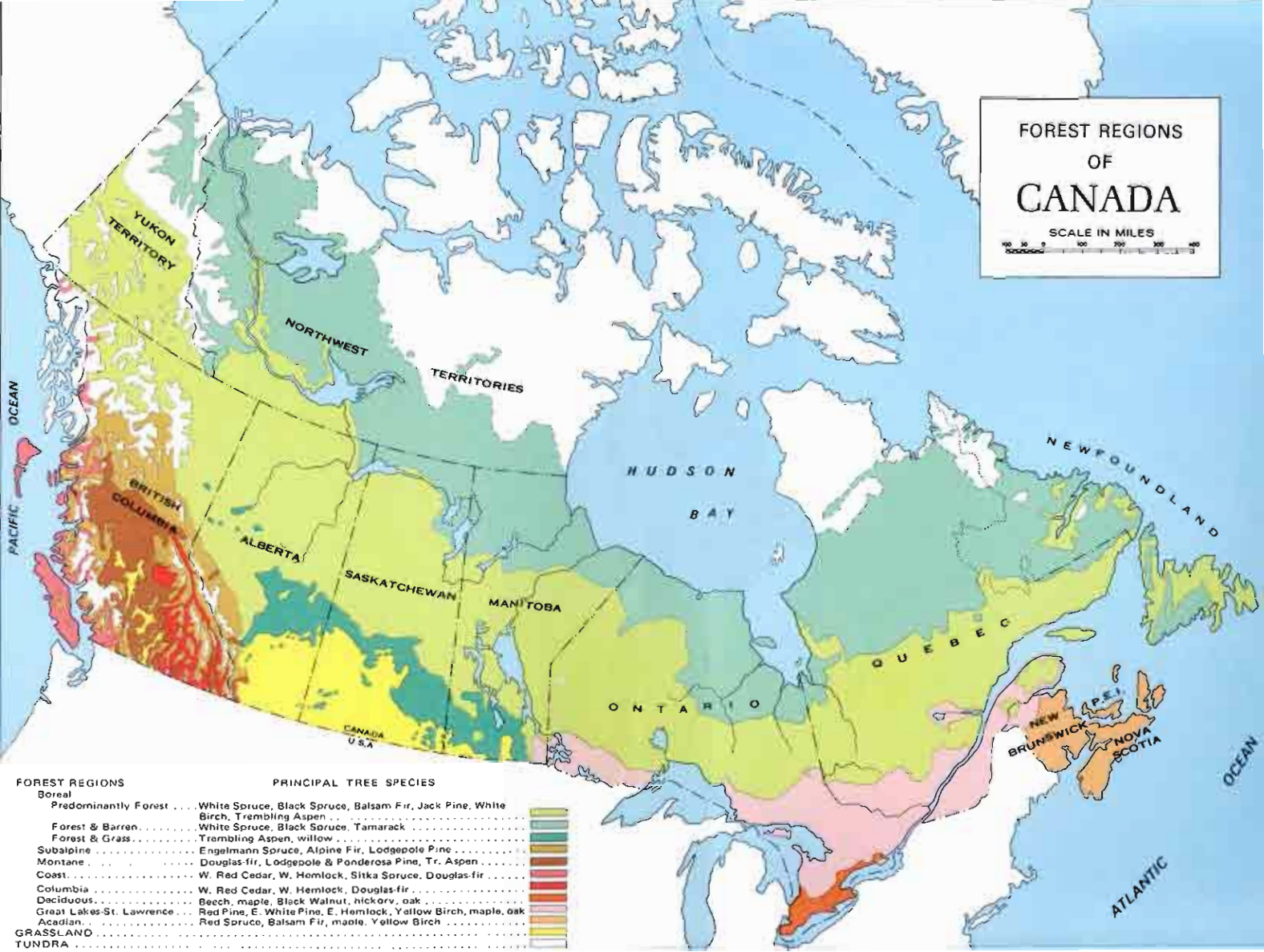
Forest Regions of Canada

by J. S. Rowe



FOREST REGIONS	PRINCIPAL TREE SPECIES
Boreal	
Predominantly Forest	White Spruce, Black Spruce, Balsam Fir, Jack Pine, White Birch, Trembling Aspen
Forest & Barren	White Spruce, Black Spruce, Tamarack
Forest & Grass	Trembling Aspen, willow
Subalpine	Engelmann Spruce, Alpine Fir, Lodgepole Pine
Montane	Douglas-fir, Lodgepole & Ponderosa Pine, Tr. Aspen
Coast	W. Red Cedar, W. Hemlock, Sitka Spruce, Douglas-fir
Columbia	W. Red Cedar, W. Hemlock, Douglas-fir
Deciduous	Beech, maple, Black Walnut, hickory, oak
Great Lakes-St. Lawrence	Red Pine, E. White Pine, E. Hemlock, Yellow Birch, maple, oak
Acadian	Red Spruce, Balsam Fir, maple, Yellow Birch
GRASSLAND	
TUNDRA	

Canadian Forestry Service
Department of the Environment

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Based on W. E. D. Halliday's
"A Forest Classification
for Canada" 1937

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Foreword

Forest Regions of Canada provides a general description of the forest geography of this land, from the east to west coasts and from the USA borders to the arctic and alpine tundra. Previous editions were those of 1937 when W. E. D. Halliday published "A Forest Classification for Canada" and of 1959 when the title "Forest Regions" was adopted and the map refined to its present form.

In this latest edition, a new text supersedes that of 1959 although the map is unchanged. The revision is not a major one; it updates available information and corrects certain inaccuracies of the earlier editions. Increased ecological knowledge has refined many of the areal descriptions, while taxonomic studies have introduced a number of new tree names.

As in previous editions, descriptive data on soils, geology and climate are included in text and appendices. Maps have been added to this material showing aspects of climate and physiography which have particular ecological relevance to Canadian forest types and their distributions.

Contents

Introduction

The first notable description of Canadian forests on a national scale was W.E.D. Halliday's "A Forest Classification for Canada" published in 1937[1], a work whose merit won it immediate acceptance and brought it into widespread use as a standard reference. This work was brought up-to-date by the present author in 1959[2] who at that time maintained in essence the framework of the original although introducing some innovations. For example, many changes were made in the placement of boundary lines in an attempt to refine the forest divisions. In areas of forest diversity a number of new Sections were recognized and the forests of Newfoundland were described for the first time within the Boreal Forest Region.

The revision of the map was largely the work of W. G. E. Brown, formerly with the Canadian Forestry Service, and in this task he received information and advice from many sources. The present edition represents a minor revision; it updates available information and corrects certain inaccuracies that have occurred in previous editions.

A treatise such as this, professing to describe the vegetation of the greater part of Canada, is likely to be used as a reference for many different purposes. Accordingly, a brief discussion of the underlying rationale may forestall some misconceptions and errors of interpretation.

First, it should be pointed out that the parent publication, like the present one, was devoted to a geographic description of the forests; it outlined their areal distribution and was not a classification in the usually accepted sense. The phrase "Forest Classification" is apt to be misinterpreted, suggesting as it does the provision of a system of purely vegetative categories based on consistently applied criteria, and the change to "Forest Regions" removes this implication while expressing more aptly the purpose.

Halliday's primary division of the forestland was into "Regions" which were equated with the "Climaxes" of F. E. Clements (1928) and were similarly described as stable, climatically controlled formations characterized by the presence of certain tree species, the climax dominants. For the most part, the Regions are the obvious large units of forest description that all field workers recognize. They are geographic entities, and their status is not weakened by the contemporary loss of faith in climatic climaxes. The sub-divisions of the Regions—the Forest Sections—were necessary for a refinement of the descriptions. As Halliday expressed it: "More detailed study of the Forest Region shows, in many cases, the possibility and advisability of distinguishing within the whole very definite areas, often of considerable extent, which are marked by the consistent presence of certain associations, and which show, in the mass, a character differing from other parts of the Region."[3] In the above quotation the term "association" is to be interpreted simply as a recurring community of one or more tree species.

The general purposes of areal forest description are satisfied by such an approach, although charges of arbitrariness cannot be denied. Observably different areas — the Sections — are blocked out, then described and defined relative to one another. Herein lies the reason for the notable lack of consistency in the use of criteria for the definition of the Sections; as more or less obvious geographical entities they have been identified first, then the criteria to define them have been selected secondarily. The approach is justified on practical grounds, for while division of the

[1]Forest Service Bulletin 89. Canada, Department of Mines and Resources.

[2]Rowe, J. S. Forest Regions of Canada. Canada, Department of Northern Affairs and National Resources, Forestry Branch, Bulletin 123.

[3]Op. cit., p. 11.

forest according to the strict application of selected criteria would provide a logical classification on paper, attempts to use such a system for physical division of the forestlands over the length and breadth of Canada would certainly prove impractical.

An alternative to the provision of geographical Forest Sections by a process of division "from above" would be their synthesis "from below". If detailed information at a large scale were available concerning the forest vegetation and the land it occupies, and if ecological knowledge were sufficient for an understanding of the relationships between the two, then it might be possible to combine similar or related forestland units, or patterns of forestland units, into larger wholes for purposes of generalization and description. Unfortunately, the information necessary to carry this method through to a successful conclusion does not exist, except perhaps locally, in Canada; the only feasible approach is "from above".

In this publication the units of forest description are much the same as those used by Halliday, though a redefinition of terms is required. The Forest Region is conceived as a major geographic belt or zone, characterized vegetationally by a broad uniformity both in physiognomy and in the composition of the dominant tree species. It corresponds to the concrete forest "formation" as generally understood, but without the classic ecological implications. Particularly is the idea of a direct cause-effect relationship between present climate and Forest Regions (or their segments) disavowed. The relationships that doubtless exist between climate and vegetation remain to be demonstrated in any particular area, with full awareness of the inter-related influences of all other components of the environment, past as well as present.

The Forest Section is a subdivision of the Region, conceived as a geographic area possessing an individuality which is expressed relative to other Sections in a distinctive patterning of vegetation and of physiography. It is a unit of convenience for forest description which, because of the scale of the map, is usually large in areal extent and, inevitably, more or less heterogeneous. Wherever the forests and land are extremely variable over short distances, one Section or another must include this variability. Hence many unions of quite different forestlands are forced, which at a larger scale would not be maintained.

The criteria appropriate for description of the boundaries of the Sections are the macrofeatures of vegetation: the distribution and range of conspicuous tree species, their lifeforms (broadleaved or needle-leaved), the physiognomy and relative areal extent of the communities in which they are associated, and the patterning of the total vegetation. At the small scale, boundaries drawn on the basis of these criteria are often coincident with major physiographic features which therefore serve a useful purpose as supplemental criteria for delimiting the Forest Sections.

The core of each Section is described in terms of the major tree species and of the cover types that they form, relatively more emphasis being given to the stable associations than to those resulting from recent fires and from exploitation of the forest. As detailed descriptions of forest types and of their comparative areal extents are not compatible with the purpose (broad description) and scale (1 inch equals 100 miles), these should not be looked for in the text. An attempt has been made to indicate what forests were present historically as well as what prevails now. Tree names are those used in "Native Trees of Canada", Canada Department of Fisheries and Forestry, 7th edition, 1969, and follow Little's "Check List of Native and Naturalized Trees of the United States (including Alaska)", issued by the U.S. Department of Agriculture

in 1953 as Agriculture Handbook No. 41. Only the common names have been used in the text, the corresponding botanical names will be found in the list following the main text. In each Forest Section a few brief notes on topography, geology and soils are given. Soil terminology follows "The System of Soil Classification for Canada", Canada Department of Agriculture, 1970.

The section on Climate and Physiography includes selected climatic data for stations taken as representative of the Sections and also a number of maps depicting certain aspects of the climate and physiography of Canada. A glossary presents the most commonly used technical terms.

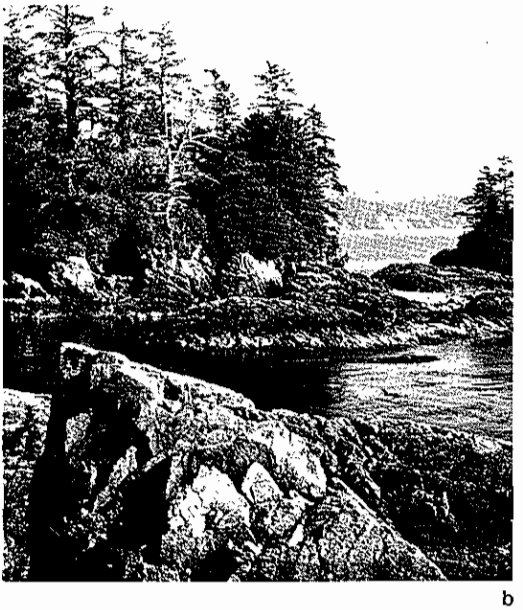
The selected bibliography lists publications of general interest dealing with the forest geography and forest ecology of various regions. Many of these were sources of descriptive material. Additionally there are numerous botanical articles scattered through the scientific literature which have been found useful, but no attempt has been made to list them all.

In separating and describing the Sections, Halliday's "Forest Classification" has of course been basic. Additional material and advice received from numerous people have contributed greatly to the information base from which the text was prepared. Of necessity the writer has had to place his own interpretation on much of the available data, and full responsibility for such interpretation is assumed.

The following organizations and persons gave assistance in numerous ways, and grateful acknowledgment is here made: to the member companies of the Pulp and Paper Research Institute of Canada, for much general information; to the Canadian Wildlife Service, Department of the Environment, for data concerning the northernmost forests; to members of the Geological Survey of Canada and the Surveys and Mapping Branch, Department of Energy, Mines and Resources, who checked the accuracy of the descriptions and landforms and geology in the Sections; and to the Soil Research Institute, Research Branch, Department of Agriculture, who rendered a similar service for the descriptions of soils. Assistance in specific areas has been given by K. A. Armson, R. D. Bird, E. Bonner, B. Boivin, D. I. Crossley, W. G. Dore, F. K. Hare, H. I. Kagis, V. J. Krajina, D. Levy, H. D. Long, S. T. B. Losee, D. Love, E. H. Moss, W. R. Parks, R. L. Schmidt, R. H. Spilsbury, E. W. Tisdale and G. M. Wilson. Dr. M. A. M. Bell and the National and Historic Parks Branch of the Department of Indian Affairs and Northern Development provided additional photographs. Finally, appreciation is expressed for the major contributions made by officers of the Canadian Forestry Service.

a Boreal Region (B.18a).
b Coast Region (C.3).
c Acadian Region (A.9).
d Columbia Region (CL.2).

a



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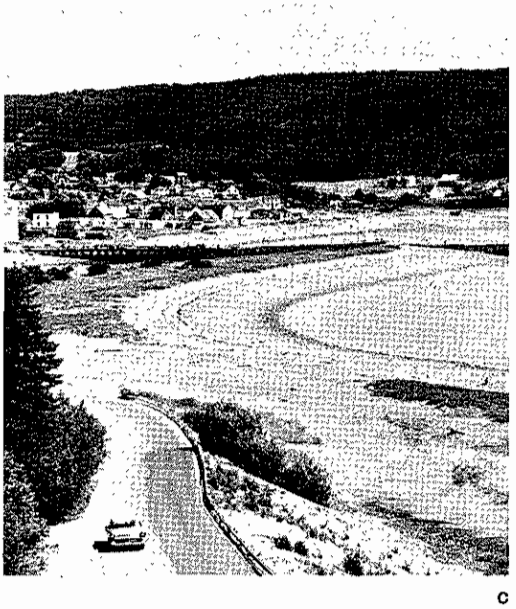

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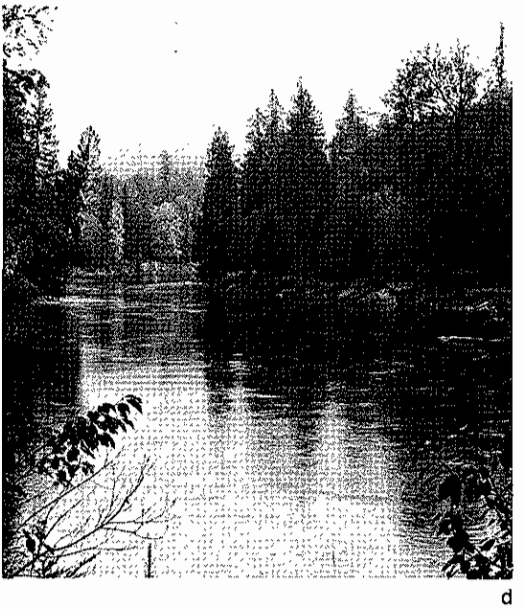

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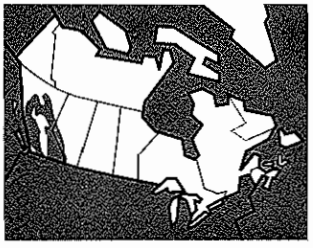
Forest Regions

There are eight recognized Forest Regions in Canada: the Boreal, Subalpine, Montane, Coast, Columbia, Deciduous, Great Lakes-St. Lawrence, and Acadian. These Forest Regions are briefly described and illustrated and, together with the Grassland, the Arctic and Alpine Tundra, are shown on the accompanying Forest Regions maps.

Boreal Forest Region

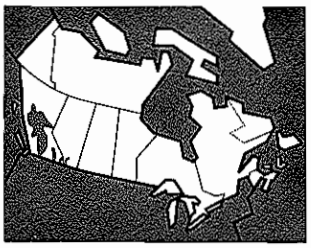
This Region comprises the greater part of the forested area of Canada, forming a continuous belt from Newfoundland and the Labrador coast westward to the Rocky Mountains and northwestward to Alaska. The white and the black spruces are characteristic species; other conifers are tamarack which is absent only in the far northwest, balsam fir and jack pine prominent in the eastern and central portions, and alpine fir and lodgepole pine in the extreme western and northwestern parts. Although the forests are primarily coniferous, there is a general admixture of broadleaved trees such as white birch and its varieties, trembling aspen and balsam poplar; the latter two species playing an important part in the central and south-central portions, particularly in the zone of transition to the prairie. In turn, the proportion of black spruce and tamarack rises northward, and with increasingly rigorous climatic and soil conditions the closed forest gives way to the subarctic open lichen-woodland which finally merges into tundra. In the east a considerable intermixture of species from the Great Lakes-St. Lawrence forest such as eastern white and red pines, yellow birch, sugar maple, black ash, and eastern white cedar occurs.

Subalpine Forest Region



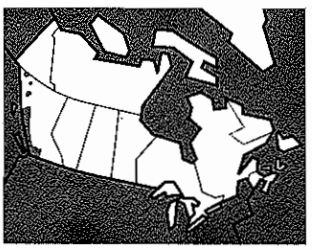
This is a coniferous forest found on the mountain uplands in western Alberta and in British Columbia. The Region extends northward to the major divide separating the drainage of the Skeena, Nass, and Peace rivers on the south from the Stikine and Liard rivers on the north. The characteristic species are Engelmann spruce, alpine fir, and lodgepole pine. There is a close relationship with the Boreal Forest Region, from which the black and white spruces and trembling aspen intrude. There is also some entry of interior Douglas-fir from the Montane Forest Region, of amabilis fir from the Coast Forest Region, and of western hemlock and western red cedar from the Columbia and Coast Forest Regions. Other occasional species are western larch, whitebark pine, and limber pine, and on the more western ranges yellow cypress and mountain hemlock.

Montane Forest Region



The Montane forest has developed in response to the prevailing dry climate of the central plateau of British Columbia and several southern mountain valleys adjacent to the Alberta boundary. The Region is a northern extension of the typical forest of much of the western mountain system in the United States and comes in contact with the Coast, Columbia, and subalpine forests. The characteristic tree is the interior or "blue" form of Douglas-fir. It is found throughout but more particularly in the central and southern parts. Lodgepole pine and trembling aspen are generally present, the latter being particularly well represented in the north-central portions. Engelmann spruce and alpine fir from the Subalpine Forest Region, together with western white birch, become important in the northern parts. White spruce is recognized as an important constituent of the exploitable forests. In the southern portion, ponderosa pine is abundant between the continental divide on the east and the Fraser Valley on the west. Extensive prairie communities of bunch-grasses and forbs are found in many of the river valleys.

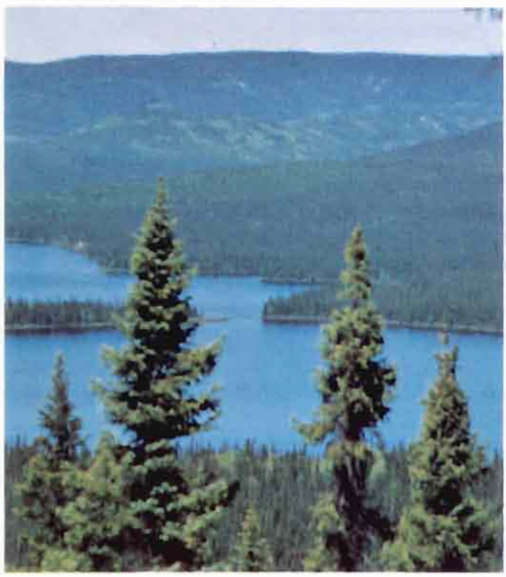
Coast Forest Region



This is part of the Pacific Coast forest of North America. Essentially coniferous, it consists principally of western red cedar and western hemlock, with Sitka spruce abundant in the north, and with coast Douglas-fir in the south. Amabilis fir and yellow cypress occur widely, and together with mountain hemlock and alpine fir, are common at higher altitudes. Western white pine is found in the southern parts, and western yew is scattered throughout. Broadleaved trees, such as black cottonwood, red alder, and bigleaf maple, have a limited distribution in this Region. Arbutus and Garry oak occur in Canada only on the southeast coast of Vancouver Island and the adjacent islands and mainland; the centres of population of these species lie to the southward in the United States.

Forest Regions

a



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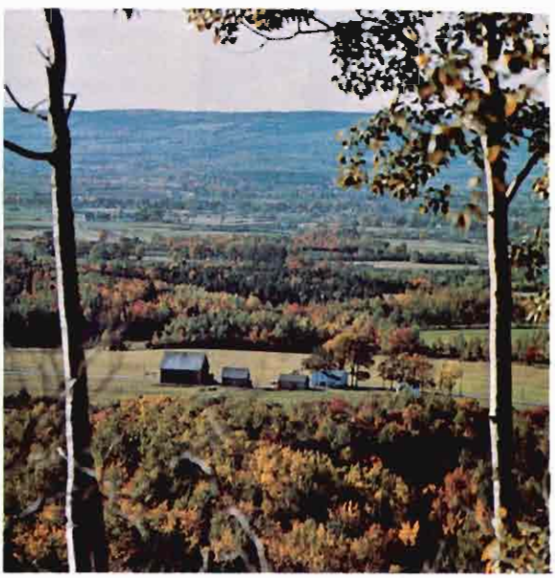

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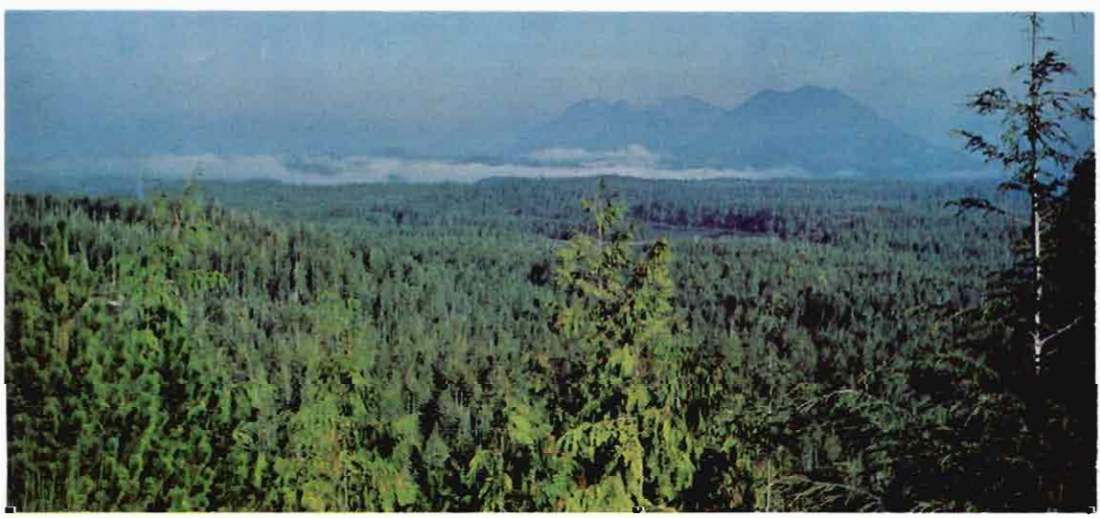
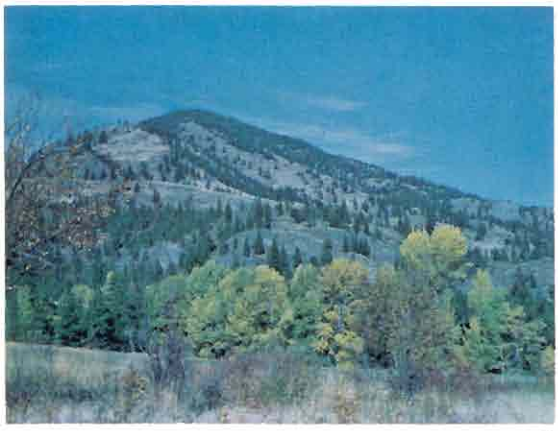


d

a Deciduous (D.1).
b Boreal (B.1b).
c Acadian (A.12).
d Coast (C.3).
e Montane (M.1).
f Great Lakes-St. Lawrence (L.2).
g Subalpine (SA.1).
h Columbia (CL.2).



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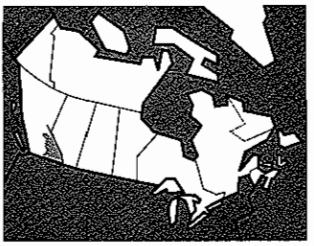
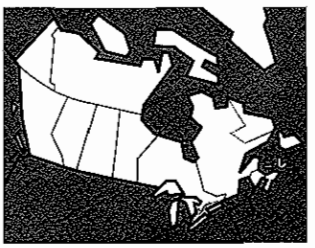
Columbia Forest Region



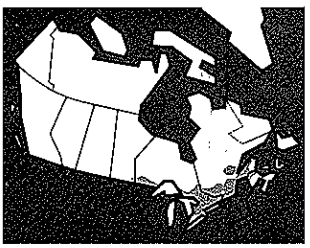
A large part of the Kootenay River valley, the upper valleys of the Thompson and Fraser rivers, and the Quesnel Lake area of British Columbia contain a coniferous forest closely resembling that of the Coast Forest Region though less rich in species. Western red cedar and western hemlock are the characteristic trees in this interior "wet belt". Associated are the interior Douglas-fir, which is of general distribution, and, in the southern parts, western white pine, western larch, grand fir and western yew. Engelmann spruce from the Subalpine Forest Region is important in the upper Fraser Valley, and is found to some extent at the higher altitude forest levels in the remainder of the Region. At lower elevations in the west and in parts of the Kootenay Valley the forest grades into the Montane Forest Region and, in a few places, into native grasslands.

Deciduous Forest Region



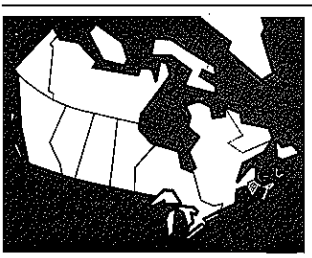
A small portion of the deciduous forest, widespread in the eastern United States, occurs in southwestern Ontario between lakes Huron, Erie, and Ontario. Here, with the broadleaved trees common to the Great Lakes-St. Lawrence Forest Region, such as sugar maple, beech, white elm, basswood, red ash, white oak, and butternut, are scattered a number of other broadleaved species which have their northern limits in this locality. Among these are the tulip-tree, cucumber-tree, pawpaw, red mulberry, Kentucky coffee-tree, black gum, blue ash, sassafras, mockernut and pignut hickories, and the black and pin oaks. In addition, black walnut, sycamore, and swamp white oak are largely confined to this Region. Conifers are few, and there is only a scattered distribution of eastern white pine, tamarack, eastern red cedar, and eastern hemlock.

Great Lakes-St. Lawrence Forest Region



Along the Great Lakes and the St. Lawrence River valley lies a forest of a very mixed nature, characterized by the eastern white and the red pines, eastern hemlock and yellow birch. With these are associated certain dominant broadleaved species common to the Deciduous Forest Region, such as sugar maple, red maple, red oak, basswood, and white elm. Other wide-ranging species are the eastern white cedar and largetooth aspen, and to a lesser extent, beech, white oak, butternut, and white ash. Boreal species, such as the white and the black spruces, balsam fir, jack pine, trembling aspen, balsam poplar, and white birch are intermixed, and in certain central portions as well as in the east, red spruce becomes abundant.

Acadian Forest Region

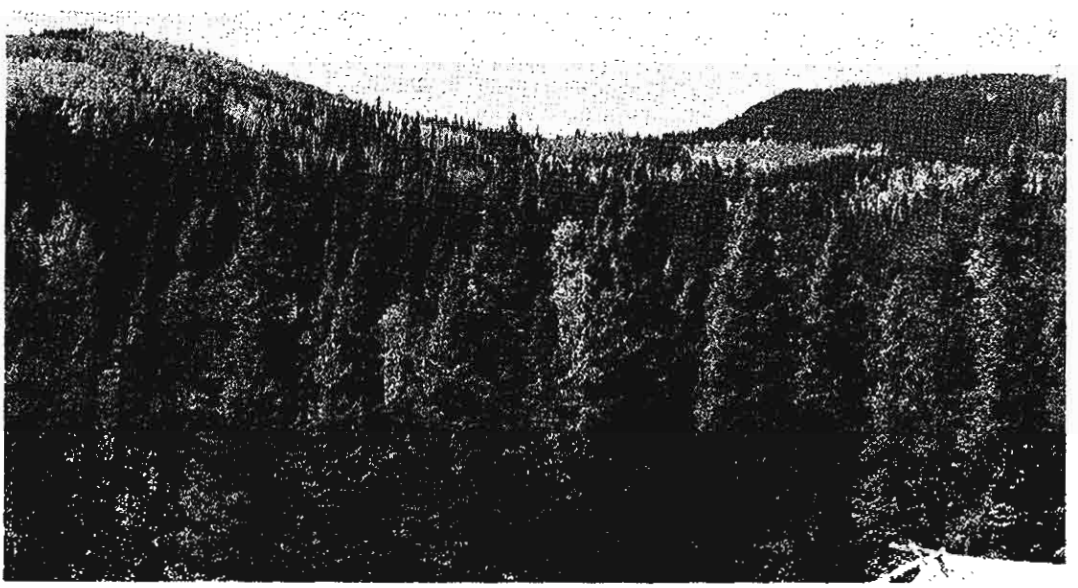


Over the greater part of the Maritime Provinces there is a forest closely related to the Great Lakes-St. Lawrence Forest Region and, to a lesser extent, to the Boreal Forest Region. Red spruce is a characteristic though not exclusive species, and associated with it are balsam fir, yellow birch and sugar maple, with some red pine, eastern white pine and eastern hemlock. Beech was formerly a more important forest constituent than at present, for the beech bark disease has drastically reduced its abundance in Nova Scotia, Prince Edward Island and southern New Brunswick. White spruce has increased in importance since the turn of the century by its widespread invasion of abandoned farmland. Other species of wide distribution are the black spruce, red oak, white elm, black ash, red maple, white birch, grey birch, trembling aspen and balsam poplar. Eastern white cedar though present in New Brunswick is extremely rare elsewhere, and jack pine is apparently absent from the upper Saint John Valley and only occasional in the western half of Nova Scotia.

a Subalpine Region (SA.2).
b Great Lakes-St. Lawrence Region (L.6).
c Boreal Region (B.1a).

a

b



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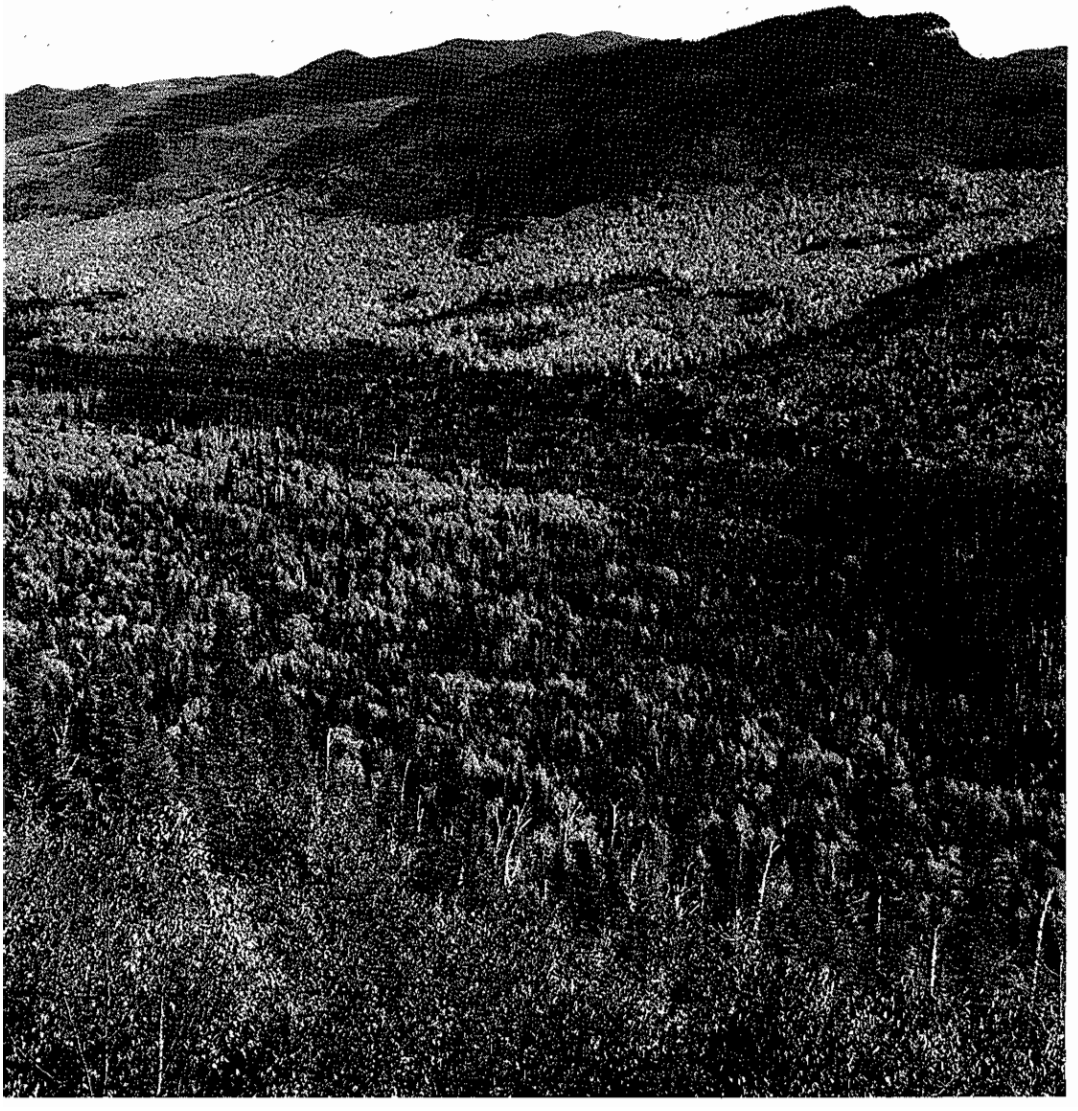
Forest Sections

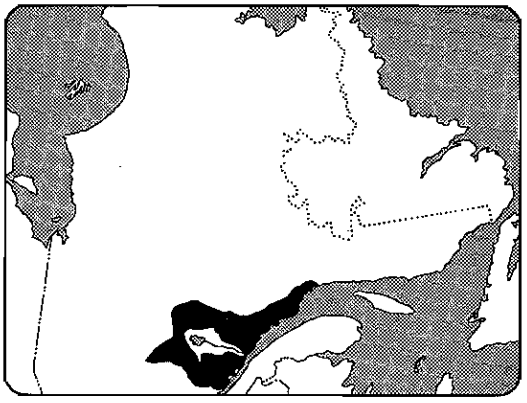
The eight Forest Regions of Canada have been subdivided on the basis of distinctive patterns of vegetation and physiography into ninety forestland units called Forest Sections. A brief forest and land description of each Forest Section, including individual maps and selected photographs, is provided.

Boreal Forest Region

Laurentide-Onatchiway (B.1a).



B.1a — Laurentide-Onatchiway

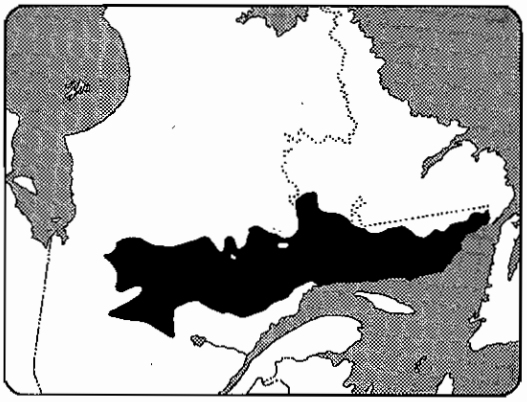


The Section comprises the Laurentide uplands and the more southern portions of the Laurentian peneplain from the Saguenay River eastward to Sept-Iles. On the north side the boundary marks a change from dominance by balsam fir to that of black spruce on upland sites (in B.1b), while to the south as well as centrally around the Lake St. John valley the Section is bounded by forests whose composition places them in the Great Lakes-St. Lawrence Forest Region. Within this and the following Section, the bulk of the pulpwood supply of the province of Quebec is found.

The forests are predominantly coniferous. Balsam fir dominates on hill slopes and on other moist well-drained sites, while black spruce is prominent on thin-soiled plateaus and on poorly-drained land. White spruce is distributed throughout, though of little numerical importance. White birch is the common hardwood associate of the fir and spruce; trembling aspen and jack pine are secondary species which dominate where fires have been frequent, especially surrounding the Lake St. John lowland. Balsam poplar, eastern white cedar, eastern white pine and tamarack are locally common while several of the tolerant hardwoods — sugar maple and yellow birch — occur at low altitudes in the southern parts.

The terrain is rolling and in part mountainous. Broadly speaking, the entire area is underlain by crystalline rocks of Precambrian age. Swift streams in sharply cut trenches mark areas of steep gradient adjacent to Lake St. John, the Saguenay and St. Lawrence rivers; farther back, on the gentler topography of the Laurentide uplands, streams radiate out in broader valleys. On the surface drift, soils of the ferro-humic and humo-ferric podzol groups are commonly developed. Shallow and deep peats characterize dwarf-shrub uplands and moss-bog lowlands, respectively.

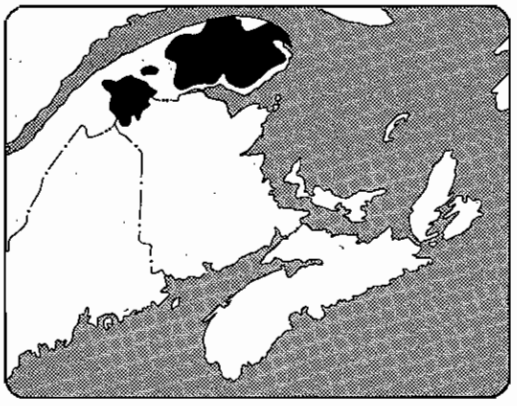
B.1b — Chibougamau-Natashquan



Along the south-facing slopes of the Laurentian peneplain, between the productive fir-spruce forests of the preceding Section and the subarctic lichen-woodland to the north, lies a productive forest belt in which black spruce is the most abundant tree. The prominence of this species both on peaty lowland sites and on well-drained upland drift and rock, plus the relative scarcity of white spruce and balsam fir, makes for a limited variety of cover types. Groves of white birch occur here and there throughout the Section, but the other boreal hardwoods — trembling aspen and balsam poplar — are less conspicuous except in the immediate vicinity of rivers and lake shores. Jack pine is confined to the western side of the Section. Evidences of a severe fire history are seen both in the upland heath barrens and open woodlands of the north and in the barren rock hills along the St. Lawrence River to the south.

The topography varies from rugged in the east where drainage is southward in deep valleys, to gently rolling or almost level in the west where, as in the Chibougamau area, less deeply incised rivers meander over sand plains and drain westward. Climatic conditions are less favourable for forest growth than in B.1a, due to a colder climate and a shorter growing season. Humo-ferric podzol profiles are typically developed in the surface materials, particularly in association with dwarf shrubs and spruce cover. Peaty phase gleysols occupy the narrow swamps between hills, while relatively fertile ferro-humic podzols are locally developed on richer tills in association with balsam fir.

B.2 — Gaspé

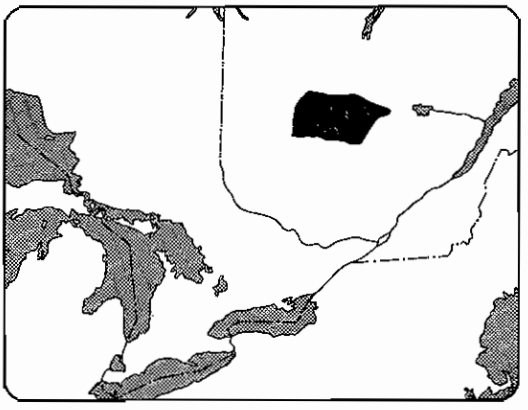


The Section comprises the plateau-like highlands of the Gaspé, which are a northeastward extension of the Appalachian mountain system. Here are two islands of boreal forest, the larger coinciding generally with the uplands of the peninsula (though extending down to the south shore of the Gulf of St. Lawrence), and the smaller west of the Matapedia River valley, extending from Quebec into northwestern New Brunswick.

