (Wahl, unpublished). Storm tracks are

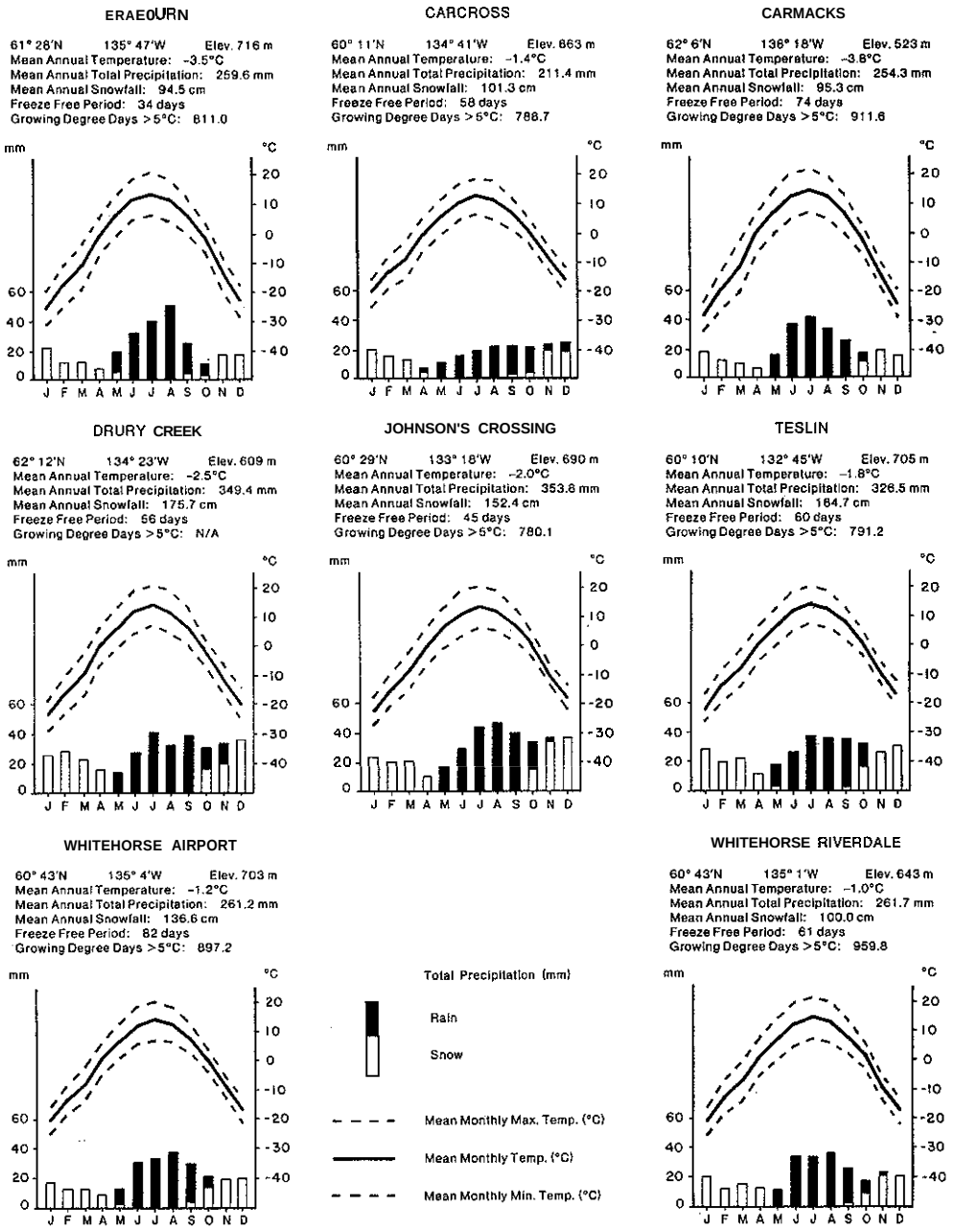

Fig. 2. Climatological Data from Lake Laberge Ecoregion.
(Atmospheric Environment Service 1982)

deflected and channeled by the topography resulting in drier conditions on leeward sides of mountain ranges than on windward sides; compare for example Teslin and Johnson's Crossing with Whitehorse and Braeburn, or Drury Creek with Carmacks. Storms from the Pacific Ocean usually deposit more precipitation on upper slopes than in valleys. Temperature inversions occur regularly during winter.

Geology

Sedimentary and volcanic rocks are the dominant bedrock types, but granitic intrusive outcrops occur thoughout (Mulligan 1963; Wheeler 1961; Bostock and Lees 1960). The primary sedimentary rocks, limestone, sandstone, and conglomerate, are prominent in a band from west of Teslin Lake to north of Carmacks, rising to over 1500 m a.s.l., forming the largest outcrops east of Whitehorse and west of Lake Laberge. Though volcanic rocks, such as basalt, andesite, and lava, occur over much of the ecoregion, except the south-central portion, the largest amounts occur near the east and west boundaries of the central part. The main outcrops of intrusive rocks extend from east of Teslin Lake north to Teslin Mountain, with minor outcrops elsewhere. The highest volcanic and intrusive outcrops attain about 2000 m a.s.l.

Glaciation and surficial materials

The ecoregion was extensively and intensively glaciated, except possibly for a few peaks over 1500 m a.s.l. near the northern boundary. The last glaciation, the McConnell, with ice originating mostly in the Cassiar Mountains to the southeast, occurred during the late Wisconsin period (about 14 000 years ago). This advance obliterated remains of previous glacial activity within the ecoregion (Hughes *et al.* 1969; Bostock 1966; Bostock and Lees 1960). The ice generally moved in a northwestward direction, but was variously deflected around mountains in the southern and northern parts of the ecoregion. Minor meltwater channels occur throughout much of the area with major channels mostly along the western boundary and in the northwest corner of the ecoregion. During deglaciation, several small lakes were formed resulting in Silt accumulations, such as near Johnson's Crossing. The main extensive glacial lake in southern Yukon, Lake Champagne, formed to the west of the ecoregion, but entered the ecoregion along the Takhini valley; however the eastern extent of this lake is undefined.

Deep deposits of glacial drift are extensive in the valley bottoms throughout the ecoregion, and thin out with increasing elevation. Streams have cut trenches over 60 m deep in glacial drift, and evidence of drift occurs to at least 1890 m a.s.l. (Bostock and Lees

1960; Mulligan 1963). Common drift features include kame-and-kettle topography, pitted outwash plains, glaciofluvial fans and esker complexes mostly of coarse-textured materials in addition to ground moraines of variable textures. The terraces noticeable along most current valleys are considered to have been formed in water bodies during deglaciation as they contain silt and fine sand overlying coarse sands and gravels.

Subsequent to deglaciation, volcanic ash and eolian material were deposited over much of the area. Volcanic ash from the White River source, deposited about 1230 years ago, is visible along some stream channels and cut banks, and can be found within 30 cm of the surface over much of the terrain (Hughes *et al.* 1972). Often the ash lies between layers of eolian or fluvial material. The most noticeable eolian deposits are active sand dunes near Carcross and stabilized dunes on the north side of Marsh Lake and south of Lake Laberge. In ail cases the parabolic dunes indicate the predominant winds resulting in the dune formations were from the south.

Soil features

Most soils developed on glaciofluvial and ablation materials are coarse textured and have little incorporated or surficial organic matter. Brunisolic development is most characteristic on medium to coarse textured soils, Eutric and Dystric Brunisols are wide spread (Davies et *al.* 1983). Regosols occur on recent alluvium, active sand dunes, and higher elevation colluvium. Luvisols occur on finer-textured, lacustrine materials, but have limited distribution. Where the water table is at or near the surface for a significant part of the year, Gleysolic soils are common. Poorly drained depressions with a high water table through most of the summer frequently contain organic soils, but these are not common. In some wet, fine-textured or organic soils, high elevation terrain, and north aspects, permafrost may occur resulting in Cryosolic soils.

The ecoregion is in the scattered discontinuous permafrost subzone of Brown (1978) except for the northern margin, which lies In the widespread subzone. However, thermal analysis (Harris 1983) and drilling (Rampton *et al.* 1983) indicate that permafrost is more prevalent in the area than first thought. It commonly occurs on north aspects and in fine-textured lacustrine soils. Where drainage is adequate, the permafrost may be expressed as small ice lenses or as dry permafrost. Lacustrine material, such as the lower Takhini valley and on the north side of Marsh Lake, can have lenticular ground ice or occasionally ice wedges.

Vegetation

White spruce is a predominant tree species throughout the ecoregion. It occurs on nearly all landforms from valley bottoms to subalpine. On alluvial sites, it is often associated with horsetail and/or rose where flooding is frequent, and with feathermoss on higher terraces where flooding is rare. Willows, shrub birch, Labrador tea, alder, grasses, and brown mosses may form the undergrowth either singly or in combination.

Lodgepole pine and aspen are prevalent at lower elevations, largely as a result of fires. In general, following fires, lodgepole pine colonizes the better-drained soils and warmer aspects, while aspen tends to be more common on finer-textured, often more poorly drained soils, though there are exceptions. Governing factors regulating which species will recolonize a burned area include which species has viable propagules present first, available nutrients, moisture, and alkalinity. It is uncommon to find both species present on the same site in close to equal proportions. Lodgepole pine is also often present near treeline as scattered, stunted, individuals, while aspen often colonizes steep, southerly aspects of fluvial terraces. On drier sites, lichens, kinnikinnick or grasses are the most common understory species. As the site moisture regime increases, lingonberry, buffalo berry, alder and willow become more common associates. Willow is a frequent post-fire species on a variety of sites, but fades out as the tree canopy develops.

Black spruce is a common species along the eastern and northern parts of the ecoregion where it may be mixed with white spruce, alpine fir or in pure stands, but is present in only a few isolated sites in the south and western portions as far north as about Braeburn. It normally occurs on poorly drained morainal or lacustrine soils or where permafrost is near the surface. Brown mosses form the most consistent ground cover, but feathermosses. willows, Labrador tea, and shrub birch are sometimes prevalent. Occasionally lichens are abundant due to the formation of drier microsites by hummocks or by growing on top of moss carpets. Graminoid species may be common in the wettest sites.

Alpine fir occurs most frequently on colluvium and morainal materials (Dystric Brunisols and Turbic Cryosols) in the subalpine and higher montane areas in the eastern and northern parts of the ecoregion. It is present mostly as scattered individuals in the western and southern parts near the shore of Bennett Lake and in subalpine woodlands west of Whitehorse. Shrub birch, willow and Labrador tea are common understory shrubs and may form continuous layers about 0.5 m in height. Feathermoss and brown mosses form lush carpets except on drier sites where lichens are common. The combined effect of vegetative growth and accumulated organic matter is conducive to the formation and maintenance of perma-

frost.

White birch is scattered among other tree species throughout much of the ecoregion, but forms nearly pure stands on only a few isolated localities, such as the southwest side of Grey Mountain and the north side of Haeckle Hill. White spruce is the principal regenerating species in the white birch-dominated stands. The undergrowth consists of a variety of grasses and forbs. Buffalo berry is often present but has low cover.

Balsam poplar is essentially restricted to recent alluvial terraces. White spruce is often associated, or constitutes the primary regeneration. The understory is related to the incidence of flooding. Horsetails are dominant where flooding is most frequent followed by rose and/or feathermoss and alder with less-frequent flooding.

Steep, medium to coarse textured. south- and west-facing glaciofluvial or silty lacustrine banks support grassland vegetation. Wormwood, rose, junipers or kinnikinnick are frequently associated with the grasses. Wiliows and aspen invade some depressions where additional moisture occurs, such as from a deeper snow pack. Forbs may be present with low cover, but bryophytes and lichens are poorly represented.

Though most of the ecoregion lies below the subalpine zone, some terrain occurs in the subalpine and alpine zones. Shrub birch and, to a lesser extent, willows are the most prominent species in the subalpine, and often a continuous moss and lichen carpet occurs below the shrubs. Bilberry and crowberry sometimes form secondary shrub layers. Tree species, such as white spruce, alpine fir, and lodgepole pine, of low stature may occur as scattered individuals or in clumps.

The alpine zone is characterized by low-growing vegetation dominated by graminoid species in wetter areas and dwarf shrubs, forbs, and lichens in moist to dry sites. Where the wetter sites are underlain by mineral rich substrates, the graminoid vegetation is lush and is accompanied by a rich assortment of forbs. In other areas, the graminoid cover is often discontinuous and few forbs are present. Mountain avens may dominate mesic to dry sites or share dominance with bilberry, shrub birch, or decumbent willows and forbs. On exposed sites, a scattering of lichens may constitute the sole vegetation cover or a few decumbent shrubs and cushion-forming forbs may be present. Where snow accumulates and persists into the growing season, mountain heather is often a prominent species.

Methods

Plant community characterization is performed by noting the species present and their coverage. Consideration is given to growth-form in that all tree species 3 m or more in height constitute the tree layer, shrubs are divided into tali (>1.5 m), medium (0.5-1.5 m), low (0.2-0.5 m) and dwarf (<0.2 m) layers, and herbs, bryophytes and ground lichens each form layers. The coverage of each layer is estimated along with the coverage of each species. The plant community names are selected from the layers and species providing the most coverage or are indicative of site conditions.

Any sign of change within a community is noted to assist in interpreting vegetation succession. Perhaps the most easily recognized indicator of change in the tree layer is regeneration. If the species in the regeneration stock are the same as in the overstory, then appreciable change is not likely to occur, while a species difference indicates a change to those species in the regeneration. In some cases, dead or dying trees of species being eliminated may be present. Change in understory vegetation is usually more difficult to evaluate. Some stands may have remnants of previous shrub layers, such as dead or dying willow. In open stands. the species composition under the trees may differ from the openings, but indicates a change only where tree regeneration is also common in the openings. The vegetation under some tree species may differ from others and indicates a change if the tree species are also changing. Perhaps the best example of this is the vegetation differences between aspen and white spruce stands. In the moss and lichen layers, one species may grow over another species, or an aggressive species may infiltrate patches of another species.

Productivity of a forest stand was determined by Variable Plot Sampling (Dilworth and Bell 1977) using wedge prisms of appropriate basal area factors. Three randomly selected prism point samples were obtained within a homogeneous vegetation community to allow for variability in tree distribution. Tree species and diameter were recorded for each tree in the prism sweeps. From these data, the number of trees per hectare. basal area per hectare and basal area average diameter were calculated. A minimum of six codominant and dominant trees, excluding veterans, were selected as sample trees for height, age and diameter measurements. The age was determined with an increment borer at 0.3 m above ground. The measured age was corrected to stand age using correction factors for northern British Columbia (B.C. Forest Service 1980).

Height-diameter equations were calculated for each tree species from the diameter and height measurements using a multiple linear regression (Dixon and Brown 1979) (Appendix B). Volumes were calculated using total tree volume equations (Massie et *al.* 1983) for all tree species except alpine fir and balsam poplar for which

equations for northern British Columbia (B.C. Forest Service 1976) were used. Volume and age data (Appendix C) formed the basis for calculating mean annual increment (MAI). The stand age correction factors employed may result in mean annual increments skewed to the high side, so these data serve only as comparative figures. Total tree oven-dry weight or biomass was determined using equations developed for Yukon (Manning et *al.* 1984). Site index equations (Thompson *et al.* 1984) were available only for lodgepole pine (Appendix D)

For indicating relative productivity of the vegetation communities described in this report, a three-class system (low, medium and high) is used. Stands rated as low have a MAI of less than 0.8 $m^3/ha/yr$, the medium range is 0.8 to 2.1 $m^3/ha/yr$ and high is greater than 2.1 $m^3/ha/yr$. Some site types have a fairly wide range in MAI, necessitating consideration of basal area, total volume and stand age for determination of relative productivity. Productivity data for each plant community are given in Appendix D.

Site characteristics were determined for each sample location using existing information or making on-site evaluations. Landform was obtained from geomorphological maps for areas where such is available, or making field determinations for areas not covered by maps. Soil texture, permeability, soil depth, moisture regime and occurrence of permafrost were determined from soil pits. Aspect and percent slope were measured with a compass and clinometer respectively. Elevation was estimated from topographic maps or with altimeters. Soil type designations follow the system devised by the Canada Soil Survey Committee (1978).

Plant communities

Several terms are used to refer to a unit of vegetation, in part because different levels of a hierarchy are being referred to and in part due to different approaches or authorities (Whittaker 1978). For the level at which this report is directed, the terms "community" and "association" are most relevant. "Community" is a general term that refers to any assemblage of species without specific reference to a particular level of vegetation stratification (e.g., Oosting 1958; Cain and Castro 1959; Hanson and Churchili 1964). "Association," the fundamental unit of the Braun-Bianquet approach and accepted by the Sixth Botanical Congress, is defined as a plant community identified by its characteristic species combination, including one or more character-species or differentiating species (Westhoff and van der Maarei 1978). An association may be further divided into subassociations, variants, and facies, or grouped into higher levels of a hierarchy. Due to the likely probability that the vegetation as-

semblages presented here constitute associations and subdivisions of these, the term "community" is used.

Though the objective was to characterize all forest communities in the ecoregion, it is likely that some were missed, and others were grouped. In order for a community to be recognized. it had to be repetitive unless it was clearly distinct from any other community. For example, Abies *lasiocarpa/Empetrum/Cladina* was grouped with A. *lasiocarpa/Betula/Cladina* to form A. *lasiocarpa/Betula-Empetrum/Cladina* because Betula and Empetrum frequently, but not always, occurred together. However, such similar communities as Pinus *contorta/Calamagrostis-Festuca*, *P. contorta/Arctostaphylos/Calamagrostis* and P. *contorta/Arctostaphylos* were treated separately because each occurred repetitively over a large area. At least 15 potential communities were either omitted due to small coverage *or* grouped with related communities.

Community names consist of the dominant or indicator species of each stratum present, provided the stratum constitutes a significant proportion of the vegetative cover. For dominants, the actual cover required varies such that the tree stratum requires 10% or more actual cover, while the shrub and nonwoody strata require 25% or more relative cover. Generally a species used in a community name provides 10% or more cover, but this may not apply to indicator species or where the vegetation is sparse. Within a community name, a dash (-) is used to separate species of the same stratum or similar lifeform, and a slash (/) separates species of different strata. Shrubs are treated as four strata (tali, medium, low, and dwarf) and bryophytes and lichens are treated as a single stratum. The generic name is most often used alone for species other than trees except where two species of the same genus occur on different sites, e.g., Alnus crispa and A. incana, or Vaccinium vitis-idaea and V. uliginosum. Salix refers most often to more than one species, or frequently the species are not known, but S. glauca is a major medium height species and S. bebbiana, S. scouleriana. and S. *arbusculoides* are common tall species. Salix myrtillifolia is treated separately as it is mostly a low or dwarf species growing in moist to wet areas.

Indicator species are used in community names wherever they can be interpreted. For example, Vaccinium vifis-idaea is rather ubiquitous over a wide range of site conditions, but its use in a community name is restricted to communities where it is abundant and no other species has sufficient coverage to be used. Rarely is a species restricted to a narrow range of site conditions as is Equisetum arvense which is largely restricted to frequently flooded alluvium. Some species may occur on a variety of sites, but within a certain moisture regime, as for example kinnikinnick on dry sites, though Some dry sites may harbor lichens and have no kinnikinnick. The most prominent feature of some stands is the lack of any understory species, though a few bryophytes or lichens may be scattered

among the litter of needles and twigs. To avoid the use of the term "nudum," these are mostly included in the lichen group. Understanding these features will help in identifying a stand in the field with one of the described communities.

The communities are arranged by tree species beginning with the conifers in alphabetical order, followed by *Populus tremuloides* communities and the single P. balsamifera community. The communities within a tree species are arranged with the tallest understory types first followed by progressively lower height undergrowths.

Community: Abies *lasiocarpa/ Alnus crispa/* Hyiocomium

Description: On cool, moist, mid to higher elevation **(1000-1350** m) sites; tree canopy provides about 50% cover; a tall (up to 4 m) shrub canopy dominated by Alnus crispa provides nearly as much cover as the trees; other vegetation layers are sparse except for a carpet of mosses.

Characteristic Species: Abies lasiocarpa. Alnus crispa, Hylocomium splendens. Ptilium crista-castrensis.

Associated Species: Picea giauca, Saiix spp.. Viburnum edule, Rosa *acicularis*, Cornus canadensis, Pyrola spp., *Geocaulon lividum*, Dicranum spp., *Peltigera aphthosa*.

Landform/Soils: Moderately well to well drained, medium-textured, colluvium material with Brunisolic soil development; mostly moderately sloping with a northerly aspect.

Successional Status: Appears stable, though the Abies regeneration is abundant and if the tree canopy becomes more closed the Alnus may be reduced or eliminated.

Related Communities: Pinus *contorta/Alnus crispa/Hylocomium*, Picea giauca/*Salix/Hylocomium*, Abies *lasiocarpa/Hylocomium-Pleurozium*, A. *lasiocarpa/Ledum/Hylocomium*.