The major forest cover types are dominated by conifers, though mixed conifer-hardwood stands are not uncommon. Balsam fir, black spruce and white spruce, often in combination with white birch, form the characteristic cover types. In addition to pure stands of balsam fir and of black spruce, mixed stands of fir-spruce often with eastern white cedar are common. Forest cover is continuous except on the exposed portions of the plateaus where climate-induced alpine tundra occurs, adjacent to which both fir and spruce show strong wind effects. On the lower slopes of the Section, and in the river valleys at its edges, there are local representations of species such as eastern white pine, sugar maple, and yellow birch from the adjacent Great Lakes-St. Lawrence Forest Region, as well as some red spruce from the Acadian Forest Region.

Elevations on the irregular, rugged plateaus range up to an average of 3,000 feet, with Mount Jacques Cartier reaching an altitude of 4,160 feet. Numerous small streams, deeply cut into the underlying soft sedimentary rocks, radiate outward in all directions from the uplands. Thin humo-ferric podzol profiles, with rather heavy but poorly-structured Bfh horizons, are common in the well-drained position, while acid peats are developed in areas of poor drainage.

B.3 — Gouin

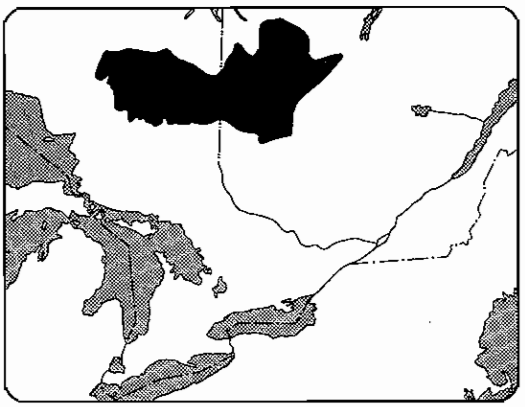


The Section covers a relatively flat plateau on the height of land between the James Bay and St. Lawrence watersheds in Quebec, from which streams flow to all points of the compass. To the north are many of the headwaters of the Chibougamau River and of streams flowing into Lake St. John. In the eastern part is the large chain of lakes from which the St. Maurice River flows; to the south lie parts of the Lièvre, Gatineau and Ottawa rivers, and to the west is situated the upper part of the Bell River.

As on many sandy areas, jack pine is particularly conspicuous to the casual traveller because most of the roads follow the well-drained sand flats. Black spruce, the usual associate of jack pine, is abundant not only in the muskeg of water-catchment areas but also on the sand plains where, like the pine, its establishment is favoured by frequent fires. Both species are found in open stands with a lichen ground cover but more commonly in closed-crown types where, however, productivity is rarely high. Mixedwoods of trembling aspen, balsam poplar, white birch, white spruce and balsam fir, occupy the upland till sites and the alluvium along rivers and lakes. Such mixed stands are similar to those of Section B.1b, though somewhat less rich in shrub and herb undergrowth.

The plateau is underlain by gneisses and granites of Precambrian age. Relief is low, and the streams and rivers run slowly, meandering in shallow beds over the sand plains or traversing the local bedrock or till deposits in short, rapid stretches. On the shallow tills, fluvial terraces and glacial outwash, humo-ferric podzol profiles which generally lack either an ortstein or placic horizon have been developed. Peaty soils occupy the extensive poorly-drained sites.

B.4 — Northern Clay

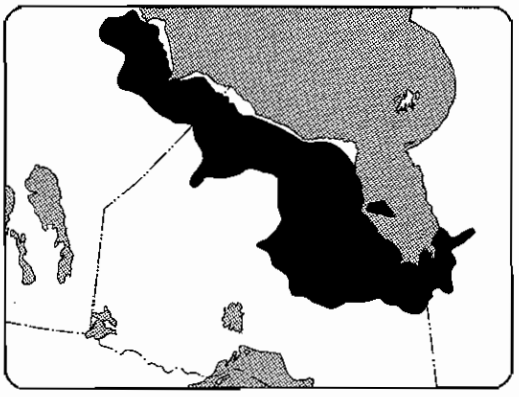


Occupying the central portions of the gentle northward slopes of the Laurentian plateau in Quebec and Ontario, the forests of this Section are conditioned by widespread surface deposits of water-worked tills and lacustrine materials, and by a nearly level topography — inheritances from glacial Lake Ojibway. It is bounded on the north by marine clays over sedimentary and igneous rocks of the Hudson Bay Lowlands Section (B.5), where the forests tend to be stunted and open-grown, and on the south by rolling glaciated uplands where the appearance of species from the Great Lakes-St. Lawrence Forest Region marks a transition zone.

The impressive characteristic of the "Clay Belt" is the seemingly endless stretches of stands of black spruce which cover the gently rising uplands as well as the lowland flats, alternating in the latter position with extensive sedge fens and sphagnum-heath bogs. Tamarack is an infrequent companion of the black spruce except in young stands. Extensive areas of spruce-cedar swamp occur but eastern white cedar reaches tree size only at the swamp borders and is rather less common in the east than in the west. Improvement in drainage, due either to slight changes in relief, to shallowly buried coarse drift or to position beside rivers and lakes, is reflected in fine hardwood or mixedwood stands of trembling aspen, balsam poplar, balsam fir, white spruce and black spruce. Jack pine has a dominant position on many of the drier sites such as outwash deposits, old beaches and eskers; white birch is also prominent on sandy soils.

The area is underlain mainly by Precambrian volcanic and granitic rocks, with lesser sediments. During glaciation the bedrock was partly covered by drift which in turn was modified by wave action and/or the deposition of lacustrine materials. Driftless areas of bedrock were also covered by lacustrine deposits, and therefore the topography is generally unbroken and relatively level with only occasional hills and ridges. Eskers and outwash plains which cross the "Clay Belt" from north to south are partially or entirely covered by the lacustrine deposits. The absence of surface rock, the extensive poorly-drained flats, relatively few lakes, and clay-banked, rather sluggish streams are characteristic. Gray luvisols have developed on the calcareous upland clays and modified tills, with peaty phase gleysols widespread on the flats particularly in the Quebec sector. There are large areas of shallow organic soils, mostly composed of sphagnum moss but with woody peat beneath. On the more siliceous shallow tills to the south and on sand ridges, a humo-ferric podzol profile is usual.

B.5 — Hudson Bay Lowlands

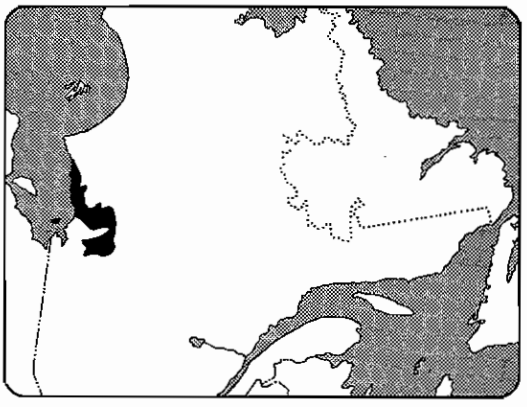


An area of Palaeozoic sedimentary bedrock overlain with marine clay and beach sand deposits borders the south and west sides of James Bay and the west side of Hudson Bay north to Churchill. It extends back to an elevation of about 500 feet above sea level, and is characterized by a flat topography and poor drainage. The rivers cross this coastal plain in roughly parallel courses with a minimum of cross-drainage, their low alluvial banks providing suitable conditions for good growth of forests. Back from the rivers lie immense areas of swamp, bog and muskeg.

The vegetation of the Section has in general a "subarctic" appearance because of the prominence of an open woodland of black spruce and tamarack in the muskegs and patterned fens. Frequently, too, the organic surface supports a dense cover of light-coloured lichens. However, on the riverbank levees, where conditions of better drainage obtain, forests of white spruce, balsam fir, trembling aspen, balsam poplar and white birch occur, in quality similar to those within the Northern Clay Section (B.4). The south James Bay area contains most of the exploitable timber resources, and logging activity for lumber and pulpwood is largely confined to areas in the vicinity of the major rivers. Here also are found outposts of such species as white elm, black ash and eastern white cedar. Jack pine is sparingly present. Northwestward the percentage of peatland and of lakes increases, and the prevalent forest is of stunted open-grown black spruce and tamarack. On the west side of James Bay, as on the coast of Hudson Bay in general, black spruce does not appear to be as well adapted to the sea-shore environment as white spruce, and the latter species forms the maritime treeline.

The surface materials of the marine flats are calcareous clays, derived by glacial action from the underlying Palaeozoic sediments and deposited in sea waters. In the Kesagami Lake area, the deposits are shallow over igneous rock of the Precambrian Shield. Organic soils predominate, some associated with perennially frozen ground. In the well-drained position on alluvium and on ridges, weak eutric brunisol soil profiles have developed.

B.6 — East James Bay

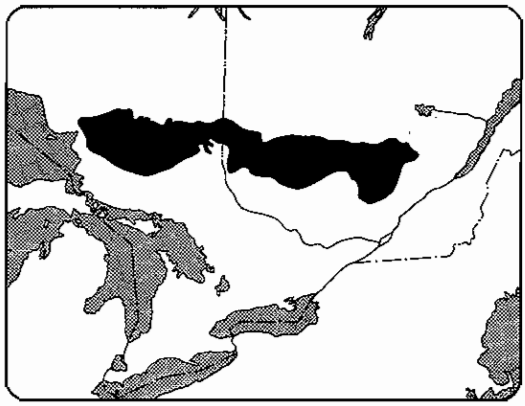


Crustal uplift on the eastern side of James Bay has resulted in terraced topography resembling a series of steps descending from east to west. The highest well-defined terraces in the glacial drift are at approximately 300 feet above present sea level, though river action has exposed stratified marine clays and sands which extend up the valleys between the rolling rock hills to elevations of more than 500 feet. As a consequence of the deep soils, conditions for forest growth are more favourable than those found over the northern parts of Quebec and Labrador to the east or than those of the poorly-drained coastal plains of James Bay and Hudson Bay to the west.

The richest forests occur below the highest marine limit on the modified deposits of glaciofluvial materials. In the sheltered valleys white and black spruce, balsam poplar, trembling aspen, white birch and balsam fir reach merchantable sizes; poor-growing black spruce, jack pine and tamarack are found on the thin tills of the intervening rock uplands. The limits of the Section to the east are indicated by a marked diminution in the abundance and quality of white spruce, balsam fir and balsam poplar, species apparently favoured by the marine influences. Back from the shore line there are limited areas of low-lying swamps, and on dry highlands the subarctic type of open lichen-woodland appears.

The pre-glacial hilly topography of the Precambrian rock uplands has been partly subdued by a covering of stony till and, at lower elevations, by the terraced marine deposits which blanket the surface near the coast and fill the inland valleys. Through the latter, swift streams are presently cutting narrow channels in the stratified sands and clays. Humo-ferric podzol soil development can be expected on the upland drift, and peaty phase gleysols on the lowlands.

B.7 — Missinaibi-Cabonga

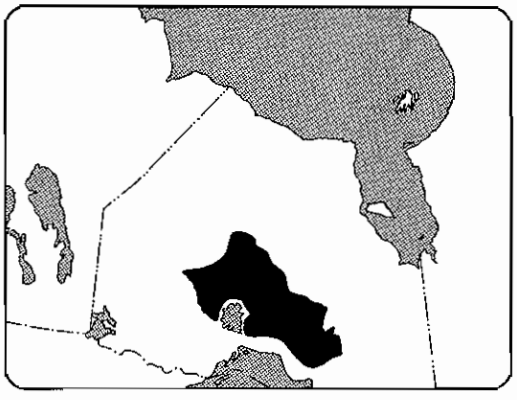


Along the height of land in central Ontario and Quebec is a Section of intermediate nature. It is basically of the Boreal Forest Region insofar as the bulk of the species and their distribution are concerned, but contains within it certain species from the Great Lakes-St. Lawrence Forest Region either as scattered individuals or as more or less isolated patches. In position it stretches from the middle St. Maurice Valley along the higher southward slopes of the Laurentians in Quebec to the south side of Lake Abitibi, from whence westward to a point just northeast of Lake Superior it occupies the height of land between Hudson Bay and the Great Lakes. Its northern boundary coincides very generally with the northernmost limits of eastern white pine, red pine, yellow birch, sugar maple and eastern hemlock.

The predominant forest is mixed in character, consisting of an association of balsam fir, black spruce and white birch with scattered white spruce and trembling aspen, this appearing as a dominant type on middle slopes. In recent years birch dieback has been severe, and the balsam fir has suffered from the devastation of the spruce budworm. The results of disease are seen in vast areas of open, snag-filled forests in which a proliferation of shrubs such as mountain maple and hazel retard regeneration of the valuable softwoods. Here and there will be found, on heavier-textured ridges and on upper north slopes in particular, groves or single trees of both sugar maple and yellow birch — a condition most commonly encountered in the Quebec portion. On rocky shores, and also on ridges, there is some presence of eastern white and red pine, though these species were mostly removed by logging several decades ago. Sand terraces along the rivers are dominated by jack pine, which species also associates with black spruce on poor, rocky soils. The black spruce, with tamarack, covers large areas of wet organic soils, and eastern white cedar accompanies black spruce in another common lowland association. There are numerous occurrences of black ash and white elm; red spruce is scattered here and there along the southern boundary in Quebec.

The topography is rolling, but with numerous flats along the rivers and lake sides. The underlying granitic, volcanic and sedimentary rocks are of Precambrian age, and from them the shallow till overburden has inherited varying degrees of fertility, from poor in the eastern portion where magnetite and other iron-bearing minerals are undesirable components, to richer in the central and western portions where rocks such as greenstone occur. In western Quebec there has been some water modification of the surface drift— probably relating to glacial lakes Ojibway and Barlow — and silty surface deposits are frequent. The soil profile is typically a humo-ferric podzol, and on the poorer acid drift with heath-and-conifer cover the presence of cemented pans (ortstein) has been observed.

B.8 — Central Plateau

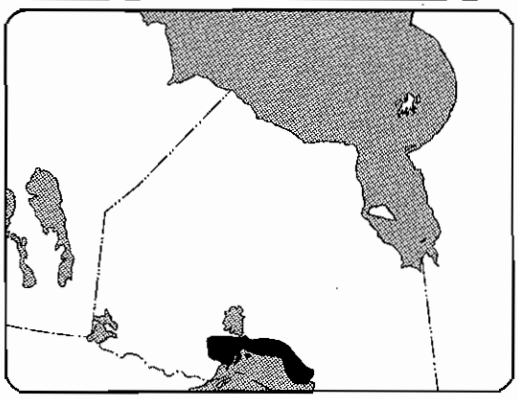


North of the rugged and rocky Lake Superior coastal strip, a relatively level plateau-like country extends northeastward in a gentle slope to the sparsely forested coastal plain around James Bay. On its western side the Section is in contact with the Nipigon basin and the transitional forests of the upper English River; eastward it meets the "Clay Belt" and the transitional forests of the preceding Section (B.7).

Extensive sand and gravel deposits, and low rocky outcrops, provide a favourable environment for the prevalent jack pine. Black spruce types are well developed, from those occupying the shallow swamps to those of maximum productivity on the better-drained level or undulating land. Mixture of the two conifers is common and white birch and trembling aspen occur within the same association. On the more restricted and favourable sites, such as river banks, lake shores and drumlinized till uplands where conditions of soil texture and drainage are optimum, communities of trembling aspen, white spruce, balsam fir, black spruce, balsam poplar and white birch are found. Such mixedwood types tend to develop a strong shrub understorey, making it difficult to solve the problem of natural softwood regeneration. In the eastern portions there is some presence of eastern white cedar or tamarack in low positions, each usually associated with black spruce. Areas of bog, muskeg and upland rock barren occur throughout, the latter condition aggravated by frequent fires.

The streams are relatively slow-flowing in their meandering courses over the plateau, except to the south where descent is rapid to Lake Superior. Glacial advance from the north covered the Precambrian granites and the intrusives with a calcareous drift and the presence of balsam poplar and white spruce on some of the moulded, morainic loams and clays seems to be correlated with the considerable lime content of these materials. On such soils, gray luvisol profiles are usual. There are local areas of very calcareous soils supporting stands of stunted black spruce. The coarser outwash and terrace deposits are leached of their lime, and podzolization is more active in them. Peaty phase gleysols and gleyed humo-ferric podzols are found on the low areas.

B.9 — Superior



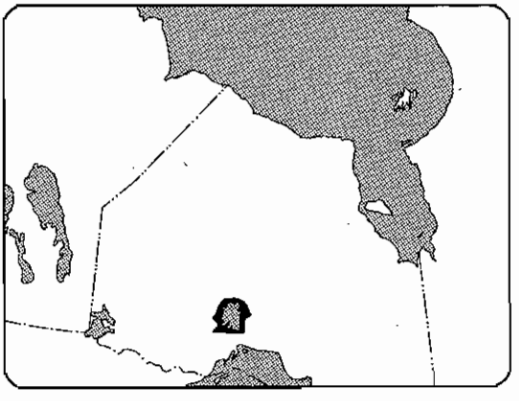
The forest conditions of the Great Lakes-St. Lawrence Forest Region found on the east and west sides of Lake Superior do not extend north of the lake. A climate of greater severity would appear to be at least partly responsible for the generally boreal nature of this Section which lies along the north shore, roughly from Michipicoten westward to Thunder Bay.

The forests are extremely variable, ranging from mixed types with luxuriant shrub undergrowth to floristically poor, single-dominant coniferous types. A relatively stable mixed forest of white spruce, balsam fir, white birch and trembling aspen is characteristic of the deep, medium-textured valley soils. On till slopes and the tops of low hills, the same association of species is found but with the birch more prominent and some black spruce also appearing. Here the red-berried showy mountain ash is conspicuous as a tall shrub or small tree. The higher, more rocky elevations, and the coarser materials in the valleys bear jack pine and white birch, with black spruce of poor form. Some of the imperfectly drained, ponded silts and fine sands of the lowlands produce exceptionally fine pulpwood stands of black spruce, and yields on such soils equal the best of eastern Canada. Tamarack or eastern white cedar are usual companions of black spruce on the wet soils.

The Section has been subjected to severe burning which has everywhere favoured an increase in the proportion of trembling aspen, white birch and pine (*Pinus* spp.). There is a limited occurrence of species from the Great Lakes-St. Lawrence Forest Region, with eastern white pine and red pine particularly evident on the terraces in the central portion between Lake Nipigon and Lake Superior. Also, in the river valleys there is some black ash, and in the eastern districts outliers of sugar maple and yellow birch occupy favourable hilltop positions.

For the most part the topography is rough to rugged on the highlands, with steeply rising basaltic trap rock and associated talus slopes a striking physiographic feature. Between the hills, wide river valleys extend northward, and in these valleys as well as along the lake shore are found deep lacustrine, ponded, deltaic and terrace deposits from glacial Lake Algonquin and its predecessors. Above the old lake levels a thin glacial drift lies over the Precambrian granites, sedimentary and volcanic rocks and later basic intrusives. Rock outcrop at the surface is extensive both in the eastern and western parts. The soils are podzolized but not to the extent of infertility except on the coarsest deposits.

B.10 — Nipigon

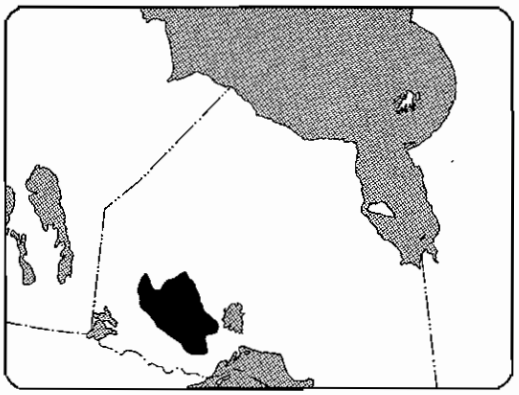


The Nipigon basin in which this Section lies is enclosed on three sides by the higher lands of the Central Plateau (B.8), and on the south by the Superior Section (B.9) to whose lowland forests its vegetation shows some similarity. In post-glacial times the basin was flooded by an arm or bay of Lake Warren or Lake Algonquin, and bedded lacustrine sands and clays were laid down both in the vicinity of the present lake and farther back in the valleys of the in-draining rivers. Subsequent crustal uplift has apparently separated these from similar deposits along the shore of Lake Superior.

The simple topographic pattern is matched by a rather uniform forest, with black spruce dominating most of the communities. Exceptionally productive pure stands of this species clothe low rises, extending upslope into dry, open jack pine stands and downslope into fen types with tamarack. There are few open bog or muskeg types. In general, the forests of the north and northwest parts are poorer than those of the south and west. Areas with better-drained more favourable soil conditions support mixed stands of trembling aspen, white birch, black spruce, white spruce and balsam fir, the last-named pair of species achieving prominence particularly on sites protected from recurrent fire. On the islands of Lake Nipigon, red and eastern white pines occur in well-drained habitats.

The topography is rolling though relief is somewhat low, with gentle rises on the valley sides to the higher portions of the divides. On the west side of the lake, younger Precambrian diabase and some sedimentary rocks form rugged exposures. Elsewhere the bedrock is composed of older Precambrian rocks, buried under the deep lake deposits in the basin or thinly covered with shallow, sandy morainic materials at higher elevations. In the latter position, thin soils over bedrock are common, and on deeper materials, shallow humo-ferric podzols with faint cementation in the subsoil occur. Organic accumulation is moderately deep on the poorly-drained lowlands.

B.11 — Upper English River

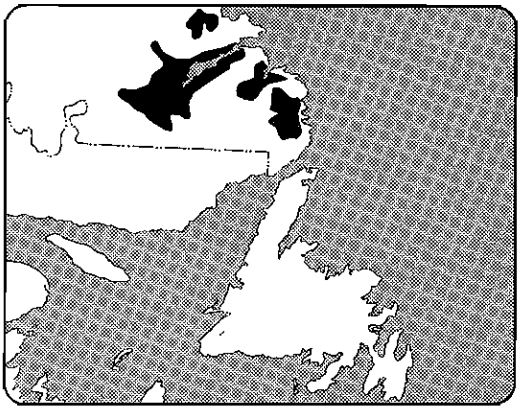


The Section includes the upper drainage basin of the English River and part of the headwaters of the Albany River. It marks a transition between the Great Lakes-St. Lawrence forest to the south and the boreal forest to the north and east.

The main body of the forest cover consists of black spruce and jack pine with mixtures of white spruce, balsam fir, trembling aspen and white birch. Jack pine stands are extensive on the dry sand plains and rocky uplands, and black spruce dominates in peat-filled depressions; mixtures of the two species are frequent in intermediate habitats. Tamarack is not abundant. Red and eastern white pines, as scattered individuals or isolated clumps, here reach their northern limits. In addition, yellow birch, largetooth aspen and eastern white cedar are reported.

The strongly glaciated terrain has a rough, rolling topography with some plateau features, although relief is not great. Occasional morainic ridges, deep-soiled lacustrine flats and till plains occur, but in general the soil mantle is thin over the granitic Precambrian bedrock and in places it has been completely removed by the scouring of ice and water. Fires have been frequent, contributing to erosion of thin-soiled uplands. Humo-ferric podzol profiles, where developed on the finer-textured surface materials, provide excellent conditions for tree growth, but large areas are covered by thin, coarse-textured soils over bedrock of poor potentiality for forest production.

B.12 — Hamilton and Eagle Valleys

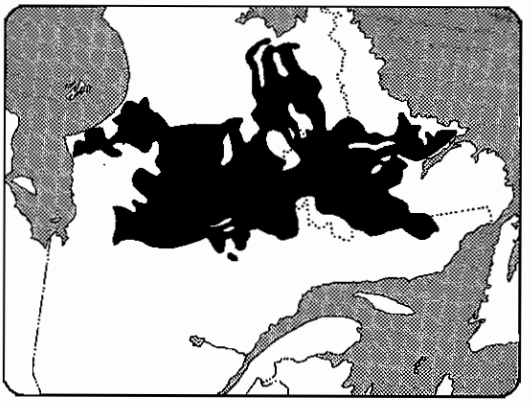


Certain of the river valleys along the eastern border of the Labrador plateau support a forest which in its richer composition and better quality of growth stands distinctly apart from the subarctic vegetation of the adjacent uplands. The largest part of this outlier of the southern boreal forest is in the valley of the Hamilton (recently renamed Churchill) River, 500 to 800 feet below the level of the surrounding country. Other segments of the Section occur on the Kaipokok, Eagle, Hawke and Alexis rivers, just inside the forest-tundra transition (B.32).

Conifers form the matrix of the forest cover, and the most prevalent species over the range of sites is black spruce which plays the role of pioneer invader after fire and participates in the more stable types as well. In pure stands, or mixed with balsam fir and white birch, it occupies the poorly-drained flats and the shallow soils of the upland slopes. On the deeper lowland soils where conditions for forest growth are most favourable, prominent associates of the black spruce are balsam fir, white spruce which here grows to a large size, white birch, balsam poplar and, occupying the northern part of its range, trembling aspen. On elevated sandy terraces and on the upper slopes of the hills where transition is made to the subarctic forest, open lichen-woodland dominated by black spruce appears on the dry sites and closed coniferous forest of spruce-fir on the moist sites. Occasional small stands of pure white birch and trembling aspen mark areas of past disturbance by landslide or fire. Jack pine does not extend into this Section, and tamarack though present is not abundant.

The lowland position, effecting an amelioration of the climate, is one feature of the environment favouring tree growth. Another is the presence of fine-textured surface deposits — derived in part at least from underlying metamorphosed Precambrian rocks or younger basic intrusives—which fill the broad valley bottoms and stand as terrace materials beside the rivers and lakes. The poorer upland soils seem to have resulted from the weathering of a thin sandy till and to some extent from a breakdown *in situ* of the gneissic bedrock. Humo-ferric podzols are usual in the well-drained position, while on wetter sites there is extensive development of sedge-and-moss peat.

B.13a — Northeastern Transition

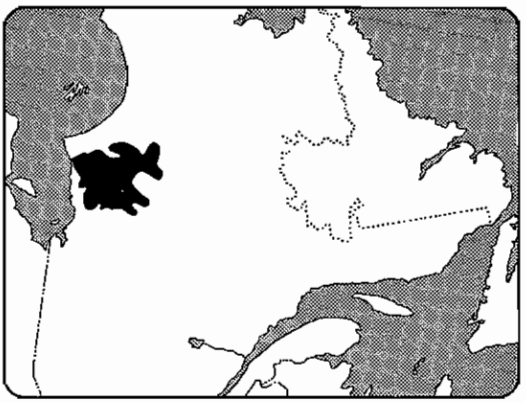


This is a broad band of subarctic forest which extends across central Labrador and Quebec, bounded on the north by the extensive "hemi-arctic" or forest-tundra transition (B.32) and on the east and west by narrow coastal strips of the same Section. The southern boundary is marked by an abrupt decrease in the prevalence of open lichen-woodland and a commensurate increase in closed-canopy coniferous forest on mesic sites.

The land is a patchwork of lakes and rivers, bogs, swamps and muskeg, with areas of upland barrens and of forest, the characteristic form of the latter being the open, park-like woodland of black spruce with an associated ground cover of light-coloured lichens. Closed forest stands are less common, although they do appear — dominated by the ubiquitous black spruce — where sites are of the moist, seepage type, as on mid-slopes and in shallow peaty draws. Species associating to some extent with black spruce in upland types on the less acidic and better drained soils are balsam fir and white spruce, the latter usually conspicuous in its sporadic occurrence due to a taller growth form than the other conifers. On the lowlands, where muskeg and bog stretch for miles, an open wet woodland type of black spruce is developed particularly on acidic geological materials. Strips of tamarack frame the lakes and water courses, or form strings in fens on calcareous substrata. Jack pine is confined to the south-western half of the Section, trembling aspen is uncommon except along the southern boundary, balsam poplar occurs infrequently along streams, and white birch has a limited abundance on the upper slopes of hills, particularly in the south.

The topography varies from flat to rolling, and though there are some quite rugged places, the relief is generally low. The geological foundation is of acid Precambrian rock, but a central strip of the Section, bordering on the Koksoak River, is underlain with altered sedimentary rocks on which a somewhat richer forest flora is found. Sandy to silty-clay glacial drift blankets the surface, drumlinized or thin over bedrock on the uplands, and deeper in terrace or outwash deposits in the valleys. Humo-ferric podzols, dystric brunisols, gleysols, regosols and peats are present, and permafrost is a common ground feature over much of the area.

B.13b — Fort George

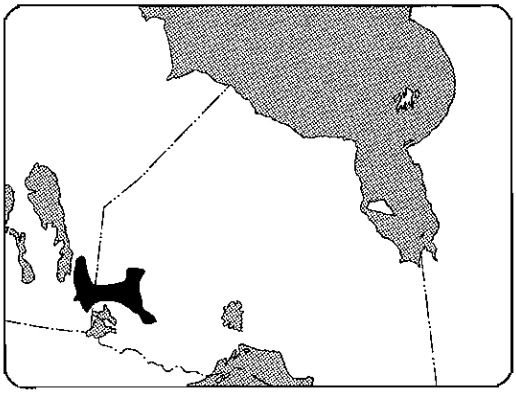


East of James Bay, in the area surrounding Sakami Lake and the lower Fort George River, lies a till-covered lowland with a gradual upward slope to the east. There is here, in general, a better forest cover than in the adjacent Northeastern Transition Section (B.13a), and extensive areas on both upland and lowland are clothed with open or closed stands of conifers.

North of the Fort George River the jack pine is abundant on low, stony morainic ridges, while black spruce with an undergrowth of dwarf shrubs occupies the shallow organic soils of the intervening clay-filled depressions. Southward the uplands are more hilly, bearing open lichen-floored stands of black spruce with some white spruce and balsam fir. There are large areas of muskeg and open bog.

The bedrock is largely composed of Precambrian granites and gneisses, with limited inclusions of schists, greenstone and quartzitic rock. It is overlain by a mantle of glacial drift, commonly moulded into drumlin landforms or, especially in the western two thirds, re-sorted by water action due to marine submergence. Rock outcrop is a prominent feature on the higher lands. Although the soils have not been investigated, humo-ferric podzol and dystric brunisol profiles are to be expected on the well-drained uplands.

B.14 — Lower English River

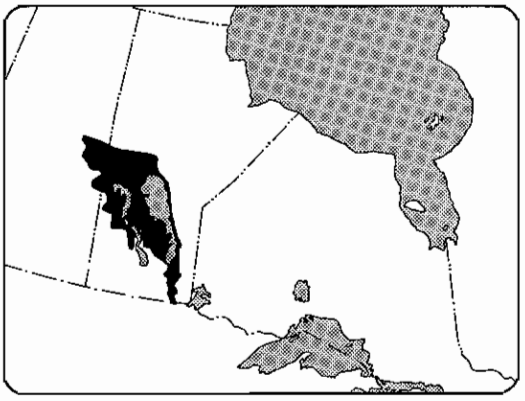


This Section includes that portion of the English River drainage area which at one time was under the influence of glacial Lake Agassiz. It is bounded to the south by the Great Lakes-St. Lawrence forest, on the west by the main basin of Lake Agassiz in the Manitoba Lowlands Section (B.15), and on the north and east by strongly glaciated Precambrian uplands.

Mixed stands of trembling aspen, balsam poplar and white spruce provide the chief forest cover on the well-drained sites. Other common boreal species, balsam fir, white birch and jack pine, are also present — the pine frequenting the sandier soils as is usual but also extending to clay and silt soils after fire. Shallow bogs are occupied by black spruce and tamarack. Eastern white pine and red pine from the adjacent Great Lakes-St. Lawrence forest have a limited presence on the rocky parts of the river banks as well as on lake shores and sand ridges. Green ash, white elm and bur oak are found also on riverine sites, apparently intrusives from the neighbouring sections to the west and southwest.

The post-glacial deposition of lacustrine materials produced a rather low relief in the area. However, the levelness of the stratified sand-and-clay surface deposits is somewhat relieved by occasional features of higher relief such as morainic ridges, rock outcrop and fluvial terraces.

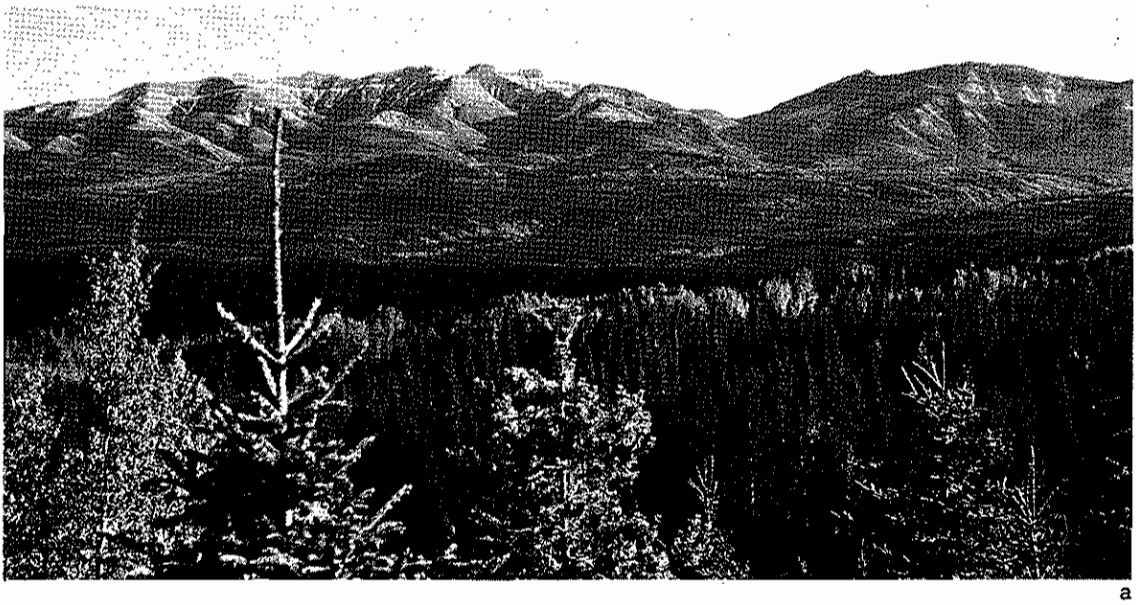
B.15 — Manitoba Lowlands



Included here is the forested area within the low, level basin of south-central Manitoba, bounded on the west by the Cretaceous escarpment and on the north and east by the shallowly mantled rock outcrop of the Precambrian Shield. Southward the Section comes in contact with the Aspen-Oak forest (B.16), the boundary between the two following the distribution limits of the boreal conifers.

The prevailing vegetation on the flat, poorly-drained land consists of forest patches of black spruce and tamarack, with intervening swamps and meadows. Good stands of white spruce, trembling aspen and balsam poplar, sometimes in mixture with balsam fir and white birch, occur on the better-drained alluvial strips bordering rivers and creeks. In the central interlake area, the effects of repeated fires and poor sites (shallow, limestone soils) are reflected in stands of scrubby, worthless aspen — these constituting a major problem so far as future land use is concerned. Low ridges throughout are generally forested with jack pine or trembling aspen, though in the southern parts bur oak is common on such sites. Also present locally are white elm, green ash, Manitoba maple and eastern white cedar.

The underlying bedrock is Palaeozoic limestone, and the overlying beds are mainly lacustrine clays deposited in glacial Lake Agassiz or modified tills. Conspicuous ridges of sand and gravel mark beaches formed at successive levels as the post-glacial lake drained, and characteristic of the old lake bottom is a succession of low, narrow, parallel rises with swampy depressions between. The influence of the limestone parent materials can be seen in the soils which tend toward humic gleysol and organic (peat) profiles. In areas long under forest, shallow gray luvisol profiles have developed on this highly calcareous substratum.

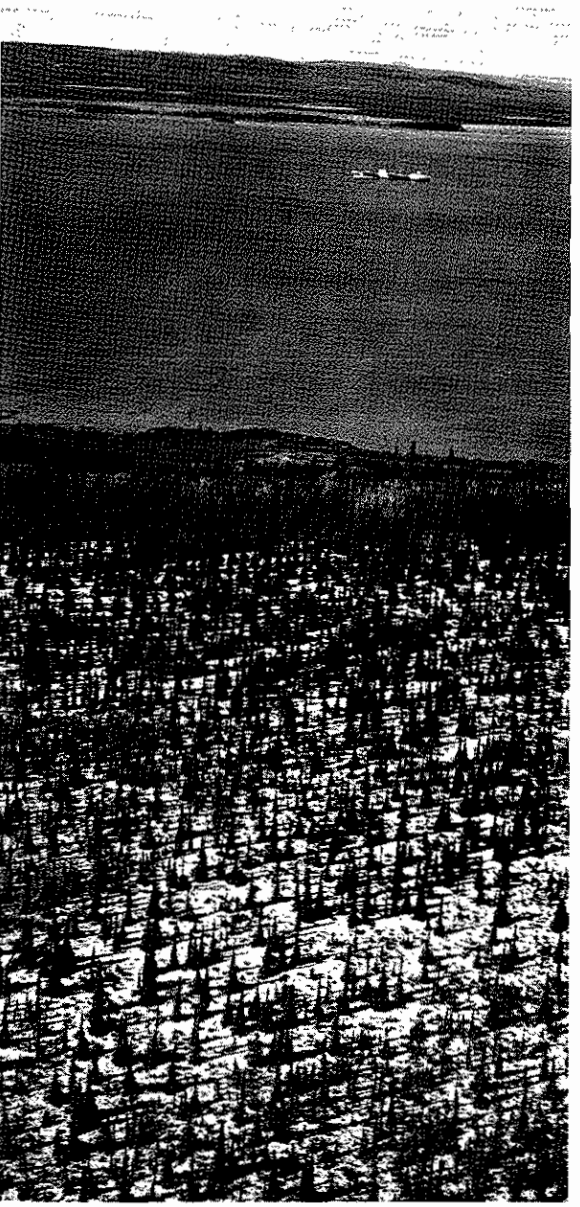


a

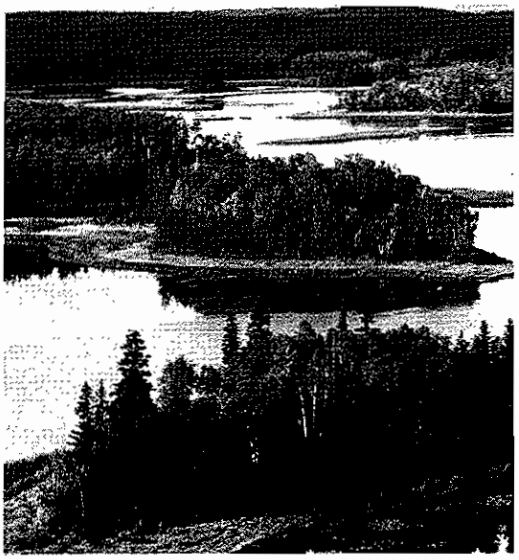
b

c

a Lower Foothills (B.19a).
b White spruce-trembling aspen.
c Upper English River (B.11).
d Hamilton and Eagle Valleys (B.12).
e Mixedwood (B.18a).
f Superior (B.9).



d



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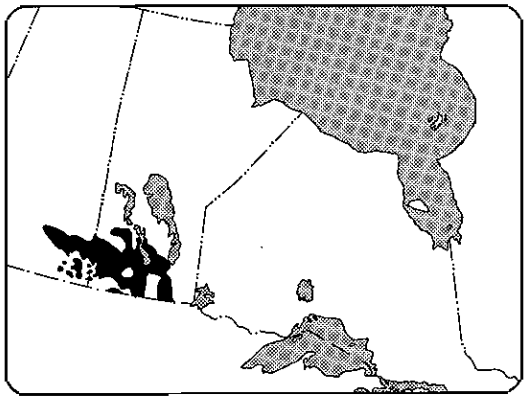
f

B.16 — Aspen-Oak

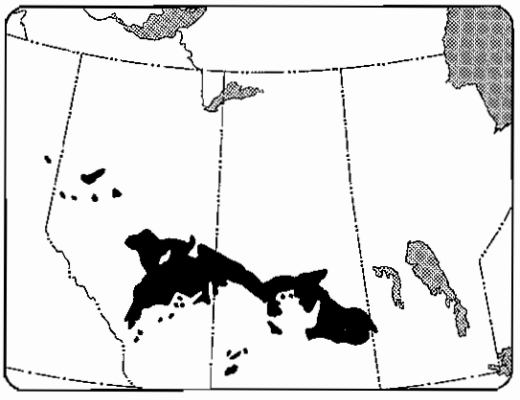


In west-central Canada, the southern edge of the boreal forest meets the prairie on a crescentic front which extends from the International Boundary in Manitoba to central Alberta and the foothills of the Rocky Mountains. The deciduous element of the boreal forest extends into this broad transition zone beyond the conifers, forming continuous closed forest where local conditions are suitable, or groveland where elements of the prairie are intermixed. The front along which the two major formations meet is not static and at present the forest appears to be encroaching on the grassland (as it is also in the forest-prairie ecotone of Interior British Columbia). While climatic fluctuations, past and present, are doubtless reflected in the vegetational shift, more direct importance may be attached to recent elimination of prairie fires and to reduction of grazing pressure.

The southeastern portion of this transition zone is placed in the present Section. Trembling aspen is the prevalent species, occurring in the prairie proper as small patches of bushy trees ringing wet depressions, and as continuous good-growth stands along the northern boundary. Balsam poplar is found locally throughout, usually in the moister locations. Bur oak is conspicuous along the rivers and on such suitable sites as shallow dry soils and south or west slopes, but in general its distribution is sporadic within the matrix of the dominant poplar vegetation. On alluvial soils white elm is a common species, growing to a large size and reaching the western limit of the Section with no marked falling off of growth. With it are associated green ash, Manitoba maple, eastern cottonwood, and occasionally, in the southeast, basswood and black ash.

The topography is varied from flat or undulating on the eastern side where influenced by the horizontally bedded Palaeozoic limestones and Lake Agassiz deposits, to rolling or rough on the morainic uplands of the central Cretaceous escarpment. Farther westward the terrain consists of a complex of old lake basins and glacial landforms. Soil development is to black chernozem profiles under grass and meadowland, and to dark gray chernozem and humic gleysol profiles under the influence of hardwood cover on well-drained and poorly-drained sites, respectively.

B.17 — Aspen Grove

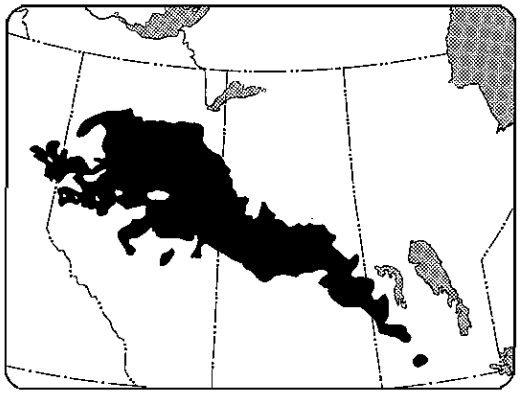


The western portion of the forest-grassland transition, very similar to the eastern (B.16), is covered by this Section. To a large extent it coincides with the black and dark gray chernozem soil zones of Saskatchewan and Alberta. Outliers are recognized within the prairie proper as on the Cypress Hills in southwestern Saskatchewan, and also within the forestland of the north where limited areas of grassland occur in the Peace River country.

Only trembling aspen is abundant in the natural stands. Balsam poplar is frequently present on moist lowlands, and occasionally it is also prominent on uplands after fire. White birch has a sporadic distribution but is usually found only on rough, broken land. There is a clear gradation in the heights reached by mature stands of trembling aspen from forest to prairie, the good growth attained in continuous stands of the north falling off to the low bluffs and patches in depressions and around sloughs in the south. River valleys traversing the eastern part of the Section in Saskatchewan and Manitoba support scattered stands of eastern cottonwood, green ash and Manitoba maple.

The topography is variable but generally rolling. Surface materials are deep tills and glacio-lacustrine deposits, mainly of loam to clay loam texture and moderately calcareous. Black chernozem profiles are predominant, though signs of podzolic degradation in the form of dark gray chernozem profiles can be recognized under the aspen stands. Interspersed with the aspen bluffs in the original vegetation were prairie and meadow patches, but most of these have disappeared today under the advance of agriculture.

B.18a — Mixedwood

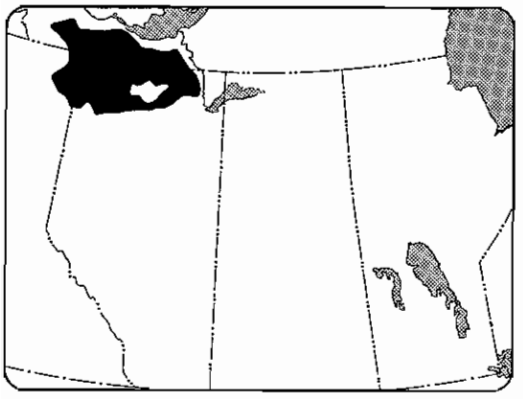


Extending from southwestern Manitoba to northeastern British Columbia and adjacent District of Mackenzie is a large and important forest area. It is roughly coincident with that part of the Cretaceous Upland north of the aspen and aspen-oak woodland, and is recognized by the appearance in abundance of the needle-leaved conifers. It is bounded on the northeast by the more level Palaeozoic and Precambrian lowlands and on the west by the appearance of Cordilleran forest elements, particularly lodgepole pine. Along this latter boundary, the forest is broken up by patches of grassland and aspen groves, as well as by lodgepole pine outliers of the Lower Foothils Section (B.19a). A related northwestern part (B.18b), described in the following Section, is climatically more severe than the main body of the area here being considered, and balsam fir is absent from it.

The characteristic forest association of the well-drained uplands is, as the name implies, a mixture in varying proportions of trembling aspen and balsam poplar, white and Alaska birches, white spruce and balsam fir, the last two species especially prominent in old stands. The cover type of greatest areal extent is the trembling aspen, a result of the ability of this species to regenerate readily following disturbance. In addition to its usual dominance on sandy areas, jack pine enters into the forest composition on the drier till soils, and mixes with black spruce on the plateau-like tops of the higher hills. Lower positions and the upper water-catchment areas develop black spruce and tamarack muskeg in which, however, the accumulation of peat is not deep. There is a minor occurrence of white elm, green ash, Manitoba maple and bur oak along the edges of the Section, noticeably in the southeast.

The relief of the area is not extreme except locally in the eastern part. It is chiefly the result of pre-glacial erosion of the soft bedrock shales, which produced such features as the Cretaceous escarpment and associated hills in the vicinity of the Manitoba-Saskatchewan border, and the Missouri Coteau farther to the west. Subsequent glaciation modified the landscape, resulting in the present topography characterized by rolling morainic deposits on the uplands and smoother glacio-lacustrine deposits on the lowlands. The characteristic soil development is to the gray luvisol rather than podzolic profiles.

B.18b — Hay River

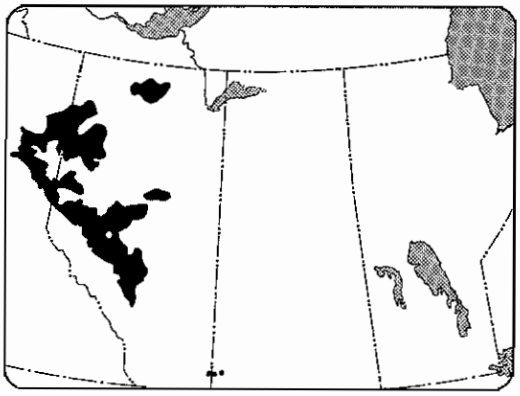


This Section represents the northern extension of the mixedwood forest, somewhat modified by a more rigorous climate (colder and drier) and a more level terrain than obtains in the previous Section to the south and east. It is in contact with the riverine forests of the Peace and Slave rivers on the east, with the upper Liard on the west and with the lowlands of Great Slave Lake and the Mackenzie River on the north, and it encloses an outlier of the Lower Foothills Section (B.19a) on the Caribou Hills.

The quality of the forest growth is not as good as that to the south, and the abundance of white spruce in mixture with trembling aspen is less. Black spruce covers a large part of the land, commonly forming stands on the plateau-like uplands as well as in the lowland habitats where it is usually found. Jack pine is abundant on the eastern side of the Section, less so in the central and western parts. Along the western boundary there is a limited distribution of lodgepole pine.

Shaly and sandy Cretaceous sedimentary rock underlies most of the Section, though in the escarpment area on the north and east the bedrock is of Devonian age and is largely limestone. Glacial advance over the latter formations incorporated a high proportion of calcareous material in the surface drift, with the result that soil profiles are frequently high in lime and hence shallowly leached.

B.19a — Lower Foothills

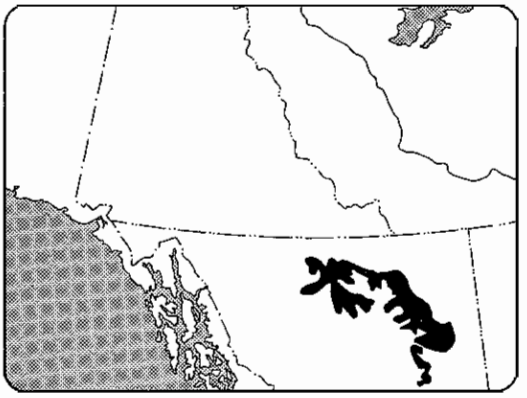


In the foothills of the Rocky Mountains, and at low elevations in the front ranges, a transition forest between the Boreal and Subalpine Forest Regions is found. The extensive eastern part of this forest ecotone covers low hills and plateaus between 4,000 and 3,000 feet in elevation in the south, descending to about 2,500 feet farther north. Three small outliers have been identified beyond its eastern boundary; one on the Caribou Hills (northern Alberta), a second centrally located on the Pelican Mountains, and the third on the Cypress Hills (extreme southeast Alberta and adjacent Saskatchewan).

The distinctive tree species is the lodgepole pine which, with trembling aspen and balsam poplar, has assumed a dominant position over much of the area in the wake of fire. In older forest stands white spruce is an important constituent and black spruce is frequently present too. White birch and tamarack have scattered representation with the above species on appropriate well-drained or poorly-drained sites, respectively. Both balsam fir and alpine fir are common locally in the main body of the Section, although the over-all importance of these species in the forests is small.

The topography is rolling, with some plateau areas among low to high rounded hills. The main rivers flow eastward in broad incised valleys. Glaciation from the east and to a lesser extent from the Cordilleran region covered the Mesozoic sedimentary rocks with a drift of variable composition, on which the usual soil development of upland sites is to gray luvisol profiles or related podzolic types depending on the calcareousness of the parent materials.

B.19b — Northern Foothills

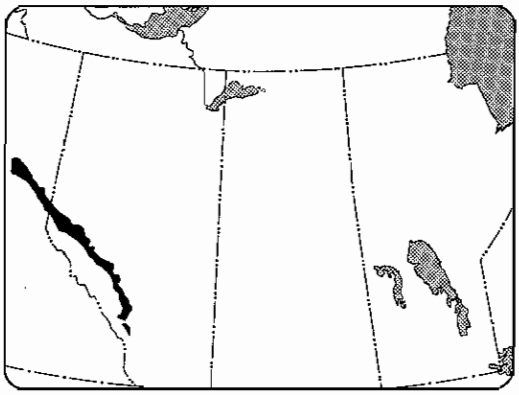


The Section fronts the Rocky Mountains in the Peace River district of northeastern British Columbia, and extends an arm around the north side of the main range to the Kechika drainage and the upper Rocky Mountain trench. Its altitudinal range extends from approximately 5,000 feet, where it begins to merge with the alpine tundra, to its contact with the forests of the upper Liard at about 3,000 feet, or lower in the interior mountain valleys.

In position relative to the alpine tundra which it partly surrounds, the Section occupies a zone comparable to that of the subalpine forests farther south. However, no Engelmann spruce is present here. The dominating trees are white spruce, black spruce and lodgepole pine, in mixture forming a variety of types. The black spruce-white spruce-pine type is distinctive of the high plateaus, though it also occupies areas of low relief on fine-textured soils. In stands predominantly of white spruce the alpine fir is a common associate, its relative abundance increasing up the slopes of the mountains. The broadleaved trees are not abundant, although some white birch varieties are scattered through upland stands, trembling aspen appears on south-facing slopes, and balsam poplar is present on lowland alluvium. Black spruce occupies the usual lowland niche on organic soils. In general the forest stands are rather patchy and open, and their productivity is not high.

The topography varies from level on the riverine flats and terraces to rolling and strongly dissected on the hills and lower mountain slopes. Some eutric brunisol soils have been reported on calcareous alluvial sites, and gray luvisol soils on the upland tills. Regosols are common on colluvial materials, and peats in the poorly-drained positions.

B.19c — Upper Foothills

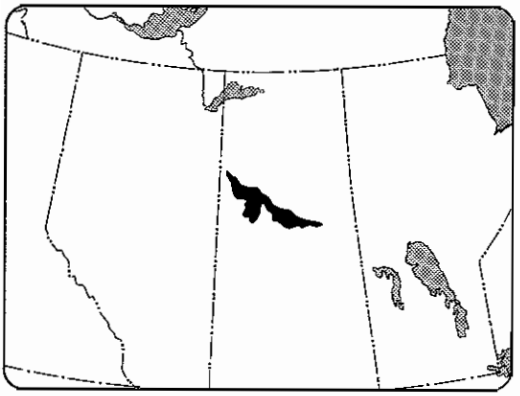


This long, narrow strip of forestland extends parallel to the front range of the Rocky Mountains, from the aspen parkland of southern Alberta to the more alpine environment of northeastern British Columbia where it merges with the Northern Foothills Section (B.19b). It lies adjacent to and above the Lower Foothills Section (B.19a), and comprises the western part of the transition from boreal to subalpine forest.

The foothills reach as high as 6,000 feet in altitude and are forested to their summits with conifers. A distinctive feature in comparison with the lower-lying forests to the east is the relative scarcity of mixedwood stands, for trembling aspen, balsam poplar and white birch are only sparsely represented. In addition to lodgepole pine, which is predominant, a major species is the typical white spruce rather than the Engelmann-white spruce complex which occupies the same altitudinal zone in subalpine forests. Black spruce is a frequent constituent of the forests north of the Red Deer River, but its occurrence is sporadic to the south. Alpine fir is somewhat less prevalent than in the neighbouring mountains, while tamarack is scattered in distribution and rare at the higher altitudes.

The Section is typified by high rounded hills and deep valleys. The uplifted and folded Mesozoic and late Palaeozoic sediments which form the bedrock are overlain by glacial deposits and colluvial material, and the mature soils show podzolic or gray luvisol development.

B.20 — Upper Churchill

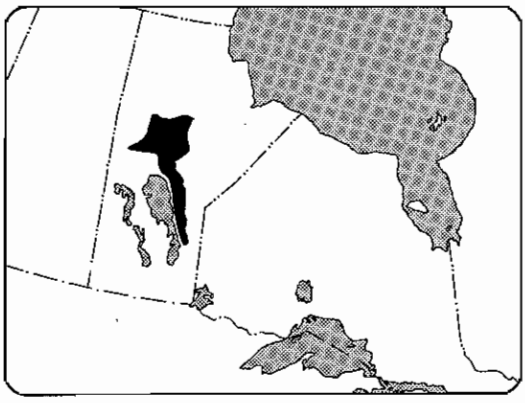


This Section in west-central Saskatchewan occupies an area of low relief, mostly below the 1,500-foot contour, bounded by the Precambrian Shield on the north and the Saskatchewan uplands on the south.

Extensive stands of jack pine occupy the sand plains and low ridges, while intervening poorly-drained areas are forested with black spruce and tamarack. White spruce and trembling aspen are of less importance here than on the upland tills of the Mixedwood Section (B.18a) to the south, though both species, and also balsam poplar, are well represented where drainage conditions are favourable. Balsam fir and white birch are present but not abundant. Large areas of swamp, bog and muskeg are common.

The area was occupied by Lake Hyper-Churchill at an early stage in the retreat of the last continental glacier, hence the flat or undulating surface. The sandy nature of the lacustrine and till deposits has possibly been inherited, in part at least, from a thin basal sandstone on the Precambrian basement at the north side of the Section, even though the main bedrock is dolomite or limestone of Devonian age. Soil profiles under jack pine forest on the sandy tills and lacustrine plains are strongly leached, the whiteness of the eluviated horizon (Ae) showing up strikingly wherever the surface humus is removed as along bush trails. On heavier materials, for example on some of the modified tills or banded lacustrine deposits, gray luvisol profiles have developed in association with white spruce and trembling aspen forests.

B.21 — Nelson River

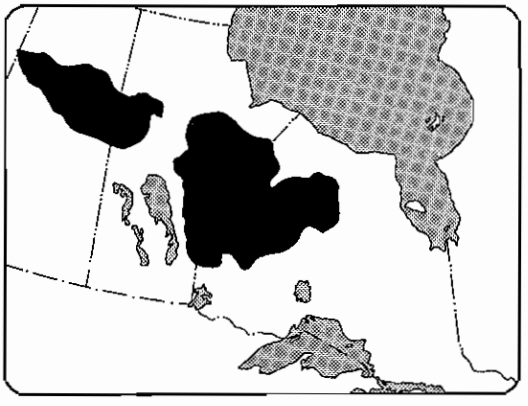


The Section includes a strip of land lying along the east shore of Lake Winnipeg and, northward, the clay belt surrounding the upper Nelson River in central Manitoba. It is bounded geographically by the lakes of the Palaeozoic lowlands on the west, and by the appearance of abundant Precambrian rock outcrop on the east and on the north. The northern boundary is also marked by a change from southern closed forest to open subarctic forest.

Stands of black spruce make up a large part of the forest cover, but proximity to the numerous and extensive swamps that lie back from the rivers is reflected in a restriction of growth. Where drainage is better as along the sides of rivers, on islands or on low ridges, good stands of white spruce with some balsam poplar, white birch, trembling aspen, and balsam fir are customary, with possibly more trembling aspen and balsam poplar under such conditions on the east side of Lake Winnipeg. Extensive and repeated fires have, however, fragmented all the forest cover, and large areas support small-growth trembling aspen, white birch, and scattered white and black spruce, or jack pine and trembling aspen, or grassy scrub on rocky barrens. Tamarack is present with black spruce in the swamps; isolated occurrences of green ash and Manitoba maple are reported on some of the river banks, and there is a little bur oak in the southern arm of the Section.

The area was covered by glacial Lake Agassiz, and the consequent deposition of lacustrine clays and sands has had the effect of levelling what was formerly an irregular and rolling Precambrian surface. The lacustrine deposits are shallow on the rocky uplands and deeper in the valleys, extending back along the latter considerable distances from the present-day lakes. On the well-drained materials, podzolic profiles normally develop. Gleysols are typical of poorly-drained slopes, while moss and woody peat characterize the spruce-tamarack muskegs.

B.22a — Northern Coniferous

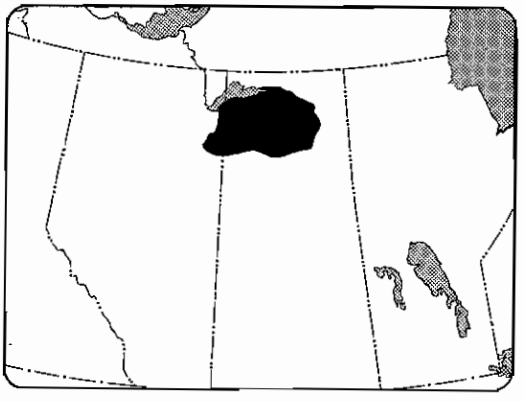


On the southwestern part of the Precambrian Shield, from western Ontario to western Saskatchewan, is a Section where climatic conditions allow reasonable tree growth and the development of closed forests wherever depth of soils is adequate. It is bounded on the north by the subarctic open forest, and is divided into a western and an eastern part by the northward extension of the Lake Agassiz lowlands (Nelson River Section, B.21).

Black spruce is the predominant tree, forming stands on the thin soils of the uplands as well as on the poorly-drained lowlands, and associated on these two positions with jack pine and tamarack, respectively. Frequent fires have favoured the spread of jack pine and are probably responsible also for the general though scattered representation of white birch over the majority of sites. In river valleys, around some of the lakes and on south-facing slopes, where more favourable conditions of soil and local climate obtain, white spruce, balsam fir, trembling aspen and balsam poplar form mixed stands of good growth.

The area is within a region where glaciation was intense, and the resulting relief is irregular, with rocky parallel ridges separating poorly-drained depressions and innumerable narrow lakes. Drift deposits on the uplands are thin in some places and absent in others where rock barrens of Precambrian granites and gneisses are exposed. The deeper drift of slopes and valleys shows humo-ferric podzol profile development, while the less well-drained areas are peat-filled.

B.22b — Athabasca South

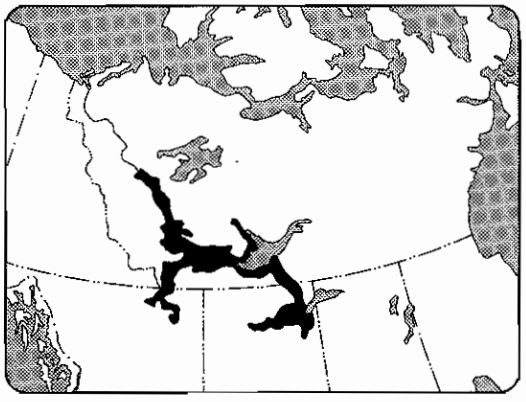


The Section comprises a broad lowland in northern Saskatchewan and northeastern Alberta, bounded by Lake Athabasca and the subarctic open woodland on the north, and by the preceding Section on the south.

Sandy soils derived by glacial action from the underlying sandstones (probably late Precambrian) have favoured forests of jack pine which are frequently park-like in structure due to rigorous climatic conditions and the frequency of fires. Moister sandy flats and the finer-textured soils bear black spruce and tamarack. Trembling aspen, balsam poplar and white spruce are uncommon except along river valleys and lake shores where good growth is made. In the southern parts, balsam fir is associated with these last-named species.

Relief is generally low, relieved only by deeply cut river valleys. Near Lake Athabasca there are wide areas of unstabilized dune sand, and farther south some remarkable drumlin fields. Ridges of morainic materials and of stratified drift contribute to the rolling topography. Humo-ferric podzols, gleysols and organic (peat) soils are present.

B.23a — Upper Mackenzie



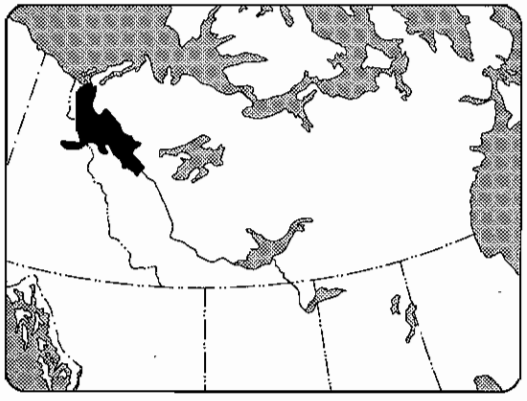
The Section is roughly V-shaped, with the arms extending upstream from the confluence of the Liard and Mackenzie rivers to the Fort Nelson River and the lower Peace River, respectively, and with the elongated apex reaching downstream to Norman Wells. It includes a large part of the riverine forest of the Mackenzie drainage, and because in the north the valley flood-plain environment is much more favourable for tree growth than that of the uplands, it coincides with some of the best timber-producing land in the northwest.

White spruce and balsam poplar form the main cover types on alluvial flats bordering the rivers. Few other species participate in forests of this particular site though balsam fir, and the white and Alaska birches are prominent south of Lake Athabasca. On the benches above the flood plains, extending back variable distances to the highlands, there is an entirely different forest pattern. Large areas of sandy soils are occupied by jack and lodgepole pines, trembling aspen and, in the moist to wet positions, by black spruce and tamarack. In contrast to its importance on the riverside alluvium, white spruce plays a minor role in the upland communities.

Excellent merchantable stands of white spruce grow along the flood plains of the Liard and lower Peace rivers, with possibly more balsam poplar intermixed with the spruce in the former than in the latter locality. Scattered lodgepole pine accompanies trembling aspen, white birch and white spruce on rocky till slopes and sandy terraces above the Liard, but on the highlands bordering the Slave River jack pine is the usual associate of these latter species. Within the northernmost strip of the Section, adjacent to the Mackenzie River, the abundance of balsam poplar and trembling aspen decreases from south to north. Here the benchlands, where forested, bear mixtures of white birch and white spruce which grow well wherever the permafrost table is sufficiently deep to allow adequate rooting. Black spruce stands are common on slopes as well as in the permafrost muskegs that commonly border the river flood plains.

Topographic conditions are everywhere very similar, the alluvial flats being bordered by low benchlands and terraces which in turn give way to undulating or rolling uplands with isolated ridges and low hills. The bedrock of Devonian and Cretaceous age is mostly buried deeply under glacial tills or more recently deposited lacustrine and alluvial materials. From south to north the frequency of frozen ground as a normal condition of the forest substratum increases, and though the full significance of this phenomenon to site productivity is not yet understood, it is believed to be of considerable importance. Gray luvisols and eutric brunisols are developed on well-drained sites in the southern parts, though immature profiles are more usual in alluvium. Northward the presence of permanent ground frost prevents soil profile development. There are large areas of swamp and peat.

B.23b — Lower Mackenzie

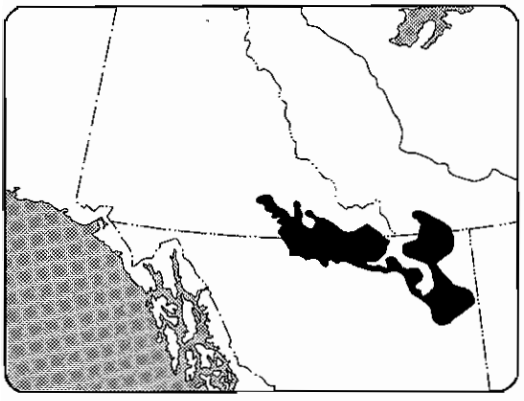


The lower part of the valley of the Mackenzie, from about the Great Bear River to the delta, defines the area of this Section. It is enclosed, east and west, by upland subarctic woodland and by transitional forest-tundra.

The dominant environmental feature is permafrost, which underlies all soils at depths depending on texture and topographic position, moistness of site and vegetative cover. Where the permafrost table is not high, as on some of the well-drained benchlands, white spruce attains sawlog size, but on fine-textured alluvium the growth of trees is poor, and scrubby types of forest composed of willows and alder with stunted white spruce and black spruce prevail. Trembling aspen and balsam poplar are not abundant, the usual position of these two species on upland sites being taken over by Alaska birch. There are great expanses of stunted black spruce on the more level, poorly-drained terrain, but tamarack — a common associate on such sites farther south — is not present. In general, through the Section as a whole, there is far more nonforested than forested land.

The underlying horizontally bedded sedimentary rocks, of Cretaceous age in the west (Peel Plateau) and Devonian age in the eastern part, control the low relief in this broad, relatively level plain. The entire area was glaciated, and the bedrock is covered with drift and recent alluvial deposits, the latter usually calcareous. The influence of ground frost, seen in such common features of the uplands as solifluction terraces and patterned ground (polygons), is also reflected within the soils where little evidence of profile development can be seen.

B.24 — Upper Liard

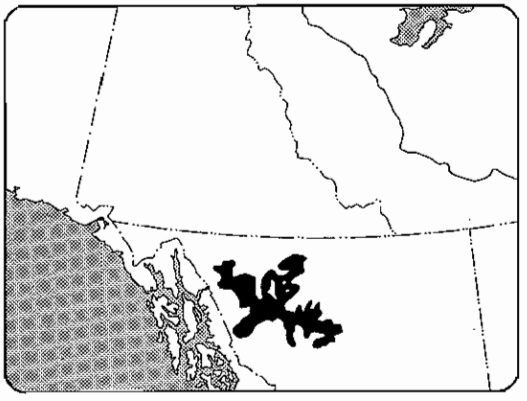


An irregular area spread along the boundary between the Yukon Territory and British Columbia, this Section includes a large part of the land draining to the Liard and Fort Nelson rivers north of the Northern Foothills Section (B.19b), with whose forests it has much in common. It is characterized by level landforms above the river courses, supporting stands of lodgepole pine, black spruce, white spruce and trembling aspen. On the north and west sides it comes in contact with the sparsely-forested Yukon plateau, and on the east with the more productive Lower Mackenzie and Hay River Sections (B.23b, B.18b), neither of the latter containing any quantity of lodgepole pine.

Good forest growth is found here, particularly on soils of the alluvial flats. The dominant trees in the latter position are white spruce and balsam poplar, the two species forming pure stands more frequently than mixtures. Above the river flood plains, black spruce and lodgepole pine form extensive pure and mixed stands. White spruce grows locally with trembling aspen and white birch on the most favourable sites, and with alpine fir as the treeline is approached on the higher lands. Past fires are responsible for an abundance of lodgepole pine stands, particularly on the sandy terraces which border the Liard in the western part of the Section. Black spruce and tamarack occur in low positions, although the former species is also prominent on upland fine-textured soils and on shaded slopes where lodgepole pine is its common associate.

The topography is that of a plain dissected by wide river valleys, these bordered by broad terraces which in turn give way to rolling uplands with low hills. The soil materials are derived from glacial, colluvial and alluvial deposits. Perennially frozen ground is not common, and the northwestern part of the Section appears to be climatically the most favourable forest-growing area in the Yukon Territory.

B.25 — Stikine Plateau

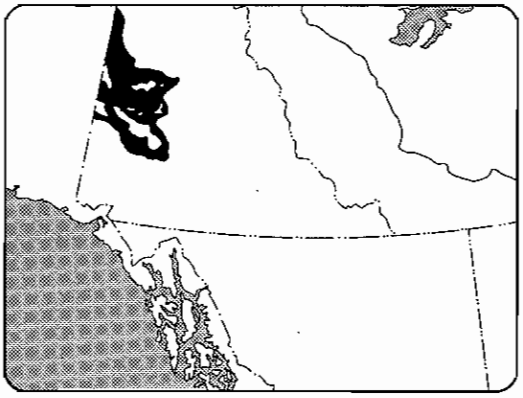


Included here are the forested parts of the area between the Cassiar and Coast mountains in northwestern British Columbia. The forest cover is scant and largely confined to the valleys; the boundaries of the Section are set altitudinally by the change from forest to alpine tundra on the mountain slopes.

An open mixture of trembling aspen, white spruce and lodgepole pine, interspersed with grassy areas, constitutes the prevailing vegetation pattern. Alaska birch has a scattered representation, black cottonwood appears on the river banks, and there is some alpine fir toward the treeline. Engelmann spruce, present in the Sections to the south, does not reach this area. Black spruce is not a prominent tree and apparently tamarack is absent.

The plateau is composed of several tablelands, separated by broad valleys and deeply cut at the margins by smaller streams. The bedrock is chiefly sediments with some lava, over which lies an uneven cover of glacial debris on the uplands, and of alluvial and colluvial deposits in the valleys.

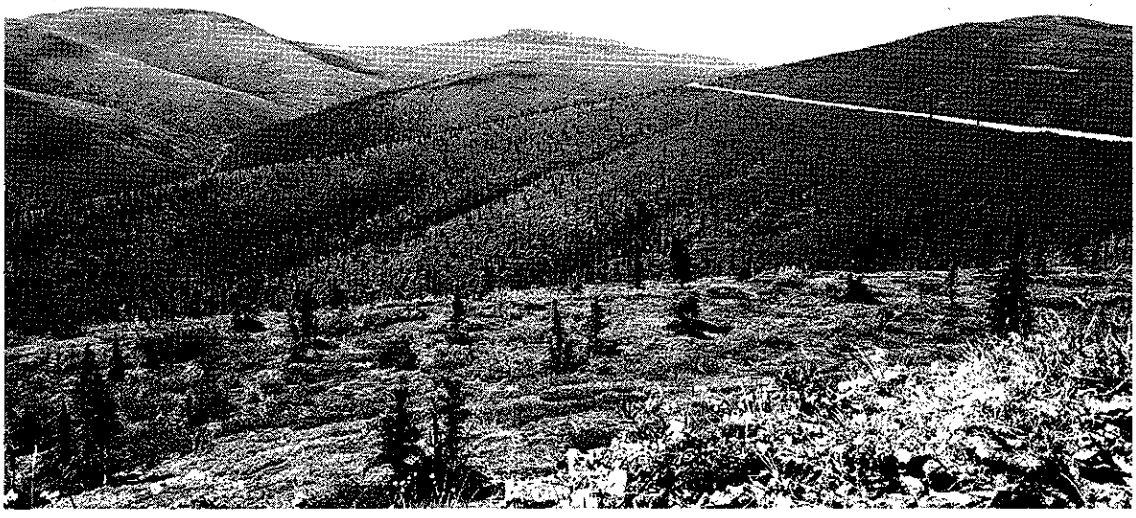
B.26a — Dawson



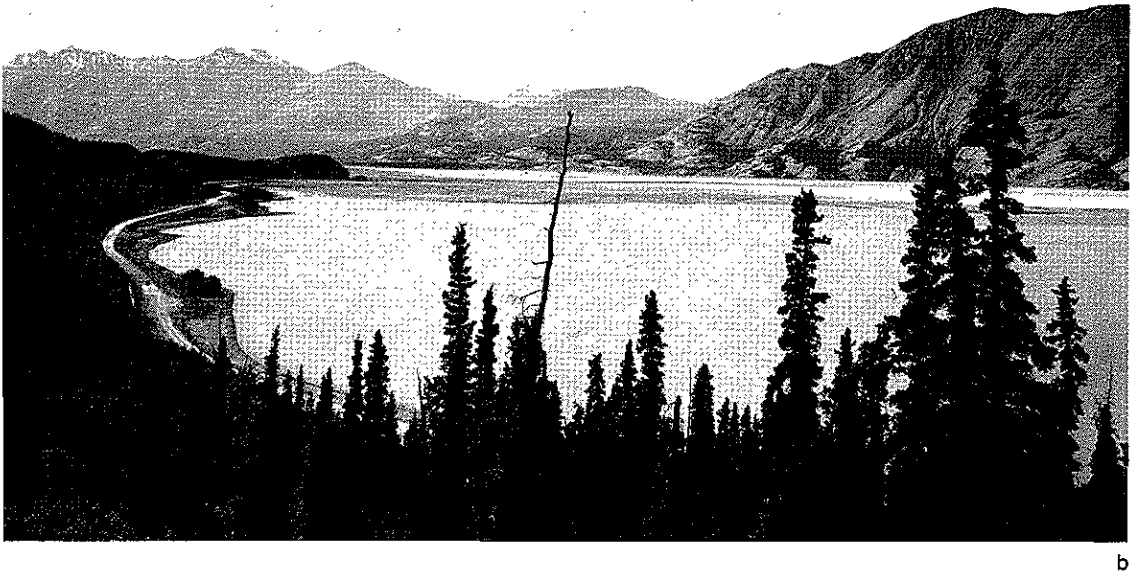
In the Yukon Territory the forests are largely confined to the plateau region of the south and west, a dissected basin of sedimentary and intrusive rocks ringed by high mountains. The major rivers, entrenched one to two thousand feet below the hilltops of the rugged upland surface, occupy narrow, steep-sided valleys. Because the plateau lies in a rain shadow, glaciation was incomplete during the Pleistocene era. One part of the unglaciated area, south of the Ogilvie Mountains and surrounding the Dawson Range and the Yukon River valley, is the subject of this description.

Alluvial flats are not common landforms here, hence the mixture of white spruce and balsam poplar so typical of the broad river valleys east and south of the Yukon Territory is not a prominent forest type. The chief forest habitat, the valley slope, bears stands of white spruce (some the Porsild variety) either pure or mixed with small groves of Alaska birch or with trembling aspen. These hardwood species, though maintained on many different sites by fires, are best suited to the warmer local climates, and trembling aspen in particular favours grassy dry hilltops and steep south-facing slopes where ground frost is minimal. The most favourable white spruce site is on lower slopes, high enough to be above the valley floors where cold air collects. In the valley bottom position, as well as on exposed uplands and in boggy areas, where the permafrost table is high, stunted stands of black spruce and white spruce are usual. On levees adjacent to the rivers, growth of the white spruce is potentially good although the usual vegetation is dense alder and willow scrub. On upland slopes there is some alpine fir associated with the black and the white spruces, and at 3,000 to 4,000 feet altitude the stunted forest changes to dwarf birch and then to an alpine tundra. Tamarack is not present in this Section, and lodgepole pine has only a scattered distribution.

Surface deposits are mainly residual, due to breakdown *in situ* of the underlying Precambrian and Tertiary rock. There has been a significant accumulation of volcanic ash in some places, and this apparently has some adverse effects on the rooting of trees. The soils are of variable petrography, but in general the effects of parent material are masked by the prevailing youthfulness of profile development. Some shallow, eutric brunisols have been noted.



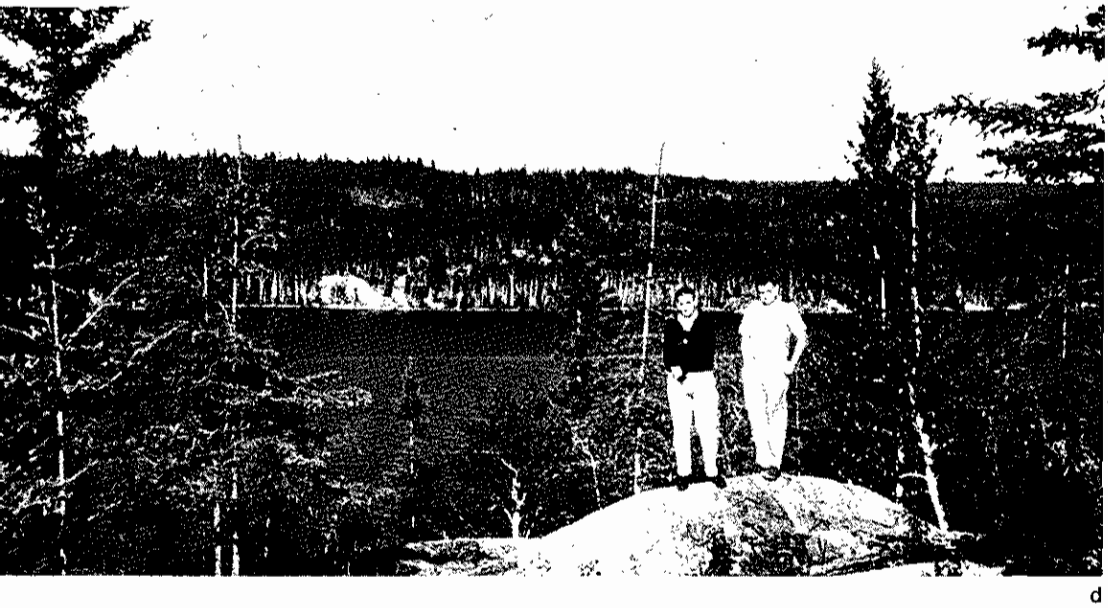
a



b

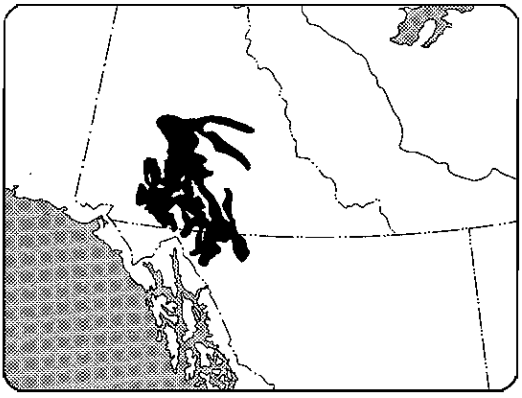
a Dawson (B.26a).
b Kluane (B.26d).
c Upper Mackenzie (B.23a).
d Northern Coniferous (B.22a).

c



d

B.26b — Central Yukon



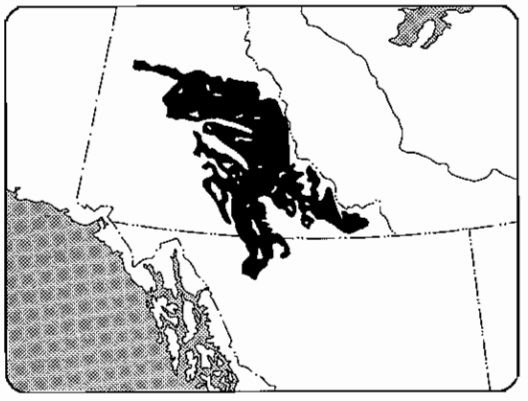
The upper drainage of the Yukon River, centred around Whitehorse in the south of the Territory, comprises a Forest Section with many similarities to the preceding one. The area is irregular in shape and encloses numerous mountain chains from the Pelly and Big Salmon ranges on the east to the Coast Range on the southwest.

The best forests are found on protected lowlands, with growth grading off as altitude increases. White spruce grows to saw-timber size on lower slopes where the surface mantle is stable, but above approximately 3,000 feet altitude its growth is restricted. On the uplands it associates with alpine fir which however ascends above it to the treeline at 4,000 to 5,000 feet. Interspersed with islands of park-like white spruce, willow and trembling aspen on the mountain slopes are patches of grassland and, in areas of soil instability, erosional barrens. Trembling aspen appears to be sensitive to aspect, and stands of open structure and flat-topped form usually occupy the south and west-facing slopes at moderate altitudes.

In the valleys, on water-modified tills and coarse terrace materials, lodgepole pine and white spruce share dominance in closed or open but rarely tall stands. Trembling aspen is a frequent associate of the conifers, and the mixed spruce-pine-aspen type is common here as in other Sections of the northwest. Lodgepole pine is particularly prevalent on dry sandy soils in the southeastern part of the Section; westward and to the north it diminishes and finally disappears as a member of the forest communities. Tamarack too is mostly limited to the eastern side. Black spruce ranges throughout on organic soils of the leveler landforms where either texture of mineral soil or frozen ground maintain a high water table. It is frequently joined on such sites by white spruce, and in this area the ecological difference between the two species is somewhat blurred. There is only a limited development of the alluvial flood-plain site and hence not much of the productive riverine spruce-poplar type so prominent along the Peace, Liard and Mackenzie rivers.