Productivity: High (BA = 50 m'lha. Total Volume = 388 m^3/ha, MAI = **3.08** m^3/ha/yr, Total Age = **126).**

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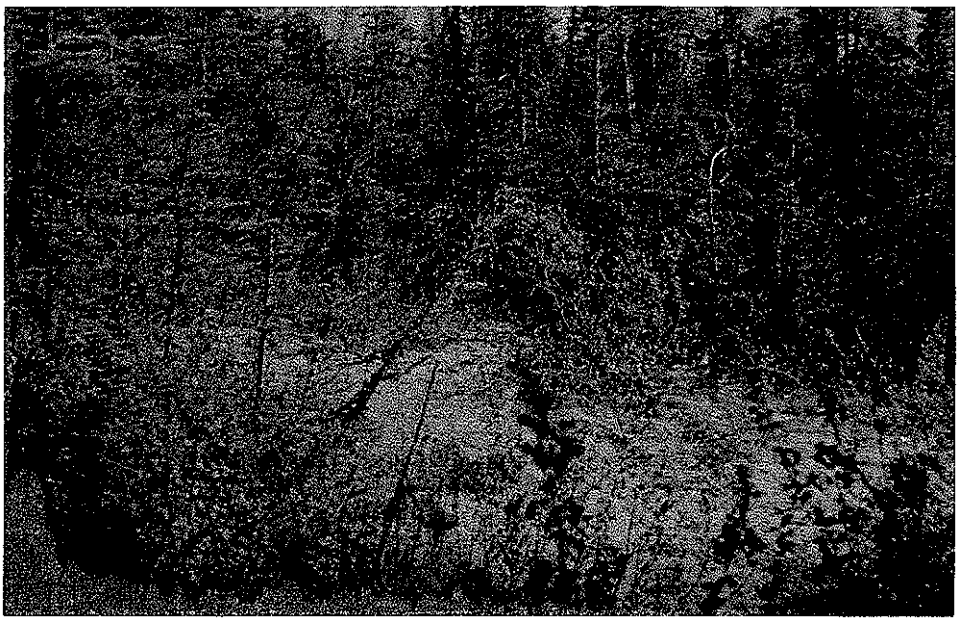


Community: Abies *lasiocarpa/ Betula/ Empetrum/ Cladina*

Description: On higher elevation (1100-1370 m), mesic to moist sites; the open tree canopy provides IO-30% cover with trees less than 15 m in height; two shrub layers are prominent, one of medium height dominated by shrub birch and the other a low shrub layer dominated by crowberry; lichens are the principal vegetation under the shrubs.

Characteristic Spesies: Abies lasiocarpa. Betula glandulosa, Empetrum nigrum, Cladina mitis, Stereocaulon tomentosum.

Associated Species: Picea glauca, Pinus contorta, Populus tremuloides, Vaccinium uliginosum, *V.* vitis-idaea, V. caespitosum, Arctostaphylos uva-ursi, Salix spp., Juniperus communis, Lupinus arcticus, Festuca altaica, *Polytricum* spp., Dicranum spp., Cladonia spp., Peltigera aphthosa, Cetraria spp.

Landform/Soils: Moderately well and well drained, medium to coarse textured, moderately sloping glaciofluvial, morainal and colluvial materials with Brunisolic and Podzolic soil development.

Successional Status: Appears stable for the most part: the pine and aspen are not likely to persist, and white spruce had little indication of increasing.

Related Communities: Abies lasiocarpal-LedumlHylocomium. A. lasiocarpaf Cetraria-Cladina, Picea *glauca/Ledum/Cladina*, P. glaucal *Betula/* Cetraria, P. *mariana/Ledum/* Cladina.

Productivity: Low (BA = 14 m^2/ha, Total Volume = 72 m^3/ha, MAI = 0.49 m^3/ha/yr, Total Age = 147).

Community: Abies lasiocarpal*Ledum/Hylocomium*

Description: Moist to wet, mid elevation (900-1200 m) sites; the tree cover is open, mostly 30-50% cover; the only prominent shrub species is Labrador tea; the moss layer is continuous.

Characteristic Species: Abies lasiocarpa, Ledum groeniandicum, Hyiocomium spiendens. Ptiiium crista-castrensis

Associated Species: Picea mariana, Betula papyrifera, Saiix spp., Vaccini*um* vitis-idaea. Empetrum nigrum, Cornus canadensis, Pleurozium schre*beri*, Sphagnum spp., Peitigera aphthosa, Nephroma arcticum.

Landform/Soils: Occurs on imperfectly to poorly drained, medium-textured, moderately sloping colluvial and morainal material with Gleysolic, organic and Cryosoiic soils.

Successional Status: Appears stable though the Sphagnum may increase at the expense of feathermoss and result in a higher incidence of permafrost; Picea mariana may increase though Abies regeneration is more common.

Related Communities: Picea *glauca-P. mariana/Ledum/Aulacomnium*, Picea mariana-P. *glauca/Salix myrtillifolia/* Auiacomnium. Picea *mariana/Ledum-*Betula. Abies *lasiocarpa/Hylocomium-*Pleurozium.

Productivity: High, but data may be above normal for this community, (BA = 37 m^2/ha, Total Volume = 266 m^3/ha, MAI = 2.36 m^3/ha/yr, Total Age = 113).

Community: Abies *lasiocarpa/* Hyiocomium-Pieurozium

Description: Cool, moist, mid to higher elevation (1000-1300 m) sites; the tree canopy is very open (about 30-40% cover); shrub and herb layers are sparse; the moss layer is continuous or nearly *so* and the primary lichens are the foliose types.

Characteristic Species: Abies *lasiocarpa,* Hyiocomium splendens, Pleurozium schreberi, Peitigera aphthosa, Nephroma arcticum.

Associated Species: Betula papyrifera, Empetrum nigrum. Cornus canadensis. Lycopodium *annotinum,* Dicranum spp., Cladina mitis.

LandformlSoils: Moderately well to well drained, medium-textured, gently to steeply sloping morainal material or colluvium associated with rock outcrops; mostly on northerly aspects with Brunisol or Regosol soils.

Successional Status: Appears stable, but Abies regeneration is sometimes rather dense *so* there could be a change toward a denser canopy.

Related Communities: Abies lasiocarpal-LedumlHylocomium, ***Pinus*** contortal *Ledum-Empetrum/Hylocomium,* Picea *glauca/Ledum/Hylocomium.*

Productivity: Low (BA = 19 m^2/ha, Total Volume = 83 m^3/ha, MAI = 0.47 m^3/ha/yr, Total Age = 176).

Community: *Abies lasiocarpa/* Cetraria- Cladina

Description: A high-elevation (1200-1350 m) community with a sparse (15-25% cover) canopy, with little understory vegetation other than lichens, except that mountain heather may be abundant where snow melt is retarded as in pockets among the trees.

Characteristic Species: Abies iasiocarpa. Cassiope tetragona (usually), Cetraria *nivalis*, C. cucuiiata. *C.* islandica, C. Richardsonii, Cladina mitis, C. amaurocraea, C. rangiferina.

Associated **Species:** Picea *glauca*, Pinus *contorta, Betula glandulosa, Ledum lan . ndi da , olifolia*, Vaccinium *uliginosum*, *Pedicularis* spp., Pinguicula viiiosa, Lycopodium alpinum, Gentiana spp., Poiytrichum juniperinom, Stereocaulon tomentosum, *Thamnolia* vermicularis. Dactylina arclica. Icmadophila ericetorum, *Alectoria* ochroieuca.

Landform/Soils: Well to rapidly drained, mostly coarse textured and *rubbly*, gently to steeply sloping colluvium and rock outcrops with Brunisols or Regosols.

Successional Status: Not likely to change appreciably, alpine fir is the primary species in all tree layers, but reproduction is sparse except for layering around existing tree clumps.

a Communities: *Picea glauca/Betula/Cetraria*, *Abies siocarpa/Betula/Empetrum/* Cladina.

Productivity: Low (BA = 19 m'lha, Total Volume = 89 m^3/ha, MAI = 0.53 m^3/ha/yr, Total Age = 169)

Community: Picea glauca-Abies *lasiocarpa/Betula-Ledum/Hylocomium*

Description: Upper-elevation (1000-1200 m), mesic sites; the tree canopy is open, providing 30-60% cover, dominated by either spruce or fir or the two can be nearly equal; similarly, the shrub layer can have an abundance of shrub birch or Labrador tea or both may be common; the feathermoss carpet is usually well developed, though a variety of lichens may be present.

Characteristic Species: Picea giauca Abies *lasiocarpa*, Betula gianduiosa. Ledum groeniandicum. Hyiocomium spiendens, Pieurozium schreberi.

Associated Species: Picea mariana, Saiix spp., Vaccinium uiiginosum. V. vitis-idaea. Empetrum nigrum, Rosa acicuiaris, Ciadina mitis, *C.* steiiaris, *Peltigera* aphthosa, Nephroma arcticum, Cladonia spp.

LandformlSoils: Imperfectly to well drained, medium to coarse textured, gently to moderately sloping morainal, colluvial or glaciofluvial materials with Brunisol or Gleysol soils.

Successional Status: There is a tendency for Abies iasiocarpa to increase at the expense of Picea giauca, and Ledum to be most abundant under lower crown covers so that this may evolve to an *Abies/Betula/* Hylocomium type.

Related Communities: Abies *lasiocarpa/Betula/Empetrum/Cladina*, A. *lasiocarpa/Ledum/Hylocomium*, Picea *mariana/Ledum-Betula*, P. marianal LedumlHylocomium

Productivity: Medium (BA = 24 m^2/ha, Total Volume = 147 m^3/ha, MAI = 1.01 m^3/ha/yr, Total Age = 145).

Community: *Picea glauca/ Alnus incana/ Hylocomium*

Description: Fluvial materials at low to mid elevation (750-1000 m); the tree canopy is open, providing 40-60% cover: a 4-m-tall shrub layer is dominated by aider: a nearly continuous feathermoss mat covers most of the ground: the other vegetation layers are mostly sparse though horsetails may be conspicuous.

Characteristic Species: *Picea glauca*, Alnus incana, Hyiocomium splendens

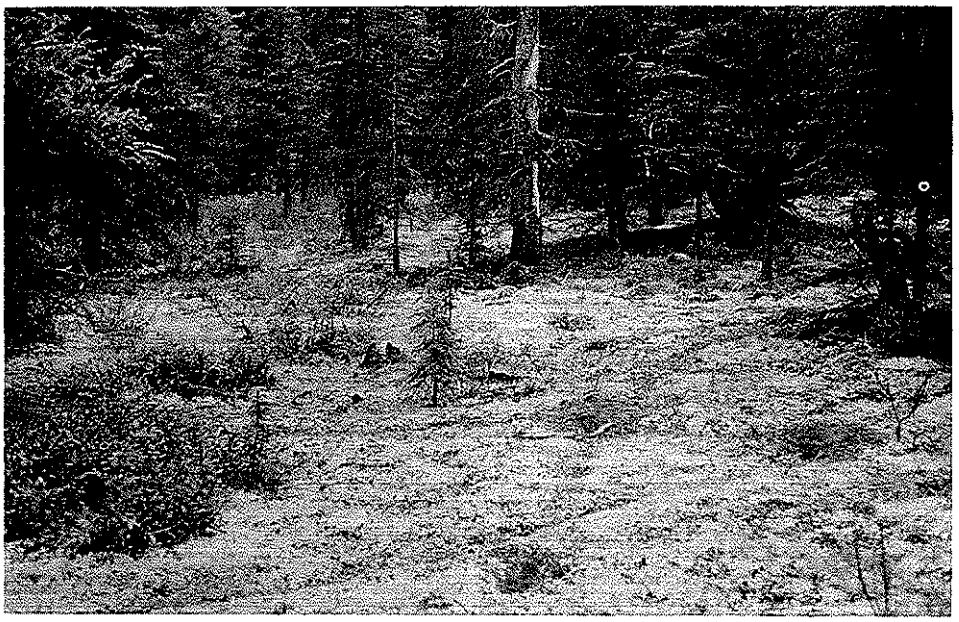
Associated Species: Populus *balsamifera*, Saiix spp., Rosa acicuiaris, Ledum groeniandicum, Linnaea borealis, Arctostaphylos rubra. Viburnum edule, Geocaulon iividum, Pyrola spp., Habenaria *obtusta*, Cypripedium *passerinum*, Equisetum scirpoides. E. arvensis, Peitigera aphthosa.

Landform/Soils: Moderately well drained, medium-textured Brunisois and Regosols, level to gently sloping on older alluvium where flooding rarely occurs.

Successional Status: Appears stable, though alder may be reduced with an increase in tree canopy cover.

Related Communities: Picea *glauca/* Hylocomium-Pleurozium, P. *glauca/ Equisetum/ Hylocomium*, Popuius *balsamifera/ Rosa/ Equisetum*

Productivity: Medium (no plot data, rating estimated).



Community: Picea *glauca/Betula/Cetraria*

Description: Mid to higher elevation (1000-1200 m) sites; the tree canopy is sparse, providing 10-20% cover; the shrub layer, mostly 0.5 to 1.5 m in height, is well developed and provides the most ground cover: lichens form the onlyother prominent layer.

Characteristic Species: Picea glauca, Betula glandulosa, Cetraria cucullata. C. nivalis, *C.* isiandica, C. Richardsonii.

Associated Species: Abies lasiocarpa, Picea mariana, Salix spp.. Vaccinium vitis-idaea, Ledum groenlandicum, *Eriophorum* spp., Carex spp., Polytrichum iuniperinum, *Pogonatum* alpinum. Cladina amaurocraea, C. mitis, C. *rangiferina*, Cladonia spp.. Peltigera aphthosa, Stereocaulon tomentosum, Thamnolia vermicularis.

Landform/Soils: Moderately well to well drained, medium to coarse textured Brunisols, Podzols or Cryosols on gently to steeply sloping colluvium or morainal material sometimes containing permafrost.

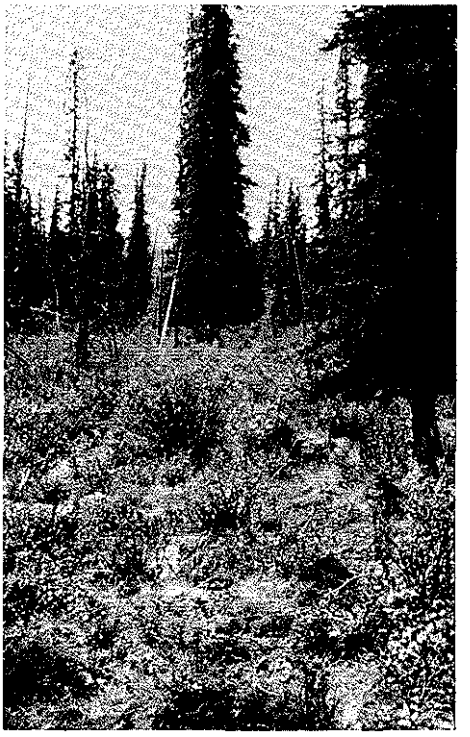
Successional Status: Appears stable: the tree regeneration is sparse except in some areas where Abies lasiocarpa is common.

Related Communities: Abies lasiocarpal Cetraria. Picea *glauca/Betula-Salix,* P. *glauca/Ledum/* Cladina.

Productivity: Low (BA = 14 m^2/ha, Total Volume = 89 m^3/ha, MAI = 0.31 m^3/ha/yr, Total Age = 287).

Community: Picea *glauca/ Betula-* Saiix

Description: Relatively cool, mostly moist, low to mid elevation (800-1200 m) sites; white spruce is usually the sole dominant in a canopy cover of 30 to 60%, but aspen, lodgepole pine, and white birch often constitute part of the canopy at lower elevations, and alpine fir and black spruce at higher elevations; the shrub layer is well developed, with shrub birch or willow or both being abundant; the ground vegetation can be dominated by lichens, feathermoss, grass or be nearly devoid of vegetation.



Characteristic Species: Picea glauca. Betula glanduiosa. Saiix spp., Vaccinium vitis-idaea. Pyrola secunda.

Associated Species: Popuius tremuioides, Pinus *contorta,* Betula *papyrifera,* Picea mariana, Abies lasiocarpa, Ledum groeniandicum, *Vaccinium uliginosum.* Rosa acicularis, Empetrum nigrum, Pyrola spp.. Pedicuiaris spp.: on moist sites: Hylocomium splendens. Dicranum spp.. Peitigera aphthosa; on drier sites: Ciadina spp.; at higher elevations: Cetraria spp., Cladina spp., Aiectoria spp.

LandformlSoils: A somewhat ubiquitous community occurring in cooler than normal sites due to cold air drainage. northerly exposures or high elevation, on a variety of landforms and soils which are poorly to moderately well drained, and with or without permafrost.

Successional Status: Wilt likely change to Picea *glauca/Betula/Hylocomium* in southwestern part of the ecoregion at higher elevation; in remainder of ecoregion Abies iasiocarpa or Picea mariana may codominate or dominate; at lower elevations the shrub layer may be reduced or eliminated as the tree cover increases, yielding to Picea *glauca/* Hylocomium-Pieurozium on better-drained sites, or to Picea giauca-P. *mariana/Aulacomnium* on wetter sites.

Related Communities: In addition to those indicated above, Picea marianal *Betula-Ledum*, Picea *glauca/Ledum/* Hylocomium or Ciadina.

Productivity: Low on upper elevation and wet sites (EA = 19 m^2/ha, Total Volume = 88 m^3/ha, MAI = 0.48 m^3/ha/yr, Total Age = 186).

Medium on lower elevation moist sites (BA = 32 m^2/ha, Total Volume = 208 m^3/ha, MAI = 1.95 m^3/ha/yr, Total Age = 107).

Community: ***Picea glauca/ Salix/ Hylocomium***

Description: Organic veneers (up to 1 m deep) at mid to upper elevations (900-1200 m); the tree canopy is open (30-50% cover); the shrub layers have a variety of species, with willow being the most abundant; the herb and lichen layers are poorly represented, but the feathermoss carpet is usually well developed.

Characteristic Species: Picea giauca, Salix spp., Hylocomium splendens.

Associated Species: Abies lasiocarpa at higher elevations.. Picea mariana at lower elevations, Potentilla fruticosa, Ledum groenlandicum, Vaccinum vitis-idaea, Empetrum nigrum, Viburnum eduie, Linnaea borealis, Pyrola spp., Mertensia panicuiafa. Cornus canadensis, Dicranum spp., Peitigera *aphthosa*.

Landform/Soils: Moist, moderately well drained, organic deposits on coiiuvium, morainal. or fluvial materials with permafrost at higher elevations and persisting seasonal frost at lower eievations.

Successional Status: Mid to late seral; Abies lasiocarpa will likely increase at higher elevations and Picea mariana at lower elevations; the Salix will likely be replaced by Betula glandulosa andlor Ledum groenlandicum, and *Hylocomium* by lichens.

Related Communities: At higher elevations: Abies *lasiocarpa/ Betula/ Empetrum/ Cladina*, A. *lasiocarpa/ Cetraria*-Cladina, A. *lasiocarpa/ Ledum/ Hylocomium*, Picea giauca-Abies lasiocarpal *Betula-Ledum/ Hylocomium*; at lower elevations: Picea *glauca/ Betula-Salix*, P. *glauca/ Ledum/ Cladina*, P. *glauca-P. mariana/ Salix/* Cladlna.

Productivity: Low (BA = 23 m^2/ha, Total Volume = 130 m^3/ha, MAI = 0.78 m^3/ha/yr, Total Age= 166).

Community: Picea glaucal*Ledum/ Hylocomium*

Description: Dry to moist sites at mid to low elevations (800-1200 m); white spruce is the dominant tree species with lodgepole pine, aspen, balsam poplar or rarely black spruce, sometimes present. The canopy cover is usually about.30-40%. The shrub layer is moderately well to well developed with Labrador tea being most abundant. Feathermoss frequently provides considerable ground cover, but sometimes lichens may be common or the **moss**-lichen layer may be nearlyabsent.

Characteristic Species: Picea giauca, Ledum groenlandicum. Vaccinium vitis-idaea, Hyiocomium splendens.

Associated Species: Pinus contorfa, Populus tremuloides, Picea mariana, Salix spp.. Linnaea borealis, Empetrum nigrum, Cornus canadensis, *Geocaulon* lividum, Lupinus arcticus. *Shepherdia* canadensis, Arnica cordifolia, Festuca altaica, Pieurozium shreberi, Dicranum spp., Cladina mitis, Peltigera aphthosa.

LandformlSoils: Moderately to well drained, level to moderately sloping relatively fine textured giaciofluvial or fluvial materials and eolian veneers or blankets on various deposits with mostly Dystric Brunisol soil development.

Successional Status: Though this community appears stable, at low elevation sites Picea mariana, and at higher elevation sites Abies iasiocarpa. regeneration is prominent. The cover by Ledum is variable and in some cases where the tree cover is increasing appears trending toward a feathermoss understory.

Related Communities: Picea glaucal Hylocomium-Pleurozium. Picea glauca-P. *mariana/ Ledum/ Aulacomnium*, P. *glauca/ Ledum/ Cladina.*

Productivity: High on recent floodplain (BA = 67 m^2/ha, Total Volume = 544 m^3/ha, MAI = 2.59 m^3/ha/yr, Total Age = 210). Medium on moist upland (BA = 27 m^2/ha, Total Volume = 187 m^3/ha, MAI = 1.22 m^3/ha/yr, Total Age = 153).

Community: *Picea glauca/ Ledum/ Cladina*

Description: Dry, rocky terrain at low to mid elevation (800-1200 m); the tree canopy is very open, providing 20-30% cover; the shrub layers are variable, but Labrador tea is the most abundant species; the forb and moss layers are poorly represented; the lichen layer is composed of several species with discontinuous cover.

Characteristic Species: Picea glauca, Ledum groenlandicum. Ciadina mitis, C. steilaris, Cetraria cucullata, Cladonia spp.

Associated Species: Pinus conforta, Populus fremuloides, Salix spp., Vaccinium uliginosum, V. vitis-idaea, Empetrum nigrum, Festuca altaica. Epilobium angustifolium, Mertensia paniculata, Hyiocomium splendens, Dicranum spp., Peltigera spp., Stereocaulon tomentosum, Cetraria islandica.

LandformlSoils: Well to rapidly drained, medium to coarse textured, shallow Brunisol and Regosol soils on gently to steeply sloping rubbly colluvium and rock outcrops, occasionally on stoney morainal material.

Successional Status: Probably an edaphic climax on rock outcrops that will persist until soil development allows for deeper and more widespread rooting.

Related Communities: Pinus *contorta/ Ledum/ Cladina*, Picea *glauca/ Cladina*, P. *glauca/ Ledum/ Hylocomium*.

Productivity: Low (estimated, no plot data).

Community: Picea *glauca* / *Rosa* / *Hylocomium*

Descrlptlon: In low-elevation (700-900 m) valleys near drainage channels that may be flooded periodically; the tree cover is about 60%, dominated by white spruce, but usually with some balsam poplar; rose is the most characteristic shrub, though on some sites willow can provide as much or more coverage: lush feathermoss forms the main ground vegetation, providing 60% or more cover.

Characteristic Species: Picea glauca. Rosa acicularis, Hyiocomium splendens, *Ptilium* crista-castrensis

Associated Species: Populus balsamifera, Ainus incana, Salix spp., Viburnum edule, Shepherdia canadensis, Vaccinium, vitis-idaea, *Empetrum* nigrum, Ribes spp., Linnaea borealis, Cornus canadensis. Mertensia *paniculata*. Pyrola spp., Lupinus *arcticus*, Equisetum spp.. Geocaulon iividum, Caiamagrostis spp., Pleurozium schreberi, Dicranum spp., Peltigera aphthosa, Cladonia spp.

Landform/Soil: Moderately well to well drained, medium to coarse textured, level to gently sloping fluvial terraces or occasionally lacustrine materials with Regosols, Brunisols or Luvisols.

Successional Status: The shrub growth will diminish as the tree canopy fills in to eventually form the Picea *glauca*/ Hylocomium-Pieurozium community.

Related Communities: Populus balsamifera/*Rosa*/*Equisetum*, *P.* balsamiferal Hylocomium-Pleurozium. *P. balsamifera*/*Salix*, Picea *glauca*/*Alnus*/*Equisetum*, P. *glauca*/*Alnus*/*Hylocomium*.

Productivity: High on recent floodplains (BA = 48 m^2/ha, Total Volume = 444 m^3/ha, MAI = 2.29 m^3/ha/yr, Total Age = 194). Medium on older floodplains (BA = 27 m^2/ha, Total Volume = 134 m^3/ha, MAI = 1.56 m^3/ha/yr, Total Age = 86).

Community: Picea *glauca/Empetrum/Peltigera*

Description: Mid elevation (900-1200 m), cool sites; the tree canopy provides 30 to 60% cover; the shrub layers consist mostly of low shrubs of which crowberry is well represented, but not always a clear dominant; the herb and moss layers consist of various species, each providing low cover; the lichen layer is not well developed, though Peltigera is relatively more common than in most other communities

Characteristic Species: Picea glauca. Empetrum nigrum, Vaccinium vitis-idaea. Peltigera aphthosa.

Associated Species: Pinus contorfa. Salix spp., Ledum groenlandicum, Arctostaphylos uva-ursi, A. rubra, Linnaea borealis, Shepherdia canadensis, Lupinus arcticus, Festuca alfaica, *Hylocomium splendens*, Pleurozium *schreberi*. Cladina mitis. Stereocaulon tomentosum, Cladonia spp., Cetraria spp.

Landform/Soils: Moderately well to well drained, fine to coarse textured, level to moderately sloping morainal and glaciofluviai materials with Brunisolic soil development.

Successional Status: An early seral community which on finer-textured, gleysolic soils will likely develop towards Picea *glauca/Ledum/Cladina* or P. *glauca-P. mariana/Ledum/Aulacomnium*, and on coarser-textured soils towards P. *glauca/Cladina*.,

Related Communities: Abies lasiocarpal-*Betula/Empetrum/Cladina*, Pinus *contorta*/Ledum-*Empetrum/Hylocomium*, P. contorta-Picea *mariana/Peltigera*, Picea *glauca/Hylocomium-Pleurozium*.

Productivity: Low (BA = 14 m^2/ha, Total Volume = 72 m^3/ha, MAI = 1.11 m^3/ha/yr, Total Age = 65; the MAI indicates medium productivity, but rating was reduced due to low stand age).

Community: Picea *glauca/Arctostaphylos/* Calamagrostis

Description: Dry sites at low to mid eievations (700-1000 m); the tree canopy is open, providing 30 to 50% cover; mid and tall shrub layers are sparse; the most prominent species in the low shrub layer is kinnikinnick; grass is most Significant in the herb layer; moss is virtually absent, but several species of lichen of low cover are present.

Characteristic Species: Picea glauca, Arctostaphylos uva-ursi, *Calamagrostis* spp., Poa spp., Stipa spp., *Bromus* spp.

Associated Species: Pinus contorta, Populus tremuloides, Shepherdia canadensis. Rosa acicularis, Pulsatilla Ludoviciana, Zygadenus elegans, Cladina spp., Cladonia spp., Cetraria spp., Peltigera spp., Stereocaulon tomentosum.

Landform/Soils: Well lo excessively drained, coarse-textured, level lo gently Sloping glaciofluvial. eolian or fluvial deposits with Regosols and Brunisols.

Successional Status: A late seral stage to Picea *glauca/Calamagrostis-Festuca*.

Related Communities: Pinus *contorta/Arctostaphylos*, P. *contorta/Calamagrostis-Festuca*, and similar communities with Populus tremuloides as the dominant tree species.

Productivity: Medium (BA = 26 m^2/ha, Total Volume = 152 m^3/ha, MAI = 1.80 m^3/ha/yr, Total Age = 84).

Community: Picea *glauca/Calamagrostis-Festuca*

Description: Mesic to dry sites at low to mid elevation (700-1100 m); white spruce is the principal tree component with 40 to 60% cover, but lodgepole pine or aspen may be present at lower elevations and occasionally alpine fir may be present at higher elevations. Shrub layers are usually poorly developed; the forb layer is dominated by grass; the moss and lichen layers are usually sparse or absent.

Characteristic Species: Picea glauca, Calamagrostis *purpurescens,* C. canadensis, Festuca altaica, Poa spp.

Associated Species: Pinus contorta, Populus tremuloides. Abies lasiocarpa, Salix spp., Shepherdia canadensis, Ledum groenlandicum, Vaccinium vitis-idaea, Linnaea borealis. *Arctostaphyios* uva-ursi, Cornus canadensis, Geocaulon *lividum,* Pulsatilla Ludoviciana. Zygadenus elegans, *Lupinus* arcticus, Arnica cordifolia, Mertensia paniculata, Epilobium angustifolium.

Landform/Soils: Well-drained, medium to coarse textured, nearly level to moderately steep glaciofluvial or morainal material, or sometimes rock outcrops, with southerly aspects and Brunisolic soil development.

Successional Status: A relatively stable community, but grades into Picea *glauca/Hylocomium-Pleurozium* at the moister end and the Picea *glauca/Arctostaphylos* or *P.glauca/Cladina* on the drier end.

Related Communities: In addition to those mentioned above and the *Pinus* contorta and Populus tremuloides varieties, the grass cover can be prominent under such shrubs as Betula glandulosa, Salix spp. and Ledum groeniandicum in stands where the tree cover is less than 50%.

Productivity: Medium, (no plot data, rating estimated from similar communities).

Community: Picea *glauca/Calamagrostis/Hylocomium*

Description: Mesic to dry sites at low to mid elevation (700-1000 m); the tree canopy is open to nearly closed (50-70% cover): shrub layers are thin and provide little coverage; grass is the most prominent herb, and feathermoss covers 30-70% of the ground; lichens are sparse.

Characteristic Species: Picea glauca. Caiamagrostis and other grasses, *Hylocomium* splendens.

Associated Species: Pinus conforfa. Populus tremuioides. *Salix* spp., Shepherdia canadensis, Rosa acicularis, Viburnum edule, Hedysarum spp., *Geocaulon lividum*, Epilobium *augustifolium*, Lupinus arcticus. Ptilium cristacastrensis, Ciadina spp., Peitigera aphfhosa.

Landform/Soil: Well-drained. medium to coarse textured, level to moderately sloping morainal and eolian materials with Brunisols on glaciofluviai Substrates.

Successional Status: A seral stage leading to Picea *glauca/Hylocomium-Pleurozium* as the tree canopy develops.

Related Communities: Picea glaucal *Calamagrostis-Festuca*, P. glaucal Hylocomium-Pieurozium, P. *glauca/Arctostaphylos/Calamagrostis* and similar communities with Pinus conforfa or Populus tremuioides as most prominent tree species.

Productivity: Medium (BA = 33 m^2/ha, Total Volume = 187 m^3/ha, MAI = 1.46 m^3/ha/yr, Total Age = 128).

Community: ***Picea glauca/Equisetum/Hylocomium***

Description: Well-drained, frequently flooded river terraces; white spruce dominates the tree layers but variable amounts of balsam poplar may persist, canopy cover is 60-70%; a sparse shrub layer of willow and rose may be present; horsetails constitute the most conspicuous ground cover.

Characteristic Species: Picea giauca, Equisetum *pratense, E. palustre, E. ar*vense, Hyiocomium spiendens.

Associated Species: Popuius balsamifera. Rosa acicularis, Viburnum edule. Shepherdia canadensis. Salix spp., *Alnus* incana, *Lathyrus* spp.. Cornus canadensis. *Pyrola* secunda, Linnaea borealis.

LandformlSoils: Well-drained, silty, sandy or gravelly Regosols on level to gently sloping river floodplains and terraces that are regularly flooded.

Successional Status: Successional to Picea *glauca/Rosa/Hylocomium* or P. *glauca/Alnus/Hylocomium* where the tree canopy remains open, and P *glauca/Hylocomium-Pleurozium* under denser canopies; sometimes an intermediary stage of P. *glauca-Populus balsamifera/Salix* exists where *Salix* establishes before or with the trees.

Related Communities: Not related to any communities other than those above, though several seral assemblages of vegetation can exist with the tree dominance ranging from solely Populus *balsamifera* to solely Picea glauca.

Productivity: High (BA = 46 m^2/ha, Total Volume = 346 m^3/ha, MAI = 2.34 m^3/ha/yr, Total Age = 148).

Community: Picea *glauca/Hylocomium-*Pieurozium

Description: Mesic sites at low to mid elevation (700-1200 m); the canopy cover is 40-70%, but where cover is lower the trees tend to be taller; may have remnants of seral tree species in canopy; shrub layers are poorly developed or in the process of being eliminated; forb layers are thin to absent; the moss layer is usually continuous and lush, but at the drier end it may be discontinuous with lichens intermixed.

Characteristic Species: Picea glauca, Linnaea borealis, Hyiocomium *splen*dens, Pieurozium schreberi, Ptilium crista-castrensis, Pelfigera aphthosa.

Associated Species: Picea mariana. Abies iasiocarpa. Betula papyrifera. Saiix spp., Betula gianduiqsa. Rosa acicuiaris, Vaccinium vitis-idaea, *Cornus* canadensis. Geocauion lividum, Pyrola spp., Ledum groenlandicum, Empetrum nigrum, Vibernum edule, Mertensia panicuiata, Festuca aitaica, *Petasites* frigidus, Equisetum scirpoides, Thuidium abietinum, *Dicra*numspp., various lichens.

LandformlSoils: Moderately to well drained, medium to coarse textured Brunisolic soils on nearly all level to steeply sloping landforms, but mostly on glaciofluvial and morainal deposits. Can also occur on Regosolic alluvial floodplains and rock outcrops.

Successional Status: This community is considered the climatic climax on moderately to well drained soils where permafrost is absent or deep.

Related Communities: Pinus contorta. Popuius tremuioides, Picea mariana or Abies *lasiocarpa/Hylocomium-Pleurozium.*

Productivity: High on recent floodplains (BA = 45 m^2/ha, Total Volume = 337 m^3/ha, MAI = 2.28 m^3/ha/yr, Total Age = 148). Medium on older floodplains and upland (BA = 33 m^2/ha, Total Volume = 202 m^3/ha, MAI = 1.58 m^3/ha/yr, Total Age = 128).

Community: Picea *glauca*/ Cladina

Description: Dry sites at low to mid elevations (700-1100 m); the open tree canopy of less than 50% cover is dominated by white spruce, but often has some lodgepole pine; shrub layers are thin to absent; the herb layer is sparse; the **moss** layer is thin or absent, and the lichen layer continuous to sparse.

Characteristic Species: Picea glauca. Cladina mitis, C. *stellaris*, Stereocaulon tomentosum, Cladonia spp.

Assgciated Species: Pinus contorta, Salix spp., Betula glandulosa, Ledum groenlandicum. Vaccinium vitis-idaea, Arctostaphylos uva-ursi, Saxifraga *tri*-cuspidata, Pulsatilla Ludoviciana, *Zy*-*gadenus* elegans, Solidago spp., Carex concina, Dicranum spp., Polytrichum juniperinum, Cetraria spp., Peltigera spp.

Landform/Soils: Rapidly to excessively drained, coarse-textured, gently to steeply sloping glaciofluvial materials, occasionally on rock outcrops with shallow soil and on sand dunes, with Regosols and Dystric Brunisols.

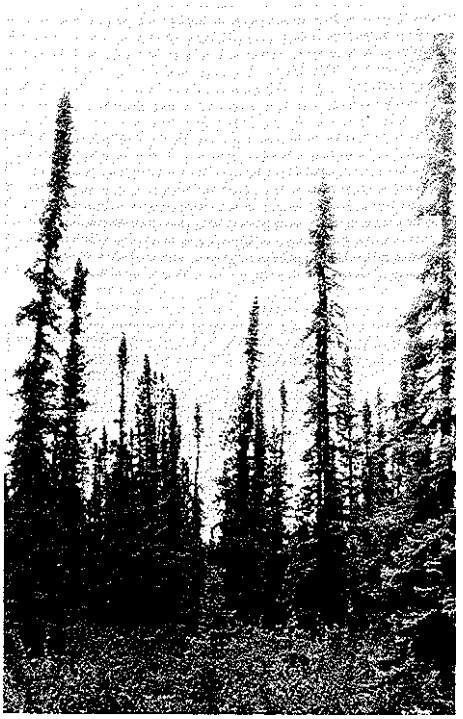
Successional Status: Relatively stable on edaphic dry sites; grades into Picea *glauca*/*Hylocomium*-*Pleurozium* with slight increase in soil moisture.

Related Communities: Pinus contorta and Populus tremuloides have similar communities probably transitional to this one.

Productivity: Medium (BA = 24 m^2/ha, Total Volume = 130 m^3/ha, MAI = 1.26 m^3/ha/yr, Total Age = 103).

Community: Picea glauca-*P. mariana/Betula/* Hylocomium

Description: Wet sites at low to mid elevation (700-1200 m); the tree canopy is open providing 40-50% cover; shrub layers are dominated by medium to tall shrub birch, though willow andlor Labrador tea can be prevalent; the herb layer is thin; the moss layer carpets the ground surface. with brown mosses and sphagnum sometimes being common, though feathermoss usually provides the most cover,



Characteristic Species: Picea glauca andlor Picea mariana. Betula *glandulosa*, Hylocomium splendens

Associated Species: Betula papyriiera, Salix spp., Ledum groenlandicum, Potentilla fruticosa. Vaccinium *vitis-idaea*, V. uliginosum, Empetrum nigrum, Arctostaphylos rubra, Carex spp., Aulacomnium spp., *Tomenthypnum* nitens. Sphagnum spp., Cladina spp.

LandformlSoils: Poorly drained, medium to fine textured mineral or organic substrates with gleyed Brunisols, Gleysols or Cryosols on depressional to gently sloping glaciofiuvial, lacustrine or morainal materials.

Successional Status: Appears stable, though Sphagnum and brown mosses may increase resulting in a degradation of the community.

Related Communities: Picea glaucal Betula-Salix, P. glauca-P. *mariana/Ledum/Aulacomnium*, P. *mariana/Salix myrtillifolia/Aulacomnium*, P. *glauca/Betula-Ledum/* Hylocomium.

Productivity: Low (BA = 23 m^2/ha, Total Volume = 105 m^3/ha, MAI = 0.61 m^3/ha/yr, Total Age = 170).

Community: Picea glauca- P. *mariana/ Salix/ Cladina*

Description: Mesic sites at mid elevations (900-1200 m); the tree canopy provides 30-60% cover, composed mostly of spruce 10-15 m in height; a tall shrub layer is dominated by willow; most other understory vegetation consists of an assemblage of moss and lichens, with lichens providing the most cover.

Characteristic Species: Picea glauca, P. mariana, Salix spp., Peifigera aphfhosa, Stereocaulon tomentosum. Ciadina mifis.

Associated Species:.. Ainus crispa. *Arctostaphylos* rubra, Linnaea borealis, Carex concinna, Hypnum spp., *Brachy*fhecium spp., Cladonia spp.

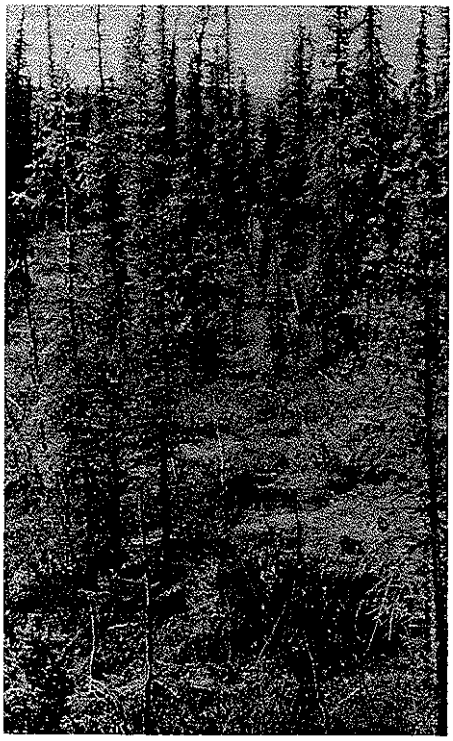
LandformlSoils: Imperfectly drained, medium-textured Brunisois on depressional to gently sloping morainal blankets.

Successional Status: The tali shrubs appear to be dying out, and black spruce regeneration is often prolific, thus will likely change to Picea glauca-P. *mariana/ Ledum/ Aulacomnium.*

Related Communities: Picea mariana-P. *glauca/ Salix/ Aulacomnium*, P. *mariana/ Ledum/ Cladina/*, P. *mariana/ Cladi*na and similar communities with P. *glauca* as principal tree species.

Productivity: Low (BA = 5 m^2/ha, Total Volume = 14 m^3/ha, MAI = 0.24 m^3/ha/yr, Total Age = 57).

Community: Picea glauca-*P. mariana*/*Ledum*/*Aulacomnium*



Description: Moist to wet, often depressional sites at low to mid elevations (800-1200 m); either or both white spruce and black spruce dominate the tree canopy of 30-50% cover; shrub layers are usually well developed and Labrador tea is most prevalent; the moss layer is usually lush but may be shared by lichens.

Characteristic Species: Picea giauca, P. mariana, Ledum groenlandicum, Salix myrtiiiifoiia. Pedicularis spp., Equisetum scirpoides, Aulacomnium *turgi*dum, Tomenthypnum nitens.

Associated Species: Betula papyrifera. Salix spp., Betula glandulosa, Potentilla fruticosa. Vaccinium vitis-idaea, *V. uli*ginosum, Pyrola spp.. Carex spp., Arctostaphylos rubra, Empetrum nigrum. Linnaea borealis, Hylocomium splendens, Cladina mitis. Peitigera *aph*thosa.