Throughout the Section there is evidence of recent strong glaciation, and the soils are predominantly of unmodified or waterworked glacial drift. In the river valleys, the modified materials tend to be somewhat coarser in texture than those present farther downstream in the more western Sections. Soil development is generally weak, due to the youthfulness of the surface materials and to the dry climate. Eutric brunisols are usual but gray luvisol and eluviated dark brown chernozem profiles also occur. The rooting depth of trees and other plants is in some areas affected by layers of volcanic ash in the soils, and in other places, particularly northward, by permanently frozen ground.

B.26c — Eastern Yukon

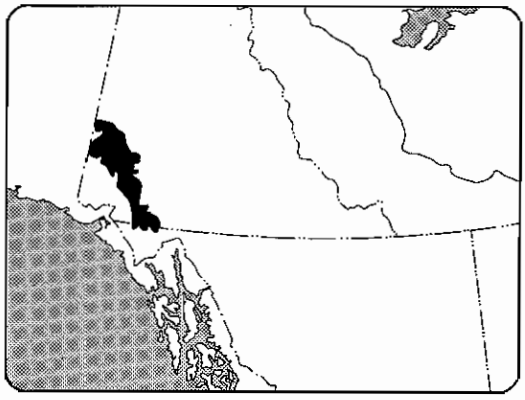


The eastern part of the Yukon plateau, bounded on the north and east by the Ogilvie and the Selwyn mountains, respectively, and on the south by the Liard and Stikine plateaus, is somewhat higher and colder than the Sections to the west. The effects are seen in the common occurrence of forestless barrens as well as in the general distribution of perenially frozen ground.

Aspect has a significant influence on forest vegetation, with south and west slopes favourable to mixed stands of white spruce, trembling aspen, Alaska and Kenai birches but with north and east slopes frequently non-forested. As in central Yukon, alpine fir occupies suitable sites on the higher slopes, either associated with a white spruce-birch-black spruce type, or alone forming a scrub growth at timberline (usually below 5,000 feet altitude). On lower slopes and valley terraces the forest cover is dominated by white spruce, lodgepole pine and trembling aspen in the southern parts, and by white spruce, birch and black spruce northward and in the mountains. The black spruce also grows in bogs and on permafrost slopes, accompanied on the former site by tamarack and on the latter by Alaska birch. Flood plains are generally narrow in the sharply cut valleys and as a result there is a low representation of balsam poplar forest. Locally, patches of well-formed balsam poplar and white spruce do occur on alluvium, backed by white spruce and white birch on the higher terraces.

The entire area was strongly glaciated, and the surface mantle consists of glacial drift, much of it calcareous. On this, as on the limited alluvial deposits of the valleys, soil profile development is poorly defined. Organic (peat) soils are extensively developed due to the widespread interruption of internal drainage by ground frost.

B.26d — Kluane

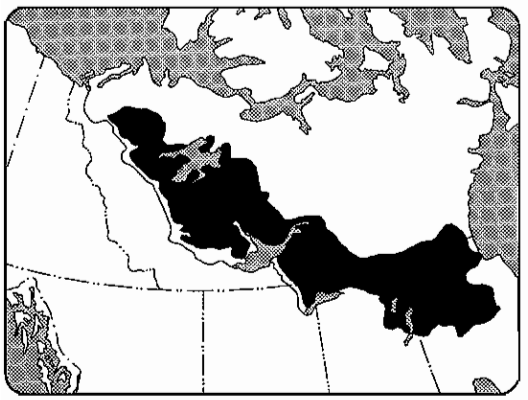


The Section comprises a narrow strip of forestland at the southwestern corner of the Yukon plateau, fronting the very high St. Elias Mountains in whose rain shadow it lies. In this dry, cold climate, the vegetation has a park-like appearance, and even in the river valleys the forest stands are rarely dense and closed. Grassy openings, alternating with groves of trees, are apparently indicative of locally warm, unfrozen soils.

The best forests are the river valley associations of white spruce, trembling aspen and balsam poplar. The spruce does not attain the growth expected of such sites in adjacent Sections to the south and east, and this indicates the poor forest potential of the area. On the benchlands of the valleys the types are composed of white spruce, trembling aspen and Alaska birch. There is no lodgepole pine in the Section, and neither black spruce nor tamarack are prominent species. On peat lands the white and black spruces appear to be ecologically interchangeable. Upland slopes bear an open forest of white spruce with an undergrowth of low willows and birches, giving way to shrubby or grassy "barrens" at about 4,500 feet altitude.

The Section comprises broad valleys flanked by hills, mostly rather low, but with some (as at Kluane) rising to an altitude of 6,000 feet. The area was heavily glaciated very recently, and some glaciers still remain.

B.27 — Northwestern Transition

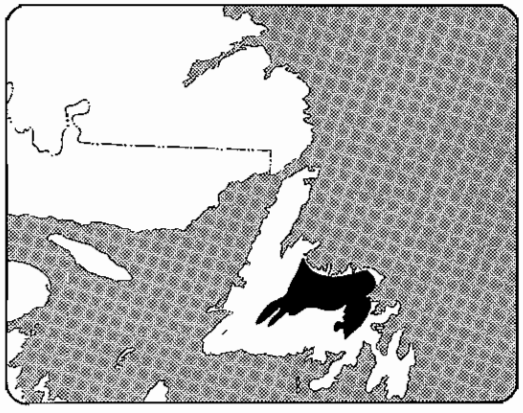


In western Canada the closed coniferous forest passes northward into a zone of open subarctic woodland which extends from Hudson Bay almost to the delta of the Mackenzie River, and includes the areas around Great Bear Lake, east Great Slave Lake, Wollaston Lake and Southern Indian Lake. It in turn gives way to mixed forest-tundra along a boundary running roughly northwest-southeast from Arctic Red River to Churchill.

In this forest fringe fronting the tundra, unfavourable climatic conditions, thin soils and frequent fires have combined to reduce the distribution, abundance and size of the tree species. Areas of bog, muskeg and barren rock are intermixed with open stands of dwarfed trees, although on local patches of sheltered, deep, frost-free soil the density and height growth of forest patches can be surprisingly good. Characteristic of the park-like coniferous stands on upland sites is a ground cover of light-coloured, foliose lichens. The most abundant tree on all sites is black spruce, and with it on the well-drained soils grows white spruce. Other accompanying species are white birch and tamarack, the latter of increased importance in the more northerly parts of the Section. Jack pine is only common in the southern parts especially on sandy soils and uplands. Stunted trembling aspen and balsam poplar extend well toward the northern boundary. Balsam fir is not present; a contrast to its commonness in comparable Sections on the east side of Hudson Bay.

Over most of the area the bedrock is of Precambrian granites and gneisses with many scattered irregular areas of sedimentary and volcanic rocks, but south and west of Great Bear Lake the Section extends onto Palaeozoic and Cretaceous sediments. A generally low relief, plus shallow depth of glacial till over bedrock, contributes to the prevalence of water-filled depressions, and vast stretches of the country appear to be almost as much lake as land. Eskers, till ridges and rock knobs are common surface forms. Ground frost is a usual feature of all but the coarsest-textured soils.

B.28a — Grand Falls

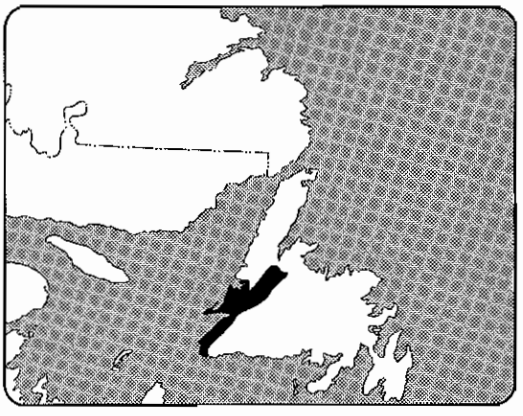


This Section, occupying the plateau of central-northern Newfoundland, contains the greatest area of productive forestland in the province. To the south and west it is bounded by highland moss barrens, on the east by the poorer forests of the Avalon peninsula, and on the north by a narrow maritime strip differentiated by a contrasting prominence of white spruce.

The forests are chiefly coniferous, dominated by balsam fir and black spruce. Regeneration of the black spruce has been favoured by a long fire history with the result that, at the present time, it is the predominant tree on the eastern side of the Section; balsam fir is more important to the west. Open black spruce stands on raw peat, and heath-covered fire barrens are common. White birch is of general though scattered distribution throughout, and small pure stands of the species are especially noticeable in the central and western parts. White spruce has a similarly widespread and scattered occurrence. Trembling aspen plays a pioneer role on some cut-over and burned areas, while balsam poplar is only occasionally seen. Formerly some good stands of eastern white pine were in existence, but there is nothing much left of them now. The only red pine in Newfoundland is found here localized in a few areas.

The topography is mainly that of a flat to gently rolling plain of low relief sloping to the northeast, with many bogs and muskegs, lakes and rivers, chief among the latter being the Exploits. The underlying strata are mostly Palaeozoic sediments with some intrusive rocks, and the derived glacial tills that cover the surface are relatively fertile. The soils are humo-ferric and ferro-humic podzols on the uplands, gleysols and organic soils (peats) on the lowlands.

B.28b — Corner Brook

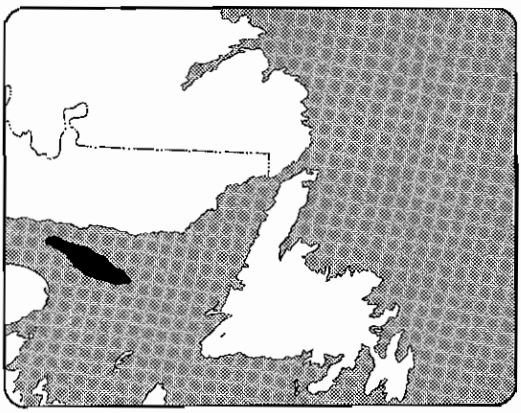


The Section embraces southwestern Newfoundland, from the coastal plain of St. George's Bay to the interior lowlands of the Humber River and Grand Lake. It is bounded north and eastward by the poorer forests and barren lands of the Northern Peninsula and the southern Long Range Mountains, respectively. The growth potential is good in this, the second largest area of productive forestland in Newfoundland.

Balsam fir, the principal softwood species, grows very well here in association with black spruce and white spruce. Though conifers predominate, the district is characterized by small stands of deciduous trees in which white birch is dominant and trembling aspen plays a lesser role. Eastern white pine, black ash, balsam poplar and yellow birch occur here and there as minor species, the yellow birch being distributed along the west coast southward from Corner Brook. Another characteristic of the Section is the abundance of mountain maple, a small tree or shrub which elsewhere in Newfoundland is rather inconspicuous.

The upland terrain is rugged, contrasting with the flat valley bottoms and coastal strips. Palaeozoic sedimentary rocks underlie the area, and humo-ferric podzol profiles are usual in the overlying glacial drift. Climatic and soil conditions are evidently more favourable than in the adjacent Sections as attested both by the good height growth of the trees and by the marked similarity in forest composition to that of the Acadian Forest Region.

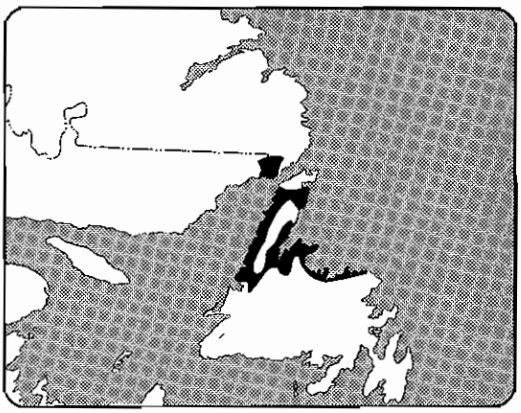
B.28c — Anticosti



The windswept island of Anticosti at the mouth of the St. Lawrence River supports a mixed forest of white spruce, balsam fir, black spruce and white birch. Trembling aspen and balsam poplar though present attain no importance in the various forest types. The height of mature trees is not great, possibly due to wind effects. A remarkable feature of the vegetation is the virtual absence of shrubs, and not even alders appear in the understorey of open stands. Burned areas apparently regenerate easily and almost immediately to white and black spruces and a large resident deer population is presently effecting changes in the forest composition by grazing and thereby eliminating balsam fir young growth.

The bedrock of Anticosti is of Silurian and Ordovician limestone, and the calcareous surface detritus, modified over most of the island by marine submergence, is well known as a habitat of rare plants, particularly along the southern coast.

B.29 — Northern Peninsula

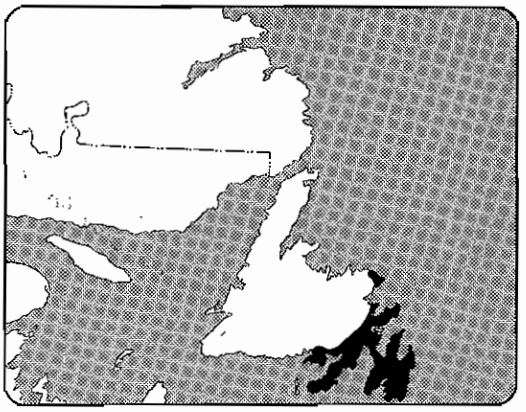


The Long Range which forms the backbone of the Northern Peninsula of Newfoundland is practically treeless at the top (B.31 Section) but the slopes toward the Gulf of St. Lawrence and the Atlantic Ocean support good coniferous stands. At the northern tip of the peninsula the closed forest grades into open lichen-woodland of the forest-tundra transition, while the southern boundary of the Section is marked by a transition to the richer forests of the Humber Valley and Grand Lake.

The principal trees are balsam fir, black spruce and white spruce. The balsam fir in particular attains very high population densities. The average growth potential is inferior to that of forests in the Grand Falls and Corner Brook Sections (B.28a, B.28b) but nevertheless high yields of pulpwood are obtained on well-drained sites, particularly on the western slope. The boreal hardwoods, trembling aspen and white birch, are of secondary importance even though the representation of white birch in the forests is apparently as high or higher here than in any other part of the province. Excepting only the Bonne Bay area, the Northern Peninsula Section contains no eastern white pine, in this differing from most other parts of Newfoundland. White spruce is a prominent tree of the maritime strip along the northern side of the island, but most of this area is nonforested rock barrens.

The topography is relatively rugged over a variable bedrock. At the higher elevations Precambrian granites underlie shallow tills, or outcrop on the slopes, while at lower elevations the bedrock under a generally deeper drift is of Ordovician limestones and sandstones. Humo-ferric and ferro-humic podzols are usual, and there is extensive development of ericaceous and moss peat on poorly-drained lands. There are some large areas of sterile serpentine soils in the western part. Climatic conditions are rigorous, and exposure to fog and wind may be factors serving to limit height growth of trees on many sites.

B.30 — Avalon

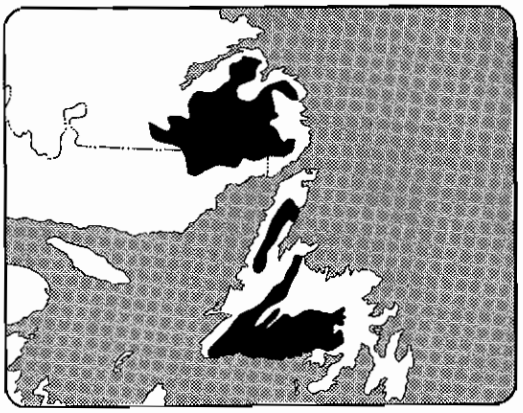


Included in this Section is the Avalon peninsula and the eastern mainland of Newfoundland. The south mainland boundary is formed by moss-and-heath barrens and the northern by a transition to the better pulpwood forests of the Grand Falls Section (B.28a). Throughout this cool and windy area the forests have been destroyed or badly decimated by fires and cultural practices, and the prevailing character of the vegetation today is that of a patchy though dense-growing young coniferous forest interrupted by extensive barrens.

Balsam fir is the most abundant tree characterizing the forests of the Avalon peninsula and the adjacent mainland. Although it grows well in early life on good sites, heights in excess of 40 feet at maturity are rarely reached. Almost equally important is black spruce which either grows with balsam fir and white spruce on the better soils or dominates alone in stunted, slow-growing stands on the poorer upland sites. Black spruce is also prevalent as usual on the wet lowlands where it is frequently accompanied by tamarack. White spruce is numerically of small importance and is found chiefly along the coastline associated with balsam fir. The only important hardwood is white birch, common on north-facing slopes and in deep valleys; although on the better soils it forms occasional pure stands, it is more commonly associated there with balsam fir. Yellow birch grows locally in protected valleys and a limited amount of red maple occurs. Eastern white pine was at one time of considerable economic significance but it is becoming increasingly rare.

The Section occupies a rolling plateau, underlain by late-Precambrian sedimentary and volcanic rocks. Inland, the area is studded with numerous lakes and ponds, and drainage is effected by many small but swift rivers. The soils developed on the thin drift over bedrock are nutrient-poor humo-ferric and ferro-humic podzols of youthful appearance. The cool, humid climate is favourable to the accumulation of peat in raised bogs, and approximately half of the terrain surface is covered by moss-and-heath bogland. Fires have undoubtedly contributed to the formation and maintenance of much of this nonforest vegetation.

B.31 — Newfoundland-Labrador Barrens

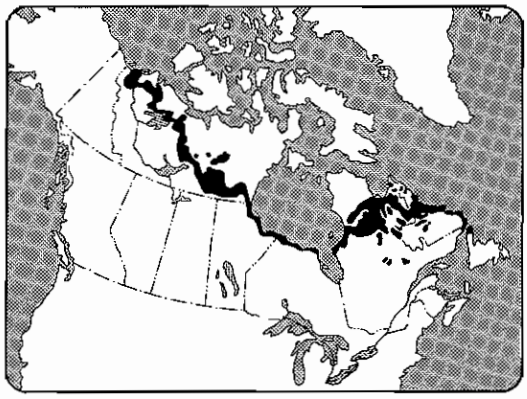


The extensive areas of sparsely forested heath-and-moss barrens in south and central Newfoundland, on the upper levels of the Long Range in the Northern Peninsula, and in southeastern Labrador, are placed together in this Section. Though it is likely that there is considerable climatic variability between these different areas, the appearance of the vegetation is everywhere much the same, i.e., a stunted, open and patchy or sometimes continuous cover of black spruce and balsam fir, alternating with moss-and-heath barrens, rock outcrop and lakes, on a generally featureless, windswept terrain.

There is a lesser percentage of nonforested barren land in the Labrador sector than elsewhere in the Section, for open lichen-woodlands dominated by black spruce are usual on the uplands. On the other hand, many upland areas and slopes on the island of Newfoundland are blanketed with moss bogs, a possible reflection of the high moisture surplus. The primary forest types of black spruce and balsam fir are often dense though usually dwarfed, indicating that conditions are suitable for establishment if not for later growth of the conifers. The presence of occasional good stands of trees on sheltered, well-drained morainic hillocks suggests that the generally poor forest growth is a result of wet, cold soils, and exposure to wind. Secondary species associating with the black spruce and balsam fir are white spruce and white birch, with tamarack on the wetter sites.

The topography is locally rugged to mountainous but with large areas of low relief. The underlying bedrock is of variable Precambrian and Palaeozoic granites and sedimentary rocks. On the surface drift, organic (peat) soils are prominent, and on well-drained sites the profile developed is a humo-ferric podzol.

B.32 — Forest-Tundra

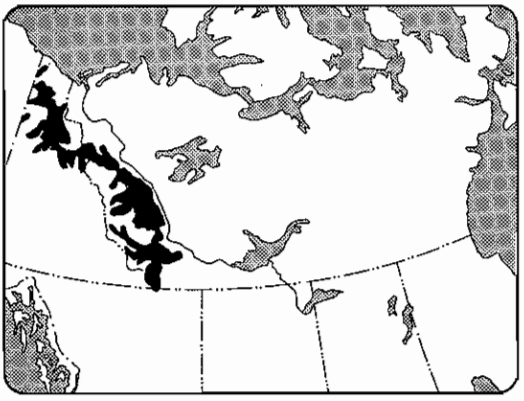


The transitional zone between subarctic forest and tundra stretches across northern Canada from the Mackenzie Delta to James Bay, thence to Ungava Bay and the Atlantic Coast. Such a broad geographic range inevitably includes a great diversity of environments, but the overriding influence of climatic severity has produced a similarity of vegetational structure throughout. This consists of a pattern of tundra "barrens" and patches of stunted forest, the latter usually but not exclusively along the shores of lakes and rivers and the former on the upland interfluves. The pattern shows a gradient change from south to north as forests shrink and tundra expands.

The primary species are the two spruces (white and black) and tamarack, accompanied by alder and willow shrubs. Where the forest-tundra is under maritime influence as around Hudson Bay and along the Atlantic coast of Labrador, white spruce is usually the most prominent tree, particularly on the immediate coastal strip. Inland, black spruce and tamarack compose the bulk of the forest patches with the former species frequently assuming a shrubby "candelabrum" form as the treeline is approached. Pine (*Pinus* spp.) is absent, and balsam fir only rarely occurs in the Ungava area; the other boreal trees — white birch, trembling aspen and balsam poplar are infrequent.

In the forest-tundra ecotone the major controlling influence is climate, and the vegetation is an expression of such environmental features as exposure to wind, protection by snow, instability of soils under permafrost conditions, low air temperatures during the growing season and fire. Thus the general environment makes forest survival precarious and there is evidence that the treeline has fluctuated widely in the past.

B.33 — Alpine Forest-Tundra



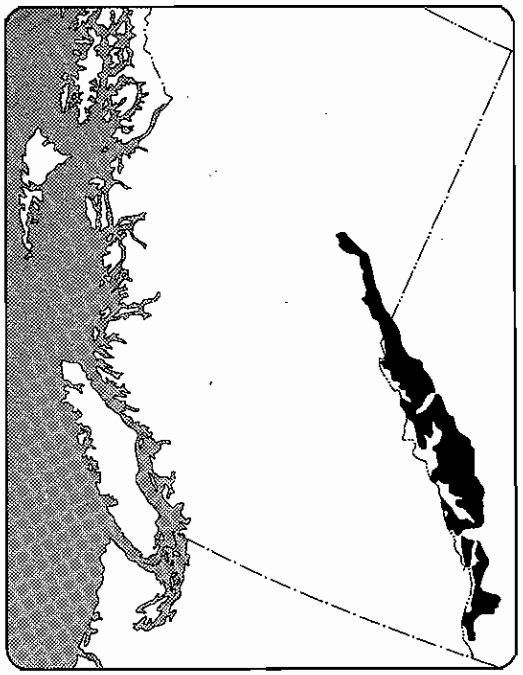
Between the Mackenzie lowlands and the mountains along the Yukon-Mackenzie boundary, and on the interior Porcupine Plain of northern Yukon, an altitudinal transition takes place from forest to alpine tundra analogous to the latitudinal transition in central and eastern Canada from forest to arctic tundra.

Open, park-like stands of stunted white spruce, alternating with patches of grassy or shrubby vegetation, or with rocky barrens, are characteristic of the mountain slopes up to treeline at about 3,500 to 3,800 feet. On northern and eastern aspects the alpine fir is usual at the treeline transition to alpine tundra, and on the same aspects but at lower altitudes the black spruce has its greatest representation, either alone or mixed with white spruce. On more favourable sites, Alaska birch is found with the white spruce. Tamarack, trembling aspen and balsam poplar are infrequent constituents of the vegetation. At the southern edge, lodgepole pine is conspicuous on mountain slopes.

Subalpine Forest Region

Interior Subalpine (SA.2).

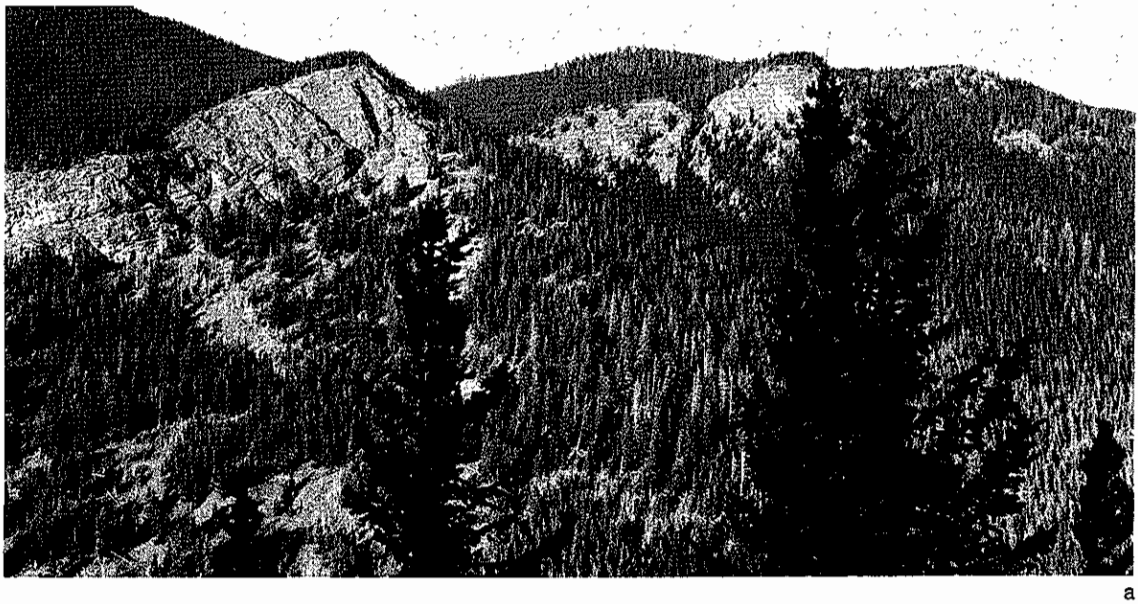
SA.1 — East Slope Rockies



Covering the eastern slopes of the Rocky Mountains and the rugged adjacent foothills, from approximately 5,000 to 6,800 feet altitude, is a coniferous forest distinguished from that of the Upper Foothills Section (B.19c) by the presence of the Engelmann spruce-white spruce hybrid complex and at the higher altitudes by Engelmann spruce alone. An important associated species is the lodgepole pine whose powers of prolific regeneration following fire have resulted in its replacing the spruce over great areas. With increasing elevation on the slopes, alpine fir becomes more important, particularly in the older spruce forests. Whitebark pine occurs in commercial volumes at lower elevations, mixed with hybrid spruce and lodgepole pine, and is also conspicuous on exposed ridges and slopes at treeline. Alpine larch occupies a similar habitat in the southern half of the Section. Along the lower altitudinal boundary, limber pine appears on rocky soils, while in the vicinity of Jasper, Banff and Waterton there is some presence of interior Douglas-fir where contact is made with isolated patches of montane forest. The transition to plains grassland on the south and east side is marked by a fringe of trembling aspen groveland.

The subalpine forest is a mountain counterpart of the boreal forest, and the primary member species of both show very close relationships. The Engelmann spruce of the former is matched by the white spruce of the latter, alpine fir by balsam fir, lodgepole pine by jack pine, and each pair of species apparently hybridizes where their ranges overlap. A marked difference in composition of the forest types of the two Regions is seen however in the relative unimportance in the Subalpine of trembling aspen, balsam poplar and white birch. Black spruce is also of limited importance compared to the role it plays in the boreal forests, and it is a rare tree south of the Red Deer River.

The mountainous topography — steep slopes and deep valleys — has been developed on uplifted Mesozoic shales and sandstones with some local Cambrian limestones. The derived residual and glacial surface materials are variable in texture and composition, and under the influence of a wide range of local climatic conditions the soil development has also been variable. Most frequent are thin soils (lithic subgroups) over bedrock and shallow humo-ferric podzols; eutric and dystric brunisol profiles occur occasionally.



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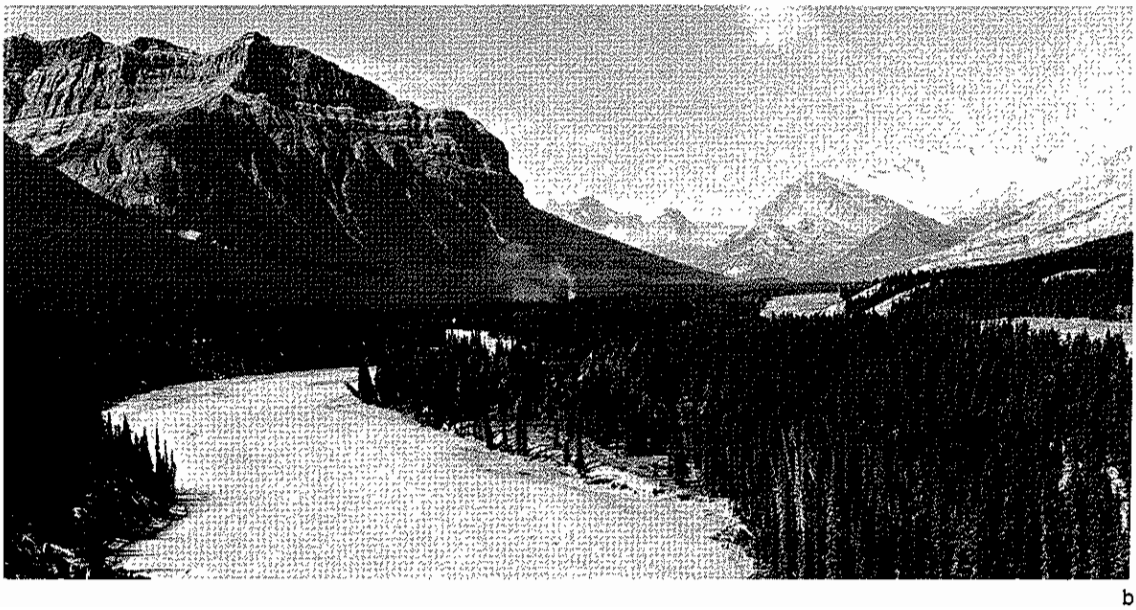


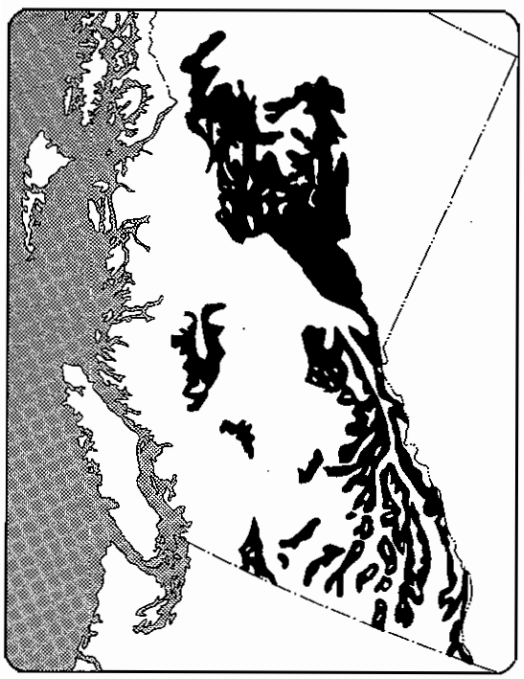
b

a East Slope Rockies (SA.1).
b East Slope Rockies (SA.1).
c Interior Subalpine (SA.2).
d Alpine fir.

c

d

SA.2 — Interior Subalpine



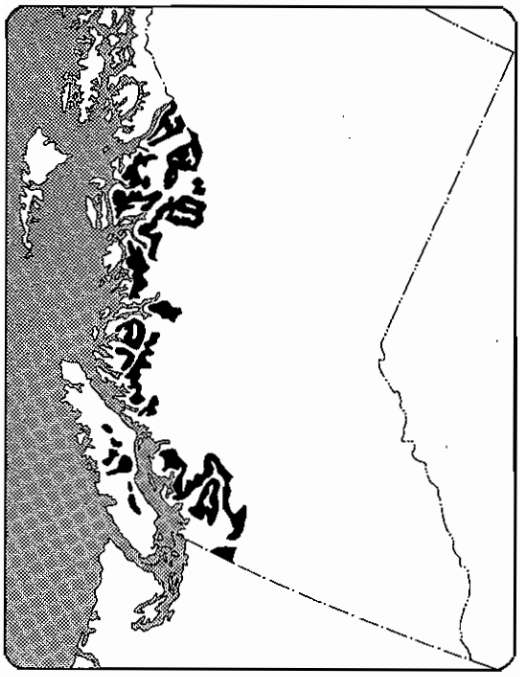
This is a much-fragmented forest, occupying to treeline the mountainous uplands which surround the Fraser and Nechako plateaus. In its northern part, beyond latitude 53°, it is the principal forest area of interior British Columbia.

Characteristic is a forest of western white spruce, Engelmann spruce and their intermediate forms, associated with alpine fir which increases in abundance at higher altitudes and is dominant at treeline. Extensive stands of the pioneer lodgepole pine cover areas of past fires.

In eastern British Columbia the lower boundary of the Interior Subalpine Section lies roughly between 3,600 and 4,000 feet above sea level, at which general elevation contact is made with the cedar-hemlock-fir stands of the Columbia Forest Region. Northward, the altitudinal range is lowered, and the spruce-pine forests are continuous from mountain slope to mountain slope across the intervening valleys. Here both black spruce and white spruce enter from the Boreal Forest Region to the north and east; in fact, north of 54° latitude the latter species is dominant and Engelmann spruce is apparently absent. Westward, on the lee side of the Coast Range, western hemlock with some western red cedar and amabilis fir, associates with white spruce, and scattered western white birch also appears. Along the upper altitudinal boundary the whitebark pine is usually represented on exposed rocky slopes, and in the southeastern parts the mountain hemlock and alpine larch have a local occurrence.

The bedrock is largely of Palaeozoic sediments with Tertiary extrusions, although long-continued erosion has exposed the granitic cores of some of the mountains and produced surface materials of wide variability. Soil conditions are much as in the previous Section.

SA.3 — Coastal Subalpine

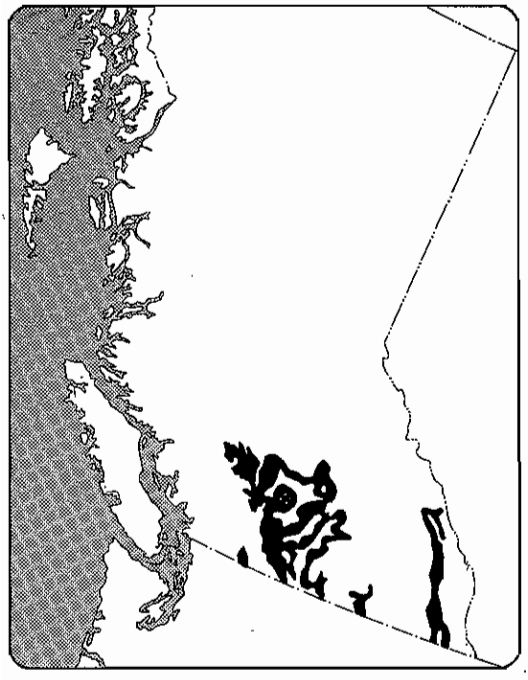


Above approximately 3,000 feet altitude on Vancouver Island and the west side of the mainland Coast Range, occupying a zone between the Douglas-fir-hemlock-cedar forests and the alpine tundra and snow fields, there is a forest with characteristics of both the Subalpine Forest and Coast Forest Regions. Mixed coniferous stands of amabilis fir, mountain hemlock and alpine fir are usual, these species decreasing in importance toward treeline in the order given. Yellow cypress is commercially important in some forest stands, though its exploitation is difficult due to the inaccessibility of most parts of the Section. No spruce species are present. A somewhat similar forest is found on the highest lands of the Queen Charlotte Islands, beginning at about the 2,000-foot contour, although true firs (*Abies* spp.) do not occur there.

Montane Forest Region

Ponderosa pine.

M.1 — Ponderosa Pine and Douglas-fir



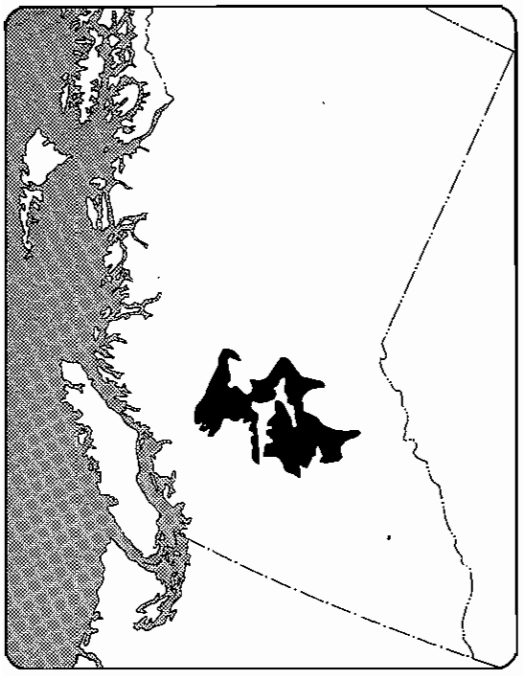
This Section includes the southernmost part of the main montane forest on the Fraser plateau, and with it the narrow, steep-sided valley of the Kootenay River and a part of the upper Columbia River valley.

Two different zones can be recognized: a lower savanna or "parkland" (south of latitude 51°) of open-grown ponderosa pine and occasional interior Douglas-fir, interspersed with bunch-grass prairie or weedy vegetation according to grazing history, and on steep slopes above 3,500 feet or so an upper or northern interior Douglas-fir forest, mixed or alternating with areas of trembling aspen and lodgepole pine. The pine forms a relatively permanent type over large areas in the western sectors of the Section because of the frequency of fires.

Environmental features such as soil texture, aspect and exposure have a critical influence on the distribution of tree species because of the dry climate. For example, Engelmann spruce descends from the upper subalpine forests to mix with the Douglas-fir and lodgepole pine on cool, north-facing slopes, and in the south the ponderosa pine extends into the grassland on rocky or sandy soils and into the Douglas-fir zone on warm sunny slopes. White spruce occupies river flats and creek sides, and although it tends to maintain an altitudinal position below Engelmann spruce, the latter species frequently accompanies it on lowland alluvium. In some areas where the Columbia forest borders the montane, western larch and occasional western white pine are present on the drier sites, associated with the ponderosa and lodgepole pines.

The plateau-land of eroded Palaeozoic and Mesozoic sediments and intrusions is moderately rugged in topography. The hills and low mountains have been strongly glaciated, and through the drift-filled lowlands the rivers flow in wide, terraced valleys where considerable later alluvial material has been laid down. Gray luvisol soil profile development is normal under the upland forests, while in the lower ponderosa pine zone, soils with more melanized profiles (dark brown, black or dark gray chernozems) are found.

M.2 — Central Douglas-fir

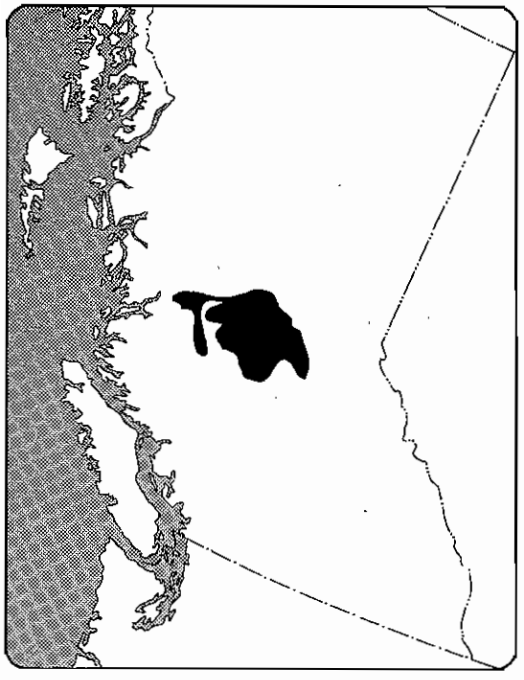


This includes the northern half of the Fraser plateau, embracing the Fraser, Chilcotin, Bonaparte and middle North Thompson valleys. Ponderosa pine is absent, and the northern distribution limit of this species marks the southern boundary of the Section. The northern boundary is set physiographically by a transition to the more subdued relief of the Nechako plateau. West and east the boundary forests are subalpine and Columbia respectively.

Interior Douglas-fir is the primary dominant of the somewhat drier lowland forests, though replaced over considerable areas by lodgepole pine after fire. Trembling aspen is well distributed, and at higher altitudes the intergrading Engelmann-white spruce complex and alpine fir enter from the subalpine forest. As in the former Section, bunch-grass prairie occupies the bottomlands and commonly extends up the lower mountain slopes, especially back from the Chilcotin, Fraser and Quesnel rivers.

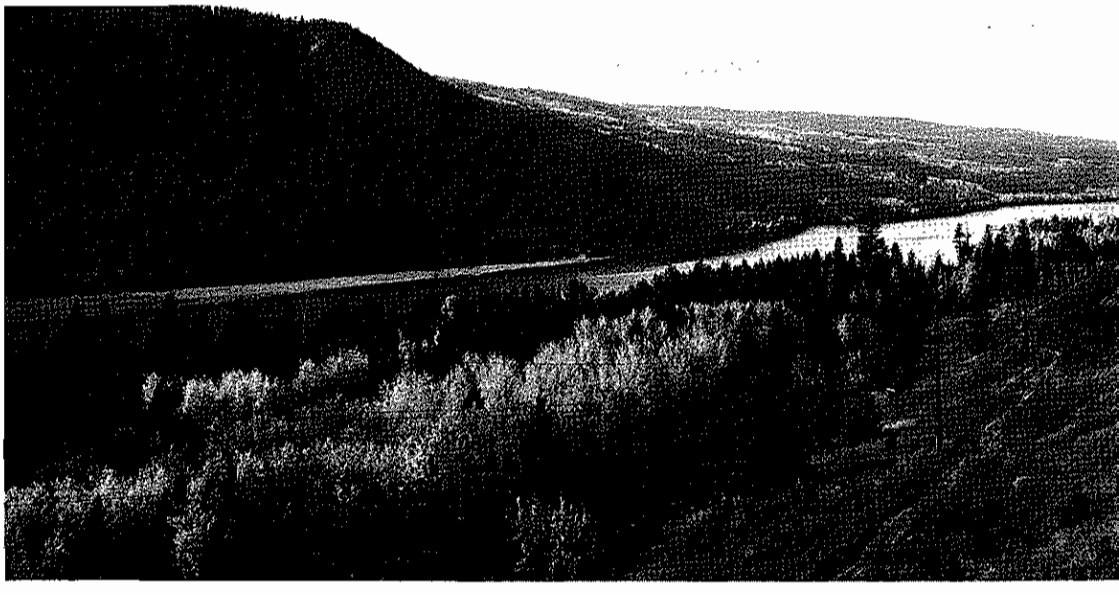
This northern part of the Fraser plateau has less relief than to the south; the valleys are broader and the hills are lower and more rounded. Many of the areas of slight relief mark ancient flows of Tertiary lavas. The effects of glaciation are seen in the form of upland tills, kame terraces, morainic hills and dammed lakes. Soils are chiefly gray luvisols, with transition to black chernozems in the valleys and to podzolic types on the slopes at higher altitudes.

M.3 — Northern Aspen

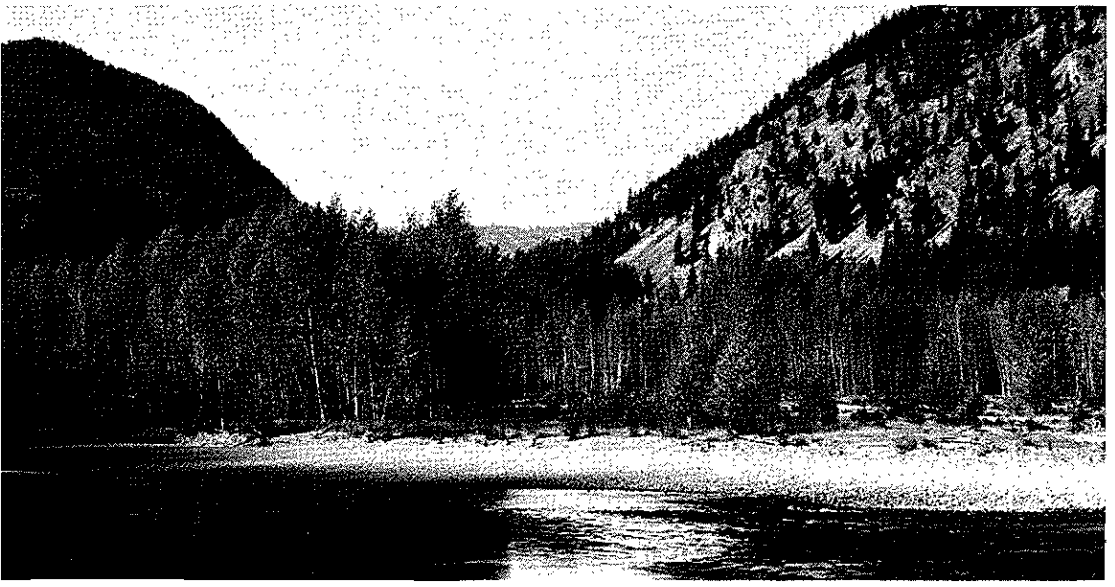


The southern half of the Nechako plateau, bounded east and west by Sections of the Subalpine Forest Region, carries a forest in which trembling aspen plays a very important part due to the prevalence of past fires. Mixed with the predominant aspen is lodgepole pine, white spruce, some Engelmann spruce and scattered interior Douglas-fir. The stands are inclined to be open and irregular grassy areas are common in the valleys, particularly along the West Road River. There is evidence that, as in the B.17 Section of the prairie provinces, aspen is invading the grasslands. Black cottonwood is conspicuous on the alluvial flats of the lowlands.

This is a rolling upland, with low mountains and rounded hills. Thick glacial deposits over the Mesozoic sediments and Tertiary lavas have contributed to the generally subdued relief. The soils developed under upland mixed forest cover are gray luvisol, though dark gray chernozem profiles are characteristic of the more open, park-like vegetation.



a Ponderosa pine and Douglas-fir.
b Montane Transition (M.4).
c Ponderosa Pine and Douglas-fir (M.1).
d Ponderosa Pine and Douglas-fir (M.1).



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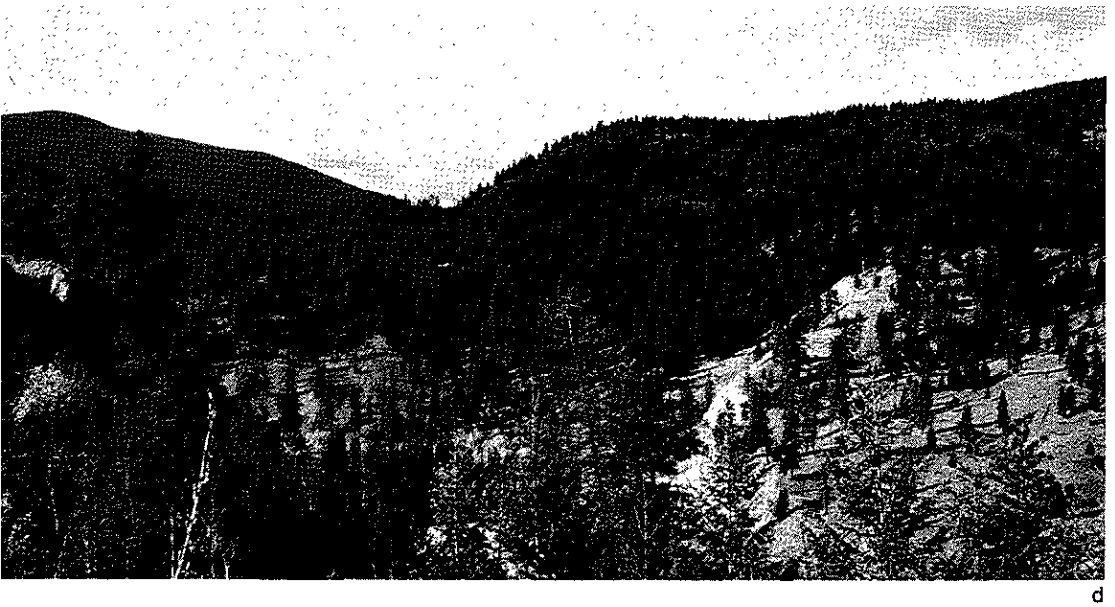
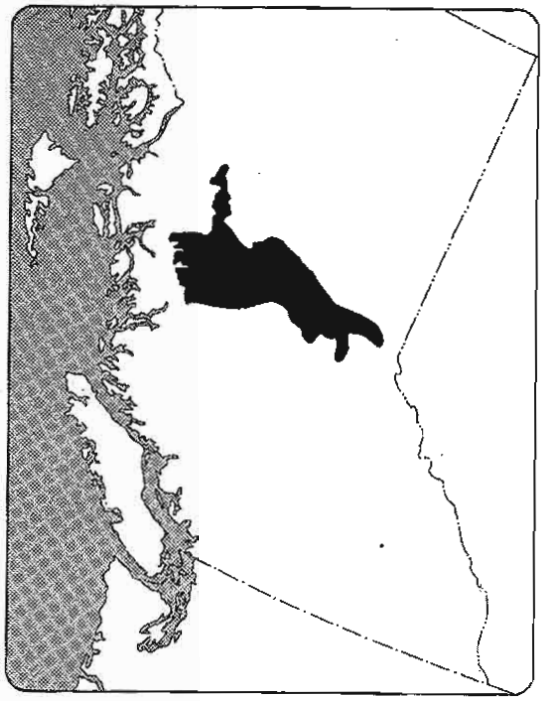


d

M.4 — Montane Transition



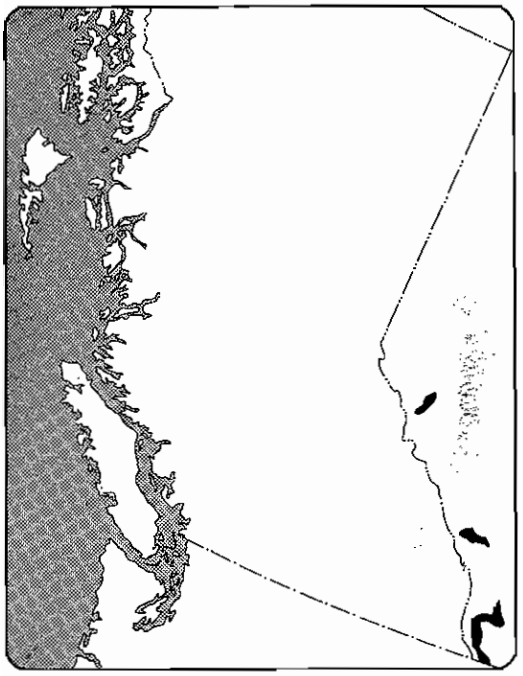
The forests of the relatively low-lying land on the northern half of the Nechako plateau are transitional in composition between the montane and the subalpine forests. Relationship to the latter is most apparent, as the characteristic forest type consists of white spruce in the north, Engelmann spruce and the white-Engelmann hybrids elsewhere, and alpine fir. However, coast Douglas-fir is also scattered throughout (the interior variety appearing in the eastern parts), and its presence has led to the inclusion of this Section in the Montane Forest Region.

The widely distributed spruce-fir forest has been decimated by fires, resulting in an expansion of associations of trembling aspen, western white birch and lodgepole pine.

Along the rivers and lakes, black cottonwood is commonly found. Numerous grassy openings and parklands with groves of aspen occur, particularly in the western half of the Section. Under the present conditions of environment, Douglas-fir appears to be losing the position of prominence that it formerly had in the vegetation pattern, except perhaps in the drier, open forest types. On the eastern side of the Section, there is a gradation into the northern Columbia forest with the appearance of mixed stands of Engelmann spruce, western red cedar and western hemlock and of Engelmann spruce with Douglas-fir. Westward, there is a gradual merging with the northern coastal forests as hemlock and cedar again appear.

The major part of the northern interior plateau is a rolling upland at about 2,500 feet altitude, and only a few hills and low mountains exceed 5,000 feet. The underlying bedrock is of rather flat-lying Palaeozoic and Mesozoic sediments, with some local Tertiary sediments and lavas. Large sections were flooded by post-glacial lakes, remnants of which still remain in the comparatively broad, flat valleys, and there has been a thick deposition of lacustrine deposits. Upper slopes and highlands are covered with glacial drift. The soils are gray luvisol or podzolic under coniferous stands, and dark gray chernozems or immature under the more open mixed and hardwood forests of the lowlands.

M.5 — Douglas-fir and Lodgepole Pine



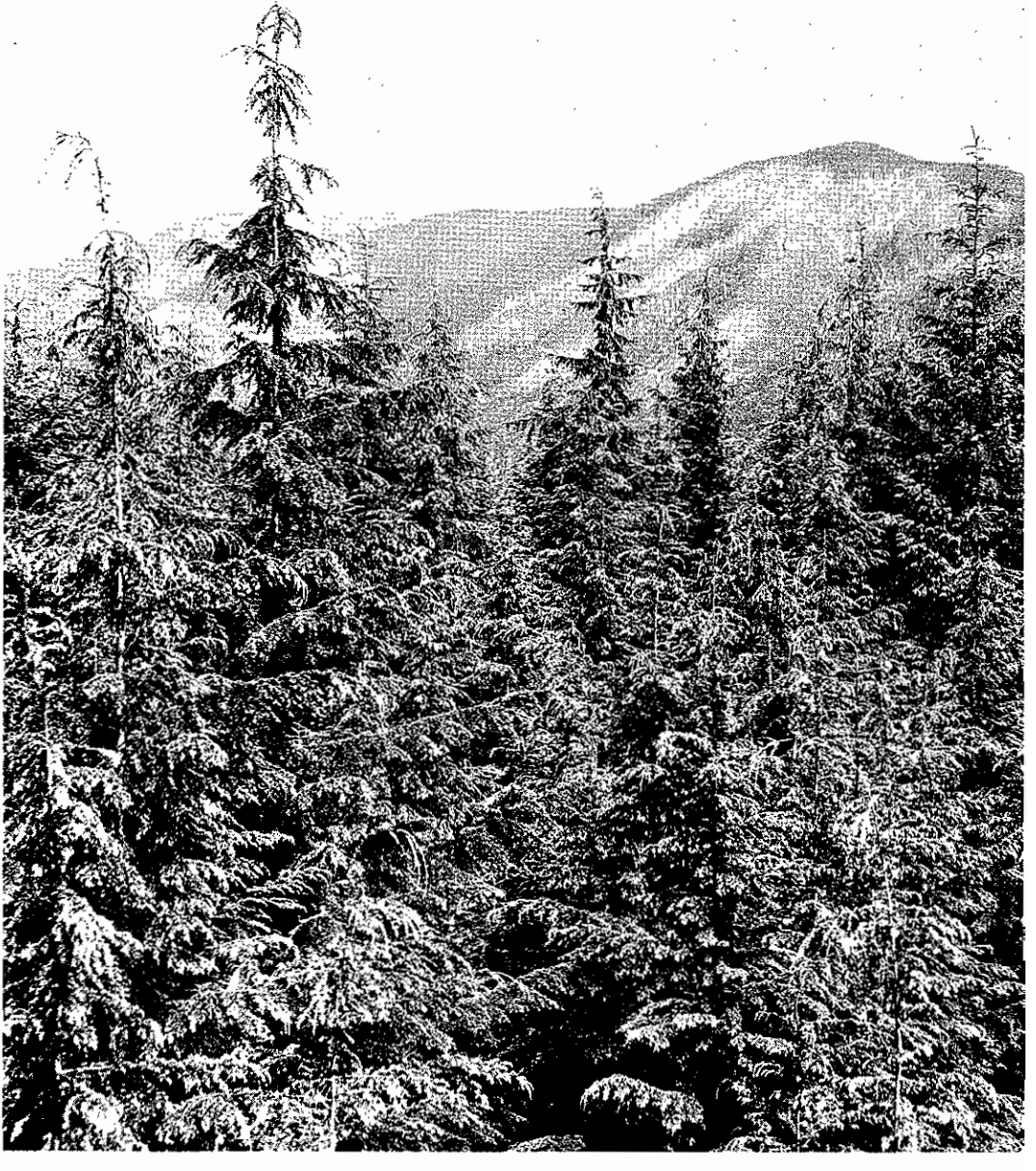
An association of the interior Douglas-fir and lodgepole pine is typical of most of the forests on the east slope of the Rocky Mountains in central Montana, and three small areas of similar forest condition appear northward in Canada: in the Porcupine Hills-Waterton Lakes District, on the Bow and Kananaskis rivers west of Calgary, and on the Athabasca River around Jasper.

The forest stands of Douglas-fir and lodgepole pine are mostly confined to warm, dry slopes, while northern aspects, seepage spots and ravine bottoms are more commonly dominated by white spruce with some black spruce. At the higher altitudes, Engelmann spruce with alpine fir and some whitebark pine appear. Limber pine occurs on rock outcrops and stony soils at lower elevations and even at the forest-grassland transition, though here groves of trembling aspen with scattered white birch and white spruce more typically represent the general vegetation.

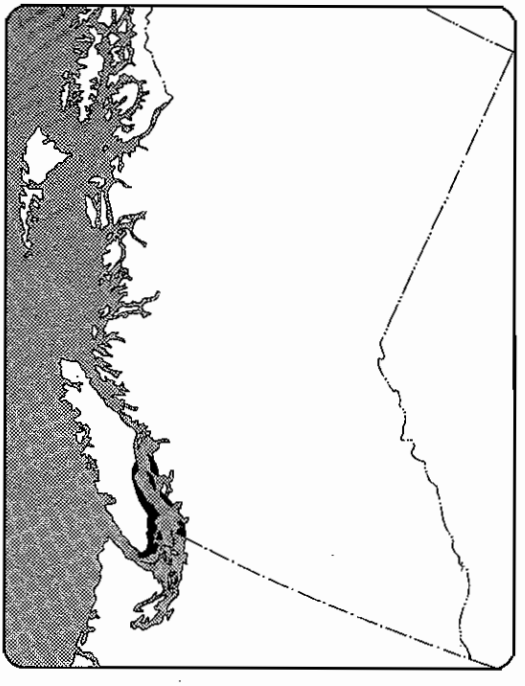
The underlying rocks are altered or contorted Palaeozoic and Mesozoic sediments. The soils are largely colluvial in origin, and gray luvisol or podzolic in profile development.

Coast Forest Region

Southern Pacific Coast (C.2).



C.1 — Strait of Georgia

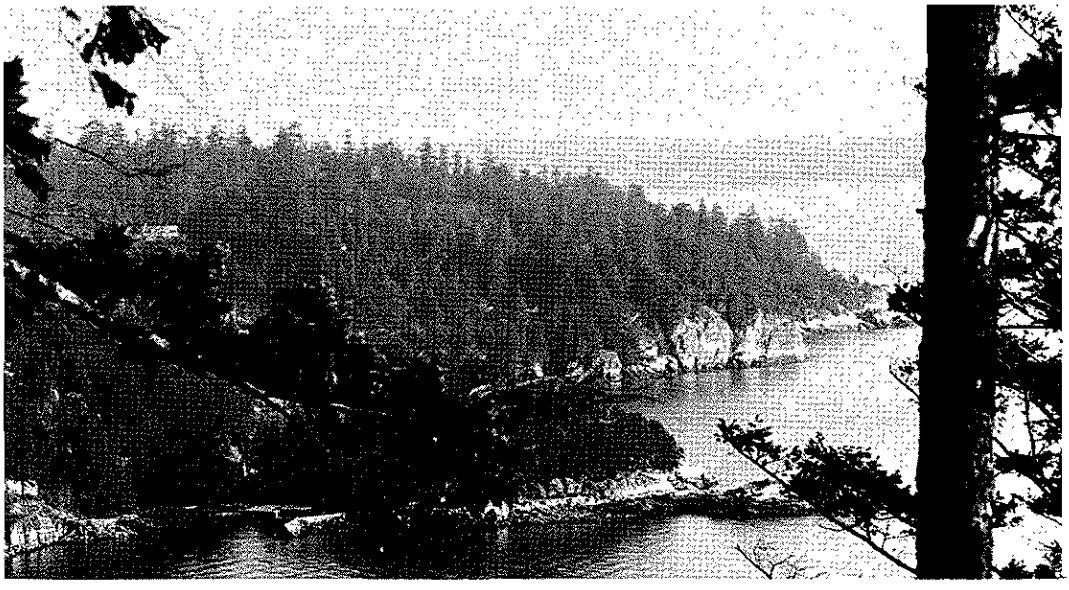


On the islands of the Strait of Georgia, on the adjacent east coast and on southeast Vancouver Island, and at scattered points along the mainland shores, two tree species not found elsewhere in Canada occur in association with the prevailing forests of coast Douglas-fir, namely, arbutus and Garry oak. Of the two, the latter is almost entirely confined to the coastal fringe of the southeast part of Vancouver Island, although extensive stands are present on the mainland south of the International Boundary. Isolated patches, such as those reported some distance up the Fraser River, may be relicts from a climatically warmer period immediately after the last glaciation.

The dominant of the well-drained sites is Douglas-fir, and the arbutus appears with it (or before it as a pioneer species) in the drier, open sites, particularly on the Gulf Islands. Garry oak tends to form pure groves, but is also found to a limited extent scattered in the above association, as is Rocky Mountain juniper. On lowland slopes, and alluvium subject to periodic flooding, western red cedar, grand fir, red alder and bigleaf maple appear, while shore pine occupies the wet acid peats. This pine species also persists in another extreme environmental niche: the crests of dry gravelly ridges. Western hemlock joins the Douglas-fir on a variety of sites, but it is best developed at higher altitudes in the neighbouring Section (C.2). Sitka spruce is occasional on low ground.

This area is related physiographically and climatically to the broad depression south of the International Boundary: the coastal trench between the Cascades and the Olympic mountains. Glacial and interglacial surficial materials as well as alluvial, deltaic and marine deposits overlie Cretaceous sediments on the Island and granitic intrusions on the mainland coast. Influenced by the summer-dry maritime climate, a wide variety of soils has developed under different cover types on the diverse sites. In well-drained positions, profiles of the dystric and sombric brunisols and black chernozem are found, while peaty phase gleysols and immature alluvial soils are usual where drainage is imperfect to poor.

a Strait of Georgia (C.1).
b Coast Douglas-fir, western red cedar, western hemlock.
c Coast Douglas-fir.



a

b

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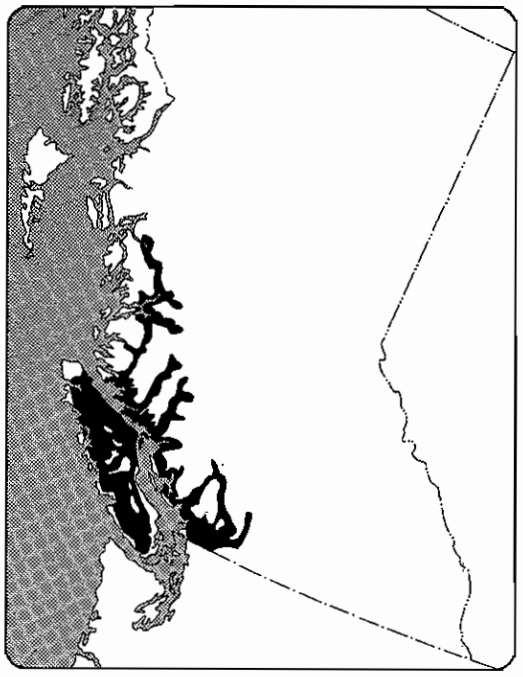
C.2 — Southern Pacific Coast



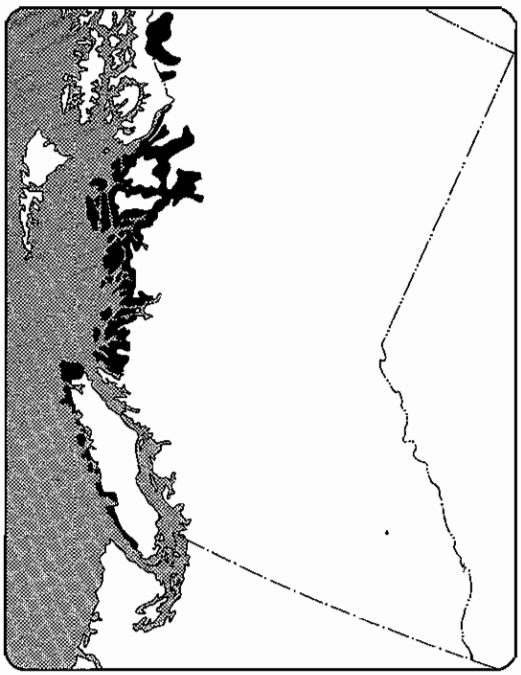
The Section includes the southern part of the Coast forest, extending over most of Vancouver Island and embracing also the protected parts of the indented coastal zone on the adjacent mainland north to Kemano. Environmental conditions are optimal for growth of the large western conifers — coast Douglas-fir, western hemlock, western red cedar — and the forest productivity of the land is the highest in Canada. Here also is the main area of abundance in western British Columbia of western white pine and, at low elevations on the mainland, of grand fir.

The upper altitudinal boundary of the Section, on the mountain slopes of the mainland and in the Island interior, is set by the transition to the Coastal Subalpine Section (SA.3) with its distinctive tree composition. The northern and western boundaries are marked by the decreased importance of Douglas-fir in the general forest vegetation, correlated perhaps with a climatic trend toward increased precipitation and increased exposure to Pacific winds. North of latitude 50° the Section boundary is close to the geographical range of Douglas-fir.

The forest cover is mostly of even-aged Douglas-fir, western hemlock, western red cedar and, in the south, scattered western white pine. In sheltered valleys and protected moist slopes, uneven-aged stands of western red cedar and hemlock, or of cedar, hemlock and amabilis fir are sometimes found, suggesting that the role of Douglas-fir is primarily that of a pioneer after fire. However, there is some evidence that in rain-shadow areas, and on drier sites in general, Douglas-fir forms rather stable forest types. Western red cedar is the characteristic tree of sites with abundant seepage water, and on alluvial soils it is frequently accompanied by black cottonwood, Sitka spruce, grand fir, red alder and bigleaf maple. The latter two deciduous species often invade logged areas vigorously, to the detriment of coniferous regeneration. The tolerant western hemlock achieves its greatest prominence in old forest stands on cool, moist sites, and with amabilis fir it dominates much of the forest above approximately the 1,600-foot contour. Other species of limited importance are shore pine, western white birch, cascara and, at the higher elevations, yellow cypress.

Underlying rocks are mainly late granitic intrusions on the mainland, and Palaeozoic and Mesozoic volcanics on Vancouver Island. The soil material is derived from surface tills of the last glaciation, and the soil types belong to the dystric brunisol, humo-ferric podzol and regosol groups.

C.3 — Northern Pacific Coast



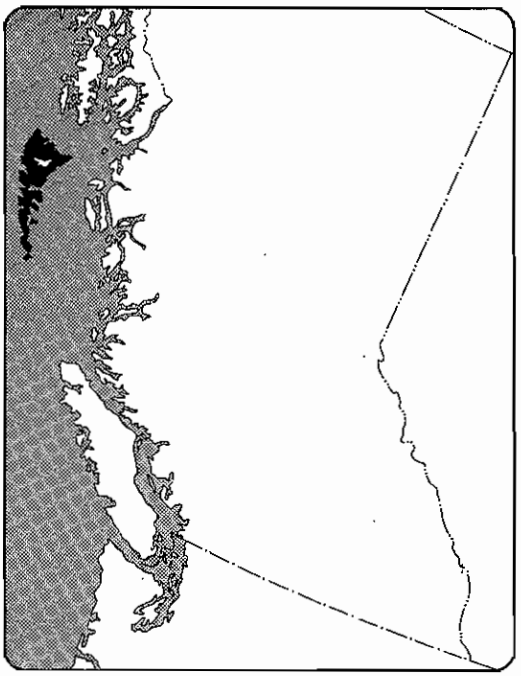
This covers the portion of the Coast forest which occupies the exposed western side of Vancouver Island, the islands (excepting the Queen Charlotte group) and adjacent mainland bordering on Queen Charlotte Sound and Hecate Strait, and many of the glacially enlarged valleys which extend far inland in the area surrounding the Alaska panhandle. Contact on Vancouver Island is with the preceding Section (C.2) but from here northward to the Portland Canal the interior boundary is set altitudinally by the Coastal Subalpine Section (SA.3). Small patches of the Section meet boreal forest on the Stikine and Taku rivers and, in extreme northwestern British Columbia, on the Tatshenshini and Alsek rivers.

The principal associates on well-drained sites are western hemlock and amabilis fir, the place of the latter species being taken by western red cedar where the ground water table is high. Sitka spruce, alone or mixed with western hemlock, is characteristic of alluvial soils, and on such sites there may also be yellow cypress, red alder, bigleaf maple and black cottonwood. In bogs the shore pine is found. There is no grand fir in this Section and the boundaries almost exclude coast Douglas-fir. White spruce advances from the east to mix with Sitka spruce in some of the northernmost valleys.

Historically, fires have been infrequent because of the wet climate, and in the absence of disturbance an uneven-aged structure of the forest has commonly developed. In decadent stands western hemlock is often severely infected with mistletoe and the cedar shows bare, spike tops. Wind is the usual agent of forest rejuvenation, and the best stands are those which have arisen even-aged after windthrow.

The topography of the southern coastal parts is rough and mountainous, dissected by numerous fjords and inlets. On the northern mainland and the coastal islands there is a more gentle relief, and lowlands border the ocean. The soils are variable drift and colluvial material, frequently shallow, and derived from the underlying acid intrusive granitic rock.

C.4 — Queen Charlotte Islands



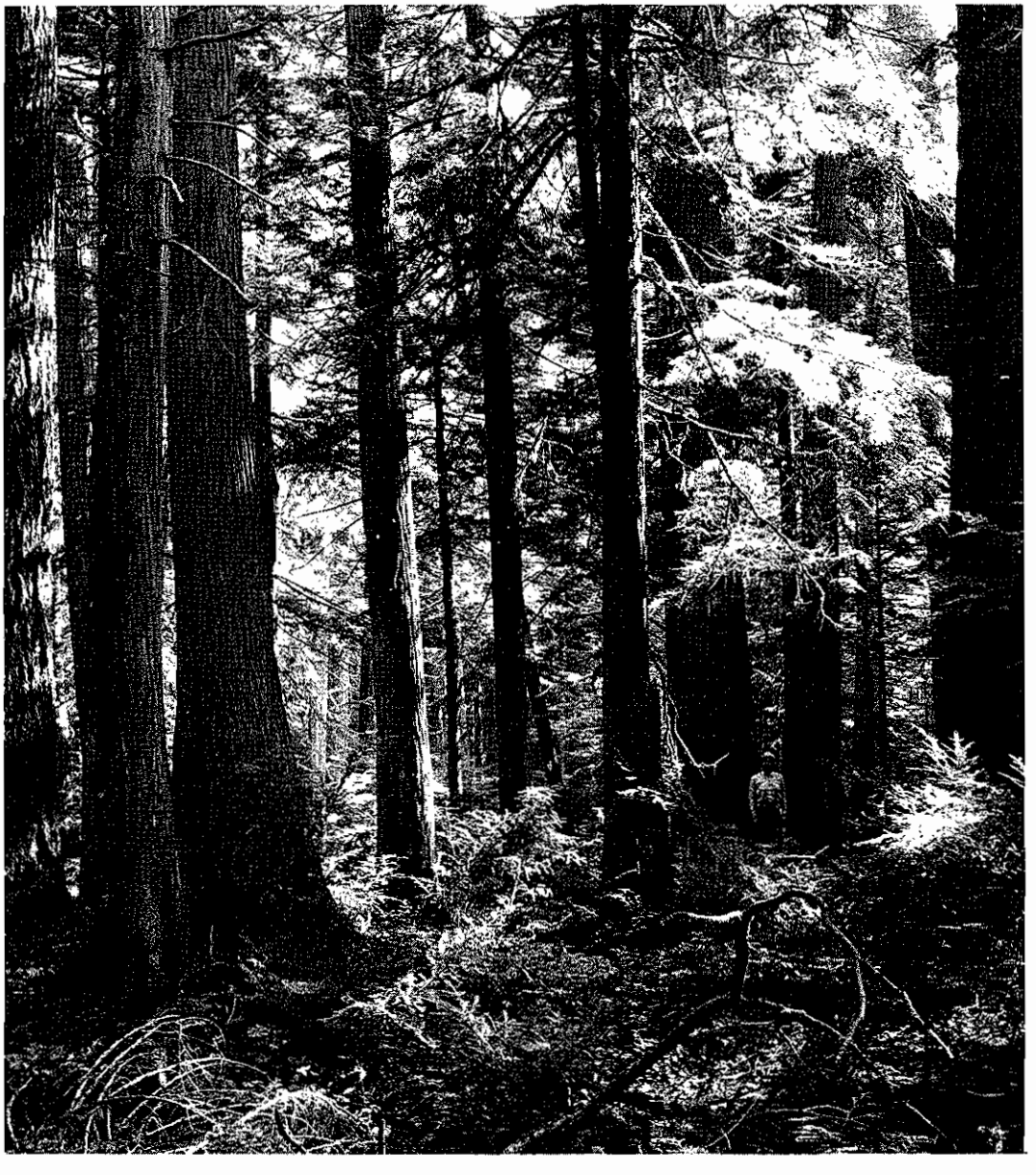
The Queen Charlotte Islands, isolated from the nearest mainland by 30 miles of sea, form a distinctive unit. A range of mountains with maximum altitudes of 3,000 to 4,000 feet runs the length of the islands from north to south creating on the east coasts of Graham and Moresby islands a rain shadow area where fires have influenced forest development.

The humid maritime climate and long growing season produce a luxuriant "rain forest" type of vegetation on well-drained sites. The primary association consists of western hemlock, Sitka spruce and western red cedar, the relative abundance of the three species being in the order given. Sitka spruce is the largest tree, and its quality for timber is better here than in any other part of the Coast forest. Above approximately 1,500 feet the composition of the forest changes with the appearance of mountain hemlock and yellow cypress. With increased altitude, these species assume the status of dominants as western hemlock and Sitka spruce diminish in abundance and western red cedar disappears entirely. Thus the highland forest is similar to what has been classed as Coastal Subalpine (SA.3) on the upper mountain slopes of the mainland coast and Vancouver Island. Species of limited importance growing mostly near tidewater are western yew and red alder. More widely ranging is the shore pine which occupies a variety of extreme habitats from exposed sandy or rocky shores to alpine ridges and muskegs. Neither coast Douglas-fir nor any of the true firs (*Abies* spp.) and maples (*Acer* spp.) appear to be native to the Islands. Nonforested peat bogs are extensively developed on gentle slopes and level lands, particularly on the central plateau and the eastern lowlands of Graham Island.

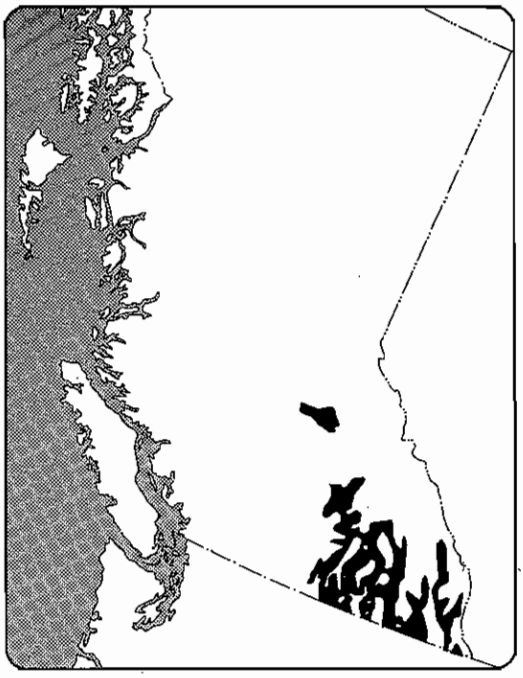
The bedrock of the Islands consists of Triassic and Tertiary sediments and volcanic rocks, which have weathered to deep soils. Glaciation during the Pleistocene was not severe, and the highlands above a zone of marine and glacial influence may have served as a refuge for forest species during the time of maximum expansion of the ice.

Columbia Forest Region

Interior Douglas-fir, western white pine, western hemlock.



CL.1 — Southern Columbia

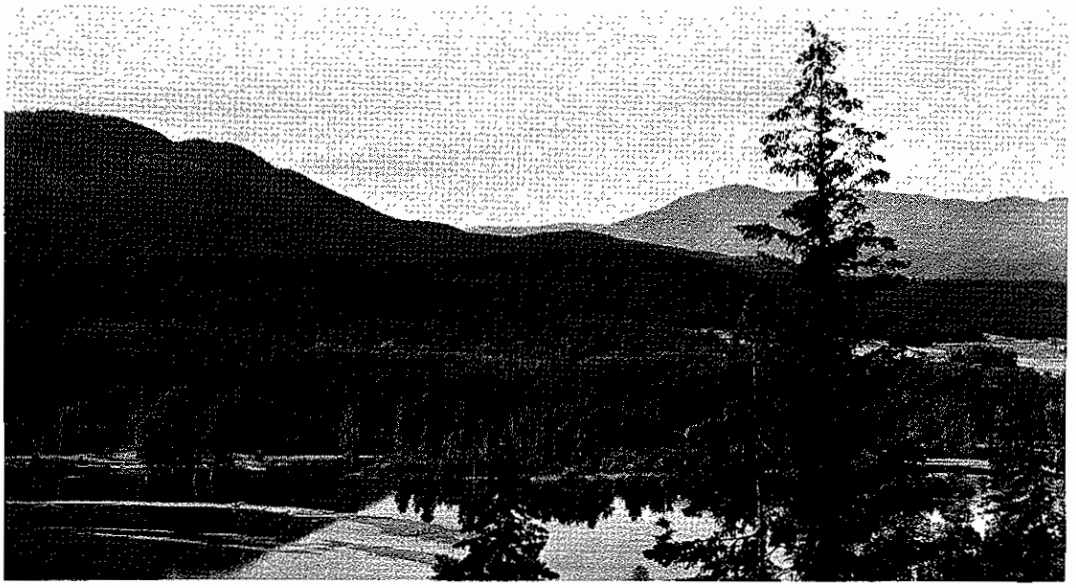


On the east side of the central plateaus of British Columbia, eastward-moving Pacific air masses encounter the Columbia Mountains and adjacent highlands. The forced rise of moist air causes cooling and condensation, resulting in what is known as the "Interior Wet Belt". In this area, on the mountain slopes below approximately 4,000 feet (the lower limit of the subalpine forest) and in the valleys, the moist climate is reflected in stands which show a marked similarity in composition to those of the humid Pacific Coast forest. To the west and south, local climates of the valleys are drier, and below about 2,500 feet a transition to montane forest or to grassland takes place.

The same dominants as in the Coast forest — western hemlock and western red cedar, both somewhat reduced in size — form the typical stand types, in company with scattered grand fir and varying amounts of western white pine. Douglas-fir and western larch are important forest constituents, particularly in the first stages of succession following disturbance. The Douglas-fir is the interior or "blue" variety, and in areas adjacent to the Montane Forest Region where drier environmental conditions prevail it shows its ecological preferences by forming well-defined associations with western larch where the more typically coastal species drop out. The distribution of lodgepole pine is favoured by fire, particularly in the latter associations with western larch though on dry sites generally. On recent alluvial soils, black cottonwood attains a large size in company with occasional western red cedar and white or Engelmann spruce. Other occasional species shared with the Coast forests are western yew and cascara.

The mountainous topography includes dissected plateau-like areas and broad valley plains in which are several large lakes. The Columbia system is older than the Rockies, and the longer period of erosion of the tilted and faulted Precambrian and Palaeozoic sediments has exposed granitic cores and later igneous intrusions. The soils are derived from mixed glacial, colluvial and fluvial deposits, and both humo-ferric podzol and dystric brunisol profiles are usual.

a Southern Columbia (CL.1).
b Northern Columbia (CL.2).