Landform/Soils: imperfectly to poorly drained, medium to fine textured, often hummocky Gieysols frequently containing permafrost on gently sloping to depressional, morainal or lacustrine, rarely colluvial. materials. Most common on northerly aspects or in valleys with cold air drainage.

Successional Status: Relatively stable, though Picea glauca may not persist in the more extreme cases of near-surface permafrost and wet conditions.

Related Communities: Picea mariana-P. *glauca*/*Salix* myrtillifoiia, P. *glauca*/Betula-Salix.

Productivity: Low (BA = 12 m^2/ha, Total Volume = 45 m^3/ha, MAI = 0.22 m^3/ha/yr, Total Age = 206).

Community: *Picea glauca-P. mariana/Hylocomium-Cladina*

Description: Mesic sites at low to mid elevation (800-1200 m); the tree canopy is open, providing a cover of 40 to 60%. and can be dominated by white spruce, black spruce or both; shrub layers are very thin, mostly composed of low growing, scattered plants; herbs are sparse; the primary ground vegetation is provided by various assemblages of feathermoss and lichens.

Characteristic Species: Picea giauca, P. mariana, Hyiocomium spiendens, *Cla*dina mitis.

Associated Species: Pinus conforta, Popuius fremuloides. Rosa acicularis, Ledum groeniandicum. Empetrum *nig*rum, Vaccinium vifis-idaea, Arctostaphylos rubra, Geocauion lividum, *Pleurozium* schreberi, Dicranum spp., Polytrichum juniperinom. Aiectoria ochroleuca, Cetraria *cucullata*, Cladina steiiaris. C. rangiferina, Peitigera aphfhosa.

Landform/Soil: Moderately well to well drained, mostly medium textured, Brunisols on level to gently sloping glaciofluvial or lacustrine materials that sometimes contain permafrost.

Successional Status: Appears transitional between Picea *glauca/Cladina* and P. *glauca/Hylocomium-Pleurozium*, favoring feathermoss under denser tree cover; P. mariana is favored on lacustrine materials where permafrost is present and may tend to Picea giauca-P. *mariana/Ledum/* Aulacomnium.

Related Communities: In addition to those indicated above, *Picea glauca/Ledum/Hylocomium*, P. *mariana/Hylocomium-Pleurozium*, P. *mariana/Ledum/Hylocomium*, P. *glauca/Ledum/* Cladina.

Productivity: Low (BA = 19 m^2/ha, Total Volume = 60 m^3/ha, MAI = 0.55 m^3/ha/yr, Total Age = 145).

Community: Picea mariana-P. *glauca/ Salix/ Aulacomnium*

Description: Moist to wet sites at low to mid elevations (800-1 100 m); the tree canopy is open, providing about 50% cover; the tall and medium height shrub layers are dominated by willow, and the low shrub and herb layers are sparse: brown mosses are the most conspicuous feature of the ground vegetation, though lichens are usually present.

Characteristic Species: Picea mariana, *P.* giauca, Salix spp., Auiacomnium *turgidum*, Tomenthypnum nitens.

Associated Species: Ledum groeniandicum. Vaccinium vitis-idaea, Empetrum nigrum, Rubus arcticus, Pedicularis spp., Equisetum scirpoides, Festuca *altaica*, *Mnium* spp., Peitigera aphthosa.

Landform/Soils: Imperfectly to poorly drained, medium to fine textured Brunisols and Cryosois on gently sloping to depressional morainal blankets. lacustrine and alluvial materials.

Successional Status: Seems fairly stable, though the tendency is for willow to be eliminated and white spruce is retarded as permafrost increases.

Related Communities: Picea *glauca-P.* marianal*Ledum/ Aulacomnium*, *P. mariana*-P. *glauca/ Salix myrtillifolia.*

Productivity: Low (BA = 10 m^2/ha, Total Volume = 34 m^3/ha, MAI = 0.30 m^3/ha/yr, Total Age = 115).

Community: Picea mariana-P. *glauca/Salix* myrtillifolia

Description: Wet sites often containing permafrost at low to mid elevations (800-1200 m); the open tree canopy (30-60% cover) is dominated by black or white spruce, but may have some white birch and occasionally other species; the shrub layer varies from sparse to nearly continuous, with Salix myrtillifolia providing the most cover; a sparse forb layer may be present; the moss layer is well developed though sometimes overgrown with lichens,

Characteristic Species: Picea mariana and/or P. glauca. Salix myrtillifolia.

Associated Species: Abies lasiocarpa. Betula papyrifera. Salix spp., Ledum groenlandicum, Betula glandulosa, Potentilla *fruticosa*, Vaccinium uliginosum, V. vitis-idaea, Pedicularis spp., Rubus *chamaemorus*, *Petasites* spp., Oxycoccus microcarpus. Aulacomnium spp., Tomenthypnum nitens, *Drepanocladus* uncinatus.

Landform/Soils: imperfectly to poorly drained, usually fine textured Gieysols, gleyed Brunisois. or Luvisols, sometimes with an organic veneer, on gently sloping to depressional lacustrine or morainal materials, frequently with a northerly aspect; may also occur in poorly drained alluvial areas.

Successional Status: Stable; an edaphic climax on wet sites.

Related Communities: Picea glauca-P. *mariana/Ledum/Aulacomnium*, P. *mariana/Ledum-Betula*.

Productivity: Medium (BA = 47 m^2/ha, Total Volume = 237 m^3/ha, MAI = 1.59 m^3/ha/yr, Total Age = 149).

Community: Picea *mariana/ Ledum- Betula*

Description: Moist to wet sites often with permafrost at low to mid elevations (800-1200 m); the tree canopy is open (15-40% cover); shrub layers are well developed often with about 30% cover of tall shrubs, 10% cover of medium shrubs and 30% cover of low shrubs; herb and moss layers are sparse: the lichen layer may cover up to 50% or more of the ground.

Characteristic Species: Picea mariana, Ledum groenlandicum, Betula glandulosa. Salix myrtillifolia, Cladina mitis. Ciadonia spp.

Associated Species: Picea glauca, Betula papyrifera, Potentilla *fruticosa,* Salix spp., Shepherdia canadensis. Empetrum nigrum. Vaccinium vitis-idaea, *V.* uliginosum, Carex spp., Lupinus arcticus. Arctostaphylos rubra, Geocaulon lividum, Solidago spp., Hylocomium splendens, Aulacomnium *turgidum*, Tomenthypnum nitens, Cladina rangiferina, *C.* steilaris, Peltigera aphthosa. Cetraria spp.

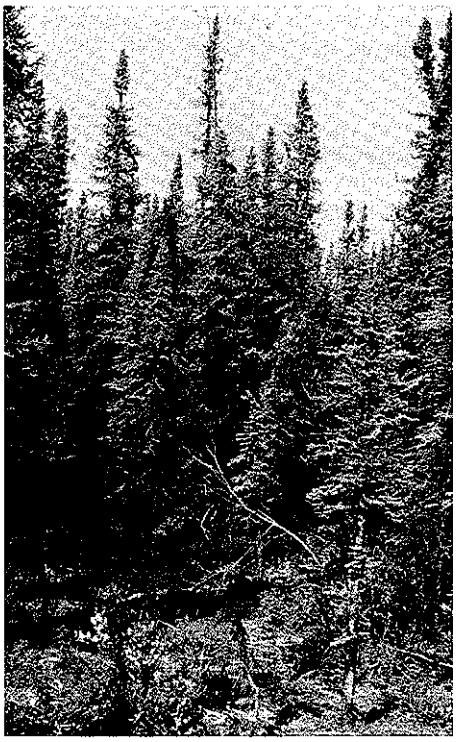
Landform/Soils: Imperfectly to poorly drained, medium to fine textured Gleysolic and Cryosolic soils on gently sloping to depressional lacustrine, morainal or colluvial materials, frequently associated with northerly aspects.

Successional Status: Generally stable with main variations in the relative cover of Ledum and Betula and of moss and lichens.

Related Communities: *Picea* glauca-P. *mariana/ Ledum/ Aulacomnium,* Picea mariana-P. *glauca/ Salix* myrtillifolia.

Productivity: Low (BA = 12 m^2/ha, Total Volume = 47 m^3/ha, MAI = 0.27 m^3/ha/yr, Total Age = 171).

Community: Picea *mariana/Ledum/Hylocomium*



Description: Moist sites at mid elevation (900-1200 m); the tree canopy is mostly closed providing 60-70% cover; shrub layers are often thin, with Labrador tea being the most prominent: the forb layer is virtually nonexistent: moss and lichen layers are discontinuous with feathermoss being more conspicuous than lichens.

Characteristic Species: Picea mariana, Ledum groenlandicum, Hylocomium splendens, Cladlna mitis.

Associated Species: Plcea glauca. *Vaccinium* vitis-idaea. Saiix spp., *Empetrum* nigrum. Dicranum spp., Tomenfhypnum nitens, Peltigera aphfhosa, Ciadonia spp.

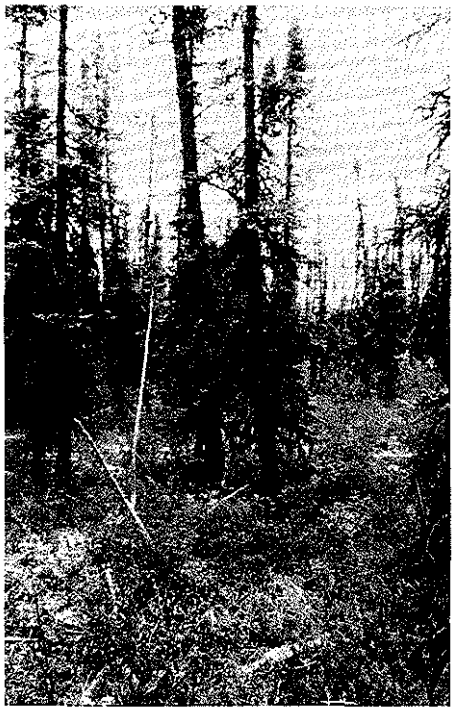
LandformlSoils: Imperfectly drained, fine to medium textured Brunisols or Cryosols, mostly on gently to moderately sloping morainal blankets or northerly aspects with permafrost often present.

Successional Status: This community is most likely trending toward *Picea* glauca-P. *mariana/Ledum/Aulacomni*umwith a dominance of P. mariana.

Related Communities: Picea *glauca/Ledum/Hylocomium*, P. mariana-P. glauca/*Salix myrtillifolia*, Abies *lasiocarpa/Ledum/Hylocomium.*

Productivity: Low (BA = 13 m^3/ha, Total Volume = 45 m^3/ha, MAI = 0.37 m^3/ha/yr, Total Age = 121).

Community: Picea *mariana/Ledum/Cladina*



Description: On moist to dry, cool sites at low to mid elevations (800-1200 m); the tree canopy provides 50-70% cover; shrub layers are well developed with Labrador tea providing the most cover, though willows can be common; lichens provide the primary cover below the shrub layers.

Characteristic Species: Picea mariana, Ledum groeniandicum. Cladina mitis. C. stellaris. C. amaurocraea, Stereocaulon tomentosum.

Associated Species: Pinus contorta, Picea glauca. Salix spp., Potentilla *fruticosa,* Alnus crispa, Vaccinium *uliginosum,* V. vitis-idaea, Empetrum nigrum. Arctostaphylos rubra, Aulacomnium turgidum, Tomenthypnum nitens, Hylocomium splendens, *Pleurozium* schreberi, Peitigera aphthosa. Nephroma *arcticum,* Ciadonia spp.

LandformlSoils: Imperfectly to well drained, medium to coarse textured Brunisols or Cryosols on depressional to gently sloping colluvium or morainal blankets, rarely glaciofluvial or lacustrine materials, mostly in areas of cold air poolingand northerlyaspects.

Successional Status: In some seral stands, Pinus *contorta* provides a significant amount of cover but is dying out; a similar situation occurs with *Salix* spp.; otherwise the community is stable.

Related Communities: Pinus *contorta/Ledum/Cladina*, Picea *glauca/Ledum/Hy*iocomium. P. *glauca/Ledum/Cladina*, P. *glauca-P. mariana/Ledum/Aulacom*nium.

Productivity: Low (BA = 14 m^2/ha, Total Volume = 60 m^3/ha, MAI = 0.56 m^3/ha/yr, Total Age = 107).

Community: Picea *mariana/* Hylocomium-Pleurozium

Description: Moist to wet, cool sites at low to mid elevations (800-1200 m); the tree canopy provides 40-70% cover; shrub, forb and lichen layers are sparse or absent; ground cover is provided by a continuous, usually lush, carpet of feathermoss.

Characteristic Species: Picea mariana. Hylocomium splendens, *Pleurozium* schreberi.

Associated Species: Picea *glauca*, iedum groeniandicum. Salix spp., *Empetrum* nigrum, Vaccinium vitis-idaea, Arctostaphylos rubra, Linnaea bore. *alis*, Dicranum spp.. *Ptilium* crista-castrensis, Peliigera aphihosa, Cladina mitis.

Landform/Soils: Imperfectly to well drained, medium to fine textured Brunisols, that are often gleyed, on level to moderately sloping morainal and fluvial materials: permafrost is sometimes present.

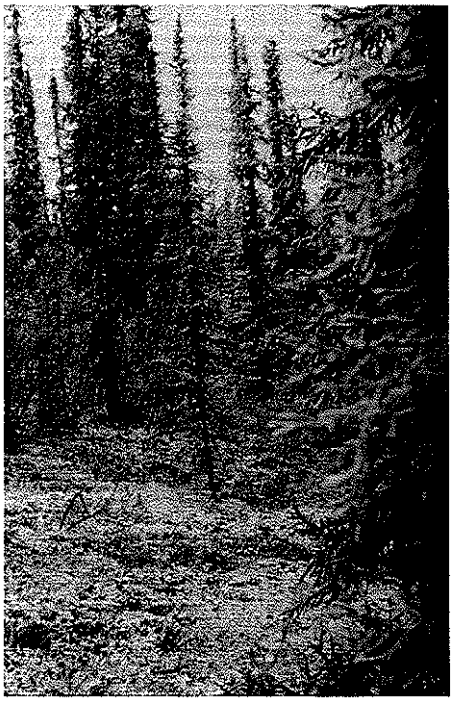
Successional Status: A subclimax stage leading to Picea giauca-P. *mariana/Ledum/Aulacomnium* as the sites become colder due to build up of organic matter.

Related Communities: Picea *mariana/Ledum/Hylocomium*, P. mariana-P. giauca/ Salix myriillifolia.

Productivity: Low on wet sites (BA = 18 m^2/ha, Total Volume = 74 m^3/ha, MAI = 0.44 m^3/ha/yr, Total Age = 167). Medium on old floodplains (BA = 32 m^2/ha, Total Volume = 157 m^3/ha, MAI = 1.75 m^3/ha/yr, Total Age = 90).

Community: Picea *mariana/ Cladina*

Description: Mesic to dry sites at mostly mid elevations (900-1200 m); the tree canopy provides 30-60% coverage, and is composed of trees up to 4 m tall, with veterans to about 10 m; the only significant understory vegetation consists of lichens.



Characteristic Species: Picea mariana. Ciadina mitis. C. steiiaris. C. amaurocraea.

Associated Species: Picea glauca, Pinus conforta, Ledum groenlandicum, *Linnaea* borealis, Dicranum spp., Peltigera aphthosa. Cetraria cucuiiata, Stereocaulon tomentosum. Cladonia spp.

Landform/Soils: Moderately well to well drained, medium to coarse textured Brunisols on gently to moderately sloping morainal, eolian, and glaciofluvial materiais.

Successional Status: A developing community composed of stable species; the Pinus contorta veterans are being eliminated and there is usually abundant Picea mariana regeneration. The canopy density will likely increase, but will stagnate and reopen likely to about its current level or less; tending towards P. *mariana/Ledum/Cladina*.

Related Communities: Pinus *contorta/* Cladina, Picea *glauca/Cladina*, P. contorta-P. *mariana/Peltigera*, Picea *glauca/Ledum/Cladina*.

Productivity: Low (no plot data, rating estimated from related communities).

Community: Pinus contorta-Picea *mariana/* Peltigera

Description: Mesic to moist sites at mid elevations (900-1100 m); tree canopy is variable in composition and provides a 40-60% cover; shrub and herb layers are poorly developed, but spruce regeneration may be common; moss layer is virtually absent; the lichen layer provides 10-30% cover of which Peltigera is usually the most abundant.

Characteristic Species: Pinus contorta, Picea mariana, Pelfigera aphthosa. P. rufescens, P. canina.

Associated Species: Picea glauca, Popuius tremuloides, P. balsamifera, Betula papyrifera, Ledum groenlandicum, Arctostaphylos rubra, Linnaea borealis, Equisetum scirpoides, Stereocaulon tomentosum. Ciadina mitis, Cetraria nivalis, Cladonia spp.

Landform/Soils: Well-drained, medium to coarse textured Brunisols on gently to moderately sloping giaciofluvial and eolian deposits.

Successional Status: A seral stage, probably leading to Picea mariana or *P. glauca/Cladina*, or P. *glauca/Ledum/* Ciadina.

Related Communities: Pinus *contorta/Ledum/Cladina*, Picea *glauca/Empetrum/Peltigera*, and those indicated above.

Productivity: Medium (BA = 10 m^2/ha, Total Volume = 47 m^3/ha, MAI = 1.39 m^3/ha/yr, Total Age = 34).

Community: Pinus *contorta/ Alnus crispa/* Hylocomium

Description: Mesic sites at low to high elevations (800-1300 m); the tree canopy provides 50-70% cover; the tail shrub layer, to about 4 m, is dominated by Ainus crispa which provides about 50% cover, constituting the most diagnostic feature of this community; lower shrub and herb layers are thin; the moss layer is mostly continuous. though is Sparse in some cases.

Characteristic Species: Pinus contorfa. Ainus crispa, Hyiocomium splendens. Pfiiium crista-casfrensis.

Associated Species: Picea giauca, Abies iasiocarpa, Salix spp., Rosa acicularis. Ledum groeniandicum, Vaccinium vitis-idaea, Linnaea borealis, Cornus canadensis, Pyrola spp., Empetrum nigrum, Dicranum spp., Pleurozium schreberi, Brachyfhecium spp., *Peltig*-era aphthosa. Cladina spp., Cladonia spp.

Landform/Soils: Moderately well to well drained, mostly medium textured Dystric and Eutric Brunisols developed on level to moderately sloping morainal or colluvial materials, sometimes with eolian veneers or blankets.

Successional Status: At higher elevations (1100-1300 m) it is successional to Abies *lasiocarpa/Alnus crispa/Hyloco*-mium, and at lower elevations (below 1100 m) to Picea *glauca/Alnus crispa/Hylocomium*, though this community was not found in thisecoregion.

Related Communities; In addition to those indicated above. *Picea glauca/Hylocomium-Pleurozium*, Pinus *contorta/Shepherdia* canaden*sis/Hylocomium*.

Productivity: High (BA = 30 m^2/ha, Total Volume = 245 m^3/ha, MAI = 3.09 m^3/ha/yr, Total Age = 79).

Community: ***Pinus contorta/ Shepherdia/ Hylocomium***

Description: Mesic sites at low to mid elevations (800-1000 m); the tree canopy provides 50-70% cover; the most characteristic feature is the abundance of soapberry (about 40% cover) and scarcely anything else but feather-moss.

Characteristic Species: Pinus contorfa, Shepherdia canadensis. Pleurozium schreberi, Hylocomium spiendens.

Associated Species: Picea glauca. Viburnum edule. *Vaccinium* vitis-idaea. *Empetrum* nigrum, *Lupinus* arcticus. *Geocaulon lividum*, Pyrola spp., Peitigera aphthosa, Cladina mitis.

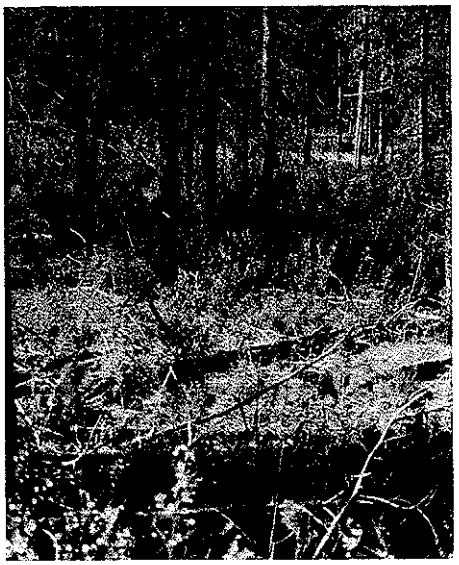
Landform/Soils: Well-drained, medium to coarse textured Brunisois on gently to moderately sloping giaciofluvial materials or lower slopes of morainal material.

Successional Status: A seral stage, most likely changing to Picea *glauca/Hylocomium-Pleurozium.*

Related Communities: *Populus* tremuioi*des/Shepherdia, P. contorta/Alnus/Hy*locomium, P. *contorta/Linnaea-Vaccinium.*

Productivity: Medium (BA = 43 m'lha. Total Volume = 290 m^3/ha, MAI = 1.67 m^3/ha/yr, Total Age = 174).

Community: Pinus *contorta/ Betula/ Festuca*



Description: Mesic to dry, mostly mid to higher elevation (900-1300 m) sites; the tree canopy Cover varies from about 30 to 70% cover; shrub birch is the most abundant shrub, though other species are sometimes very common as well; the grass cover varies from around 10 to 50%, and on sites with relatively low grass cover, feathermoss or lichens may be prominent.

Characteristic Species: Pinus contorta, Betula glanduiosa, Festuca aitaica, Calamagrostis spp.

Associated Species: Picea giauca, Abies lasiocarpa. Saiix spp., Ledum groeniandicum, Vaccinium uiiginosum. *V.* vitis-idaea, Empetrum nigrum, *Arcto*staphylos uva-ursi, A. rubra. LInnaea borealis, Lupinus arcticus, Hyiocomi*um* splendens, Poiytrichum *juniperinum*, Dicranum spp., Ciadina mitis, *C.* rangiferina, Nephroma arcticum, Cetraria nivalis, Peitigera aphthosa, Ciadonia spp.

Landform/Soils: Moderately well to well drained, medium to coarse textured Brunisols on level to moderately sloping morainal, eolian, and glaciofluvial materials.

Successional Status: A mid to late seral community succeeding toward *Picea glauca/Betula/Cetraria* at higher elevations and to P. *glauca/Ledum/Hyloco*miumor Ciadina at lower elevations.

Related Communities: Pinus *contorta/Salix/Calamagrostis*, P. contortal Calamagrostis-Festuca. Picea glau*ca/Arctostaphylos/* Calamagrostis.

Productivity: Medium (BA = 18 m^2/ha, Total Volume = 138 m^3/ha, MAI = 1.30 m^3/ha/yr, Total Age = 106).

Community: *Pinus contorta/ Betula/ Hylocomium*

Description: Mesic, mid to higher elevation (900-1300 m) sites; the tree canopy provides 50-70% cover; mid and tall shrub layers of shrub birch and willow are well developed; a low shrub layer is usually present; herbs are sparse; feathermoss usually provides 30-50% cover, and lichens are sparse.

Characteristic Species: Pinus contorta, Betula glandulosa. Hyiocomium splendens.

Associated Species: Picea glauca, Abies lasiocarpa at higher elevations, Salix spp., Empetrum nigrom. Vaccinium vitis-idaea, V. uliginosum, Cornus canadensis, Lupinus arcticus, Festuca altaica, Lycopodium spp., *Pleurozium* schreberi, Dicranum spp., Nephroma arcticum, Ciadina mitis, C. rangilerina, Cladonia spp., Stereocaulon tomentosum.

LandformlSoils: Well-drained, medium to coarse textured Brunisols on gently to moderately sloping morainal and colluvial materials.

Successional Status: The primary change is for the Pinus *contorta* to be replaced by Picea glauca and/or Abies lasiocarpa which may reduce the shrub cover, but the shrub species will remain.

Related Communities: Pinus *contorta/ Betula/ Festuca*, P. contortal Vaccinium *uliginosum/ Cladina*, Picea *glauca/ Betula/ Cetraria*, Abies *lasiocarpa/ Betula/ Empetrum/* Ciadina.

Productivity: Medium (no plot data; rating estimated from similar communities).

Community: *Pinus contorta/Salix/Calamagrostis*

Description: Mesic sites at low to mid elevation (800-1000 m); the tree canopy is open (about 40% cover); mid and tall shrub layers are dominated by willow and provide 30% or more cover; grass is the only other prominent type of understory vegetation except for spruce regeneration.

Characteristic Species: Pinus coniorta, Salix spp., *Calamagrostis* spp.. Festuca *altaica*, Poa spp.

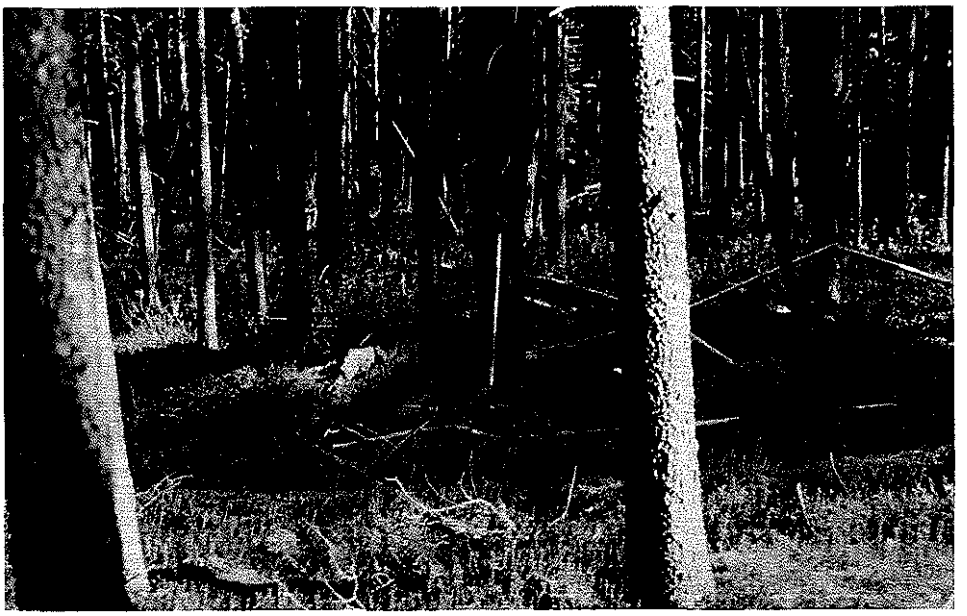
Associated Species: Picea glauca, Betula glandulosa. Ledum groenlandicum, *Arctostaphylos* uva-ursi, Epilobium angustifolium. Fragaria virginiana. Achillea *millifolium*, *Peltigera* spp.

Landform/Soils: Well-drained, medium textured Brunisols on nearly level fluvial and lacustrine materials.

Successional Status: An early successional stage probably leading to Picea *glauca/Hylocomium-Pleurozium*.

Related Communities: Populus tremuloides/*Salix/Linnaea*, P. *tremuloides*/Shepherdia, Picea *glauca/Ledum*, Picea *glauca/Equisetum*, *Pinus contorta/Alnus/Hylocomium*.

Productivity: High (BA = 33 m^2/ha, Total Volume = 183 m^3/ha, MAI = 5.92 m^3/ha/yr, Total Age = 31).



Community: *Pinus contorta/Ledum-Empetrum/Hylocomium*

Description: Cool, moist to mesic environments at mid elevation (900-1200 m); the tree canopy provides 40-70% cover: low and mid shrub layers provide about 50%cover, a good representation of crowberry is diagnostic for this community: the herb layer is sparse, and the moss layer is well developed but usually discontinuous; lichens are sparse.

Characteristic Species: Pinus contorta, Ledum groenlandicum, *Empetrum nigrum*, Hylocomium spiendens, *Pleurozium* schreberi.

Associated Species: Abies iasiocarpa, Picea giauca. Saiix spp.. Betula glandulosa, Vaccinium vitis-idaea, *V. uliginosum*, Cornus canadensis, Arctostaphylos rubra, Dicranum spp., Ptiium crista-castrensis, Aulacomnium *turgidum*, Cladina spp., Ciadonia spp.. *Peltigera* aphthosa.

LandformlSoils: Moderately to well drained, medium-textured Brunisolic soils on gently to steeply sloping colluvial and morainal material.

Successional Status: A seral stage leading most likely to Abies *lasiocarpa/Ledum/Hylocomium*, Abies lasiocarpal *Hylocomium-Pleurozium*, or Picea *glauca/Hylocomium-Pleurozium* depending on moisture and elevation.

Related Communities: In addition to those above, Picea *glauca/Ledum/Hylocomium*, Picea glauca-P. marianal *Ledum/Aulacomnium.*

Productivity: High (BA = 36 m^2/ha, Total Volume = 269 m^3/ha, MAI = 2.81 m^3/ha/yr, Total Age = 96).

Community: Pinus *contorta/Ledum/Vaccinium* vitis-idaea

Description: Moist sites at low to mid elevation (800-1000 m); the tree canopy provides 50 to 80% cover, dominated by lodgepole pine though black spruce can be prevalent in early and advanced regeneration stages; shrub layers are usually well developed and may be dominated either by Labrador tea or lingonberry or both; herb and moss layers are sparse to nonexistent; the lichen cover can be sparse to nearly continuous.

Characteristic Species: Pinus contorta, Ledum groenlandicum, Vaccinium vitis-idaea. Ciadina mitis.

Associated 'Species: Picea mariana, P. glauca, Saiix spp., Betula giandulosa. Vaccinium uliginosum, Alnus crispa, Shepherdia canadensis. Rosa acicuiaris, Epiiobium angustifolium. Lupinus articus. *Hylocomium* splendens. Pogonatum spp., Peltigera aphthosa, Cladonia spp., Stereocaulon tomentosum.

Landform/Soils: Moderately well to well drained, coarse-textured Brunisols on level to gently sloping or depressional glaciofluviai and eolian materials.

Successional Status: A seral Stage tending toward Picea mariana or P. glauca/*Ledum/Cladina* or a similar community lacking Ledum.

Related Communities: Pinus contortal *Ledum-Empetrum/Hylocomium*, P. *contorta/Vaccinium/Hylocomium*, P. *contorta/Linnaea-Vaccinium*, plus those mentioned above.

Productivity: High (BA = 25 m^2/ha, Total Volume = 129 m^3/ha, MAI = 3.40 m^3/ha/yr, Total Age = 38).

Community: ***Pinus contorta/Linnaea- Vaccinium vitis-idaea***

Description: Dry to moist sites at low to mid elevations (700-1000 m); the tree canopy is open (40-60% cover), the most characteristic feature is the relative abundance of twinflower and lingonberry, though Labrador tea may be common as well: herb, moss and lichen layers are sparse.

Characteristic Species: Pinus contorfa, Linnaea borealis, Vaccinium *vitis-*idaea, Ledum groenlandicum.

Associated Species: Picea glauca, Salix spp., Shepherdia canadensis, Rosa acicularis, Lupinus *arcticus,* Epilobium angusfifolium, Cornus canadensis, Mertensia paniculafa, Arnica cordifolia, Pyrola spp., Hylocomium splendens, Peitigera aphfhosa.

Landform/Soils: Moderately well to well drained, medium to coarse textured Brunisois mostly on gently to moderately sloping glaciofluvial and eolian materials.

Successional Status: A seral stage'that will probably end up as Picea *glauca/* Hylocomium-Pleurozium.

Related Communities: Picea *glauca/Ledum/Hylocomium*, P. *glauca/Calamagrostis-Festuca*, P. *glauca/Hylocomium-Pleurozium* and successional stages to these.

Productivity: High on moist sites (BA = 30 m^2/ha, Total Volume = 213 m^3/ha, MAI = 3.74 m^3/ha/yr, Total Age = 57). Medium on dry sites (BA = 26 m^2/ha, Total Volume = 168 m^3/ha, MAI = 1.52 m^3/ha/yr, Total Age = 111).

Community: ***Pinus contorta/ Vaccinium*** vitis-*idaea/ Hylocomium*

Description: Dry to mesic sites at low to mid elevations (800-1000 m); the tree canopy provides 50-70% cover; lingonberry covers **40-70%.** but other shrubs are sparse; the forb layer is thin and composed of variable assortments of species; the feathermoss layer provides **40-70%** cover.

Characteristic Species: Pinus conforfa, Vaccinium vitis-idaea prominent, *Hylocomium* splendens, Ptilium cristacasfrensis.

Associated Species: Picea glauca, Salix spp., Ledum groenlandicum, Viburnum edule, Shepherdia canadensis, Epilobi*um angustifolium*, Cornus canadensis, Linnaea borealis. Arnica cordifolia, *Lupinus* arcticus, Pyrola spp., Zyga*denus* elegans, Cladina mitis.

Landform/Soils: Well-drained, medium to coarse textured Brunisols, mostly on gently to moderately sloping glaciofluvial, eolian and morainal materials.

Successional Status: An early seral stage that wiii likely change to Picea *glauca/Hylocomium-Pleurozium.*

Related Communities: Pinus *contorta/* Hylocomium-Pleurozium. P. confor*ta/Arctostaphylos* uva-ursi. P. *contorta/Ledum-Empetrum/Hylocomium.*

Productivity: High (BA = **38** m^2/ha, Total Volume = 311 m^3/ha, MAI = **4.26** m^3/ha/yr, Total Age = 73).

Community: Pinus *contorta*/ Vaccinium *uliginosum*/ Cladina

Description: Higher-elevation (1000-1300 m) mesic sites; the tree canopy cover varies from about 35 to 70% and can have a large proportion of white spruce, but the pine trees are taller; low to medium height shrubs are abundant with no clear dominant species, but bilberry is more prevalent than in any other community; grasses can be very common and lichens are abundant.

Characteristic Species: Pinus conforfa, Picea glauca, Vaccinium uliginosum, Cladina mitis.

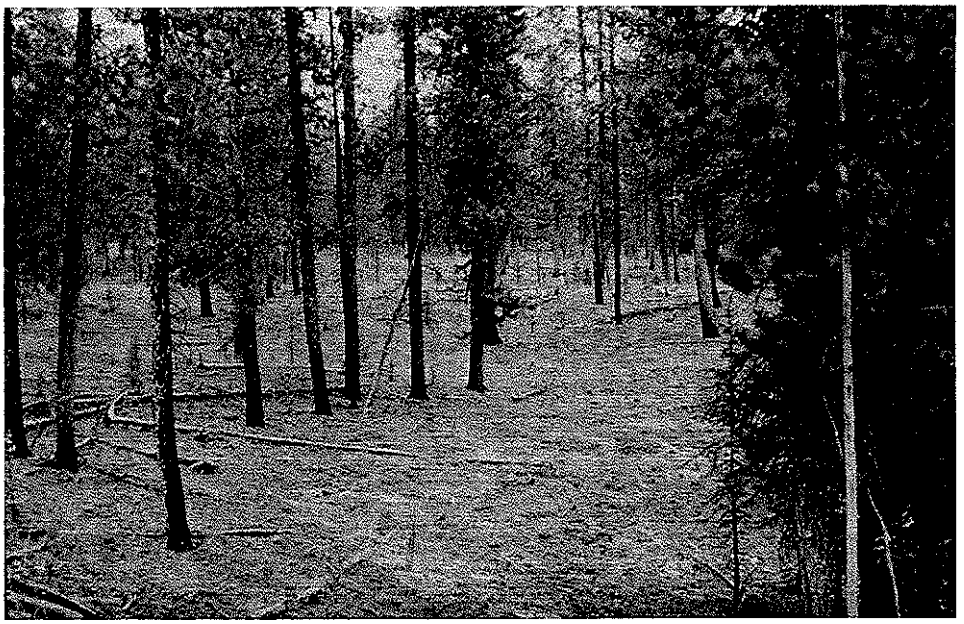
Associated **Species:** *Populus* tremuloides, Salix spp., Betula glandulosa, Ledum groenlandicum, Vaccinium vifis-idaea. V. caesipifosum, Empetrum nigrum, Rosa acicuiaris, *Arctostaphylos* uva-ursi, A. rubra. Linnaea borealis, Festuca aifaica. Lupinus arcficus. Pieurozium schreberi, *Ptilium* crista-casfrensis, Dicranum spp., Cladina Cladina rangiierina, C. sfeiiaris. Cladonia spp., Pelfigera aphfhosa.

Landform/Soils: Rapidly drained, coarse-textured Brunisois on level to gently sloping upper elevation glaciofluvial materials.

Successional Status: The Pinus conforfa is being replaced by Picea glauca, but there is no clear direction in the progression of the shrub layers. A likely trend is toward Picea *glauca/Ledum-Vaccinium/Cladina*, with Vaccinium *uliginosum* and *V.* vifis-idaea being well represented.

Related Communities: Abies *lasiocarpa/-Betula/Empetrum/Cladina*, Picea giauca/*Betula/Cetraria*, P. *glauca/Ledum/* Cladina.

Productivity: Medium (BA = 24 m^2/ha, Total Volume = 173 m^3/ha, MAI = 1.68 m^3/ha/yr, Total Age = 103).



Community: *Pinus contorta/Arctostaphylos*

Description: Dry Sites at low to mid eievations (800-1000 m); tree canopy is open (30-60% cover), dominated by pine; shrub cover is 10-50% of which kinnikinnick is prominent; moss and lichen cover is variable, 0-40%.

Characteristic Species: Pinus conlorla, Arctostaphylos uva-ursi, Rosa acicuiaris, *Pulsatilla* Ludoviciana. Zygadenus elegans. Dicranum spp., Peitigera canina. Cladina mitis.

Associated Species: Picea glauca. Popuius *tremuloides*, Linnaea borealis, Cornus canadensis, Geocaulon *lividum*, Epilobium anguslifolium. Salix spp., *Empetrum* nigrum, Viburnum edule, Saxihaga *tricuspidata*, Lupinus *arcticus*, *Mertensia* paniculala, *Polytrichum* juniperinum.

Landform/Soils: Moderately to rapidly drained, medium to coarse textured Brunisols and Regosols on level or gently to steeply sloping, usually south or west facing, glaciofluvial. eolian or lacustrine materials.

Successional Status: Relatively stable on dry or exposed sites; Picea *glauca* replaces Pinus *contorta,* though this may be slow; grasses or mosses tend lo follow the spruce.

Related Communities: Pinus *contorta/* Cladina, P. *contorta/Calamagrostis-*Fesluca, Picea *glauca/Arctostaphylos*, Popuius *tremuloides/Arctostaphylos*.

Productivity: Medium (BA = 22 m^2/ha, Total Volume = 124 m^3/ha, MAI = 1.30 m^3/ha/yr, Total Age = 95).

Community: ***Pinus contorta/Arctostaphylos/ Calamagrostis***

Description: Mesic to dry sites at low to mid elevations (800-1100 m); tree canopy provides 30-70% cover, dominated by pine; kinnikinnick and grasses in variable proportions dominale the understory; ***moss*** and lichen layers are sparse to absent.

Characteristic Species: Pinus conforfa, Arcfostaphylos uva-ursi, *Calamagrostis* purpurascens, C. canadensis, Festuca alfaica, *Trisetum spicatum* (one or more species of grass may dominate **a** given site).

Associated Species: Picea giauca, Populus fremuloides, Shepherdia canadensis. Rosa acicularis. Vaccinium vitis-idaea, Linnaea borealis, *Epilobium angustifolium*, Pulsatilla *Ludoviciana*, *Zygadenus* eiegans, Senecio spp., Poiyfrichum *juniperinum*, Ciadina spp., Cetraria spp., Pelfigera spp., *Stereocauion tomentosum*.

Landform/Soils: Well to rapidly drained, coarse-textured Brunisois on level to gently sloping glaciofluvial or lacustrine materials.

Successional Status: The Pinus is giving way to Picea giauca; under denser tree cover the most likely climax will be Picea *glauca/Calamagrostis-Festuca* and under more open tree cover, P. *glauca/Arctostaphylos.*

Related Communities: Pinus *contorta/Calamagrostis-Festuca*, P. conforta/*Arctostaphylos*, P. *contorta/Cladina.*

Productivity: Medium (BA = 19 m^2/ha, Total Volume = 118 m^3/ha, MAI = 1.34 m^3/ha/yr, Total Age = 88).

Community: ***Pinus*** *contorta/ Calamagrostis-Festuca*

Description: Dry to mesic sites at low to mid elevations (800-1100 m); *the tree canopy cover is* **40-60%:** *shrubs cover* **0-30%** *with variable species composition; forbs cover* 30-70% *dominated by grass;* moss *and lichen layers are sparse to absent.*

Characteristic Species: Pinus contorta. Calamagrostis purpurascens, C. canadensis, Festuca altaica. Agropyron violaceum spp. violaceum, A. yukonense. Linnaea borealis, Vaccinium vitis-idaea.

Associated Species: Picea glauca, Populus tremuloides, Salix spp.. Shepherdia canadensis, Rosa acicularis, Viburnum edule, Arctostaphylos uva-ursi, Empetrum nigrum, Lupinus articus, Mertensia paniculata, Geocauion lividum, Pulsatilla Ludoviciana. Epilobium angustifolium. Polytrichum juniperinum, Ciadina mitis. Peltigera aphthosa.

LandformlSoils: Moderately to well drained, medium to somewhat coarse textured (mostly loams) *Brunisols on level to steeply sloping eolian or glaciofluviai materials: occasionally on silty Luvisols in lacustrine materials.*

Successional Status: A mid seral stage to Picea glauca/Calamagrostis-Festuca or Picea glauca/Hylocomium-Pleurozium.