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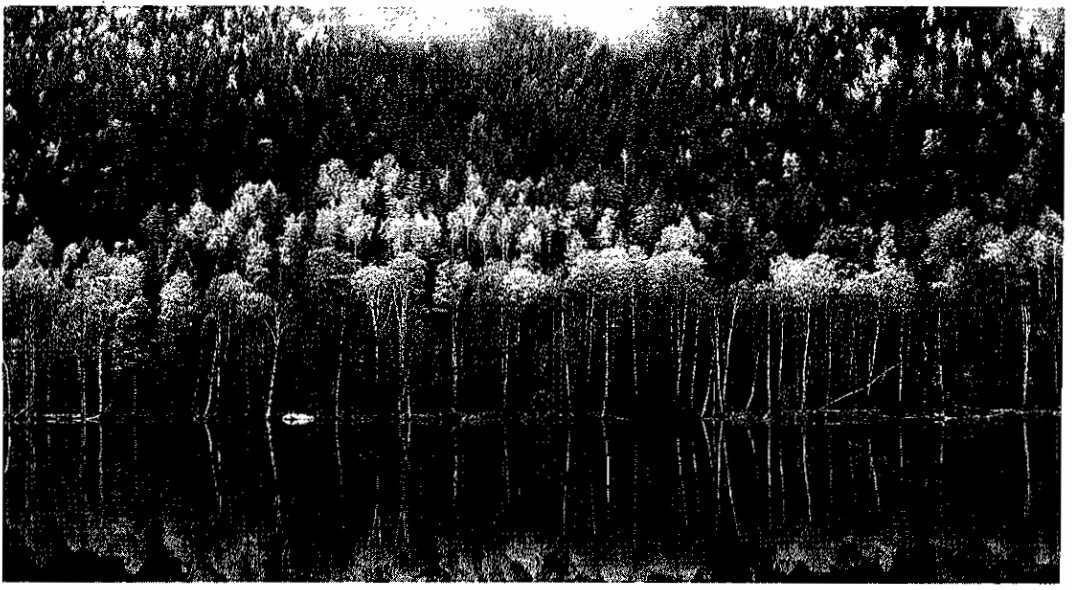
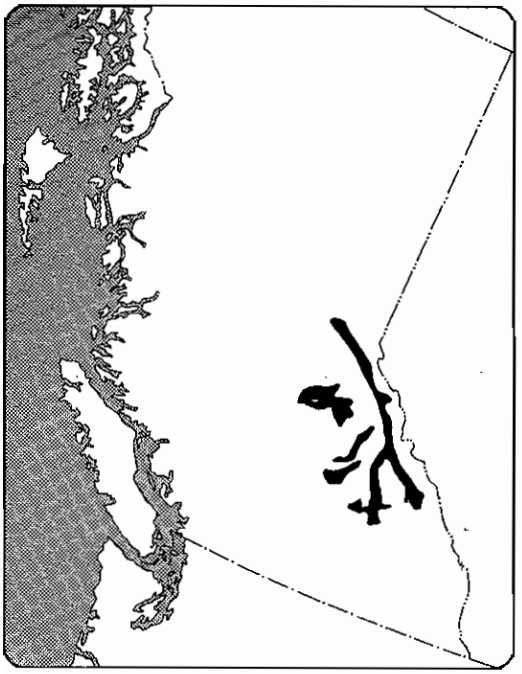


b

CL.2 — Northern Columbia



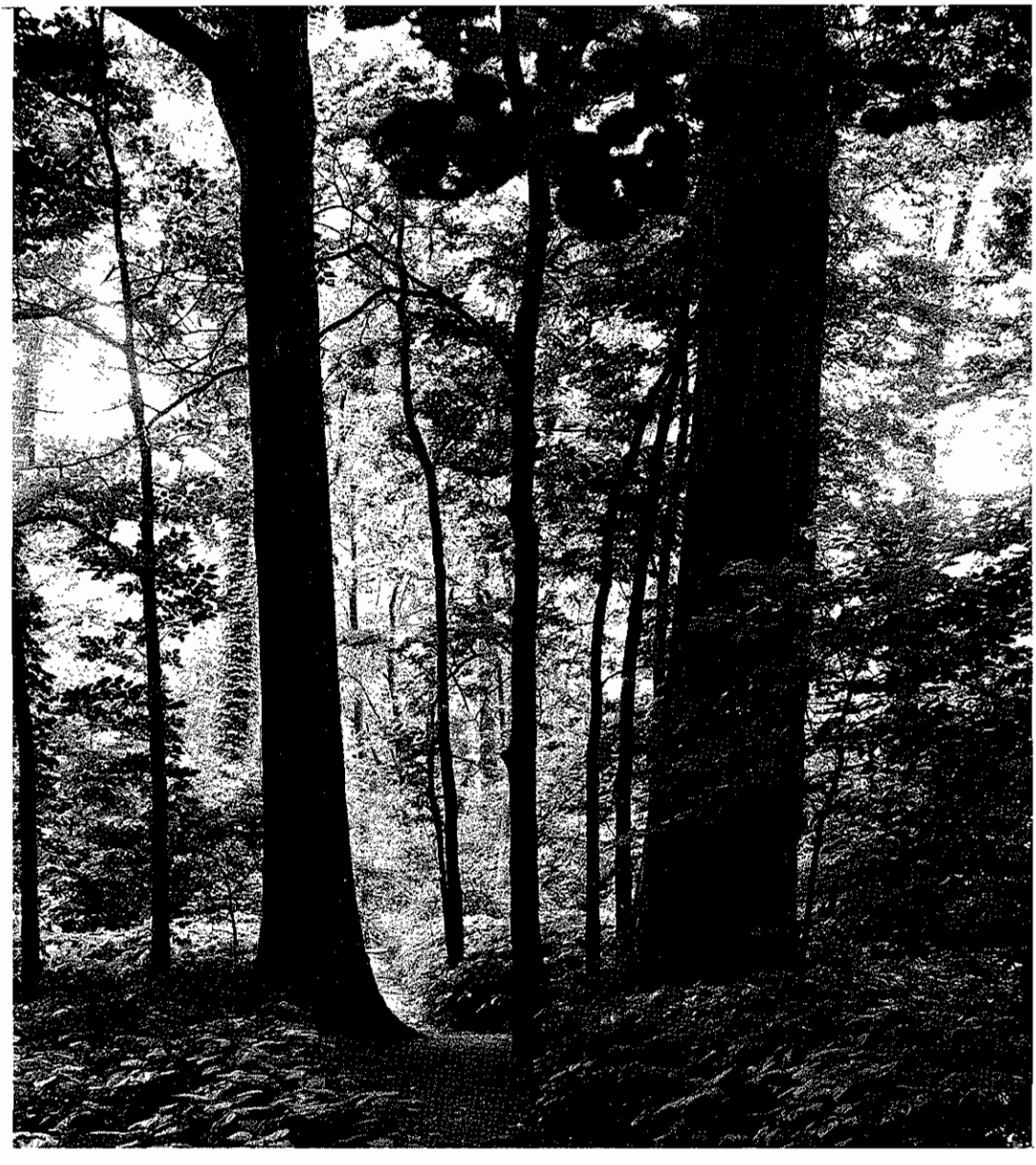
The northern half of the Selkirk and Monashee mountains, part of the Cariboo mountains, and the valley of the upper Fraser are included in this Section. As in the Southern Columbia Section (CL.1), the subalpine forest forms the adjacent zone on the higher slopes, and mixing of the dominants results. Contact with the montane forest occurs at places on the west slope of the Cariboo and Monashee mountains.

The primary mature forest types are dominated by western hemlock on the best moist sites, and by western red cedar and interior Douglas-fir on the wet and the dry positions, respectively. The latter species has some distribution in most of the forest types, except those of the wettest sites, for it commonly plays a pioneer role after fire. Western white pine, though more important than in the previous Section, is nowhere abundant and disappears entirely in the northwestern and northern parts; western larch and grand fir are not present. White spruce, Engelmann spruce and their intermediate forms, plus alpine fir, contribute increasingly to the forest composition at higher elevations. These species also accompany western red cedar on slope "flushes", and grow with black cottonwood on lowland alluvium. In the upper Fraser Valley there are scattered stands of black spruce on boggy valley sites while white spruce and occasionally white birch mix with cedar, hemlock and Douglas-fir on the benchlands. On higher slopes but below the true subalpine spruce-alpine fir forest, white spruce forms a simpler type with Douglas-fir alone.

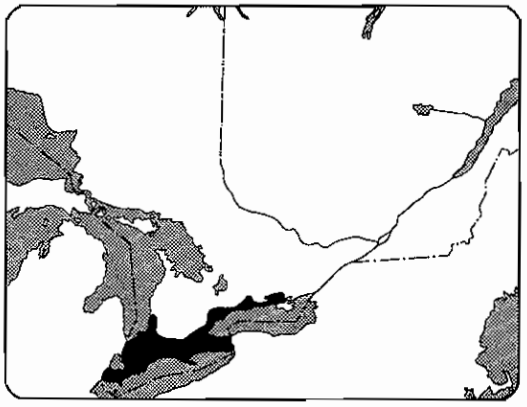
The topography, surface glacial deposits and rock formations are much as in the previous Section, though igneous intrusions are fewer. The soils belong mostly to the gray luvisol, humo-ferric podzol and dystric brunisol categories, with some eutric brunisol types on calcareous materials.

Deciduous Forest Region

Tolerant hardwoods.



D.1 — Niagara



The Niagara Section includes the main body of the rather low-lying portion of the Ontario peninsula which is enclosed by lakes Ontario, Erie and Huron. Here, very favourable climatic and soil conditions have allowed the extension into Canada of many trees, shrubs and herbs from the deciduous forest to the south.

The forest communities are dominated by broadleaved trees. The characteristic association, common in part to both the Great Lakes-St. Lawrence and the Deciduous Forest Regions, consists primarily of beech and sugar maple, together with basswood, red maple, red oak, white oak and bur oak. Also within this area is found the main distribution in Canada of black walnut, sycamore, swamp white oak and shagbark hickory, with the more widely distributed butternut, bitternut hickory, rock elm, silver maple and blue-beech. Other species with a sporadic occurrence as scattered individuals or groups, either on specialized sites or within the characteristic forest types of the Section, are the following: tulip-tree, black cherry, mockernut and pignut hickories, chinquapin oak, pin oak, black oak, black gum, blue ash, cucumber-tree, pawpaw, Kentucky coffee-tree, red mulberry and sassafras. The chestnut used to be present before the blight removed it from the forests.

The presence of the species just listed, and the predominance of beech within the main association, indicates a close relationship to the forests of the east-central United States. There is, furthermore, a poor representation of needle-leaved species, though eastern hemlock is sometimes scattered through upland forests, eastern white pine occurs locally in small stands on coarse-textured soils (often with an understorey of black and scarlet oaks), eastern red cedar is found on gravelly or rocky sites. Occasional peat bogs may support the boreal relicts black spruce and tamarack, or eastern white cedar. As most of the land is now closely settled, the natural forest vegetation has been mostly reduced to farm woodlots, hedge-rows and remnant stands on soils too poor to farm.

The Section is underlain by successive Palaeozoic formations — from west to east, Devonian, Silurian and Ordovician. These limestones and shales are covered by glacial material of considerable depth, with some clay-and-sand deposits from glacial lakes Iroquois and Algonquin present on the northeast and northwest sides, respectively. The topography is undulating to flat or plain-like. Owing to the influence of favourable climate plus broadleaved vegetation and underlying calcareous bedrock, very fertile soils of the gray brown luvisols and humic gleysols have developed.

a

b

c

a Tulip-tree.
b Black maple.
c Niagara (D.1).
d Tolerant hardwoods.
e Sycamore.
f Silver maple.

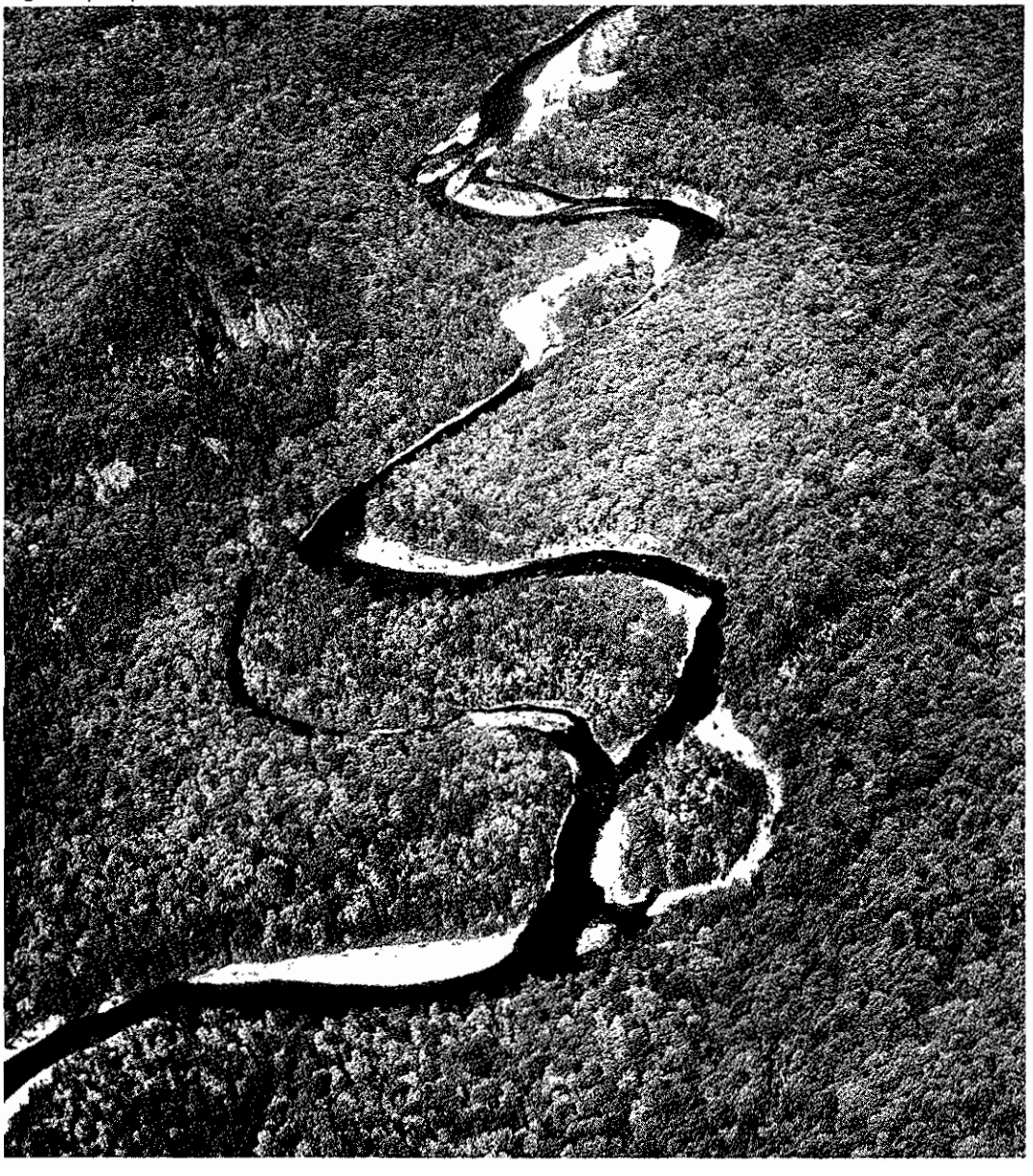
d

e

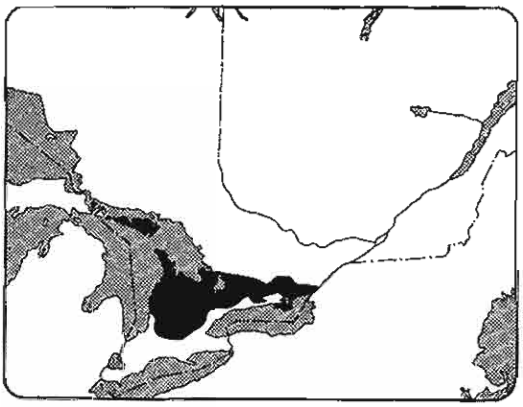
f

Great Lakes-St. Lawrence Forest Region

Algoma (L.10).



L.1 — Huron-Ontario



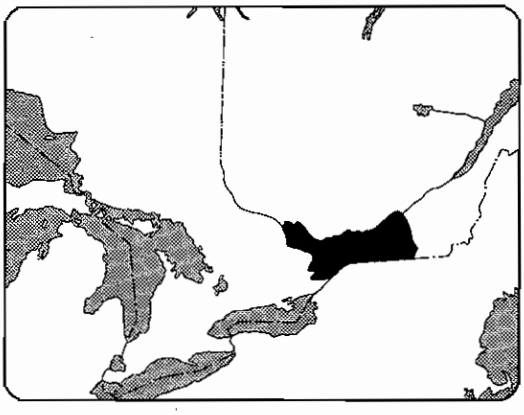
Included here is the main body of the Ontario peninsula north of the Niagara Section, extending from Lake Huron and the southern portion of Georgian Bay to Lake Ontario, and taking in Manitoulin and St. Joseph islands on the extreme west. The northern boundary coincides with the contact between Ordovician limestones of the peninsula and the ancient granitic rocks of the Precambrian Shield, and is marked by the distribution limits of such species as sycamore and black walnut, which enter from the south, and jack pine from the north. The Section is well settled, and extensive forest tracts no longer exist.

Sugar maple and beech are common over the whole area. With them are basswood, white and red ashes, yellow birch, red maple, and red, white and bur oaks. Frequently eastern hemlock, eastern white pine, and balsam fir occur within the tolerant hardwood types, plus scattered largetooth aspen, butternut, bitternut hickory, hop-hornbeam, black cherry, sycamore, and black oak. Blue-beech, silver maple, slippery and rock elms, and black ash are found locally on river-bottom and swamp sites, and eastern white cedar is present in swampy depressions and on old fields. In the Thousand Islands area at the eastern extremity of the Section the pitch pine grows on dry slopes and ridges. After fires, largetooth aspen and white birch often form secondary communities.

The topography is irregular but frequently plain-like. The underlying Ordovician bedrock (Silurian in the highlands south of Georgian Bay) is overlain by limy glacial deposits of variable thickness. The western and eastern portions are somewhat modified by the lacustrine clay deposits from glacial lakes Algonquin and Iroquois. Broad flats and strongly drumlinized areas are featured in several localities in this Section. Gray-brown luvisols and melanic brunisols are present, and humoferric podzols are evident on some of the coarser-textured surface materials.

On Manitoulin Island sugar maple forms the dominant association with a varying admixture of red maple, white elm, basswood, yellow birch, red and bur oaks, hop-hornbeam, beech, largetooth aspen, white birch and the white, black, and red ashes. Red and eastern white pine, white spruce, balsam fir, eastern hemlock and eastern red cedar are present but in no great quantity. Lacustrine flats and drumlinized areas do occur, but in general the Island is a flat plain sloping to the southwest, with water-washed, somewhat acidic tills and beach materials forming a shallow mantle over soft, fractured limestone.

L.2 — Upper St. Lawrence



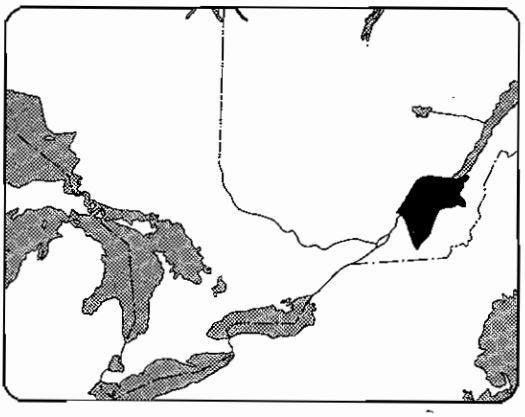
Between the Laurentian upland to the north and west, and the Adirondacks and the Alleghenies to the south, lies a lowland through which the waters of the Great Lakes system drain. The western part of this lowland, including the upper St. Lawrence and the Lower Ottawa valleys, is treated here. In general, the physiographic boundaries of the Section coincide with a vegetational change from predominantly deciduous forest within to mixed deciduous-and-conifer forest without.

The dominant cover type is composed of sugar maple and beech, with red maple, yellow birch, basswood, white ash, largetooth aspen, and red and bur oaks, with local occurrences of white oak, red ash, grey birch, rock elm, blue-beech and bitternut hickory. White elm is particularly prominent in the contemporary settled landscape. Butternut, eastern cottonwood and slippery elm have a sporadic distribution in river valleys, and some small pure stands of black maple and silver maple are reported on fertile, fine-textured lowland soils. Poorly-drained depressions frequently carry a hardwood swamp type in which black ash is prominent.

The general character of the forest cover is broadleaved on deep calcareous soils, while on shallow, acidic or eroding materials a representation of conifers is usual, particularly the eastern hemlock, eastern white pine, white spruce and balsam fir. Coarse-textured soils commonly support stands of eastern white pine and red pine, and wet sites may bear black spruce or eastern white cedar. The latter species is also found on dry, rocky or stony sites. After fires, largetooth aspen and white birch, with balsam fir and white spruce, play a prominent role in the pioneer forest stands.

The upper St. Lawrence River valley has a bedrock of flat-lying Ordovician limestones and shales, and local Cambrian beds, covered by glacial deposits over which in turn lie extensive marine clays and sands dating from the period of inundation by the Champlain Sea in late Pleistocene times. Gray brown luvisols and melanic brunisols generally have been developed, with locally some humo-ferric podzols and organic soils (muck and peat). Extensive settlement and clearing has taken place over much of this Section.

L.3 — Middle St. Lawrence

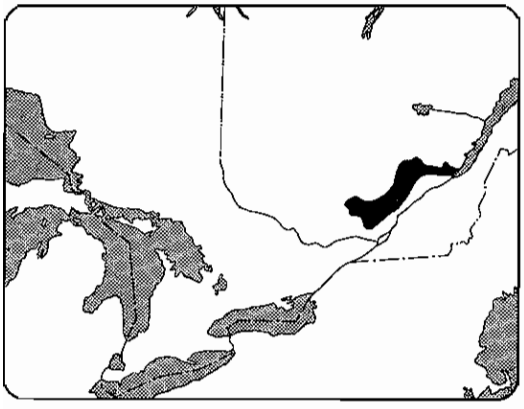


The Section comprises an eastern part of the St. Lawrence River valley, narrowing from the west where it touches the previous Section to a marginal strip on both sides of the St. Lawrence above Quebec City. To the south and north it is in contact with the more diversified forests of, respectively, the Cambrian and Precambrian uplands.

Characteristically, a mixed forest prevails, showing in its species composition a strong boreal influence and the effects of widespread disturbance. Important forest types are formed by white spruce and balsam fir, as well as by the following principal species: sugar maple, yellow birch, eastern hemlock, eastern white pine, red maple and grey birch. Occurring locally with the above-mentioned trees are red oak, beech, white ash, white elm and red pine. Following fires or other disturbance, trembling aspen and white birch become prominent temporarily. Eastern cottonwood and red maple are found along river banks, and black ash, eastern white cedar and black spruce in swamps. The butternut and silver maple here reach the northern limits of their distributions.

As in the previous Section, marine clay-and-sand deposits of the Champlain Sea lie deep over Ordovician limestones and shales. Humo-ferric podzols have generally been developed, with melanic brunisols occurring locally. Areas of organic soils (muck and peat) are present. Parts of this Section have been cleared for agricultural purposes, but extensive forest areas still remain.

L.4a — Laurentian

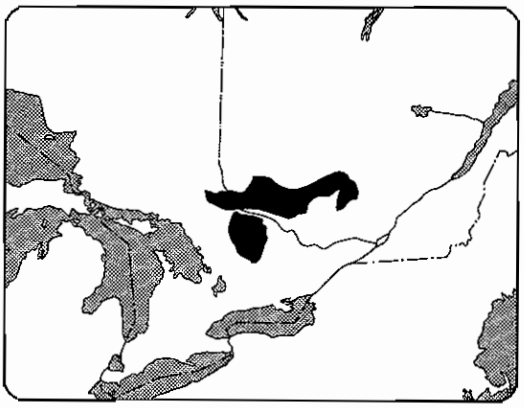


In the present treatment, Halliday's original L.4 Section has been subdivided into five parts. The first of these borders the northern side of the preceding Section where it occupies a zone of transition to the boreal forest. Its southern boundary is defined geologically by the abrupt transition to the sedimentary limestone of the St. Lawrence Valley and by the general northern limit of the post-glacial Champlain Sea deposits. Its northern edge coincides roughly with the limits of distribution of red spruce and red oak.

The forest cover is much like that of the Acadian Forest Region. It is largely composed of upland tolerant hardwood stands with mixedwoods and softwoods in the valleys, the chief species on hill slopes being yellow birch, sugar maple, red spruce, balsam fir, red maple and white birch. Eastern hemlock, beech and white spruce are also distributed throughout, the first and second species occurring as scattered trees with their northern limits within the Section. Historically the forest contained large eastern white pine, and there still is a consistent representation of this species although it is no longer important. Black spruce occupies poorly-drained uplands and lowland peats, accompanied on the latter sites by eastern white cedar and tamarack, with occasional black ash.

The topography is dissected and rugged. The Precambrian gneisses, granites and schists are mostly covered with a shallow layer of glacial till which has been water-worked in places. Areas of sand terraces and silt flats are also present. Dystric brunisols and humo-ferric podzols have been developed over most of the area.

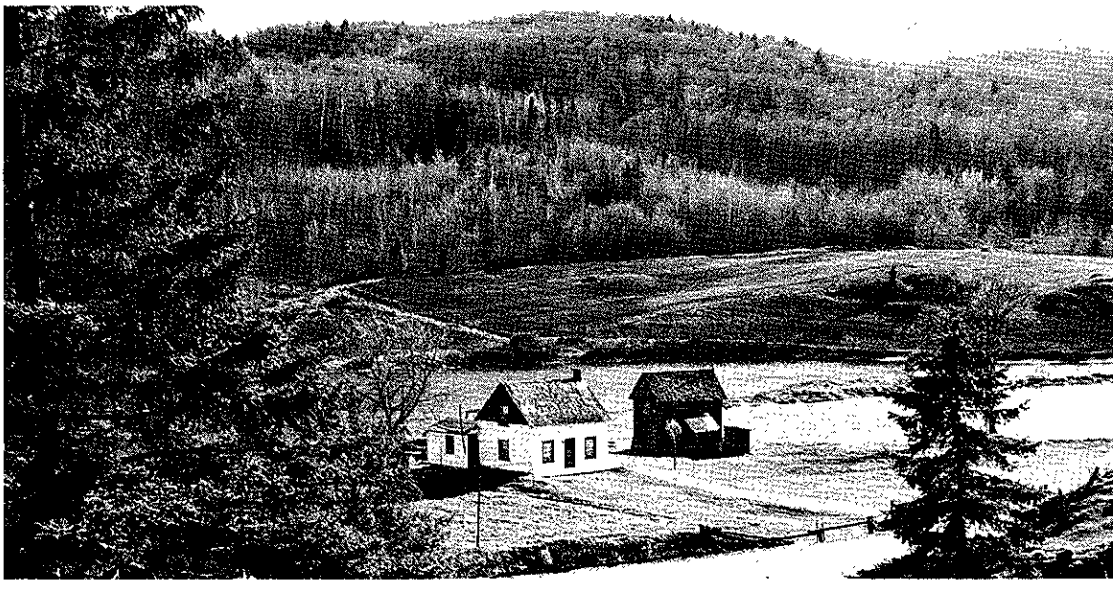
L.4b — Algonquin-Pontiac



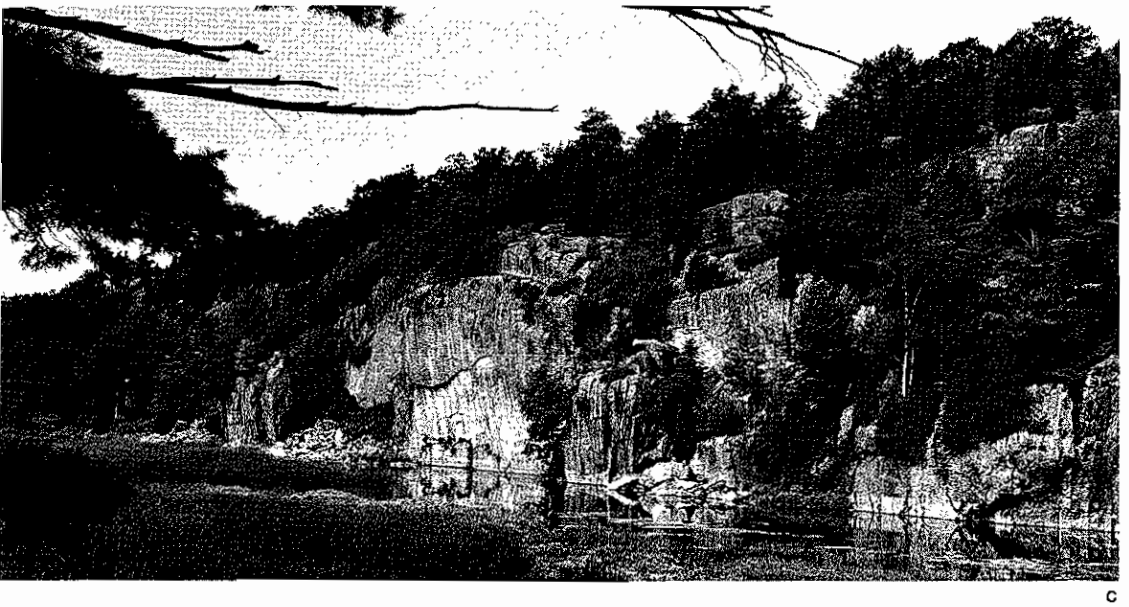
The Section extends from the vicinity of lakes Timiskaming and Kipawa to the western side of the Laurentian Section (L.4a), sharing with the latter a transitional position on the south side of the Boreal Forest Region. It consists of two parts; an area on the south-facing slopes of the Laurentian Shield where the red and eastern white pines are, or at least have been, prominent, and the Algonquin Highlands south of the Ottawa River with fewer pine stands and proportionally more of the hardwoods.

In general, the forest cover shows a greater degree of boreal influence than do other eastern parts of the Great Lakes-St. Lawrence Forest Region. For example, black spruce is abundant and is frequently found growing to large diameter size on upland sites. However, the characteristic species of the Region — sugar maple, red maple, yellow birch, eastern hemlock and eastern white pine — are prominently distributed, frequently in mixture with the boreal conifers. A tendency for the hardwoods to segregate out on the finer-textured soils of warm slopes and hilltops is noticeable. Red spruce enters extensively into the composition of both the forests of the eastern portion and those on the Algonquin Highlands. Balsam fir is abundant, white spruce has a moderate distribution, and jack pine appears on suitably dry sandy sites throughout. Other trees present are beech, eastern white cedar, white birch and trembling aspen, presence of the latter two hardwoods usually reflecting recent disturbance. Fine stands of eastern white pine and red pine originally occupied large areas, but fires and lumbering have now reduced their abundance.

The Algonquin Highlands have a rough and irregular topography over granitic bedrock. Shallow glacial till (water-washed extensively in some areas), sand terraces and drumlins are the landscape features of the area, and in general the soils are coarse in texture. The remainder of the Section, north of the Ottawa River, has a similar bedrock of granites, granite-gneisses and altered sediments. For the most part, glacial till and glacio-fluvial deposits, with some drumlin and esker landforms, overlie the bedrock which is frequently close to the surface. Lacustrine flats and broad swamps are conspicuous locally.



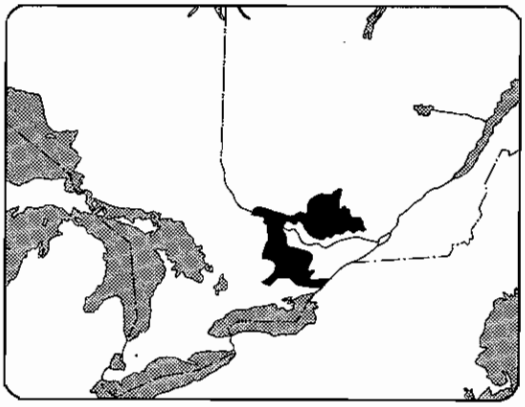
a Middle Ottawa (L.4c).
b Georgian Bay (L.4d).
c Upper St. Lawrence (L.2).
d Temiscouata — Restigouche (L.6).



c

d

L.4c — Middle Ottawa

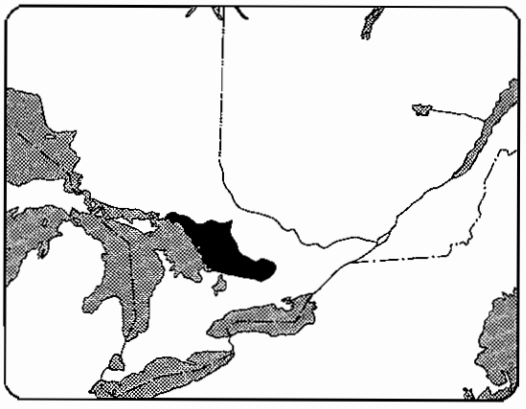


The area is roughly U-shaped, comprising in the main a hardrock upland which encloses the Palaeozoic lowlands of the upper St. Lawrence on all but the eastern side. The adjoining Section on the north and west (L.4b) has a more boreal character, seen in the prominence there of balsam fir and white spruce, while the Section at the extreme south (L.1) differs in its pronounced affinities to the deciduous forest.

The usual constituents of the upland forests are sugar maple, beech, yellow birch, red maple, and eastern hemlock, almost always accompanied by eastern white pine and red pine. The last two species also characterize dry ridges and sand flats in association with jack pine. Varying amounts of white spruce, balsam fir, trembling aspen, white birch, red oak and basswood are present throughout. Rather common are hardwood and mixedwood swamps in which eastern white cedar, tamarack, black spruce, black ash, red maple and white elm appear. A number of more southerly species, not characteristic but scattered here and there, are butternut, bitternut hickory, bur oak, white ash and black cherry.

The topography is irregular, varying from lowland flats to a strongly rolling type of upland terrain. The underlying bedrock of Precambrian granites, gneisses, schists and crystalline limestones is covered with glacial deposits, shallowly on the hills and more deeply in the valleys. Some of the landforms are drumlins, till-capped rock ridges and lacustrine plains, the latter resulting from post-glacial Lake Algonquin. Along the boundary north of the Champlain Sea re-entrant, marine silts and clays are spread in and out among the hills. One extensive area of marine modification is the Gatineau River valley as far north as Maniwaki. Dystric brunisols and humo-ferric podzols are usual, with some development of melanic brunisol profiles on calcareous materials.

L.4d — Georgian Bay

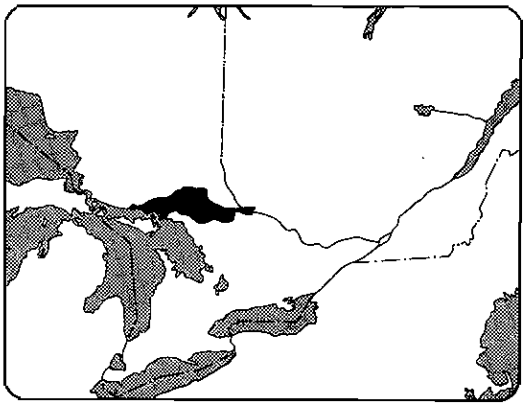


Between Georgian Bay and the Algonquin Highlands lies a mixed forest similar to that of the Laurentian (L.4a) and the Middle Ottawa (L.4c) Sections. Its southern boundary coincides with the contact between the Precambrian rocks and the Ordovician sedimentaries of the peninsula. On the north it meets the forests of the Sudbury-North Bay Section (L.4e). Its location in the lee of Georgian Bay puts it in a local snowbelt, and the summer precipitation is likewise higher than at similar altitudes farther inland.

The most important forest trees are sugar maple, beech, basswood, yellow birch, eastern hemlock, eastern white pine, red maple and white ash, these species forming mixed stands on the uplands. White spruce is common on sand flats and other coarse-textured soils, an ecological contrast with the preceding Section where the red and eastern white pines are more usual on such sites. Eastern hemlock appears to increase in abundance from the inland toward Georgian Bay, and along the thin-soiled rocky shores there are scrubby stands of jack pine, trembling aspen, red oak, white birch, white spruce and black spruce. In southern and western areas, extensive swamp stands of red maple, black ash and eastern white cedar are present. At the highest altitudes, a more boreal character of the forest types is evident, with strengthened representation of spruce and balsam fir.

The granite and sedimentary gneisses and schists of the Precambrian Shield are overlain for the most part by a thin layer of glacial till which has been water-washed in some places. A portion of the Section has been influenced by glacial Lake Algonquin, with consequent deposition of lacustrine sands and silts. Though lowland areas occur, the topography is essentially hilly, rough and irregular. Humoferric podzol and dystric brunisol profiles are developed on the well-drained positions; organic soils (peat and muck) on poorly-drained flats.

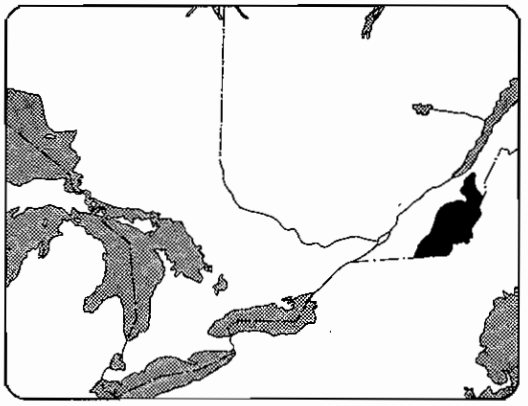
L.4e — Sudbury-North Bay



Surrounding Lake Nipissing and extending west to Lake Huron lies an area of lowlands and flats interrupted by rugged outcrops of bedrock from which recent erosion has removed most of the soil and vegetation. Extensive disturbance by cutting, fire and smelter fumes has destroyed or reduced the abundance of many of the naturally occurring species, so that the tree cover is predominantly of the hardy pioneer species: trembling aspen and white birch. The distribution of the tolerant hardwoods, such as sugar maple and yellow birch is very limited. Jack pine occurs frequently on the sand flats and other coarse-textured soils, and red pine, eastern white pine, balsam fir and black spruce have a scattered occurrence where suitable soils remain.

Surface deposits over the variable Precambrian rocks are water-modified tills and lacustrine silts and sands. Much of the area was influenced by post-glacial lakes Nipissing and Algonquin. The soils are mostly humo-ferric podzols though some moderately calcareous profiles are also known.

L.5 — Eastern Townships

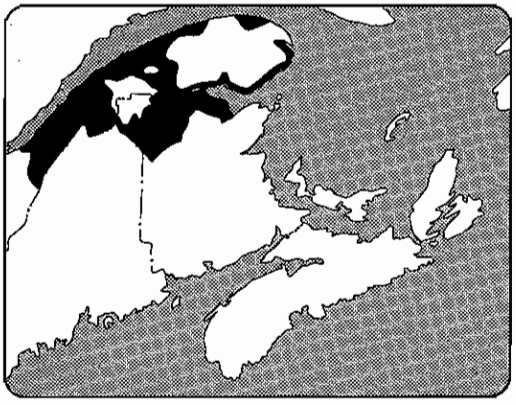


East of the St. Lawrence Valley, in the southeast corner of Quebec, there is an upland area with parallel ridges and valleys running in a northeast-southwest direction. This is the northern termination of the Green Mountains of the Appalachian system.

It is a well-forested region. Sugar maple, yellow birch, white spruce, balsam fir, eastern white pine and eastern hemlock are the species associated with the richer, well-drained slope sites. Less common are beech on warm upper slopes and basswood on lower slopes. Red spruce is distributed through the Section with the above-named species and, as has also been pointed out for Section L.4a, there is a close similarity to forests of the Acadian Forest Region. On ridges, exposed sites and shallow soils the prevailing dominants are white spruce, balsam fir and white birch. In swampy depressions coniferous stands of eastern white cedar, tamarack or black spruce are usually found; hardwood swamps with black ash occur only occasionally although white elm is prominent today. Following fires and other disturbance, the aspens, birches and cedars pioneer the first stages of forest succession. Grey birch is particularly prominent on old fields accompanied by white spruce, trembling aspen and largetooth aspen.

In general, the terrain is rolling, dissected by deep stream-cut valleys. The bedrock is mainly Cambrian and Ordovician strata enclosing minor belts of Precambrian intrusive and metamorphic rocks, and it is covered for the most part with glacial till and glaciofluvial deposits. In addition, along the northwest side of the Section, there are beach and marine deposits of the Champlain Sea. Humoferric podzols and dystric brunisols are typically developed.

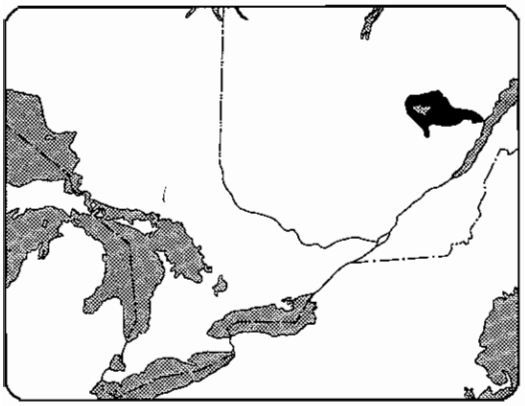
L.6 — Temiscouata-Restigouche



The Section extends northeastward from the previous one, along the south shore of the St. Lawrence River almost to its mouth into New Brunswick around the Restigouche River and the upper valley of the Saint John River, and along the north side of the Baie de Chaleur. Outliers are found at various points of lower elevation along the shoreline of the Gaspé Peninsula, interrupted by arms of the interior highland boreal forest.

Immediately adjacent to the St. Lawrence south shore lies a narrow zone of coniferous forest dominated by white spruce with some white birch, eastern white cedar, tamarack and trembling aspen. Inland the forest as a whole is characterized by sugar maple, beech and yellow birch on the hill tops with balsam fir and white spruce in the valleys. Compared to the adjacent Sections L.3 and L.5, red spruce, eastern hemlock and grey birch are uncommon. Eastern white cedar of good size is common on lower slopes. On hillsides and low rocky knolls balsam fir forms mixtures with yellow birch, white birch and, formerly at least, with the eastern white and red pines. Though much reduced in importance relative to their earlier status, the pines are locally abundant, and eastern white pine shows up prominently in second growth stands which have sprung up following fire. Alluvial flats support balsam poplar, black ash, white elm and white spruce. Other species distributed through the Section are red maple, white birch and jack pine, the latter species forming locally important pulpwood stands. Following fire both white birch and aspen gain numerically. Black spruce and tamarack are found on bottomlands and in boggy areas. The bedrock is of Cambrian, Silurian and Devonian strata, locally metamorphosed. The topography is rolling and the rivers cut through the plateau in deep, narrow valleys. The soils are derived from glacial and residual materials, with some marine clays on the northern parts along the St. Lawrence River. In New Brunswick in particular, the soft nature of the bedrock and its steep dip have resulted in effectively deep soils of good structure. The humo-ferric podzols become coarser in texture toward the northeastern part of the Section.