Related Communities: On the drier end it is related to Pinus contorta/Arctostaphyios and Picea glauca/Calamagrostis-Festuca; on more mesic sites it is related to Picea glauca/Betula-Salix, Picea glauca/Hylocomium-Pleurozium and similar varieties of Populus tremuloides communities.

Productivity: Medium (BA = **24** m^2/ha, *Total Volume* = **151** m^3/ha, MAI = **1.84** m^3/ha/yr, *Total Age = 82).*

Community: Pinus *contorta/ Hylocomium-Pleurozium*

Description: Moist to mesic sites at low to mid elevations (800-1 100 m); the tree canopy cover of 50-70% is dominated by lodgepole pine with aspen sometimes present, and white spruce in reproductive layers: shrub layers are thin to absent; forbs are variable: the moss layer covers 30-70% of the ground: lichens may be present.

Characteristic Species: Pinus contorta, Picea glauca, Vaccinium vitis-idaea. Linnaea borealis. Hylocomium *splendens*, Pleurozium schreberi, Ptilium crista-castrensis, Thuidium abieiinum, Pelfigera aphthosa.

Associated Species: Populus fremuioides, Picea mariana, Shepherdia canadensis, Betula *glandulosa*, Saiix spp., Ledum groeniandicum, Empetrum nigrum, Viburnum eduie, Rosa acicuiaris, Festuca altaica, Polytrichum *juniperinum*, Dicranum spp., Cladina spp.

Landform/Soils: Moderately well drained, medium-textured Dystric Brunisols mostly on level to gently sloping morainal material or eolian veneers. sometimes on loamy lacustrine deposits.

Successional Status: A transitional stage to Picea *glauca/Hylocomium-Pleurozium*: Picea mariana may be a codominant with P. *glauca* on some sites.

Related Communities: Several transitional communities with Pinus conforta as dominant tree species and *Hylocomium-Pleurozium* as a principal ground cover, but with various low to tall shrubs present: Picea glauca, P. mariana and Abies lasiocarpa with feathermoss understories are associated.

Productivity: High (BA = 32 m^2/ha, Total Volume = 200 m^3/ha, MAI = 2.28 m^3/ha/yr, Total Age = 88).

Community: Pinus *contorta*/ Cladina

Description: Dry Sites at low to mid elevations (800-1000 m); the tree canopy provides 20-50% cover; shrub cover is 0-10%; forbs and mosses are sparse to absent; lichen cover is mostly continuous (70-95%).

Characteristic Species: *Pinus* coniorta, Pulsatilla Ludoviciana, Zygadenus *elegans*. Ciadina mitis, *C. stellaris,* C. rangiferina. Stereocaulon tomentosum, Cladonia spp.

Associated Species: Picea giauca, Populus tremuloides, Juniperus communis, *Arctostaphylos* uva-ursi, Vaccinium viiis-idaea, Salix giauca, Empe*trum* nigrum. Ledum groeniandicum. Epilobium *angustifolium*, Geocaulon lividum, Hylocomium splendens, *Pleurozium* schreberi, Dicranum spp., *Polytrichum* juniperinum. Cetraria spp.

LandformlSoils: Rapidly to excessively drained, coarse-textured Dystric or Orthic Erunisols on level to gently sloping glaciofluvial material; occasionally on the southern aspects of rock outcrops or steep, south-facing slopes of pitted outwash complexes.

Successional Status: This community appears stable as tree regeneration is severely restricted due to drought; Picea glauca may eventually replace the Pinus contorta and *Arctostaphylos* uva-ursi may become more prominent, but the Succession rate is extremely slow.

Related Communities: Picea glaucal Ciadina, *P. glauca/ Ledum/ Cladina*, Pinus *contorta/ Arctostaphylos*.

Productivity: Medium (EA = 24 m^2/ha, Total Volume = 150 m^3/ha, MAI = 1.48 m^3/ha/yr, Total Age = 102).

Community: *Populus tremuloides/ Shepherdia*

Description: Moist to mesic sites at low elevation (800-950 m); tree canopy is closed or nearly *so* with a dominance of aspen; medium-height shrub layer has a coverage of 30%or more and a low shrub layer provides about 20% cover; the herb layer consists of an assortment of species, each with low coverage, though grass can be common, but collectively it provides 10%or more cover; the moss and lichen layers are sparse.

Characteristic Soecies: *Populus tremuloides,* Shepherdia canadensis, Linnaea borealis. *Arctostaphylos* uva-ursi.

Associated Species: Picea glauca. Pinus conlorla, Salix spp., Rosa acicularis, Viburnum eduie, Vaccinium vifis-idaea, Epilobium angustiiolium, Cornus canadensis. Lupinus *arcticus*, Solidago spp., Arnica cordiiolia, Pyrola spp., Pedicularis spp., Geocaulon lividum, Fesfuca allaica, *Calamagrostis* spp.

Landform/Soils: Moderately well to well drained, medium-textured Brunisols mostly on gently to moderately sloping morainal or eolian materials.

Successional Status: A seral stage to Picea *glauca/Calamagrostis-Festuca* if the Picea cover remains open, or Picea *glauca/Hylocomium-Pleurozium* under denser Picea.

Related Communities: Picea *glauca/Arctostaphylos* plus those indicated above and successional communities to these.

Productivity: Medium (BA = 23 m^2/ha, Total Volume = 129 m^3/ha, MAI = 1.47 m^3/ha/yr, Total Age = 88).

Community: Popolos *tremuloides/ Salix/* Linnaea

Description: Mesic Sites at low to mid elevation (500-1 100 m); aspen dominates a tree canopy of 60-80% cover, usually with white spruce reproduction most common; mid to tall shrub layers are dominated by willows; twinflower is most common in a sparse ground cover of forbs mosses and lichens.

Characteristic Species: Populus *termuloides*, Salixspp., Linnaea borealis.

Associated Species: Picea glauca. *Shepherdia canadensis*, Viburnum edule. ***Cornus*** canadensis, Vaccinium vitisidaea. Rosa acicularis, Lafhyrus spp., Epilobium angusfifolium, Pyrola secunda, Mertensia paniculata, *Arctostaphylos* rubra, A, uva-ursi, Dicranum spp., *Hylocomium* splendens.

Landform/Soils: Moderately well to well drained, medium to coarse textured Brunisols or Regosols on gently sloping to depressional glaciofluvial, morainal or lacustrine material frequently in the fog zone of water bodies.

Successional Status: A seral stage successional to Picea *glauca/ Hylocomium-Pleurozium*.

Related Communities: Pinus *contorta/ Salix/ Festuca*, Populus tremuloidesl *Shepherdia/ Linnaea*.

Productivity: High (BA = 55 m'lha, Total Volume = 332 m^3/ha, MAI = 2.61 m^3/ha/yr, Total Age = 127).

Community: ***Populos tremuloides/ Salix/ Arctostaphylos***

Description: Mesic sites; the tree canopy provides 30-60% cover; medium and tall shrub layers have a cover of 20-50% dominated by willow, and the low shrub layer a cover of 10-20% dominated by kinnikinnick; the herb, moss and lichen layers consist of variable assortments of species, each with low cover.

Characteristic Species: Popuius tremuloides, Saiix spp., Arctostaphylos uva-ursi.

Associated Species: Picea glauca, Populus balsamifera, Rosa acicularis, *Potentilla* fruticosa, Shepherdia canadensis. Pulsatilla Ludoviciana, Epilobi*um* angustifolium. Pyrola spp., Fragaria virginiana. Cerafodon purpureus. Cladonia spp.

LandformlSoils: Well-drained, medium to coarse textured Brunisols and Regosols mostly on level to gently sloping glaciofluvial materials, sometimes on eolian deposits.

Successional Status: A seral stage most likely trending toward Picea glaucal Calamagrosfis-Fesfuca or P. *glauca/* Arctostaphylos.

Related Communities: Populus fremuloi*des/ Salix/ Calamagrostis, P.* tremuioi*des/ Arctostaphylos*, P. tremuioi*des/ Arctostaphylos/* Calamagrostis and similar communities with Pinus conforfa as dominant tree species.

Productivity: Medium (BA = 18 m^2/ha, Total Volume = 100 m^3/ha, MAI = 1.47 m^3/ha/yr, Total Age = 68).

Community: ***Populus*** *tremuloides/ Salix/ Calamagrostis*

Description: Dry to mesic sites; the tree layer provides 40-60% cover dominated by aspen; medium to tall shrub layers are dominated by willow and provide 10-30%cover; the herb layer has a cover of 20-50% dominated by grasses: moss and lichen layers are sparse.

Characteristic Species: Populus fremuloides. Salix spp., Calamagrostis spp., *Poa* spp., *Bromus* spp., *Festuca* alfaica.

Associated Species: Picea glauca, Arctostaphylos uva-ursi, *Pulsatilla Ludoviciana*, Zygadenus elegans, Galium boreale, Fragaria virginiana, Pelfigera spp., Cladina spp.

Landform/Soils: Well-drained, coarse-textured Brunisols or Regosols on level to gently sloping glaciofluvial, fluvial or occasionally morainal materials.

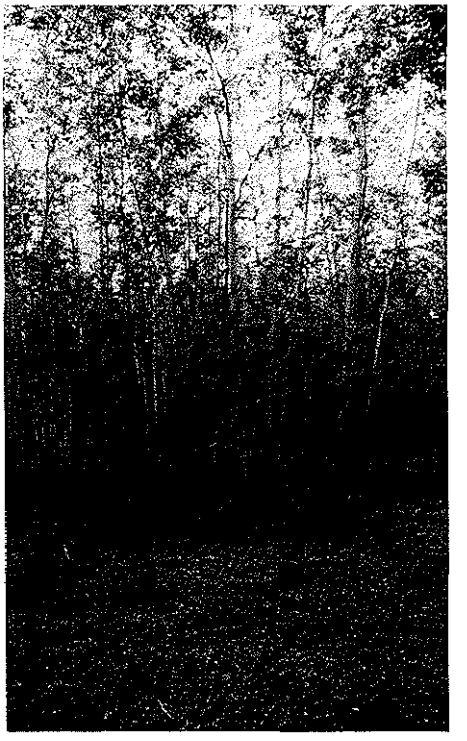
Successional Status: A young seral stage most likely developing toward Picea *glauca/ Calamagrostis-Festuca*.

Related Communities: Populus fremuloi*des/ Salix/ Linnaea*, P. *tremuloides/* Calamagrosfis-Fesfuca, P. fremuloi*des/ Salix/ Arctostaphylos*, Pinus *contorta/ Salix/* Calamagrosfis.

Productivity: Medium (BA = 22 m'lha, Total Volume = 122 m^3/ha, MAI = 1.65 m^3/ha/yr, Total Age = 74).

Community: *Populus tremuloides/Arctostaphylos*

Description: Dry sites at low elevation (700-900 m); the tree canopy provides 60-70% cover dominated by aspen; the shrub layers, other than kinnikinnick and sometimes rose, are usually thin to nonexistent; herb, moss and lichen layers are sparse.



Characteristic Species: Populus tremuloides. Arctostaphylos *uva-ursi.*

Associated Species: Picea giauca, Saiix spp., Rosa acicuiaris, Shepherdia canadensis, Epilobium angustiioiium. Pyrola spp., Linnaea borealis, Astragalus spp.. Lupinus arcticus, *Polytrichum* juniperinum, Peltigera spp.

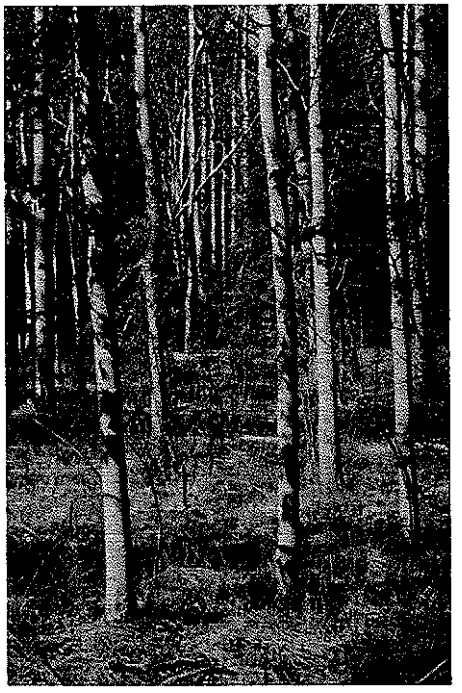
Landform/Soils: Well-drained, mostly coarse textured Regosols or Brunisols on gently to steeply sloping glaciofluvial and eolian materials.

Successional Status: A seral stage to Picea *glauca/Arctostaphylos* or one of its related communities.

Related Communities: Pinus *contorta/Arctostaphylos*, P. *contorta/* Vaccinium/*Hylocomium*, Picea *glauca/Calamagrostis-Festuca*, P. *glauca/Arcto*staphyios.

Productivity: Medium (BA = 24 m'lha, Total Volume = **123** m^3/ha, MAI = 1.56 m^3/ha/yr, Total Age = 79).

Community: *Populus tremuloides/* Arctostaphylos/ Calamagrostis



Description: Dry to mesic sites at low to mid elevations (700-1000 m); tree canopy provides 50-70% cover; usually the most noticeable understory vegetation consists of grasses with about 50% cover and kinnikinnick with about 20% cover, but included are stands that may have up to 30% cover by lingonberry; other vegetation layers are thin.

Characteristic Species: Populus tremuioides, Arctostaphyios uva-ursi, *Vaccinium* vifis-idaea, Caiamagrostis spp., Festuca altaica, Poaspp.

Associated Species: Picea giauca, *Pinus* contorfa, Saiix spp., Shepherdia canadensis, Linnaea borealis, Epiiobium *angustifolium*, Lupinus arcticus, Fragaria virginiana. Galium boreaie, *Lathyrus* spp., Solidago spp., Ceratodon *purpureus*, Poiytrichum juniperinum, *Peltigera* spp.

Landform/Soils: Well-drained, medium to coarse textured Brunisols on level to gently sloping glaciofluvial and eolian materials.

Successional Status: A seral Stage to Picea *glauca/Calamagrostis-Festuca* or P. *glauca/Arctostaphylos.*

Related Communities: In addition to those indicated above, Pinus confor*ta/Arctostaphylos/Calamagrostis*, Popuius *tremuloides/Arctostaphylos.*

Productivity: Medium (BA = 19 m^2/ha, Total Volume = 101 m^3/ha, MAI = 1.44 m^3/ha/yr, Total Age = 70).

Community: ***Populos tremuloides/ Vaccinium/*** Calamagrostis

Description: Mesic sites at low to mid elevation (700-1000 m); tree canopy provides 60-70% cover; tall and medium-height shrubs are poorly represented, but a low shrub layer provides 20% or more cover with lingonberry the most abundant shrub; grass is the most conspicuous herb; mosses and lichens are sparse.

Characteristic Species: Populus fremuloides, Vaccinium vitis-idaea. *Calamagrostis* spp., Poa spp., Festuca altaica, Bromus spp.

Associated Species: Picea glauca, Salix spp., Rosa acicularis, Ledum *groenlandicum*, Empetrum nigrum, Linnaea borealis, Shepherdia canadensis, *Geocaulon* lividum. Epilobium *angustifolium*, 'Zygadenus elegans, Corailorhiza triflda, Hylocomium splendens, Hypnum spp., Dicranum spp., Ciadina mitis, Peitigera spp.

Landform/Soils: Moderately well to well drained, medium-textured, gently to moderately sloping Brunisols on glaciofluviai and eolian materials.

Successional Status: A seral stage, probably lo Picea *glauca/Calamagrostis*-Festuca and then to P. *glauca/Hylocomium-Pleurozium* as the spruce canopy develops.

Related Communities: Popuius tremuloi*des/Shepherdia*, P. *tremuloides/ Arctostaphylos/Calamagrostis*, P. *tremuloides/Calamagrostis* and similar communities with Pinus conforta as principal tree species.

Productivity: Medium (no plot data, rating estimated from similar communities).

Community: ***Populos tremuloides/ Calamagrostis- Festuca***

Description: Dry sites: tree canopy cover may range from 40 to 70%; mid lo tall shrubs provide little cover, but low shrubs may be conspicuous; grass is the most prominent component of the ground vegetation; moss and lichen layers are sparse.

Characteristic Species: Populus tremuioides. *Calamagrostis* spp., Festuca *altaica*. Poa spp.. Bromus spp.

Associated **Species:** Picea glauca. Rosa acicularis. Salix spp., Ledum *groenlandicum*, Shepherdia canadensis. Empe*trum* nigrum. Vaccinium vifis-idaea. Linnaea borealis, Epilobium *angustifolium*, Geocauion lividum. Lupinus *arc*ficus, Equisetum scirpoides, Hyiocomi*um splendens*, Dicranum spp., Ciadina spp., Cladonia spp., Pelfigera aphthosa.

LandformlSoils: Moderately well to excessively drained, medium to coarse textured Brunisols on gently lo moderately sloping glaciofluvial, morainal or lacustrine materials.

Successional Status: A seral stage trending toward Picea *glauca/ Calamagrostis-Festuca* on coarser soils and *P. glauca/ Hylocomium-Pleurozium* on finer textures.

Related Communities: In addition to those indicated above, Popuius fremu*loides/ Calamagrostis/ Hylocomium*, P. *tremuloides/ Arctostaphylos/ Calamagrostis* and similar communities with Pinus conforta or Picea glauca as the primary species.

Productivity: Medium (BA = 15 m^2/ha, Total Volume = 77 m^3/ha, MAI = 1.52 m^3/ha/yr, Total Age = 51).

Community: ***Populus balsamifera/ Rosa/ Equisetum***

Description: Moist river floodplains that are flooded periodically: tree canopy provides 30-60% cover and mid to tall shrub layers consist of variable assemblages of willow, alder, red osier dogwood. high bush cranberry and soapberry with rose being the most consistently present; similarly. horsetail is the most consistent member of the herb layer providing up to 60% cover, though an assemblage of other species may be present and occasionally prominent; moss and lichen layers are virtually absent in many stands,

Characteristic Species: Populus balsamifera, Rosa acicularis, Equisetum spp.

Associated Species: Picea glauca, *Alnus* incana, Salix spp.. ***Cornus*** stolonifera. Viburnum edule, Shepherdla canadensis, Linnaea borealis. Epilobium *angustifolium*, Pyrola spp., Geocaulon lividum, Fragaria vlrginiana. Mertensia paniculata, Galium boreale.

LandformlSoils: Moderately well to well drained, medium-textured Regosols on level to gently sloping fluvial materials Subjected to periodic flooding.

Successional Status: A seral stage that eventually ends as Picea *glauca/* Hylocomium-Pleurozium.

Related Communities: Picea *glauca/ Equisetum*, *P. glauca/ Alnus incana/ Hylocomium*. P. *glauca/ Rosa/ Hylocomium*.

Productivity: High (BA = 40 m^2/ha, Total Volume = 272 m^3/ha, MAI = 2.33 m^3/ha/yr, Total Age = 117).

Discussion

Forest productivity

Of the variety of sites on which white spruce grows in the Lake Laberge Ecoregion, the highest productivities were measured on recent floodplains. These floodplains are subjected to intermittent flooding which adds nutrients and tends to warm the soil earlier in the spring than on non-flooded sites. The highest basal areas and total volumes occurred on these sites, though the MAI was not always the highest largely due to stand age (Appendix C). Some measured trees had diameters up to **61** cm and heights of 32 m at ages in excess of 150 years.

Old floodplains. occurring above normal flood levels, had somewhat lower productivity. Most of these sites had medium-textured, moderately well to well drained soils, but with adequate moisture derived largely from upslope runoff the productivity was often higher than on upland sites. Diameters up to 49 cm and heights of 28 m were measured on white spruce, but tree ages were usually less than on recent floodplains due to fires.

Upland sites have the widest range in white spruce productivity due to variability in Site conditions. White spruce had diameters up to 42 cm and heights to 23 m on moist, fine-textured sites. The productivity on drier, more coarse textured sites was somewhat lower. These sites are more susceptible to fires, consequently tree ages are mostly less than those on moist sites. Where black spruce occurred on upland sites, its productivity was usually less than white spruce. The lowest productivity of both black and white spruce occurred on sites perpetually wet during the growing season, such as sites with fine-textured material with poor drainage, sites with organic soils, and sites with near-surface permafrost. Basal area of about 15 m^2/ha and stand heights of less than 9 m were common on these sites.

Ail lodgepole pine stands measured were on upland sites. The basal area and volume of lodgepole pine on moist upland sites were comparable to those of white spruce on older floodplains, but the MAI was higher largely due to the lower age of lodgepole pine. On moist sites, lodgepole pine reached heights of 23 m. These upland sites were mostly on well-drained, medium to fine textured soils on morainal or lacustrine materials. Understories of ***Alnus*** crispa, Ledum groenlandicum, Vaccinium vitis-idaea and feathermoss are indicators of moist conditions. Communities with a dominance of Vaccinium vitis-idaea in the understory had consistently high productivities. Somewhat lower productivities were encountered on

dry upland sites. These sites have well to rapidly drained, coarse-textured soils on largely glaciofluvial materials, or occupy steep southerly aspects. Maximum tree heights were about 18 m and basal areas and volumes were 30-40% less than those on moist sites. Kinnikinnick, grass and lichen understories were most characteristic of dry sites.

Though alpine fir mostly occurred in subalpine areas, some stands occurred in mid to higher elevations of the Boreal montane. Very good productivity was found on a moderately sloping, east-facing, morainal blanket with moist, medium-textured soil. Diameters of 34 cm and heights of 26 m were measured, making these the largest alpine fir trees we have observed in Yukon. At high elevations, the productivity is much lower; basal areas of up to 20 m^2/ha and stand heights up to 10 m were among the best. Very open, krummholtz stands of alpine fir, white and black spruce and lodgepole pine were not measured as these sites have no forest potential.

Aspen occurs mostly on upland sites, but has a more uniform productivity than lodgepole pine on moist to dry sites. It most often occurs on fine to medium textured, moderately well to well drained soils where it has maximum diametersof 28 cm and heights of 17.5 m. The productivity is comparable to that of lodgepole pine on dry sites. Aspen also occurs on steep southerly exposures, but has low productivity. On these sites, disease often adds to the adverse climatic conditions resulting in deformed, stunted trees.

Balsam poplar rarely occurs in pure stands in this ecoregion, but competes with vigorous white spruce on recent floodplains. Diameters up to 38 cm and heights to 19 m place it among the larger trees in the ecoregion. Ages were up to 150 years.

Attempts at comparing the growth performance of one species on a range of sites or several species on one site type are complicated due to the lack of suitable site index and growth curves. Stand ages, densities and dominant species are exceedingly variable on any one site type that has extensive. disjunct representation within the ecoregion largely due to fires. The fact that lodgepole pine and aspen grow faster than white spruce in the early years after establishment is readily evident in many early seral stands, but later white spruce surpasses the pine and aspen.

Another unknown factor is the length of time required for a seedling to attain a "free to grow" height in early seral stands. This is primarily relevant to the determination of total age. Commonly, ages are determined at stump height (0.3 m) or breast height (1.3 m) with a correction factor used to relate to actual tree age. However, several factors influence the early development of tree seedlings, some of which are site related. Site index curves would allow more meaningful comparisons to be made among communities.

Vegetation Succession

There are two types of succession to be considered. Primary succession occurs on newly exposed materials suitable for plant growth, while secondary succession follows some catastrophic disturbance. Within the study area, the principal disturbance within the forest environment is fire. Other types of succession such as mining spoils, abandoned ploughed land, and logging, are of minor consequence and were not examined.

The most prevalent condition leading to primary succession is the exposure of recent alluvium brought about largely by alterations in drainage channels. The exposed material consists of silt or fine to coarse sand on gravel bars or banks on the subdued side of a shifting channel. Horsetails are commonly the first colonizers, followed by willow and/or grey alder and then by trees. Rose may also become a major constituent and will persist in periodically flooded tree stands. The first trees to become established are either balsam poplar or white Spruce. As the stand matures, white spruce eventually eliminates the balsam poplar. Feathermoss dominates the ground vegetation as light becomes restrictive for other species. This sequence is very similar to that reported by Viereck (1970) for the Chena River in Alaska. However, he reported further development brought about by development of permafrost and the replacement of white spruce with black spruce to form a climax of black spruce/sphagnum. This was not observed in the Lake Laberge Ecoregion, but it may be due to the young age of the stands found.

Secondary succession following fires assumes quite a different pattern, and varies according to several factors such as site conditions, size and timing of the fire, burn intensity, and status of the vegetation prior to the fire. Most natural fires in the Yukon occur from late spring to mid summer because of dry conditions and a higher incidence of lightning. On dry sites with open forest stands, fire can sweep through quite rapidly, particularly if aided by wind, killing the trees and surficial vegetation, but with limited penetration in the duff or soil. In denser forests, the fire may be more intense at ground level, but there is frequently a thicker layer of organic residue which may be sufficiently moist below the surface to protect the root systems of certain species. Even in large fires, tongues of unburned vegetation may be left along drainage channels or moist lower slopes; these then become a seed source for revegetation of the burn. Fire tends to induce suckering of willow and aspen, and to release the seed of mature lodgepole pine and black spruce where these were present prior to the fire.

Following fires in the early part of the year, the first noticeable vegetation is usually shoots from willow and alder stumps, and bulbous species if they were present. The more prominent herbs that become established during the first year include fireweed, which

either originates from seed or from runners, Corydalis spp. and geranium. Ceratodon purpureus, Polytrichum juniperinom and *Marchantia polymorpha* may be abundant. Lodgepole pine seeds may germinate in early fall of the year of the fire if adequate moisture is available.

A profusion of growth by shrubs and herbs occurs during the year following the fire. There is usually an influx of species not present the year of the burn; these nearly all grow from seed deposited by wind from adjacent areas, though some latent seed may germinate as well. Grass, at least on some sites, can become noticeable. The primary shrubs to dominate the vegetation are usually willow and alder. Aspen established from suckering the preceding year can put on up to a metre of growth on some sites. Some of the lodgepole pine seedlings originating the previous year become dessicated, but other seeds germinate. It seems to take two to three years for pine seedlings to get adequately established to allow profuse growth. Black spruce germination mostly occurs the year following fires, but some seeds may germinate the year of burn and others over a period of four to five years. Seedling growth is slow in comparison to pine.

During subsequent years, the initially invading species reach maturity and start to decline in vigor and areal coverage as new species capable of establishment and growth in a competitive environment gain control. Browsing, primarily perhaps by ungulates and rabbits, can have an influence on succession at this time. White spruce eventually becomes established, depending on seed availability and site conditions, though it may take 25 or more years.

On dry sites the rate of initial vegetation establishment and subsequent invasion of seral species can be very slow. Lichens, bryophytes and perhaps grass may constitute the early seral stages. Tree seeds may germinate virtually every year, but establishment only occurs when climatic and soil conditions are suitable. The species and seral stages on north aspects are frequently different than on south aspects because they tend to be cooler and more moist. On wet sites many species, especially those of low stature growing in organic matter, are little-affected by the fire.

Length of time between burns has a pronounced effect on the vegetation, especially trees. Lodgepole pine can produce cones in 10 to 12 years, but the viable seed at this stage is not adequate to regenerate a satisfactorily stocked pine stand. Normally, the trees would have to be at least 20 years old to produce adequate seed. Fires at short intervals are even more devastating to white spruce. This species requires about *25* years to produce cones, and probably about 50 years or more to produce a satisfactory amount of seed. Since fires can be repetitive and extensive, white spruce can be totally eliminated from large tracts of land, requiring seed depo-

sition from an outside source to get reestablished, unless there is latent seed from a previous stand. Perhaps this is why some current pine stands, especially those on dry sites where even young pine stands are susceptible to burning, have no white spruce regeneration.

The role played by the early colonizers following fire, though not addressed in this report, should not be underestimated. The existing forest cover and the status of current stands is dependent to some extent on the early seral species, as well as the conditions prior to and at the time of burn.

On excessively drained, coarse-textured soils, lodgepole pine is currently the principal tree species. Even after a century, white spruce regeneration may be virtually nonexistent; however, almost every such stand has a few white spruce trees. The duff layer on these sites is very thin, and mineral soil, a usual requirement for white spruce regeneration, is usually exposed. Seed dropped from the mature white spruce in the stand may germinate, but establishment requires favorable climatic conditions for at least two consecutive years. Since the white spruce invasion is extremely slow, and the stands often burn again before the spruce gets much of a foothold. lodgepole pine might be considered as a pyroclimax species on these sites. However, given sufficient time uninterrupted by fire, white spruce will become the dominant tree species.

Mesic to moist sites are more favorable for white spruce regeneration under either lodgepole pine or aspen. Frequently, white spruce becomes established at the same time or only shortly after the other species, but does not grow as fast during the early years. Subsequent to early stand development, white spruce may be the only species in the regeneration layer, or black spruce on moist and/or cool sites and alpine fir at higher elevations may be associated. Since virtually all current stands in the Lake Laberge Ecoregion are in some seral stage, the common situation is a mixture of species dominated by lodgepole pine or aspen during mid seral stages with white spruce, and sometimes black spruce and alpine fir, dominating the regeneration layers. Even the later seral stages where lodgepole pine and aspen have been eliminated are stili undergoing change. The build up of organic matter, resulting from a combination of lush undergrowth (whether by bryophytes or shrubs) and reduced temperatures causing delayed decomposition, hinders white spruce regeneration. As the organic material builds up, soil temperatures are reduced and growth of even established white spruce is slowed. Black spruce and alpine fir are aided by these conditions, not only because their seedlings can become established but also they are capable of layering as their lower branches become covered by organic debris.

The eventual climatic climax for a good portion of the study area

might be black spruce/sphagnum as indicated by Viereck (1970). The most likely initial sites for development of a black spruce/ sphagnum community would be on north aspects with fine to medium textured soils. It is not likely that such a community would ever develop on coarse-textured, excessively to rapidly drained, glaciofluviai soils under current climatic conditions. White spruce/ feathermoss will remain the most common climatic climax on these sites.

References

Atmospheric Environmental Service. 1982. Canadian climate normals, 1951-1960. Voi. 2 -Temperature, Vol. 3 - Precipitation, Vol. 4 -Degree Days. Can. Climate Prog., Atmos. Environ. Ser.. Environ. Can., Downsview, Ontario.

Bostock. H.S. 1965. Physiography of the Canadian Cordillera. with special reference to the area north of the fifty-fifth parallel. Can. Oept. Mines and Res.. Bureau of Geol. and Topogr., Geoi. Sur., Mem. 247.106 pp.+ maps.

Bostock, H.S. 1966. Notes on glaciation in central Yukon Territory. Dept. Mines and Tech. Sur., Geol. Sur. Can., Paper 65-36. 18 pp. + maps.

Bostock, H.S. and E.J. Lees. 1960. Laberge map area, Yukon. Dept. Mines and Tech. Sur., Geol. Sur. Can., Mem. 217.32 pp. + map.

British Columbia Forest Service. 1976. Whole stem cubic meter volume equations. B.C. For. Serv., For. Invent. Div. Mimeo. Tables.

British Columbia Forest Service. 1980. Forest service cruising procedures andcruise compilation. B.C. Min. of For. Mimeo. Publ.

Brown, R.J.E. 1976. Permafrost. Hydrological Atlas of Canada, Fish and Environ. Can., Ottawa. Plate 32.

Cain, S.A. and G.M. Castro. 1959. Manual of Vegetation Analysis. Harper & Brothers. Pubi., N.Y. 325 pp.

Canada Soil Survey Committee. 1978. The Canadian system of soil classification. Can. Dept. Agric., Publ. 1646. 164 pp.

Davies. D., C.E. Kennedy and K. McKenna. 1963. Resource inventory-southern lakes. Land Planning Br., Dept. Renewable Res., Gov. of Yukon. 151 pp. +Append. and maps.

Dilworth, J.R. and J.F. Bell. 1977. Variable probability sampling, Variable Plot and Three-P. O.S.U. Book Stores, Inc., Corvalis, Ore. 130 pp.

Dixon, W.J. and M.B. Brown. 1979. BMDP-79: Biomedical computer programs. Univ. of Calif. Press, Berkeley.

Hanson, H.C. and E.D. Churchili. 1964. The Plant Community. Reinhold Publ.Corp.N.Y.216. pp.

Harris, S.A. 1963. Comparison of the climatic and geomorphic methods of predicting permafrost distribution in western Yukon Territory. Proc. Fourth Intern. Conf. on Permafrost: 450-455. Fairbanks, Nat. Acad. Press, Washington.

Hughes, O.L., R.B. Campbell, J.E. Muller and J.O. Wheeler. 1969. Glacial limits and flow patterns, Yukon Territory, south of 65 degrees north latitude. Dept. Energy, Mines and Res., Geol. Sur. Can. Paper 68-34, 9 pp. + map.

Hughes, O.L.. V.N. Rampton and N.W. Rutter. 1972. Quaternary geology and geomorphology, southern and central Yukon (Northern Canada). Guidebook, Field Excursion A11, Internat. Geol. Cong.. 24th Session, 59 PP.

Manning, G.H., M.R.C. Massie and J. Rudd. 1984. Metric single-tree weight tables for the Yukon Territory. Can. For. Serv., Pac. For. Res. Cent., Inf. Rept. BC-X-250, 60 pp.

Massie, M.R.C., G.H. Manning and K.R. McCloskey. 1983. Metric single-tree total volume tables for the Yukon Territory. Can. For. Serv., Pac. For. Res. Cent., Inf. Rept. BC-X-242. 19 pp.

Mulligan. R. 1963. Geology of Tesiin map-area, Yukon Territory. Dept. Mines and Tech. Surv.. Geol. Surv. of Can., Mem. 326, 96 pp. + map.

Oosting, H.J. 1958. The Study of Plant Communities. Second edition. W.H. Freeman and Co., San Francisco. 440 pp.

Oswaid, E.T. and J.P. Senyk. 1977. Ecoregions of Yukon Territory, Fish and Environ. Can., Can. For. Serv., Pac. For. Res. Cent. Inf. Rept., BC-X-164, 115 pp.

Oswald, E.T. (compil.). 1979. Forest resource assessment of the Nisutiin Test Area. Environ. Can., Can. For. Serv.. Pac. For. Res. Cent., File Rept. 79 pp.

Oswald. E.T. and R.K. King. 1980. Vegetation classification and forest analysis of the Lake Laberge Ecoregion by remote sensing. Environ. Can., Can. For. Serv., Pac. For. Res. Cent., File Rept. 46 pp + maps.

Oswald, E.T., B.N. Brown and R.K. King. 1983. Vegetation, forest cover and fuelwood mapping in the Carmacks-Ross River Priority Area, Yukon Territory. Environ. Can., Can. For. Serv., Pac. For. Res. Cent., File Rept. 61 pp. + maps.

Rampton, V.N.. J.R. Ellwood and R.D. Thomas. 1983. Distribution and geology of ground ice along the Yukon portion of the Alaska highway gas pipeline. Proc. Fourth Intern. Cont. on Permafrost: 1030-1035. Fairbanks, Nat. Acad. Press, Washington.

Spartan Aero Ltd. 1970. Marsh Lake area, Yukon T.. Land capability for forestry. Spartan Aero Ltd., Calgary, Alberta. 1:125,000 map.

Stanek. W. 1980. Vegetation types and environmental factors associated with Foothills gas pipeline route, Yukon Territory. Environ. Can., Can. For. Serv.. Pac. For. Res. Cent., BC-X-205.48 pp.

Thompson, R.. R. Alfaro and G. Manning. 1984. Site index curves for lodgepole pine from southeastern Yukon. Environ. Can.. Can. For. Serv.. Pac. For. Res. Cent.. BC-X-247. 12pp.

Viereck, L.A. 1970. Forest succession and soil development adjacent to the Chena River in interior Alaska. Arctic and Alpine Res. 2: 1-26.

Wahl, H.E. (unpubl.). Draft of Climate of Yukon. Environ. Can., Atmos. Environ. Serv., Whitehorse, Y.T.

Westhoff. V. and E. van der Maarel. 1976. The Braun-Blanquet approach. pp. 287-399. In Whittaker, R.H. ed. Classification of Plant Communities. Dr. W. Junk bv Publ. The Hague, Boston. 408 pp.

Whittaker. R.H. (ed.) 1978. Classification of Plant Communities. Dr. W. Junk bv Publ. The Hague, Boston. 408 pp.

Wheeler, J.O. 1961. Whitehorse map-area, Yukon Territory. Dept. Mines and Tech. Surv., Geol. Surv. Can., Mem. 312. 156 pp. + maps.

Appendixes

Appendix A: **Temperature, precipitation and growing degree-days data for weather stations in Lake Laberge Ecoregion**

Appendix B: **Height/diameter equation coefficients**

Appendix C: **Tree species, forest site types and productivity**

Appendix D: **Vegetation communities and forest productivity**

Appendix E: **Glossary**

APPENDIX A. Temperature (°C), precipitation (mm) and growing degree-days data for weather Stations in Lake Laberge Ecoregian (Atmospheric Environment Service 1982)

Braeburn (8)[1] 61°30'N, 135°45'W Elev. 640m GDD[2] > 5°C = 611 MDT[2] –3.5 MATP[2] 259.6

	J	F	M	A	M	J	J	A	S	O	N	D
MD max	–19.4	–10.3	– 2.9	5.5	13.3	18.9	20.9	16.5	12.1	4.0	– 7.9	–17.2
MD	–25.1	–17.2	–10.8	–0.8	6.5	11.8	13.7	11.3	6.1	–1.1	–13.5	–22.8
MD min	–30.8	–24.1	–18.6	–7.0	–0.3	4.4	6.5	4.1	0.1	-6.2	–18.9	–27.9
MR	0.0	0.0	0.0	0.0	13.4	31.6	37.8	48.5	21.0	2.1	0.7	0.0
MS	20.6	11.1	11.5	5.0	4.7	0.6	0.0	***0.6***	4.4	7.5	13.7	14.6
MTP[3]	21.7	12.7	13.2	6.9	17.9	32.2	37.8	49.6	25.4	9.4	16.6	16.2

Carcross (8) 61°11'N, 134°34'W Elev. 661m GDD > 5°C = 788.7 MDT–1.4 MATP211.4

MD max	–15.1	– 7.7	– 1.6	5.6	11.5	16.7	18.9	17.9	12.3	5.1	– 3.9	–11.2
MD	–19.8	–13.2	– 6.3	–0.2	5.5	10.7	12.7	11.4	6.9	0.9	– 7.9	–15.5
MD min	–24.8	–18.7	–14.6	–5.9	–0.5	4.6	6.4	4.9	1.4	–3.2	–12.0	–19.8
MR	0.2	1.0	0.0	1.6	11.5	14.9	19.2	21.2	19.8	12.6	4.7	11.6
MS	24.2	17.8	10.2	4.3	0.3	0.4	0.0	0.0	2.4	4.6	18.2	18.7
MTP[3]	19.4	16.5	12.6	6.5	11.8	15.0	19.2	21.2	21.8	20.4	22.9	24.1

Carmacks (8) 62°06'N, 136°18'W Elev. 521m GDD > 5°C = 911.6 MOT–3.8 MATP254.3

MD max	–23.4	–13.0	– 3.1	6.8	14.4	20.1	21.7	19.6	13.2	3.0	– 9.7	–19.1
MD	–28.2	–19.4	–11.6	–0.1	7.1	12.5	14.5	12.4	8.7	–2.0	–13.6	–24.0
MD min	–33.1	–25.9	–20.1	–7.0	–0.3	4.9	7.3	5.1	0.2	-6.8	–17.6	–28.8
MR	0.0	0.0	0.2	0.7	12.9	37.5	42.3	34.8	23.3	5.5	0.7	0.0
MS	17.6	10.7	9.4	7.1	1.6	0.0	0.0	0.0	1.3	12.6	17.1	17.2
MTP[3]	16.4	12.5	10.6	7.2	15.5	37.4	42.3	34.1	25.1	17.7	16.6	14.9

Drury Creek (8) 62°12'N, 134°23'W Elev. 609m MOT–2.5 MATP349.4

MD max	–16.5	–10.1	– 2.6	***6.5***	13.6	19.3	21.1	16.8	13.2	4.0	– 6.0	–14.2
MD	–23.7	–16.5	– 9.9	0.0	6.6	12.1	14.3	11.8	***6.6***	–0.8	–11.1	–19.7
MD min	–26.9	–22.9	–17.3	-6.6	–0.4	4.7	7.5	4.6	0.5	***-5.6***	–16.1	–25.4
MR	0.0	0.3	0.1	1.3	12.1	27.8	41.7	33.2	38.7	14.0	13.3	0.4
MS	25.0	29.5	21.9	15.0	1.4	0.1	0.0	0.0	***0.6***	17.2	28.8	**35.9**
MTP[3]	25.6	29.3	23.0	15.8	13.7	28.0	41.7	33.2	38.6	31.3	32.9	36.1

Haines Junction (1) 60°45'N, 137°35'W Eiev. 599m GDD > 5°C = 679.6 MOT–3.2 MATP292.5

MD max	–17.0	***-6.0***	– 1.9	5.9	12.6	16.1	19.9	18.5	13.1	4.5	***-6.5***	–14.7
MD	–22.9	–15.6	–10.0	–0.6	5.4	10.3	12.5	10.8	6.2	–1.3	–12.2	–20.5
MD min	–28.6	–23.1	–16.1	–7.1	–1.9	2.5	5.0	3.0	–0.9	–7.1	–17.8	–26.2
MR	0.6	0.6	0.3	1.2	11.6	29.1	38.3	28.8	26.9	13.4	4.0	2.6
MS	22.5	16.4	10.1	6.9	3.4	0.0	0.0	0.1	***0.5***	19.7	31.1	30.0
MTP[3]	21.9	15.9	9.5	7.6	14.9	29.1	38.3	28.9	29.4	33.1	34.1	31.6