L.7 — Saguenay

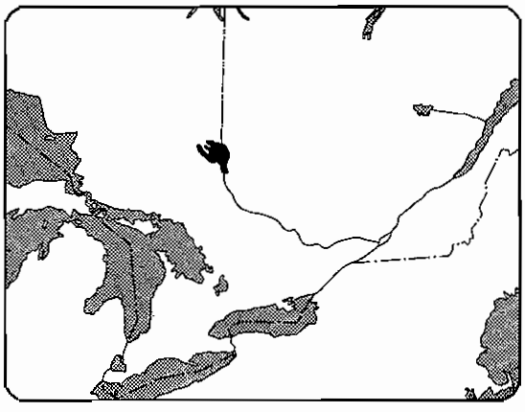


West of the estuary of the St. Lawrence River is a basin-like area centering round Lake St. John, connected by the fault line and deep valley of the Saguenay to the estuary. Here the typical tolerant hardwoods of the Great Lakes-St. Lawrence Forest Region are characteristic (though only dominant locally), possibly indicating more favourable conditions of climate and soil than in the surrounding boreal forest lands.

Sugar maple and yellow birch occur in protected areas, particularly along the Saguenay, but stands of these species are not extensively developed. Eastern white pine and scattered red pine are present with eastern white cedar, basswood, white elm, black ash and balsam poplar in local patches and along river banks. However, the forest is essentially boreal in appearance, with communities of jack pine predominating on sandy areas and with trembling aspen, white birch, white spruce, black spruce and balsam fir common on other sites. Fire, clearing and other disturbances have favoured the expansion of areas occupied by these species.

The underlying bedrock is mainly Precambrian granite gneisses, with a few local patches of Ordovician limestone, and with basic intrusive rocks near Lake St. John. Marine clays and sands of considerable depth have been deposited on the lowlands, and glacial drift or alluvium elsewhere. Because of the favourable topography, much of the Section has been cleared for agriculture. Humo-ferric podzols and humic gleysols are usual.

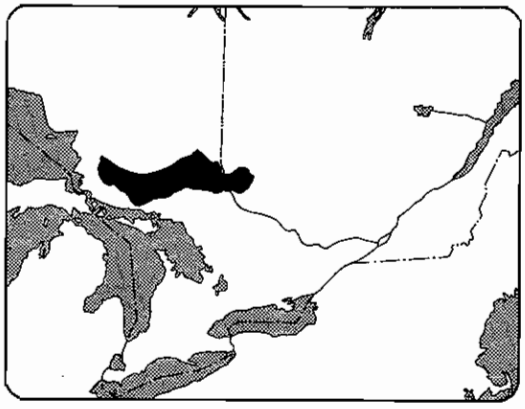
L.8 — Haileybury Clay



From Lake Timiskaming northward toward the height of land, the fault valley containing this lake opens up to an undulating and gently inclined plain, the "little clay belt". Here the forests are transitional in nature, with close affinities to those of the Northern Clay Section (B.4) but also strongly influenced by the more southern hardwood species, especially in the vicinity of the lake. Black spruce communities are characteristic on lacustrine flats but continual cutting has reduced their areas of distribution. With the spruce are associated balsam fir, white birch and trembling aspen, the prominence of the latter two species being greatly increased as the result of fires. On moist flats and river banks, stands of balsam poplar of large size are found, as well as good-growth eastern white cedar. White spruce is not abundant and is distributed mainly along rivers and lake shores, and on well-drained slopes. Of similar scattered occurrence is eastern white pine which favours the coarse-textured soils by river banks and around lakes, especially in the northeastern parts of the Section adjoining the Ottawa River. Yellow birch, sugar maple, red oak and red maple occur mainly at the head of Lake Timiskaming, but with some presence throughout, and there is a limited amount of basswood, white elm and black ash along the rivers.

Topographically the Section is a plateau with gentle slopes southeastward to the Ottawa River basin and northward towards the James Bay watershed. There are few hills and the underlying rocks, mainly of sedimentary and volcanic origin and of Precambrian age, are covered by lacustrine clays and sands from glacial Lake Barlow. Surface drainage is generally poor and organic soils occupy a large percentage of the area. Much of the upland has been cleared for cultivation, and the extent of the natural forest has been further reduced by past fires. Gray luvisols and humo-ferric podzols are typical of the well-drained sites, with humic gleysols and organic soils on poorly-drained sites.

L.9 — Timagami

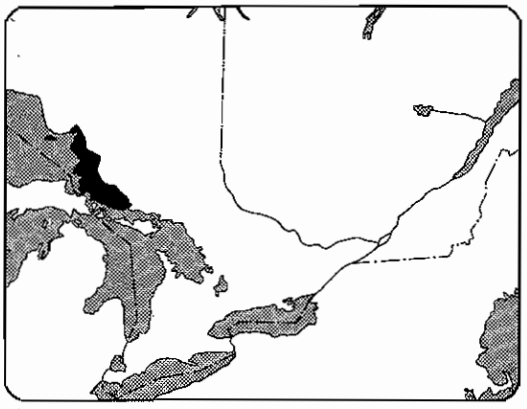


This is a large upland area north of Lake Huron, stretching east and west from Lake Timagami, and occupying a generally southward-sloping surface. The northern boundary marks a diffuse transition to forest lands bearing a preponderance of boreal types.

The typical association of the Section consists of eastern white pine with scattered white birch and white spruce, although the spruce frequently rivals the pine in abundance. Another common though variable type is a mixture of the birch, pine and spruce, with balsam fir, trembling and largetooth aspens. Both red pine and jack pine are present, the former often prominent in bluffs along ridges and the latter generally restricted to the driest sandy or rocky sites. The tolerant hardwoods, yellow birch and sugar maple, have only a scattered occurrence. The prevalent forest cover on the uplands is clearly a reflection of periodic past fires, and the sandy soils have provided conditions especially favourable for the propagation of eastern white pine, red pine and jack pine. On the lowlands, in poorly-drained depressions and in swamps, black spruce with tamarack or eastern white cedar, form well-marked communities.

The topography is gently to moderately rolling in the west, more rugged and broken in the eastern part. A shallow till overburden is usual on the hills, but extensive areas of exposed bedrock — Precambrian granite and gneiss, with local conglomerates and sandstones of the Huronian series — occur in all parts of the Section. Sandy and gravelly soils of glacio-fluvial and fluvial origin, relating to the upper levels of glacial Lake Algonquin, contribute to the pine sites in the central and southern portion; rock-cored drumlins, present in the western and eastern areas, are absent centrally. Humo-ferric podzols and organic (peat) soils characterize slopes and depressions, respectively.

L.10 — Algoma

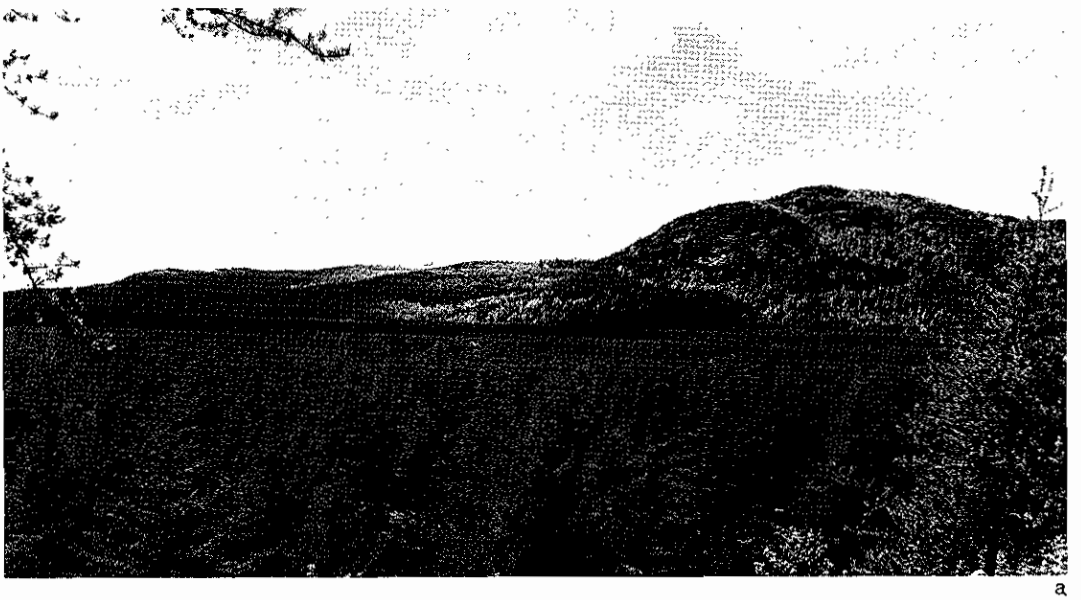


This area has a varied topography which is reflected in the character of the vegetation. It consists of a lowland along the Lake Huron-Lake Superior shore, backed by a series of high east-west ridges with steep southern and gentle northern slopes. The prominent distribution of the tolerant hardwoods on this terrain serves to differentiate it from the Timagami Section (L.9) where sugar maple and yellow birch are much less evident.

Characteristic is a mixture of yellow birch, white spruce, balsam fir, sugar maple, hop-hornbeam and eastern white cedar, the association being found principally on the gentle northern slopes. The upper slopes and tops of the ridges are covered with pure hardwood stands of sugar maple with a scattered distribution of yellow birch. Eastern white pine and occasional red pine dominate on the upper, steep south-facing slopes; white spruce, eastern white cedar, and balsam fir on the middle and lower slopes. After fire, trembling aspen, white birch and sugar maple are often prominent. A noticeable feature in the northern part of the Section is the marked development of a white spruce-balsam fir association on the river terraces and adjoining flats, and in such communities white birch and black spruce are usually present. Fire is to some extent a contributing factor to this condition, as it is also to the stands of jack pine on sand plains. Along the shore of Lake Superior are lowlands with stunted eastern white cedar, black spruce, tamarack and alder thickets, while scrubby red maple and white elm grow on higher lands back from the lake. Eastern hemlock and beech are sparsely represented in the southern part of the Section and red oak has a limited occurrence on the southwest side near Batchawana Bay.

Drainage is generally to the west and southwest through the pre-glacial valleys, some of which have been filled with deep glacio-fluvial materials. Precambrian granites, gneisses and schists, with some greenstone and sedimentary rocks of the Huronian series, underlie the Section. The lowland areas along the lake shores are gently undulating to gently rolling, with lacustrine and fluvial flats between islands of till-capped rock. The rougher upland areas are covered with glacial drift, worked into drumlin landforms in the northeast; along the western and southern portions there are more recent deposits of alluvial and lacustrine materials from glacial Lake Algonquin. Dystric brunisols and humo-ferric podzols are reported on the upland sites.

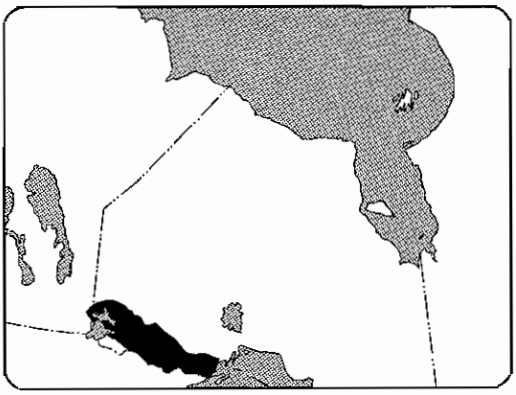
a Timagami (L.9).
b Eastern white pine.



a

b

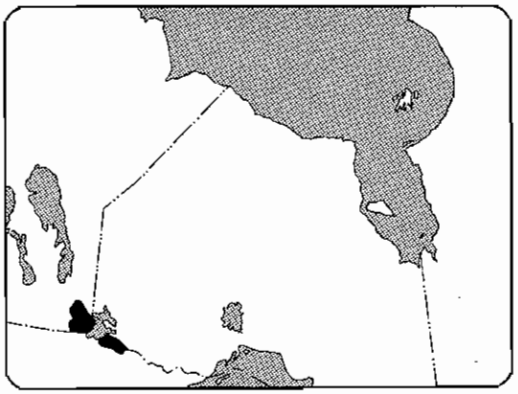
L.11 — Quetico



After the retreat of the last ice-sheet, species of the fragmented Great Lakes-St. Lawrence forest migrated northward into the country between Lake of the Woods and Lake Superior. The general character of the soils and climate apparently favoured the development of pine communities, and large areas are still dominated by the eastern white and red pines. Logging and recent fires have brought various boreal species into prominence, and pure or mixed stands of jack pine, trembling and largetooth aspens, white birch, balsam fir and the white and black spruces are frequent, associated with varying amounts of the eastern white and red pines. The fir-white spruce-birch type is particularly common, and in low-lying areas a spruce-fir forest type is often present. In the southern and eastern parts there is a scattering of yellow birch, sugar maple, basswood, Manitoba maple, hop-hornbeam, and red and bur oaks. Hardwood species of wet valley sites are black ash, white elm and red maple. Eastern white cedar grows along lake shores and in rich swamps; black spruce and tamarack are usual in stagnant mossy bogs.

Over the greater part of the area the underlying granites, sediments and volcanic rocks of the Precambrian Shield have been strongly glaciated, and the resulting soil deposits are thin and of coarse texture. The irregular nature of the terrain is reflected in great numbers of rock-rimmed lakes of various sizes. At the eastern end of the Section, bedrock conglomerates and slates have largely been covered with clays and sands laid down in glacial Lake Algonquin, while in the central and western portions, local lacustrine and beach deposits occur as small discontinuous patches in a complex with water-washed till.

L.12 — Rainy River



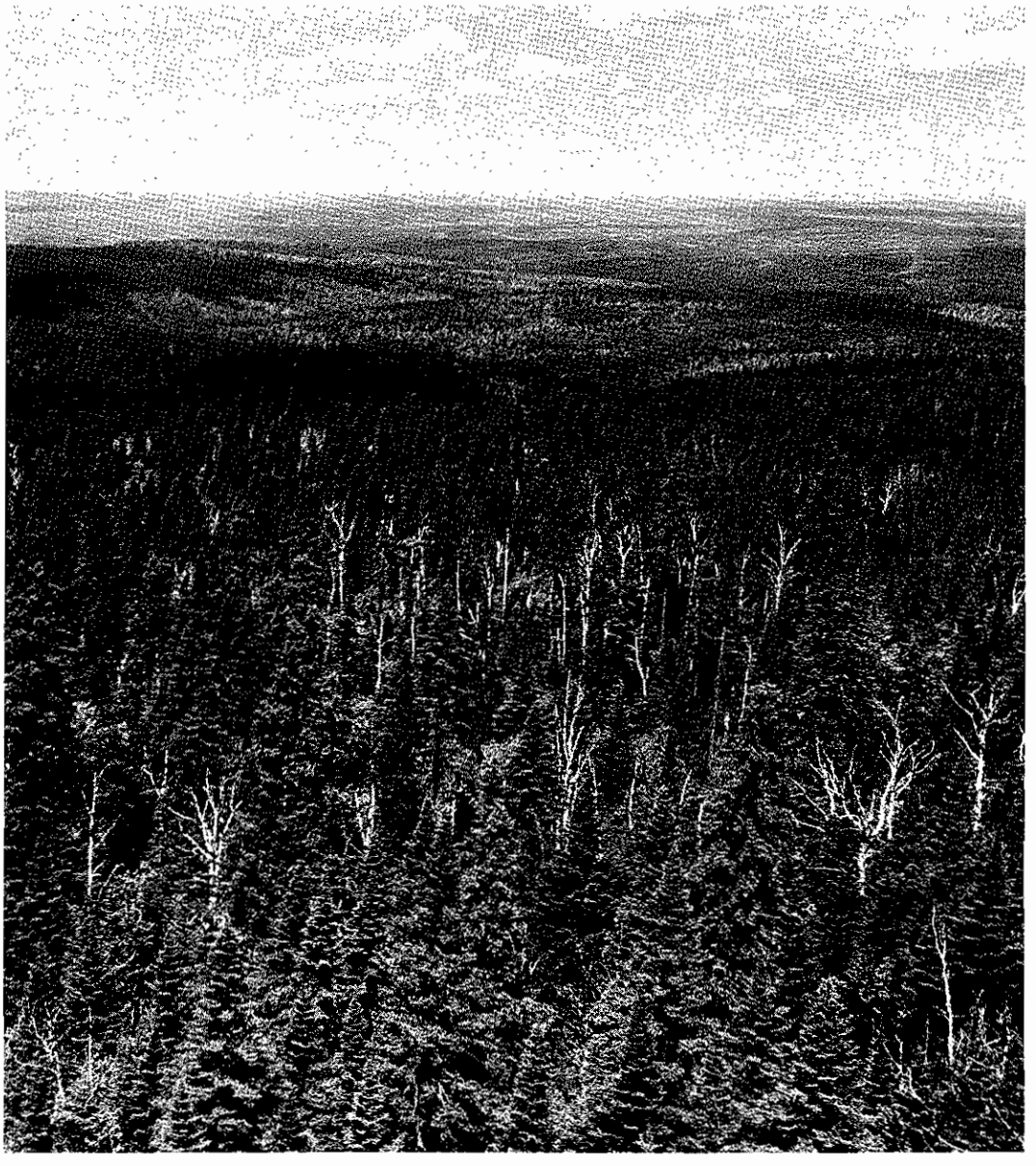
During its early stages, glacial Lake Agassiz extended to the east in a wide lobe, reaching Rainy Lake and passing to the south of Red Lake in Minnesota. Over this country, lacustrine and modified glacial deposits are found. However, an island of higher land, with water-washed till and outwash sands, was not covered by the lake; this is the Sandilands Provincial Forest in Manitoba. The present Section, one of strong boreal affinities, includes the Sandilands and the surrounding lake-modified area.

The forest cover shows the influence of the northward movement of the Great Lakes-St. Lawrence forest, as assumed also in the previous Section, as well as the influence of the tension zone between forest and adjoining prairie to the west. The red and eastern white pines, formerly of greater extent, have now only a scattered representation on suitable sites, particularly in the eastern parts, for logging and fires have led to their almost complete replacement by jack pine. Low relief and poor drainage have favoured the development of extensive swamps, with black spruce, tamarack, eastern white cedar, willow and alder scrub, particularly in the western portions over sedimentary rocks. The northwestern limits of the Section are principally coincident with the range of this swamp association and the presence of eastern white cedar, though isolated populations of this species are also found farther to the northwest. Large areas of balsam poplar, white spruce, balsam fir and scattered tamarack are found inland from the rivers. On the river banks white elm, basswood, Manitoba maple, and bur oak occur, the latter species often forming a savanna type with grassy openings. Trembling aspen is common throughout the Section.

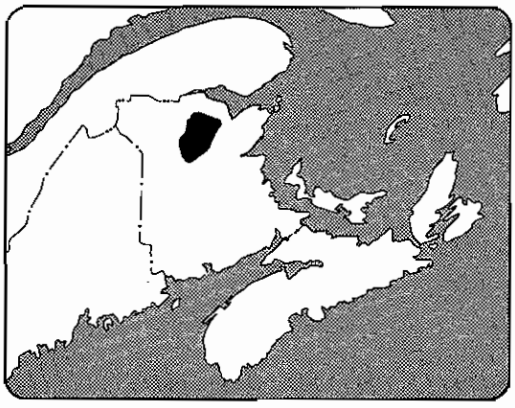
Relief is low, and the topography is mostly flat to undulating, with areas of modified glacial till and deltaic materials in the eastern portion, and coarse-textured materials, outwash, and old beaches and bars of Lake Agassiz in the west. Broad swamps are prominent features of the former lake bottom. The well-drained soils are podzolic in type and their generally coarse texture renders them unsuitable for agriculture. However, agricultural settlement on the finer-textured materials along Rainy River has led to considerable clearing in that area.

Acadian Forest Region

New Brunswick Uplands (A.1).



A.1 — New Brunswick Uplands



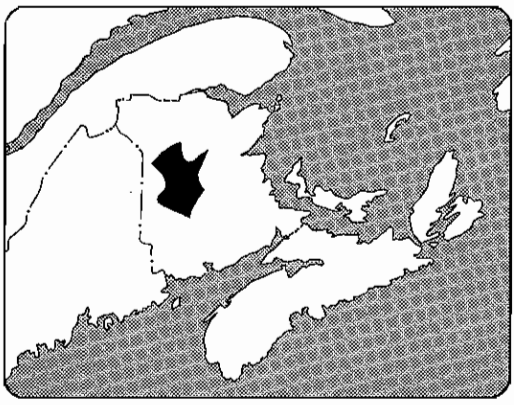
In the north-central part of New Brunswick lies a large, rough upland area. Here are the highest parts of the province, with elevations up to 2,700 feet. The effects of altitude are reflected in a predominantly coniferous forest with pronounced boreal affinities, contrasting with the surrounding forests at lower elevations in which the tolerant hardwoods — sugar maple, beech and yellow birch — assume greater significance. The boundary of the Section lies close to the 1,500-foot contour on the south and west sides.

The forest is composed mainly of balsam fir, black spruce, white spruce and white birch. An interesting ecological feature is the common occurrence of eastern white pine in mixed stands of these species. Balsam fir is probably the most abundant tree throughout, but it is usually inferior in quality to the other conifers except on deep loamy soils; black spruce is present in greater quantity than white spruce, and in the southern part of the Section it exceeds balsam fir in importance. Both eastern hemlock and red spruce are present sporadically, except on the poor sites of the higher uplands. They are absent, for example, from the hard granites of the Mount Teneriffe district (as is also eastern white pine), and consequently the spruce-fir-birch stands there take on a truly boreal character. The prominence of trembling aspen, jack pine, and white birch, as well as the eastern white pine and red pine is due to the widespread distribution of sandy soils and to a long fire history.

Though yellow birch frequently forms a small percentage of upland stands, the tolerant hardwoods are generally inconspicuous. In the northeast there is the occasional ridge of sugar maple, and here also the relative frequency of eastern white cedar is highest. Beech grows only at the borders of the Section. On low, swampy ground there is a limited presence of tamarack and black ash.

The rock strata were folded and intruded in Devonian time, and they are mainly soft shales in the northern and eastern parts, and acid intrusions on the south and west. Heavy glaciation of the rugged terrain exposed some of the underlying rock but more generally deposited on it a thin, stony loam till of only moderate potential for forest growth.

A.2 — Upper Miramichi-Tobique

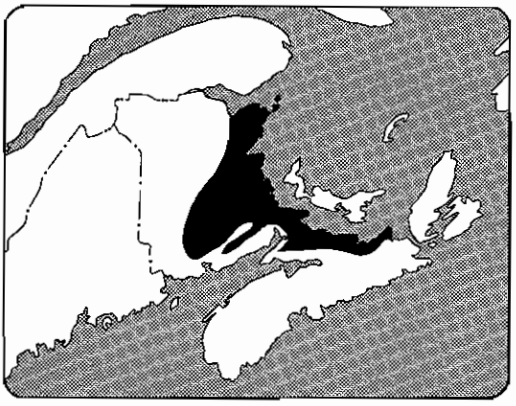


The Section occupies the southern approaches to the predominantly boreal forest of the New Brunswick uplands. In character it is thus a transitional vegetation of intermediate elevations, passing westward into the deciduous forest of the upper Saint John River valley, eastward into the spruce-hemlock forest of the central New Brunswick lowlands, and northward into the boreal conifer types.

On upper well-drained slopes and low hilltops it is usual to find sugar maple, yellow birch and beech, and on middle slopes mixed stands of these species plus red spruce, white spruce, eastern hemlock and balsam fir. The coniferous trees come into more prominence on lower slopes and bottom lands where the hardwoods are less aggressive, and the valleys of the Tobique and Becaguimec rivers, for example, bear forests composed largely of the spruces, fir, eastern white cedar and tamarack. In the northern and northwestern parts of the Section, balsam fir, white birch, white spruce and black spruce play a conspicuous role on the upland sites as well, and some of the more rugged hilltops support forests recognizably boreal in composition. White birch, red maple and trembling aspen are commonly present in young stands originating after disturbance, but white birch is not the prominent component of stable mixedwood types that it is in the Gaspé and New Brunswick Uplands Sections (B.2, A.1). Grey birch grows only in the south; eastern white pine is most prominent in the eastern part, to which area also the red and jack pines are restricted. Various combinations of eastern white cedar, red maple, black ash, black spruce and tamarack grow on the wet sites, of which there are many.

The topography is generally rugged and mountainous, with deep valleys and steeply rising hills. The bedrock is a complex of metamorphosed sedimentary, intrusive and volcanic rocks, mostly hard and resistant to erosion. The surface mantle of rocky loam till, variable in depth, shows humo-ferric podzol development.

A.3 — Eastern Lowlands



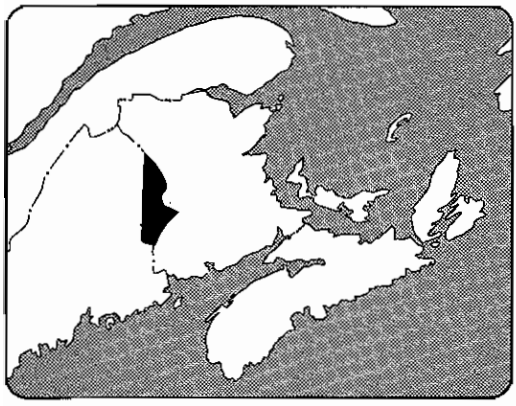
The large triangular area extending from south-central New Brunswick to the Gulf of St. Lawrence coastline, from Baie de Chaleur to Antigonish in Nova Scotia, is included here. This Section is predominantly coniferous in character, and its boundaries on the western and southern sides are formed by highlands where the tolerant hardwoods become more conspicuous components of the forests.

Level landforms with impeded drainage are prevalent, favouring softwood stands of black spruce, red spruce and balsam fir, or mixed-woods in which these species are associated with eastern white pine, red maple, sugar maple, yellow birch and white birch. Widespread fires appear to have favoured propagation of the coniferous species in the past, particularly black spruce, jack pine, and to a lesser extent eastern white pine and red pine, though grey birch, white birch and trembling aspen have also benefited. In older stands, eastern hemlock is present to a limited extent; it was formerly well represented over the whole plain and probably reached its best growth there, but lumbering and fire have largely eliminated it.

On well-drained sites, particularly on the higher grounds of the western part and just north of the Cobequid Mountains, yellow birch, white birch, sugar maple and red maple increase at the expense of the conifers. Though good stands of tolerant hardwoods occur locally, as on the slopes of the Miramichi River, the hardwood association is not well developed generally, and the sugar maple and beech that grow patchily on ridges and steep slopes are of poor form. On flat, poorly-drained lands, broad areas of open peat bog are interspersed within forests predominantly composed of black spruce and tamarack; the eastern white cedar is present only on the lowlands of the New Brunswick side of the Section. In the immediate vicinity of the coast, the forest trees are somewhat reduced in stature due to wind effects; white spruce seems to be the species most tolerant of this exposed environment.

The gently undulating plain is underlain by flat-bedded sandstones, shales, mudstones and conglomerates of Carboniferous age. The surface tills are mostly of a clay loam or sandy loam texture, deficient in lime and humo-ferric podzol in soil profile development. The best soils are the alluvial materials in the river valleys.

A.4 — Carleton



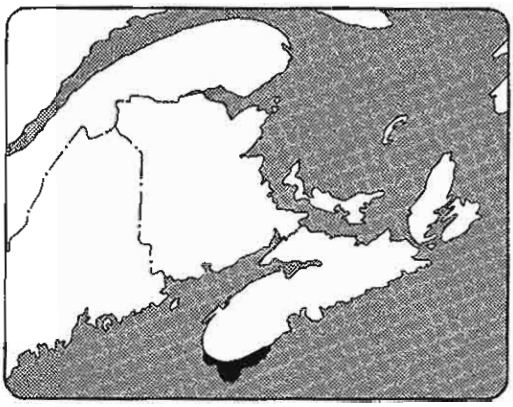
A distinctive forest, predominantly hardwood in character, occupies the central portion of the Saint John River valley in western New Brunswick. Its eastern and southern boundaries are set by the transition at higher altitudes to mixed forests in which yellow birch and balsam fir, eastern hemlock and eastern white pine make their appearances in quantity.

The hardwood stands are composed of sugar maple, beech, yellow birch, red maple and white ash, accompanied by such relatively uncommon species as butternut, basswood and hop-hornbeam. Favourable topography and fertile soils have led to extensive clearing of the land for agricultural purposes, and the historical prevalence of hardwoods is not immediately apparent in many places today.

On long steep slopes the conifers have their highest representation in mixed stands, with balsam fir and white spruce probably the most common species. Eastern hemlock is also prominent, particularly on lower slopes and in the broad flat valley bottoms of the southern and eastern parts, on steep sides of narrow valleys in the central area, and on uplands in the north. Red spruce is uncommon in the Section, eastern white pine is sparsely present throughout, and grey birch occurs only in the southern half. Agricultural development has largely eliminated forest fires with the result that stands of the intolerant hardwoods—other than old-field trembling aspen — are few. The soils of poorly-drained flats are often mildly alkaline, a condition reflected in the presence of eastern white cedar, black ash, red maple and white elm.

Loams and sandy loams containing calcareous rock fragments form the prevalent well-drained mantle over steeply dipping slate and shale bedrock in and adjacent to the Saint John River valley. Over much of the area the topography is undulating, though in the southeast where a complex of Devonian and Ordovician intrusive and mixed metamorphic bedrock occurs, uneven uplands are separated by broad rolling lowlands. The soils belong mainly to the humo-ferric podzol group.

A.5a — South Atlantic Shore

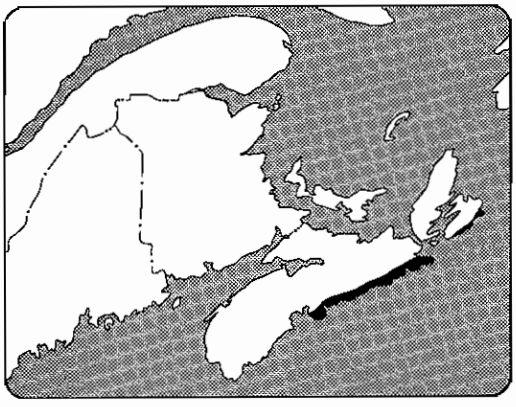


A coniferous forest of white spruce, black spruce and balsam fir, showing relationships to that of the Avalon Section (B.30) in Newfoundland, occupies a narrow strip along most of the southern coastline of Nova Scotia. It is divided into two parts on the basis of relative abundance of the dominant species, and in the A.5a Section which comprises the cool, moist and windy coastal area around Cape Sable, white spruce is the conspicuous tree. A forest of similar physiognomy but distinguished by a prevalence of red spruce occurs in the maritime zone surrounding the Bay of Fundy (Section A.9).

The three characteristic conifers — white spruce, balsam fir, black spruce — are accompanied by white birch and red maple. Most of the forest has been cleared or burned at one time or another, and the two spruces with fir have invaded the disturbed ground. Some eastern white pine, red oak and, occasionally, red spruce occur along the inland border, the presence of these trees probably marking a boundary where amelioration of a rather rigorous coastal climate begins. Some areas are burned frequently to culture blueberries, a forestland crop that competes locally with wood products.

Palaeozoic slates and quartzites intruded by Devonian granites underlie most of this Section. None of the strata attain appreciable elevation, as they rise gradually from the coast in a low though rough terrain. The soil materials consist of coarse loamy sands in some areas, and of deep, often drumlinoid sandy loams in others. Notable features of the soils are the thick accumulations of surface humus and the extensive pan formations (ortstein) within the profiles. Drainage of the land is good, considering the relatively high annual precipitation.

A.5b — East Atlantic Shore

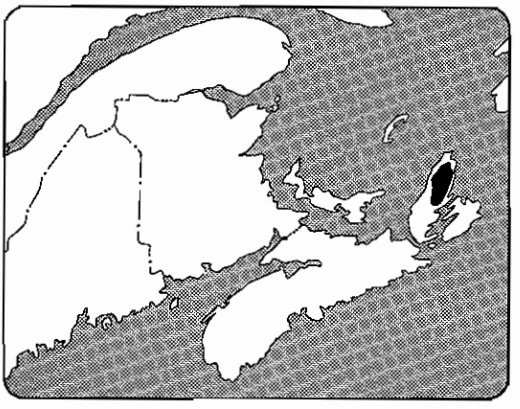


A band of coastline five to twenty miles wide, extending from Mahone Bay to the eastern end of Cape Breton Island, makes up this Section. Its characteristic features are dense low stands of balsam fir, black spruce and white spruce, and the virtual absence of red spruce, eastern white pine and most hardwoods. It also includes large areas of fire barren, bog and bare bedrock.

White spruce is less abundant than either black spruce or balsam fir except along the immediate coastline; it does, however, form nearly pure stands in old clearings or otherwise disturbed areas. White birch is a common tree throughout, and tamarack is widespread on the flat, poorly-drained portions of Cape Breton Island. The presence of jack pine in several places on Cape Canso suggests periods of droughtiness and fire, though there is evidence that most of the history of burning is related to attempts by the settlers to extend their pasturing areas. In general the growth of all species of trees is slow, and excessive density as well as coastal exposure may be a contributing factor to this condition. In the south, good forests containing yellow birch grow within a mile of the coast where high hills cut off the cool sea breezes.

Slates and quartzites, intruded by granite, underlie most of the mainland parts; in Cape Breton, volcanic and sedimentary rocks, some of Precambrian age and intruded by granites and diorites, are common. Though some of the overlying materials are of heavy clay texture, most are sandy loams or loamy sands. Where burned or cleared these latter soils frequently remain barren for years.

A.6 — Cape Breton Plateau



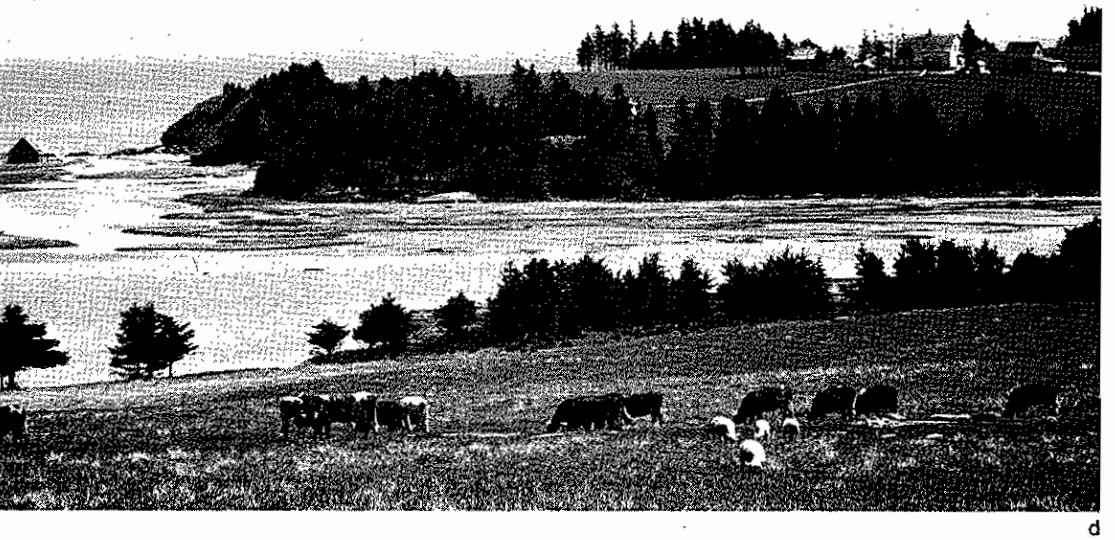
The highlands at the northern end of Cape Breton Island carry forests which show marked similarities to those of the New Brunswick Uplands Section (A.1) and the Gaspé Section (B.2). At altitudes varying from about 700 to 1,100 feet, depending on aspect and exposure, the tolerant hardwoods of the lower lands thin out, and the change to a more boreal type of vegetation takes place as conifers assume greater prominence. With increasing altitude, particularly on top of the plateau, the forest cover becomes discontinuous due to a prevalence of large moss-covered or heath barrens.

Balsam fir, white and black spruces and white birch are the four chief species, the fir dominating most forest types. Scattered yellow birch and shrubby red maple are present except on the highest land, but like the beech and sugar maple which extend in a limited way into the lower river valleys, they are not conspicuous or important elements of the forest. The pines (*Pinus* spp.), if present, are very rare, and this suggests what studies of forest genesis have shown, namely that forces other than fire are the effective agents of forest destruction and regeneration. The influence of the wind can be seen in the stunted appearance of many forest stands, particularly on hills and ridges, while in sheltered places both the form and growth of trees is excellent. On the high plateau itself, balsam fir continues to dominate, accompanied as before by black and white spruces, tamarack and showy mountain-ash. Here dense thickets of the bushy, deformed conifers, mostly too small to be of any economic value, alternate with peat bogs on moist, seepage slopes and in hollows, or with heath-shrub barrens on the ridges.

The Cape Breton highlands themselves show little relief. Near the edge of the upland plain the streams have cut valleys that are deep and steep-walled but a short distance back from the edge, on the plateau itself, such down-cutting is not pronounced. The bedrock is mainly of sedimentary and metamorphic rocks intruded by granite, an assemblage which is probably of Palaeozoic age. On the plateau shallow soils prevail, and elsewhere coarse sandy loams or bedrock exposures are usual. Profile development under the cool-moist climatic conditions is to ferro-humic podzols, gleysols and organic (peat) soils according to drainage position.

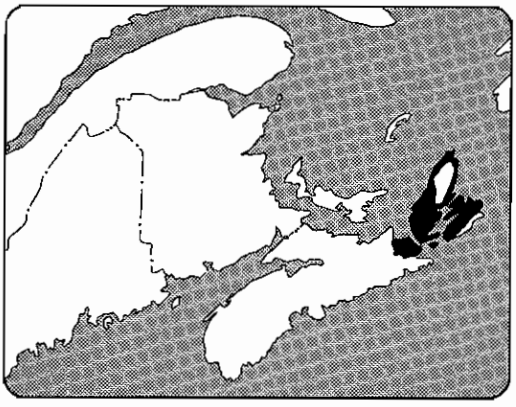
a East Atlantic Shore (A.5b).
b Fundy Coast (A.9).
c Cape Breton — Antigonish (A.7).
d Prince Edward Island (A.8).

c



d

A.7 — Cape Breton-Antigonish

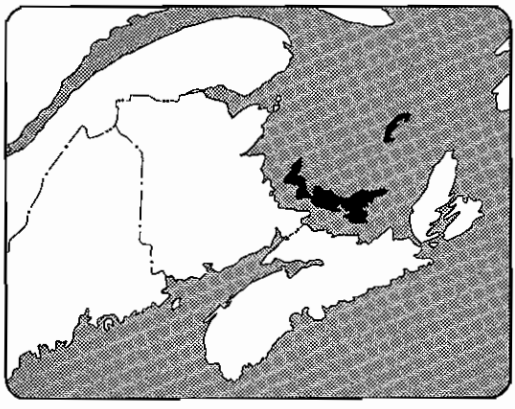


The major part of Cape Breton Island is included here, excepting only the southeast portion facing the Atlantic and the Cape Breton plateau. Also included is a small part of the mainland immediately west of Canso Strait. The Section consists of a complex series of lowlands, rolling foothill country and, approaching the plateau previously described, table-topped highlands dissected by steep-sided U-shaped valleys. The distribution of tree species and forest types is closely related to the topographic and soil conditions of these land types.

White spruce and balsam fir are the primary constituents of stands on the heavy soils of the lowlands, the great abundance of white spruce being attributable largely to abandonment of fields. Where soil drainage is poor, black spruce is common, and this tree also occupies dry river terraces. Alluvium is colonized by white spruce, balsam poplar, white ash and the occasional white elm. The hilly lands tend more to support mixed stands of red maple, white and yellow birches, balsam fir and white spruce. The last-named conifers are particularly prominent in some places — as where land has formerly been cleared — but are absent in others. In ravines and on moist slopes eastern hemlock may be locally abundant, and beech may be plentiful on steep dry hillsides. Toward the north, on the slopes of the highlands, the forest is predominantly deciduous, with sugar maple, beech, yellow birch and red maple the usual species. The same kind of forest becomes very luxurious in some of the narrow valleys, but at higher elevations it passes into mixed or coniferous types. Occasional companions of the hardwoods on the slopes are eastern white pine, white spruce, eastern hemlock and balsam fir. Red spruce is uncommon in the Section; red oak has a local abundance in some of the northern valleys. There is a limited occurrence of disturbance stands of trembling aspen and white birch.

The area is underlain by gently to steeply folded Carboniferous strata in the southern part and by rocks similar to those underlying the Cape Breton plateau in the north. The foothills have developed on harder sandstones and shales, and the soils are coarser and better drained than on the lowlands. The rough highlands owe their character to hard igneous and metamorphic Precambrian bedrock, over which lies a thin mantle of stony loam till.

A.8 — Prince Edward Island

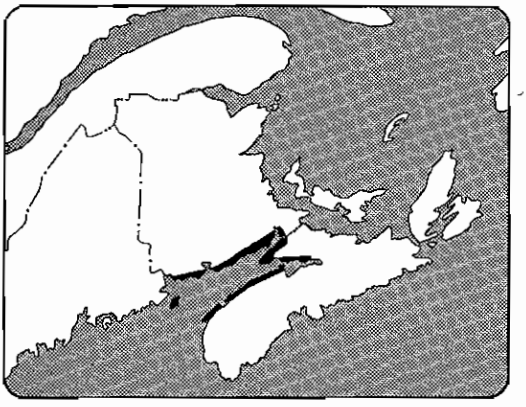


The Island is practically all farmed and very little of the original vegetation is left. However, it appears that formerly the forest cover was predominantly deciduous, and that sugar maple, beech and yellow birch had a wide distribution.