(Cont'd)

APPENDIXA. Cont'd

	J	F	M	A	M	J	J	A	S	O	N	D
Johnson's Crossing (8) 60°29'N, 133°18'W Elev. 690m **GDD>5°C** = 780.1 MDT–2.0 MATP353.8												
MD max	–17.4	– 8.8	– 1.8	5.9	13.1	18.7	20.3	18.3	12.4	4.3	**– 5.9**	–13.3
MD	–22.3	–14.6	– 8.6	-0.6	6.1	11.0	13.1	11.5	6.9	0.2	– 9.6	–17.6
MD min	–27.0	–20.3	–15.3	-6.8	–1.1	3.3	**5.9**	4.7	1.3	–3.9	–13.1	–21.8
MR	0.0	0.2	0.0	0.8	15.5	28.6	44.4	46.0	38.9	18.4	2.4	0.2
MS	22.5	17.8	19.3	8.4	1.5	0.0	0.0	0.0	2.8	15.4	**31.2**	33.5
MTP[3]	24.4	18.9	19.9	9.4	17.1	28.6	44.4	46.0	**39.9**	33.9	35.7	35.9
Teslin (2) 60°10'N, 132°45'W Elev. 701m **GDD>5°C** = 791.2 MDT–1.8 MATP326.5												
MD max	–16.8	– 8.3	– 2.1	**5.3**	12.2	17.9	19.8	18.1	12.5	4.6	– 5.4	–12.7
MD	–21.6	–13.9	– 8.4	**-0.5**	5.8	11.1	13.4	11.8	7.0	0.4	**-9.3**	–17.0
MD min	–26.4	–19.6	–14.7	-6.2	-0.7	4.4	6.9	5.5	1.5	–3.7	–13.2	–21.3
MR	0.2	0.3	0.3	1.7	14.7	26.7	38.1	36.6	34.5	14.6	1.7	0.5
MS	29.9	20.5	23.1	10.6	2.4	0.1	0.0	T	2.2	17.9	26.4	31.6
MTP[3]	27.7	19.6	22.5	11.9	17.1	27.0	38.1	**36.6**	36.7	32.5	26.0	30.6
Whitehorse Airport (1) 60°43'N, 135°04'W Elev.694 **GDD>5°C** = 897.2 MDT–1.2 MATP261.2												
MD max	–16.4	– 8.3	– 2.3	**5.6**	12.7	16.4	20.3	18.4	12.4	4.4	– 5.3	–12.5
MD	–20.7	–13.2	– 8.2	0.3	6.7	12.0	14.1	12.5	7.5	0.6	– 8.8	–16.6
MD min	–25.0	–18.1	–14.0	-5.1	0.6	**5.5**	7.9	6.5	2.6	–3.1	–12.3	–20.7
MR	T	T	T	0.8	10.1	29.8	33.9	37.0	25.9	6.7	1.1	0.2
MS	21.3	15.2	16.4	10.5	2.9	0.9	0.0	0.8	4.5	16.1	23.8	24.2
MTP[3]	17.7	13.3	13.5	9.5	12.9	30.7	**33.9**	37.9	**30.3**	21.5	19.8	20.2
Whitehorse Riverdale (8) 69°42'N, 135°02'W Elev. 641m **GDD>5°C** = 959.8 MDT–1.0 MATP261.7												
MD max	–16.1	– 7.0	– 0.6	7.4	13.9	19.5	21.4	19.5	13.4	5.5	– 5.4	–12.7
MD	–20.9	–12.9	– 7.4	1.0	6.7	12.1	14.5	12.6	–7.8	1.3	– 9.4	–17.1
MD min	–25.5	–18.7	–14.3	–5.5	-0.6	–4.6	–7.2	**-5.6**	–2.1	–3.0	–13.3	–21.5
MR	0.0	0.0	0.3	1.4	**9.3**	33.2	33.6	36.3	20.7	7.3	1.6	0.2
MS	19.5	10.8	13.7	7.9	0.6	0.7	0.0	0.0	2.8	9.3	16.4	18.3
MTP[3]	21.6	12.1	15.4	12.2	11.1	**33.9**	**33.6**	35.2	25.1	17.5	23.6	20.4

[1] 1 = **30 years or more** data, 2 = 25 lo 29 years data, 8 = adjusted normals based an 5 to 19 years inclusive, and otheravallabledata.

[2] GDD = Growing degree-days. MDT = Mean daily temperature. MATP = Mean annual total precipitation, MD max = Mean daily maximum temperature, MD = Mean daily temperature, MD min = Mean daily minimum temperature, MR = Mean monthly rainfall, MS = Mean monthly snowfall, MTP = Mean monthly total precipitation

[3] The explanation for mean monthly total precipitation not equating the combination of mean rainfall plus mean snowfall given by AES (1982) is "At ordinary climatological stations. the water equivalent of the snowfall is Obtained by simply dividing the amount of snow by 10. At principal climatological stations equipped with a shielded Niphergauge, it is measured after melting the contents. Total precipitation is recorded as rainfall plus the measured water equivalent of the snowfall, while the snowfall is recorded as the depth of hewly fallen snow. In addition, there are a few stations Operated by provincial agencies which are not equipped with a Nipher gauge yet observe the water equivalent of fresh snowfall. At these stations as well as those equipped with a Nipher gauge, the accumulated total of rainfall plus snowfall will not necessarily equal the precipitation total."

APPENDIX B: Height/diameter equation coefficients

$Y = a + bX + cX^2$ where Y = Height (m), X = Diameter (cm), and a, b, c are regression coefficients.

Tree species	Site type	Equation coefficients a	b	c	No. of sample trees	r^2	S.E.	Valid[1] diameter range (cm)
Alpine fir	High elevation	-0.30608	0.73694	-0.00552	54	0.89	1.31	7-28
Alpine fir	Moist upland[2]	4.14468	0.86429	-0.00661	19	0.62	1.77	12-34
White spruce	Recent fluvial	3.57208	0.92796	-0.00623	76	0.91	1.44	10-58
White spruce	Old fluvial	2.41147	1.02338	-0.01158	107	0.88	1.46	6-44
White spruce	Upland	0.46437	1.04979	-0.01324	323	0.95	1.26	3-40
Spruce[3]	Wet or organic	0.39688	0.88415	-0.01223	163	0.88	1.13	4-36
Lodgepole pine	Moist upland	-1.37612	1.66921	-0.03367	190	0.82	1.56	8-25
Lodgepole pine	Dry upland	0.30784	1.07107	-0.01879	325	0.88	1.23	4-29
Trembling aspen	Upland	0.60862	1.32281	-0.02957	213	0.91	1.18	4-22
Balsam poplar	Recent fluvial[3]	4.08435	1.01313	-0.01723	18	0.95	0.60	10-29

[1] Equations are only valid for the range of diameters used in their construction. After the high diameter in the range is reached the equation will decrease the height.
[2] Very limited number of sample trees, equations only valid for the plots involved.
[3] Equation is good for both black and white spruce. On these poor sites their growth characteristics are similar.

APPENDIX C: Tree species, forest site types and productivity

Tree species	Site type	No. of plots	No. of trees /ha	Basal area (m^2/ha)	Total[1] volume (m^3/ha)	Total oven-dry[1] weight (t/ha)	Stand age	BA[1] avg. dia. (cm)	BA[1] avg. Ht. (m)	MAI[1] (m^3/ha/yr)
Alpine fir	Upland	2	2010	43	327	—	120	16.6	18.5	2.7
Alpine fir	Subalpine	8	1000	18	96	—	156	15.2	9.6	0.6
White spruce	Recent floodplains	11	1240	45	368	244	163	21.6	19.8	2.3
White spruce	Old floodplains	19	2190	34	218	140	121	14.1	14.5	1.8
While spruce	Upland	50	1720	29	166	107	130	14.7	13.1	1.3
Black or white spruce	Wet or organic	24	1500	14	53	39	158	10.8	8.5	0.3
Lodgepole pine	Moist upland SI = 17.1	33	2710	33	245	133	83	12.5	14.2	3.0
Lodgepole pine	Dry upland SI = 12.8	45	1920	22	134	73	92	12.0	10.5	1.5
Trembling aspen	Upland	35	1840	20	107	62	68	11.8	12.1	1.6
Balsam poplar	Recent floodplains	2	1490	40	272	—	117	18.5	18.9	2.3

[1] See end of Appendix D for meaning.
[2] BA avg ht = Average height for trees of average basal area.

APPENDIX O: Vegetation communities and forest productivity

Vegetation community	No. of plots	No. of trees /ha	Basal area (m^2/ha)	Total volume (m^3/ha)	Total oven-dry[2] weight (t/ha)	stand age	BA[3] Avg. dia. (cm)	MAI[4] (m^3/ha/yr)
Abies lasiocarpa/Alnus crispa/Hylocomium		1760	50	388	—	126	19.0	3.1
Abies lasiocarpa/Betula-Empetrum/Cladina	3	760	14	72	—	147	15.3	0.5
Abies lasiocarpa/Ledum/Hylocomium	1	2250	37	266	—	113	14.4	2.4
Abies lasiocarpa/Hylocomium-Pleurozium	2	1280	19	83	—	176	13.7	0.5
Abies lasiocarpa/Cetraria-Cladina	1	1410	19	89	—	169	13.2	0.5
Picea glauca-Abies lasiocarpa/Betula-Ledum/ Hylocomium	2	900	24	147	—	145	18.5	1.0
Picea glauca/Alnus incana/Hylocomium	1	720	21	131	86	221	19.4	0.6
Picea glauca/Betula/Cetraria	1	970	14	89	55	287	13.5	0.3
Picea glauca/Betula-Salix (upland)'	3	1040	32	208	138	107	19.8	2.0
(wet or organic)	2	840	19	88	63	186	16.8	0.5
Picea glauca/Salix/Hylocomium (upland)	3	840	24	153	102	179	19.2	0.9
(wet or organic)	2	670	22	106	74	152	20.2	0.7
Picea glauca/Ledum/Hylocomium (recent floodplain)	1	1500	67	544	384	210	23.8	2.6
(upland)	2	690	27	187	123	153	22.3	1.2
Picea glauca/Rosa/Hylocomium (recent floodplain)	2	790'	48	444	305	194	28.0	2.3
(old floodplain)	1	3360	27	134	80	86	10.1	1.6

(Cont'd)

APPENDIX D: Cont'd

Vegetation community		No. of plots	No. of trees /ha	Basal area (m^2/ha)	Total volume (m^3/ha)	Total oven-dry weight (t/ha)	stand age	BA[3] Avg. dia. (cm)	MAI[4] (m^3/ha/yr)
Picea glauca/Empetrum/Peltigera		2	1090	14	72	46	65	12.8	1.1
Picea glauca/Arctostaphylos-Calamagrostis		3	1430	26	152	92	84	15.1	1.8
Picea glauca/Calamagrostis/Hylocomium		5	2430	33	187	118	128	13.2	1.5
Picea glauca/Equisetum/Hylocomium		3	1390	46	346	228	148	20.5	2.3
Picea glauca/Hylocomium	(recent floodplain)	6	1240	45	337	223	148	21.4	2.3
Pleurozium	(old floodplain)	13	1980	34	220	140	125	14.8	1.8
	(Upland)	23	1970	33	185	120	132	14.5	1.4
Picea glauca/Cladina		6	1510	24	130	83	103	14.1	1.3
Pinus contorta/Alnus crispa/Hylocomium	SI" = 19	5	2350	30	245	133	79	12.7	3.1
Pinus contorta/Shepherdia/Hylocomium	SI = 12	2	2500	43	290	163	174	14.9	1.7
Pinus contorta/Betula/Festuca	SI = 14	5	860	18	138	75	106	16.1	1.3
Pinus contorta/Betula/Hylocomium	SI = 17	1	1440	43	410	224	137	19.6	3.0
Pinus contorta/Salix/Calamagrostis	SI = 25	1	3930	33	183	99	31	10.4	5.9
Pinus contorta/Ledum-Empetrum/ Hylocomium	SI = 16	7	2620	36	269	146	96	13.2	2.8
Pinus contorta/Ledum-Vaccinium vitis-idaea	SI = 20	2	3550	25	129	71	38	9.8	3.4

(Cont'd)

APPENDIX D: Cont'd

Vegetation community		No. of plots	No. of trees /ha	Basal area (m^2/ha)	Total[1] volume (m^3/ha)	Total oven-dry[2] weight (t/ha)	stand age	BA[3] Avg. dia. (cm)	MAI[4] (m^3/ha/yr)
Pinus contorta/Linnaea- (Moist)	SI = 19	4	2670	30	213	117	57	11.9	3.7
Vaccinium vitis-idaea (Dry)	SI = 12	3	1610	26	168	90	111	14.2	1.5
Pinus contorta/Vaccinium vitis-idaea /Hylocomium	SI = 18	3	2890	38	311	168	73	13.0	4.3
Pinus contorta/Vaccinium uliginosum /Cladina	SI = 13	3.	1530	24	173	96	103	14.1	1.7
Pinus contorta/Arctostaphylos	SI = 12	8	2350	22	124	66	95	10.9	1.3
Pinus contorta/Arctostaphylos /Calamagrostis	SI = 14	10	1512	19	118	64	88	12.6	1.3
Pinus contorta/Calamagrostis-Festuca	SI = 14	11	2150	24	151	82	82	11.9	1.8
Pinus contorta/Hylocomium-Pleurozium	SI = 15	5	3460	32	201	110	88	10.9	2.3
Pinus contorta/Cladina	SI = 13	7	2380	24	151	82	102	11.4	1.5
Pinus contorta-Picea mariana/Peltigera	SI = 19	1	1540	10	47	27	34	9.1	1.4
Populus tremuloides/Shepherdia		4	1800	23	129	74	88	12.9	1.5
Populus tremuloides/Salix/Linnaea		1	1840	55	332	195	127	19.5	2.6
Populus tremuloides/Salix/Arctostaphylos		1	1620	18	100	59	68	12.0	1.5
Populus tremuloides/Salix/Calamagrostis		3	1500	22	122	70	74	13.6	1.7

(Cont'd)

APPENDIX D: Cont'd

Vegetation community	No. of plots	No. of trees /ha	Basal area (m^2/ha)	Total[1] volume (m^3/ha)	Total oven-dry[2] weight (t/ha)	stand age	BA[3] Avg. dia. (cm)	MAI[4] (m^3/ha/yr)
Populus tremuloides/Arctostaphylos	5	2550	24	123	71	79	109	1.6
Populus tremuloides/Arctostaphylos/Calamagrostis	10	1620	19	101	59	70	12.2	1.4
Populus tremuloides/Calamagrostis-Festuca	9	1640	15	77	45	51	10.3	1.5
Populus balsamifera/Rosa/Equisetum	2	1490	40	272	—	117	16.5	2.3
Picea glauca-Picea mariana (Upland)	1	2650	20	a7	**55**	117	9.8	0.7
/Hylocomium-Cladina (Wet or organic)	1	1630	18	73	56	173	12.0	0.4
Picea glauca-Picea mariana/Betula/Hylocomium	2	1230	23	105	70	170	15.5	0.6
Picea glauca-Picea mariana/Salix/Cladina	1	910	5	14	10	57	6.1	0.2
Picea glauca-Picea mariana/Ledum/Aulacomnium	7	1370	12	5	32	206	10.6	0.2
Picea glauca-Picea mariana/Salix/Aulacomnium	1	1360	10	34	28	115	9.7	0.3
Picea mariana-Picea glauca/Salix myrtillifolia	1	3510	47	237	151	149	13.0	1.6
Picea mariana/Ledum-Betula	3	1110	12	47	34	171	11.6	0.3
Picea mariana/Ledum/Hylocomium	4	1990	13	45	36	121	9.3	0.4
Picea mariana/Ledum/Cladina	4	1630	14	60	46	107	10.0	0.6
Picea mariana/Hylocomium- (Wet or organic)	2	1560	16	74	51	167	12.3	0.4
Pleurozium (Old floodplain)	1	4520	32	157	115	90	9.4	1.6

[1] Total volume = Total volume inside bark of the whole stem.
[2] Total oven-dry weight = Total oven-dry weight of all above-ground tree components.
[3] BA AVG DIA = Diameter of the tree of average basal area.
[4] MAI = Mean Annual Increment based on total volume divided by stand age.
[5] When a vegetation type occurs on more than one broad site type, plots are split by site type
[6] SI = Site index at age 100.

Appendix E: Glossary

Ablation: the combined processes by which a glacier wastes; includes evaporation and melting of snow and ice.

Alluvium (alluvial): a general term for all detrital deposits resulting from the operations of modern rivers; includes sediments laid down in river beds, flood plains, lakes, fens and estuaries.

Boreal montane: of. relating to, or located in northern mountains; refers primarily to the zone between the valley floor and the subalpine zone.

Brown mosses: a group of bryophyte species growing in moist, usually forested, environments of which Tomenihypnum niiens, Aulacomnium turgidum. A. *palustre*, *Drepanocladus uncinatus* and Brachythecium spp. are principal members.

Brunisols: soils with weak horizon development, but with some accumulation of clay, iron and aluminum in a Bm horizon.

Dystric Brunisols are acid without a well-developed mineral-organic surface horizon.

Eutric Brunisois have a relatively high degree of base saturation as indicated by a near neutral pH and lack a well-developed mineral-organic surface horizon.

Climax: Climatic climax: a stable vegetation association in equilibrium with a regional climate representing the end point of a successional sequence.

Edaphic climax: a relatively stable vegetation association under the influence of some soil characteristic overriding the regional climate.

Topographic climax: a relatively stable vegetation association influenced by Some topographic factor. mainly steepness or aspect of slope, that overrides the regional climate.

Topoedaphic climax: both soil and topographic characteristics override the regional climate.

Pyroclimax: a relatively stable vegetation association prevented from reaching the climatic climax stage because of the frequency of fires.

Cryosols: soils developed in mineral or organic materials with near-surface permafrost.

Turbic Cryosols developed primarily in mineral material and have marked evidence of cryoturbation (churning).

Dry permafrost: perennially frozen soil or rock without ice or with an ice content lower than the pore volume *so* that it does not yield excess water on thawing.

Eolian: mineral deposits arranged by the wind, as sand along shores; deposits which are due to the transporting action of the wind.

Feathermoss: a group of bryophyte species, usually in forested environments of which Hyiocomium splendens, Pleurozium schreberi, *Ptilium* crista-castrensis and Abietineila abietina are principal members.

Fluvial: of or pertaining to rivers; produced by river action.

Glaciofluvial: pertaining to streams flowing from glaciers or to the deposits made by such streams.

Gleysols: soils with features indicative of periodic or prolonged saturation with water and reducing conditions; usually associated with a high water table at some period of the year or temporary saturation above a relatively impermeable layer.

Graminoid: grass-like, pertains to a group of herbaceous species of which sedges, rushes, and cottongrasses are principal members.

Lacustrine: produced by or belonging to lakes; of, or pertaining to, or formed or growing in, or inhabiting, lakes.

Luvisols: soils commonly in fine-textured, weii to imperfectly drained materials, generally with a light-colored, eluvial horizon and an illuvial B horizon.

Moisture Regime: the annual fluctuation in soil and ambient air moisture influenced by precipitation, evapotranspiration. insolation and ground water movement.

Dry: a moisture deficit occurs during 50% or more of the growing season.

Mesic: a moisture deficit occurs during 15-50%of the growing season.

Moist: a moisture deficit occurs at short intervals and, in total, for less than 15%of the growing season.

Wet: a moisture deficit never, or rarely, occurs during the growing season.

Moraine: drift, deposited chiefly by direct glacial action, and having constructional topography independent of control by the surface on which the driftlies.

Organic soils: soils with a Surficiai layer of plant remains that must be 60 cm deep if the material is only partially decomposed, or at least 40 cm deep if moderately to well decomposed.

Productivity terms:

BA: basal area: total area in square metres per hectare of the cross-Section at breast height of all the trees.

Total Volume: volume of the main stem, including stump and top in cubic metres per hectare of all the trees.

MAI: mean annual increment, average annual increment in $m^3/ha/yr$ calculated by dividing total volume by total age.

Total Age: number of years elapsed since germination of the seed; estimated by determining the age at 0.3 m and adding a factor for years to reach 0.3 mas calculated in northern British Columbia.

Note: rating terms, high, medium, and low. are relative to the Yukon only: see Canada Land inventory rating for relating Yukon trees to other parts of Canada.

Propagules: refers to virtually any structure capable **of** reproducing a plant, e.g., cuttings, seeds, spores, root stalks. and rhizome segments.

Regosols: young soils with horizon development too weak to meet the requirements of any other soil order.

Seral: **of,** relating to, or constltutingone of a series of ecological communities that succeed one another leading to a climax.

Shrub heights:
tall ---------- > 1.5 m
mid ---------- 0.5-1.5 m
low ---------- 0.2-0.5 m
dwarf ---------- < 0.2 m

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