In the west, and along the north shore, conifers are prominent on upland flats and in broad valley bottoms. Here forest stands of white spruce, black spruce, balsam fir and tamarack are usual. Also present are red maple, and occasional eastern white pine, red spruce, eastern white cedar and eastern hemlock. On the somewhat higher land of the central and eastern parts, the tolerant hardwoods prevail and the conifers are conspicuous mainly in narrow belts along the streams; red spruce and eastern hemlock on lower slopes, white spruce and balsam fir on valley flats, black spruce and tamarack in peaty depressions. White spruce invades easily on disturbed land, and it is characteristic of old fields and fence rows. Eastern white pine is widespread on the coarser-textured soils, but jack pine is uncommon. The most adaptable and best-growing forest trees seem to be white spruce, balsam fir and yellow birch, but these as well as the other species require shelter from the sea winds in order to attain merchantable size.

The topography is gentle, the relief low. Horizontally stratified sandstones and conglomerates of Permo-Carboniferous age underlie the well-drained mantle of red loams and sandy loams. The soils though humoferric podzols are relatively fertile.

A.9 — Fundy Coast



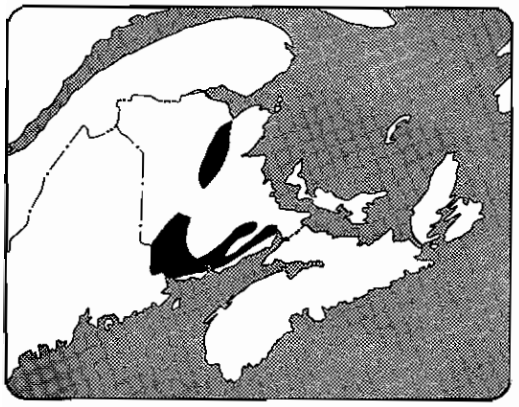
This is a small but heterogeneous Section bordering the Bay of Fundy. On the New Brunswick side it includes a narrow coastal strip, with many similarities to the Atlantic Shore Sections (A.5a, A.5b), backed by steeply rising uplands where the maritime influence apparently favours the dominance of red spruce; on the Nova Scotia side it includes the more gently sloping seaward face of North Mountain where widespread disturbance has resulted in an abundance of white spruce.

Immediately adjacent to the northern shore of the Bay is a patchy forest of poor quality composed of white spruce and black spruce, balsam fir and tamarack. Also present are huge raised sphagnum bogs. Inland, balsam fir and red spruce make up most of the forest stands, though the white and black spruces continue to be plentiful. On the highland slopes, white and yellow birch join the red spruce and beech, and sugar maple appears sparingly. Only on hill-tops and north-facing slopes do the tolerant hardwoods achieve prominence however. The absence of eastern hemlock, eastern white cedar and the pines (*Pinus* spp.) is characteristic of this area. Trembling aspen, white and grey birches, and red maple have re-populated old burns, and red spruce has invaded swamps and abandoned fields.

Nearly all of the original forest has been cleared from the south side of the Bay, and white spruce rather than red spruce has invaded the old fields. The tolerant hardwoods may once have been prevalent, possibly mixed with balsam fir and spruce, but the only broadleaved species now present in any quantity are red maple, white birch and trembling aspen.

An extremely variable bedrock is found in the coastal zone, and the surface mantle of soils is equally variable. In general, Triassic basalts and lavas line the south shore, and the overlying loams are relatively unleached and of good structure. On the northern side is a complex of Precambrian strata and volcanic rocks, with glacial drift and marine clays at the surface. Humo-ferric podzol profiles are usual.

A.10 — Southern Uplands

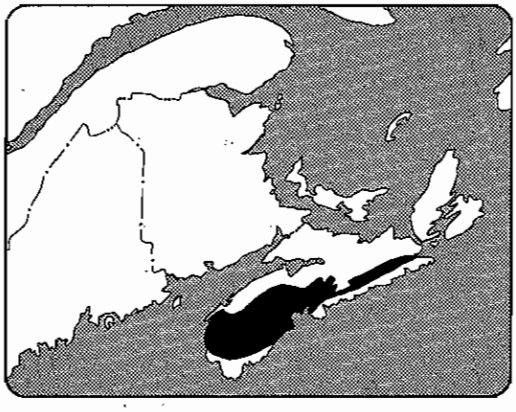


This is a rugged upland area with a pronounced hardwood forest character, comprising for the most part the hills and mountains inland from the coastal spruce-fir zone in southwestern and southern New Brunswick. The interior boundaries of the Section are marked in the eastern part by a decrease in altitude and a levelling of terrain which bring a more coniferous vegetation into prominence (Eastern Lowlands Section, A.3), and in the western part by a change to the distinctive composition of the central Saint John Valley forest (Carleton Section, A.4). Also included is a small isolated area, on the eastern side of the New Brunswick uplands, which shows less similarity to its surroundings than to this southern Section.

On hilltops and well-drained upper slopes with deep soils the tolerant hardwoods — sugar maple, beech and yellow birch — form stable types. At relatively lower elevations, mixtures of the same species with red maple, white birch, balsam fir, red spruce, eastern white pine and eastern hemlock are usual. On many of these sites a long fire history has apparently favoured the maintenance of the pioneer hardwoods, particularly on the thinner soils, and stands of trembling and largetooth aspens, white and grey birches and red maple tend to predominate. It is only in valleys, on lower flats, and to a limited extent on very exposed positions, that the conifers — spruce, fir and pine — hold the ground. On sandy outwash or river terrace materials good stands of red pine and eastern white pine are occasionally encountered, and on slightly heavier soils in the lowlands the pines may be found intermixed with red maple, balsam fir, red spruce and white spruce. This last-named tree species also takes its usual prominent place in abandoned fields. Eastern hemlock is quite prevalent throughout the Section, particularly on lower slopes where the red spruce is most abundant too. Eastern white cedar is plentiful; red oak is common only in the south. In swamps, stands of black ash, red spruce, eastern white cedar, and red maple appear, or on acid peat substrata, stands of black spruce and tamarack.

The topography is hilly to mountainous, with extensive areas above 1,000 feet in altitude. West of the Saint John River the bedrock is mainly Precambrian and Palaeozoic strata intruded by granites, while on the east side Carboniferous beds partly conceal harder Precambrian inliers. Surface materials are variable-textured glacial drift, mostly sandy and stony loams to clay loams. Humo-ferric podzol profile development is the norm.

A.11 — Atlantic Uplands



This Section, comprising more than half the area of Nova Scotia, occupies the greater part of the tilted plain which rises gradually from the Atlantic shore and terminates irregularly on high lands of the interior. It is limited on the south by the coastal spruce-fir forest and on the north by the various physiographic breaks coinciding with the change to the generally lower-lying forests of the Central Lowlands Section (A.12). Exposure to the moisture-laden winds from the ocean make this one of the more humid parts of the Maritime Provinces. Wind damage to the forests is of frequent occurrence.

The natural vegetation has been greatly disturbed over most of the Section, and broad areas of brushland and of fire-created or erosion barrens are characteristic. The forest cover is largely coniferous, featuring red spruce in mixture with lesser amounts of eastern hemlock, eastern white pine, red pine, black spruce, white birch and red maple. Balsam fir is abundant only as young growth, for the parasitic balsam woolly aphid has reduced the role of fir in mature stands to that of a minor constituent. Rather large and almost pure stands of old eastern hemlock were present until recently in some of the southern parts of the Section, and eastern white pine was also abundant on the numerous areas of coarse glacial drift throughout. Now, however, these conifers are far less common than formerly, although the eastern white pine appears to be reproducing more aggressively than elsewhere in the Maritime Provinces. Stands of the pioneer species — white birch, grey birch, red maple, and trembling aspen — are numerous. Red oak is a conspicuous tree both as a companion of the other upland species and in pure stands; its prominence in the southern and western parts is apparently the result of past fires. Some of the "barrens" support a parkland of open black spruce, with scattered trembling aspen, red maple, red oak and eastern white pine.

On the better soils, particularly in the western interior and on the highlands along the northern boundary, the tolerant hardwoods are prominent though not usually of good quality. Here are found stands of sugar maple, yellow birch and beech, with red spruce and eastern hemlock. On wet sites, in areas of peat accumulation and in swamps, the black spruce, tamarack, red maple, black ash and alder brush are usual. In addition, the combination of moist climate and gentle relief has produced considerable areas of nonforested bogland.

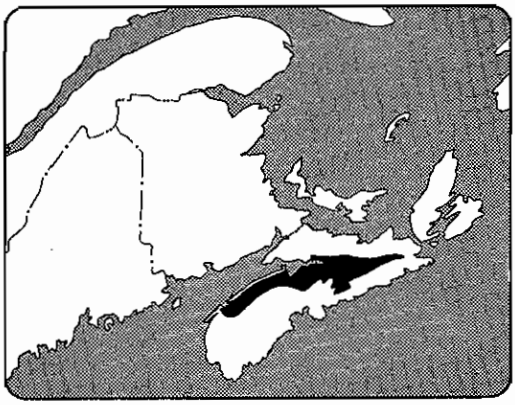
The surface of the uplands is irregular even though changes in relief are not abrupt. Stream valleys tend to be shallow in the interior, deepening toward the south. The highest lands to the north are underlain by granitic intrusions of Devonian age, while southward the bedrock is of metamorphosed sediments, chiefly folded slates and quartzites. Humoferric podzol profiles, frequently with cemented horizons (ortstein), normally develop on the prevalent mantle of acid, sandy or loamy till.

a Central Lowlands (A.12).
b Atlantic Uplands (A.11).

a

b

A.12 — Central Lowlands



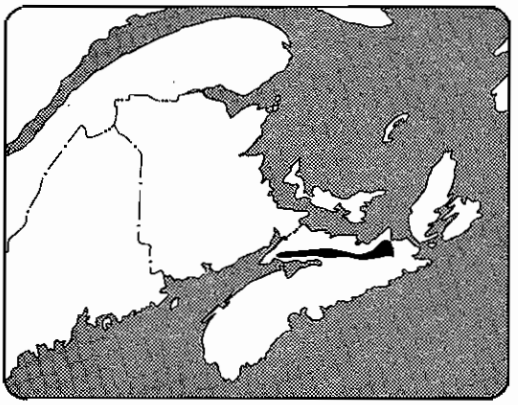
Between the rugged hills of northern Nova Scotia and the Atlantic uplands of the south, a lowland area of comparatively gentle topography is interposed. Favourable conditions of climate and soils have resulted in much agricultural activity, and for the most part the forests are today confined to such non-arable sites as the steeper hillsides, valley bottoms and poorly-drained flats. The boundaries of the Section are not clearly defined vegetationally, but in general may be said to fall at the transition to upland forests poorer in conifers (especially red spruce) and richer in tolerant hardwoods.

Forests of the well-drained sites are composed predominantly of conifers: the spruces (white, red and black), balsam fir, eastern hemlock and eastern white pine. Intermixed with these are white birch, red maple, sugar maple, yellow birch and beech. The last named tolerant hardwoods are most apparent in forest types of hills, ridges and dissected upland terrain. In the Annapolis Valley, the orchard land on the till slopes was formerly occupied and in part still is by stands of the hardwoods, including red oak and white ash, with some red spruce, eastern hemlock and balsam fir, while the lower sandy slopes and valley bottom bear more eastern white pine, red pine and red maple with only scattered tolerant hardwoods.

Eastward in the Section, where valley soils tend to be finer in texture, the lower slopes and bottom lands are generally more favourable to the existence of spruce-fir-hemlock mixtures than pine types. Imperfectly-drained upland flats also support similar forests. Fires have everywhere increased the prevalence of grey birch, white birch, trembling aspen, red maple and, to some extent, eastern white pine and spruce. On cleared, abandoned land the reversion to coniferous forests is marked, with white spruce, red spruce and balsam fir the usual invaders. Swampy flats support white elm and black ash with occasional white ash, while the peatier lowland sites have tamarack and black spruce.

In the Annapolis Valley and around Minas Basin the bedrock is a soft, red Triassic sandstone from which the humo-ferric podzol sands and sandy loams of the lowlands have been derived. At the eastern end of the Section the soils also tend to be coarse-textured on the somewhat elevated strata of Mississippian age. Between the extremes, in the central lowlands proper, the soils of the gently undulating lands are heavier — loams and clays — overlying in part Triassic beds and in part Carboniferous shales, sandstones and conglomerates.

A.13 — Cobequid



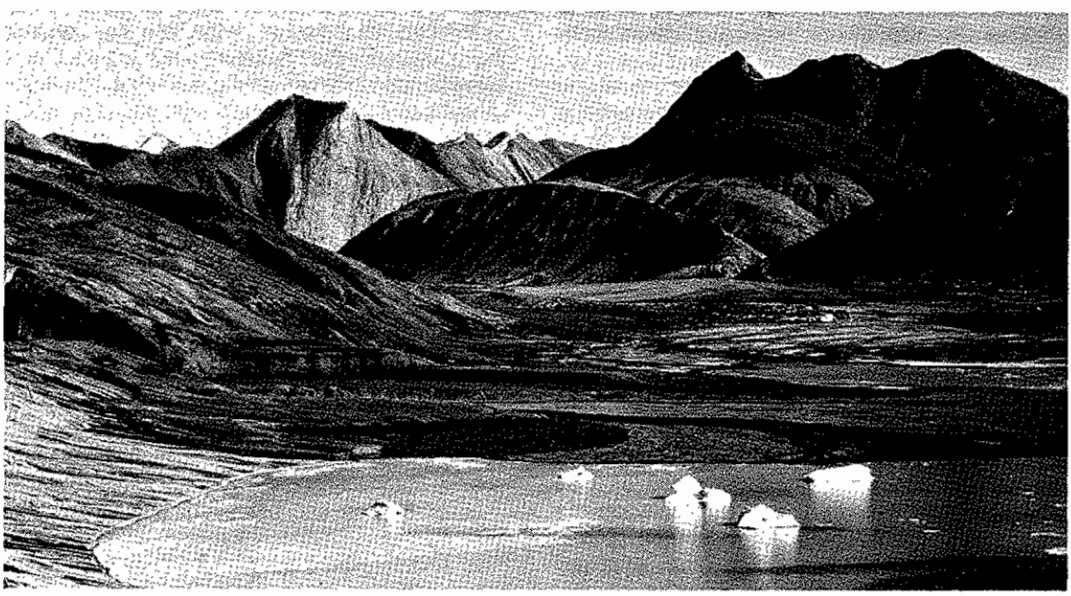
A narrow east-and-west trending highland, cored with hard rock, lies between the extension of the Eastern Lowlands Section (A.3) in northern Nova Scotia and the preceding Section. In ascending this upland from the north or south sides, a change in forest composition is noticeable between approximately 400 to 600 feet altitude, where the beginning of dominance by tolerant hardwoods on slope sites first becomes evident. Below this elevation the conifers are more prominent in the various forest assemblages, and this is particularly so at the western extremity where contact is made with the coastal spruce-fir forest.

This is the chief hardwood region of the Nova Scotia mainland, and large stands of tolerant hardwoods cover much of the flanks and the tops of the plateaus. On some of the more level terrain the forest takes on a coniferous character, but generally the low ridges and hills support beech, yellow birch, sugar maple and red maple, with scattered red and white spruces and balsam fir. The same kind of forest occurs both on the rolling topography of the Pictou upland (where, however, red spruce is less common) and generally on the mid and upper positions of the steep slopes that bound the Section. On high exposed ridges in the western portion an association of yellow birch, balsam fir and white birch occurs. Toward the bottoms of the hills, in ravines and valleys, where sites tend to be cool and very moist, the conifers apparently do well, and mixtures of eastern hemlock, red spruce, yellow birch, red maple, balsam fir and white spruce are usual. On the relatively lower lands of the Pictou Basin in the centre of the Section, where eastern hemlock, eastern white pine, sugar maple and beech were formerly associated, agricultural clearing has eliminated most of the original forest, and here, as elsewhere, there has been a marked conversion to white spruce on abandoned farms. Grey birch and white birch, trembling aspen, largetooth aspen and red maple form common but temporary community types. Clearing has also taken place on the upland plateau, and today some of the fields are successfully used for blueberry culture. Areas of bog are few, but seepage swamps carry black spruce, tamarack and red maple.

Marked changes in relief are confined to the sides of the Section, where altitudinal elevations of several hundred feet or even more take place in a short distance. The highest points on the Cobequid Hills reach approximately 1,200 feet. The bedrock is a complex of volcanic rock and resistant Palaeozoic beds, cut by granite. Glacial and recent erosion of these rocks has produced shallow but productive sandy loam soils on the crystalline rock of the uplands, and somewhat finer textures (loams and clay loams) in a number of the lower areas such as the Pictou Basin.

a Grassland.
b Arctic tundra.

a



b

Appendices

List of Common and Botanical Names

Alder	*Alnus* spp.
Alder, red	*Alnus rubra* Bong. (*Alnus oregona* Nutt.)
Arbutus	*Arbutus menziesii* Pursh
Ash, black	*Fraxinus nigra* Marsh.
Ash, blue	*Fraxinus quadrangulata* Michx.
Ash, green	*Fraxinus pennsylvanica* Marsh. var. *subintegerrima* (Vahl) Fern.
Ash, red	*Fraxinus pennsylvanica* Marsh.
Ash, white	*Fraxinus americana* L.
Aspen, largetooth	*Populus grandidentata* Michx.
Aspen, trembling	*Populus tremuloides* Michx.
Basswood	*Tilia americana* L.
Beech	*Fagus grandifolia* Ehrh.
Birch, Alaska	*Betula neoalaskana* Sarg.
Birch, dwarf	*Betula glandulosa* Michx.
Birch, grey	*Betula populifolia* Marsh.
Birch, Kenai	*Betula papyrifera* Marsh. var. *kenaica* (W. H. Evans) Henry
Birch, northwestern white	*Betula papyrifera* Marsh. var. *subcordata* (Rydb.) Sarg.
Birch, yellow	*Betula alleghaniensis* Britton (*Betula lutea* Michx. f.)
Birch, western white	*Betula papyrifera* Marsh. var. *commutata* (Reg.) Fern.
Birch, white	*Betula papyrifera* Marsh.

Blue-beech	*Carpinus caroliniana* Walt.
Butternut	*Juglans cinerea* L.
Cascara	*Rhamnus purshiana* DC.
Cedar, eastern red	*Juniperus virginiana* L.
Cedar, eastern white	*Thuja occidentalis* L.
Cedar, western red	*Thuja plicata* Donn
Cherry, black	*Prunus serotina* Ehrh.
Chestnut	*Castanea dentata* (Marsh.) Borkh.
Cottonwood, black	*Populus trichocarpa* Torr. & Gray
Cottonwood, eastern	*Populus deltoides* Bartr.
Cucumber-tree	*Magnolia acuminata* L.
Cypress, yellow	*Chamaecyparis nootkatensis* (D. Don) Spach
Douglas-fir, coast	*Pseudotsuga menziesii* (Mirb.) Franco
Douglas-fir, interior (blue)	*Pseudotsuga menziesii* (Mirb.) Franco var. *glauca* (Beissn.) Franco
Elm, rock	*Ulmus thomasii* Sarg.
Elm, slippery	*Ulmus rubra* Mühl.
Elm, white	*Ulmus americana* L.
Fir, alpine	*Abies lasiocarpa* (Hook.) Nutt.
Fir, amabilis	*Abies amabilis* (Dougl.) Forbes

Fir, balsam	*Abies balsamea* (L.) Mill.
Fir, grand	*Abies grandis* (Dougl.) Lindl.
Gum, black	*Nyssa sylvatica* Marsh.
Hackberry	*Celtis occidentalis* L.
Hazel	*Corylus cornuta* Marsh.
Hemlock, eastern	*Tsuga canadensis* (L.) Carr.
Hemlock, mountain	*Tsuga mertensiana* (Bong.) Carr.
Hemlock, western	*Tsuga heterophylla* (Raf.) Sarg.
Hickory, bitternut	*Carya cordiformis* (Wang.) K. Koch
Hickory, mockernut	*Carya tomentosa* Nutt.
Hickory, pignut	*Carya glabra* (Mill.) Sweet
Hickory, shagbark	*Carya ovata* (Mill.) K. Koch
Hop-hornbeam	*Ostrya virginiana* (Mill.) K. Koch
Juniper, Rocky Mountain	*Juniperus scopulorum* Sarg.
Kentucky Coffee-tree	*Gymnocladus dioicus* (L.) K. Koch
Larch, alpine	*Larix lyallii* Parl.
Larch, western	*Larix occidentalis* Nutt.

Maple, bigleaf	*Acer macrophyllum* Pursh
Maple, black	*Acer nigrum* Michx. f.
Maple, Manitoba	*Acer negundo* L.
Maple, mountain	*Acer spicatum* Lam.
Maple, red	*Acer rubrum* L.
Maple, silver	*Acer saccharinum* L.
Maple, sugar	*Acer saccharum* Marsh.
Mountain-ash, showy	*Sorbus decora* (Sarg.) Schneid.
Mulberry, red	*Morus rubra* L.
Oak, black	*Quercus velutina* Lam.
Oak, bur	*Quercus macrocarpa* Michx.
Oak, chestnut	*Quercus prinus* L.
Oak, chinquapin	*Quercus muehlenbergii* Engelm.
Oak, Garry	*Quercus garryana* Dougl.
Oak, pin	*Quercus palustris* Muenchh.
Oak, red	*Quercus rubra* L.
Oak, scarlet	*Quercus ellipsoidalis* E. J. Hill
Oak, swamp white	*Quercus bicolor* Willd.
Oak, white	*Quercus alba* L.
Pawpaw	*Asimina triloba* (L.) Dunal
Pine, eastern white	*Pinus strobus* L.

Pine, jack	*Pinus banksiana* Lamb. (*Pinus divaricata* (Ait.) Dumont)
Pine, limber	*Pinus flexilis* James
Pine, lodgepole	*Pinus contorta* Dougl. var. *latifolia* Engelm.
Pine, pitch	*Pinus rigida* Mill.
Pine, ponderosa	*Pinus ponderosa* Laws.
Pine, red	*Pinus resinosa* Ait.
Pine, shore	*Pinus contorta* Dougl. var. *contorta*
Pine, western white	*Pinus monticola* Dougl.
Pine, whitebark	*Pinus albicaulis* Engelm.
Poplar, balsam	*Populus balsamifera* L.
Sassafras	*Sassafras albidum* (Nutt.) Nees
Spruce, black	*Picea mariana* (Mill.) B.S.P.
Spruce, Engelmann	*Picea engelmannii* Parry
Spruce, Porsild	*Picea glauca* (Moench) Voss var. *porsildii* Raup
Spruce, red	*Picea rubens* Sarg.
Spruce, Sitka	*Picea sitchensis* (Bong.) Carr.
Spruce, western white	*Picea glauca* (Moench) Voss var. *albertiana* (S. Brown) Sarg.
Spruce, white	*Picea glauca* (Moench) Voss
Sycamore	*Platanus occidentalis* L.
Tamarack	*Larix laricina* (Du Roi) K. Koch
Tulip-tree	*Liriodendron tulipifera* L.

Walnut, black	*Juglans nigra* L.
Willow	*Salix* spp.
Yew, western	*Taxus brevifolia* Nutt.

Climate and Physiography

Climatic data for selected stations are presented in the following Table to illustrate some of the general characteristics of temperature and precipitation regimes in the Forest Sections. Data were compiled from Temperature and Precipitation Tables, Atmospheric Environment Service, Department of the Environment (formerly Meteorological Branch, Department of Transport). Stations selected have an appreciable length of record over the period 1931-1960. The actual period of record used to compute the data can be determined from the following climatic data categories:

1. Normals are computed directly from a period of record of 25 to 30 years within the period 1931-1960. In most cases the record existed over the full 30 years.
2. Same as Code 1, but not as much confidence has been placed in the data. These data are considered suspect, but the over-all values are mapable.
3. The data for these normals are from the full ten-year period 1951-1960 adjusted to the standard normal period 1931-1960.
4. These averages are based on the complete ten years of record 1951-1960. No adjustment factor is used.
5. These averages are obtained by taking a ten-year period of record, ending in the early 1960's. No adjustment factor is used.
6. These averages are based on the period of record of 10 to 24 years during the period 1931-1960. No adjustment factor has been used.
7. At several locations the observing station was moved from the town or city to an airport during the 1930's. At many of these locations the records were kept separate, but at those locations indicated by Code 7, the airport and town data were considered homogeneous. The resulting normals are based on the full 30-year period 1931-1960.
8. These data are based on the period of record of less than ten years.
9. These data are based on a period of record of less than ten years, but adjustments have been made when an unusually warm or cold month unduly influenced the average values.

* Two numbers are shown where temperature (T) and precipitation (P) data are in different categories.

Potential evapotranspiration has been abstracted from Canada Land Inventory Report No. 3, 1966, Department of Forestry and Rural Development, or has been computed using J. A. Turner's "Simplified Scheme for Computing Thornthwaite's Potential Evapotranspiration", Tech. Circ. No. 284, Meteorological Branch, Canada Department of Transport. Potential evapotranspiration (P.E.) is a theoretical value representing the amount of water that would be transferred from the soil to the atmosphere by evaporation and transpiration if it were constantly available, and it is therefore an index of water need and thermal efficiency for any given station (Thornthwaite, 1948). There is very little or no potential for evapotranspiration during the winter months over most of continental Canada, consequently the annual P.E. index is strongly weighted by the growing season months.

For more complete climatic descriptions of particular Forest Sections the reader is referred to "Climatological Atlas of Canada" (Thomas, 1953) and to the series "Climatic Summaries for Selected Meteorological Stations", Atmospheric Environment Service, Department of the Environment.

Selected Climatic Data for Forest Sections

Forest Section	Station	Location			Climatic Data Category	Mean Annual Temp.	Jan. Av. Daily Min. Temp.	July Av. Daily Max. Temp.	Av. Date Mean Temp. Rises to 42°F	Av. Date Mean Temp. Falls to 42°F	Av. No. of Days Mean Temp. 42°F and Above	Mean Temp. May to Sept.	Mean Rainfall May to Sept.	Mean Annual Precip.	Annual P.E.
		Lat.	Long.	Elevation											
Boreal Region															
B.1a	Bersimis	49°	69°	150′	2	36°F	− 2°F	70°F	8 May	10 Oct	155	54°F	15″	34″	19″
B.1b	Mistassini Post	50	74	1246	1	30	−16	71	16 May	5 Oct	142	53	17	32	19
B.2	Summit Depot	48	68	1350	3	35	− 2	62	6 May	9 Oct	156	55	20	40	19
B.3	Barrage Gouin	48	74	1325	2	34	− 8	72	7 May	9 Oct	155	55	20	40	19
B.4	Iroquois Falls	49	81	850	1	34	−13	76	3 May	11 Oct	161	56	18	33	20
B.5	Moosonee	51	81	34	1	30	−16	71	17 May	8 Oct	144	53	16	31	18
B.6 & B.13b	Fort George	54	79	22	6	26	−19	64	28 May	30 Sept	125	48	12	24	16
B.7 East	Barrage Caborga	47	76	1186	2	36	− 4	75	1 May	14 Oct	166	57	19	37	20
West	Chapleau	48	83	1405	2T & 1P	34	−10	78	3 May	8 Oct	158	56	16	31	19
B.8	Longlac	50	86	1040	1	32	−16	76	8 May	8 Oct	153	55	16	30	19
B.9 & B.10	Cameron Falls	49	88	750	2	34	− 8	73	13 May	12 Oct	152	55	14	27	19
B.11	Sioux Lookout	50	92	1227	7	34	−10	76	2 May	12 Oct	163	58	16	28	20
B.12	Goose Bay	53	60	144	3T & 6P	32	− 5	70	17 May	6 Oct	142	53	15	33	19
B.13a	Nitchequon	53	71	1759	6	26	−20	65	29 May	23 Sept	117	48	17	30	17
B.14	Oryden	50	93	1220	1	35	−12	78	28 Apr	14 Oct	169	58	16	27	21
B.15	The Pas	54	101	890	3	31	−16	75	2 May	6 Oct	157	57	11	18	20
B.16	Minnedosa	50	100	1700	6	35	− 8	78	24 Apr	11 Oct	170	58	12	18	22
B 17 East	Rosthern	53	107	1672	6	35	−10	79	23 Apr	9 Oct	169	59	9	14	22
West	Camrose	53	113	2215	2	35	− 7	75	22 Apr	8 Oct	169	56	10	15	21
B.18a East	Prince Albert	53	106	1414	7	33	−13	77	27 Apr	9 Oct	165	57	10	16	21
Central	Cold Lake	54	110	1784	8T & 5P	34	−11	73	28 Apr	10 Oct	165	56	13	20	20
West	Fort McMurray	57	111	1213	7	31	−16	76	29 Apr	3 Oct	157	55	11	17	19
B.18b	Hay River	61	116	729	1	25	−21	69	18 May	21 Sept	126	51	7	13	18

Selected Climatic Data for Forest Sections — Continued

Forest Section	Station	Location			Climatic Data Category	Mean Annual Temp.	Jan. Av. Daily Min. Temp.	July Av. Daily Max. Temp.	Av. Date Mean Temp. Rises to 42°F	Av. Date Mean Temp. Falls to 42°F	Av. No. of Days Mean Temp. 42°F and Above	Mean Temp. May to Sept.	Mean Rainfall May to Sept.	Mean Annual Precip.	Annual P.E.
		Lat.	Long	Elevation											
Boreal Region (continued)															
B.19a	Edson	54°	116°	3032'	1	35°F	- 2°F	73°F	27 Apr	5 Oct	161	53°F	14"	21"	19"
B.19b	Beatton River	57	121	2755	6	30	-12	69	6 May	25 Sept	142	51	10	17	18
B.19c South	Ghost Ranger Station	51	115	4705	9	36	3	70	6 May	16 Oct	163	51	16	25	19
North	Muskeg Ranger Station	54	119	4025	9	32	- 1	68	17 May	24 Sept	130	48	13	23	17
B.20	Lac la Ronge	55	105	1200	6	31	-13	75	4 May	4 Oct	153	56	11	18	19
B.21	Wabowden	55	98	764	6	28	-19	73	12 May	1 Oct	142	53	12	17	19
B.22a East (North)	Trout Lake	54	90	720	6	27	-21	70	23 May	29 Sept	129	52	15	24	18
East (South)	Pickle Lake	51	90	1210	6	30	-16	74	12 May	7 Oct	148	55	16	27	20
West	Island Falls	56	102	980	1	29	-21	74	9 May	1 Oct	145	54	12	19	19
B.23a Mackenzie River	Fort Simpson	62	122	576	1	25	-24	74	8 May	23 Sept	138	54	8	13	19
Peace River	Fort Vermilion	58	116	915	1	29	-19	75	28 Apr	29 Sept	154	55	8	14	19
B.23b South	Fort Good Hope	66	129	174	1	17	-32	72	20 May	13 Sept	116	50	7	13	16
North	Fort McPherson	67	135	100	6T & 1P	17	-27	68	28 May	10 Sept	105	47	8	12	15
B.24	Watson Lake	60	129	2248	6	27	-21	71	6 May	26 Sept	143	53	8	17	17
B.25	Dease Lake	58	130	2678	6	30	-11	68	9 May	27 Sept	141	50	8	15	17
B.26a	Dawson	64	139	1062	1	24	-25	72	7 May	27 Sept	143	52	7	13	17
B.26b South	Teslin	60	133	2300	6	30	-11	69	11 May	23 Sept	135	50	6	13	17
Central	Whitehorse	61	135	2289	6	31	- 8	68	7 May	26 Sept	142	52	5	10	18
West	Haines Junction	61	138	1960	6	26	-17	68	15 May	16 Sept	124	48	5	11	16
B.26c	Mayo Landing	64	136	1625	1	25	-23	71	6 May	19 Sept	136	51	7	11	17
B.26d	Snag	62	140	1925	6	22	-28	69	10 May	14 Sept	127	50	9	14	16

Selected Climatic Data for Forest Sections — Continued

Forest Section	Station	Location			Climatic Data Category	Mean Annual Temp.	Jan. Av. Daily Min. Temp.	July Av. Daily Max. Temp.	Av. Date Mean Temp. Rises to 42°F	Av. Date Mean Temp Falls to 42°F	Av. No. of Days Mean Temp. 42°F and Above	Mean Temp. May to Sept.	Mean Rainfall May to Sept.	Mean Annual Precip.	Annual P.E.
		Lat.	Long.	Elevation											
Boreal Region (continued)															
B.27 East	Brochet	58°	102°	1150′	6	23°F	-29°F	68°F	25 May	22 Sept	120	50°F	11″	16″	16″
Central	Yellowknife	62	114	682	6	22	-26	69	23 May	21 Sept	121	51	5	10	18
West	Port Radium	66	118	626	6	19	-22	62	29 May	14 Sept	108	46	5	9	16
B.28a	Gander	49	55	482	1	40	14	72	10 May	20 Oct	163	55	16	40	19
B.28b	Deer Lake	49	57	57	1	39	11	72	9 May	20 Oct	164	55	17	36	20
B.28c	Anticosti S.W. Point	49	64	24	6	37	10	64	20 May	14 Oct	147	52	14	33	18
B.29	Fogo	50	54	482	6	39	18	67	19 May	22 Oct	156	53	15	34	19
B.30	St John's	48	53	200	6	42	20	70	12 May	30 Oct	171	55	18	53	20
B.31	Burgeo	48	58	40	3	40	19	61	15 May	27 Oct	165	52	24	59	18
B.32 East	Cartwright	54	57	47	1T & 6P	32	0	68	28 May	4 Oct	129	49	16	36	17
West	Ennadai Lake	62	101	1065	6T & 1P	15	-31	53	13 June	10 Sept	89	43	6	9	14
Subalpine Region															
SA.1	Lake Louise	51	116	5032	2T & 1P	32	- 7	71	10 May	25 Sept	138	49	11	30	18
SA.2 Southwest	McCulloch	50	119	4100	1	36	8	73	4 May	7 Oct	156	51	11	28	19
East	Glacier	51	117	4094	1	36	9	72	4 May	3 Oct	152	52	15	57	19
North	Germansen Landing	56	125	2450	5T & 9P	33	- 8	70	5 May	28 Sept	146	51	8	21	17
Montane Region															
M.1 Southwest	Princeton	49	121	2283	7	42	10	80	9 Apr	19 Oct	193	56	5	14	22
Northeast	Golden	51	117	2563	1	40	5	81	14 Apr	16 Oct	185	56	7	19	22
M.2	Ashcroft River	51	121	1600	3T & 6P	46	14	83	31 Mar	23 Oct	206	63	4	10	25
M.3	Quesnel	53	123	1600	2T & 1P	41	6	76	13 Apr	18 Oct	188	57	10	20	21

Selected Climatic Data for Forest Sections — Continued

Forest Section	Station	Location			Climatic Data Category	Mean Annual Temp.	Jan. Av. Daily Min. Temp.	July Av. Daily Max. Temp.	Av. Date Mean Temp Rises to 42°F	Av. Date Mean Temp. Falls to 42°F	Av. No. of Days Mean Temp. 42°F and Above	Mean Temp. May to Sept.	Mean Rainfall May to Sept.	Mean Annual Precip.	Annual P.E.
		Lat.	Long.	Elevation											
Montane Region (continued)															
M.4	Fort St. James	54°	124°	2280′	1	36°F	2°F	71°F	28 Apr	7 Oct	162	53°F	8″	18″	20″
M.5 North	Jasper	53	118	3480	1	37	2	74	26 Apr	5 Oct	162	57	9	18	20
Central	Kananaskis	51	115	4560	3T & 6P	37	4	72	3 May	9 Oct	159	52	15	25	19
South	Pincher Creek	50	114	3790	1	40	9	77	23 Apr	17 Oct	177	56	12	21	21
Coast Region															
C.1	Victoria	48	123	228	1	50	36	68	21 Feb	15 Dec	297	58	5	27	25
C.2 Vancouver Island	Port Alberni	49	125	195	3T & 1P	49	30	77	21 Mar	12 Nov	236	60	10	75	24
Mainland (NW)	Powell River	50	125	176	3T & 6P	51	34	75	10 Mar	29 Nov	264	62	9	37	27
(SE)	Haney UBC Forest	49	123	600	3T & 6P	48	29	74	20 Mar	12 Nov	237	60	19	85	25
C.3 North	Ethelda Bay	53	130	0	9	47	36	64	28 Mar	19 Nov	236	54	32	126	25
South	Spring Island	50	127	37	3T & 6P	48	37	62	15 Mar	22 Dec	282	55	24	110	24
C.4	Sandspit	53	132	25	3	46	32	62	10 Apr	18 Nov	222	55	11	47	26
Columbia Region															
CL.1	Nelson	50	117	1980	3T & 1P	47	22	83	31 Mar	28 Oct	211	62	9	29	24
CL.2	Revelstoke	51	118	1497	3T & 1P	44	17	81	6 Apr	21 Oct	198	60	12	43	24
Deciduous Region															
D.1	Chatham	42	82	600	1	49	20	83	5 Apr	11 Nov	220	67	13	30	25

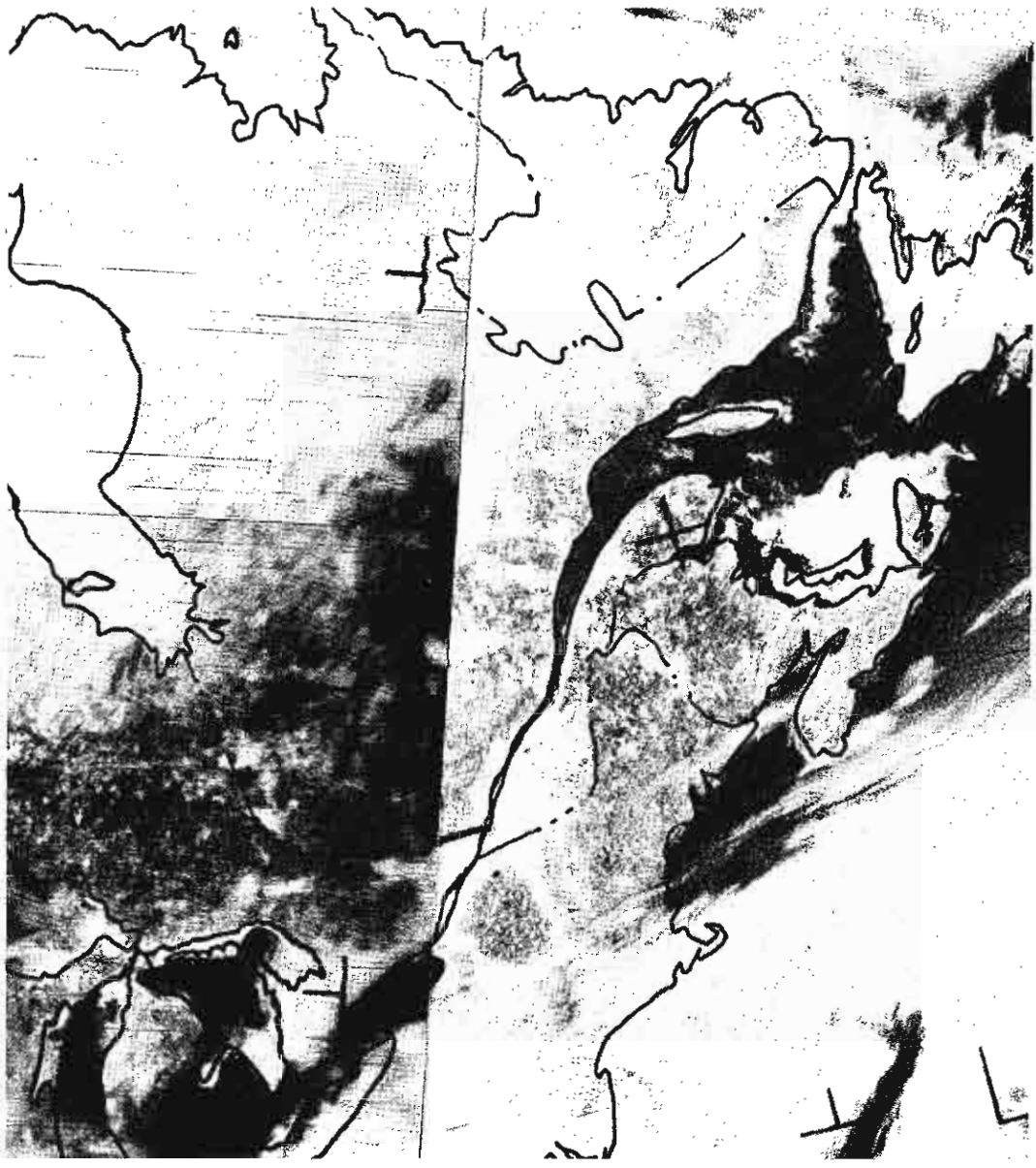
Selected Climatic Data for Forest Sections — Continued

Forest Section	Station	Location			Climatic Data Category	Mean Annual Temp.	Jan. Av. Daily Min. Temp.	July Av. Daily Max. Temp.	Av. Date Mean Temp. Rises to 42°F	Av. Date Mean Temp. Falls to 42°F	Av. No. of Days Mean Temp. 42°F and Above	Mean Temp. May to Sept.	Mean Rainfall May to Sept.	Mean Annual Precip.	Annual P.E.
		Lat.	Long.	Elevation											
Great Lakes-St. Lawrence Region															
L.1 South	Guelph	44°	80°	1095'	1	45°F	14°F	79°F	14 Apr	1 Nov	201	63°F	15"	33"	23"
North	Gore Bay	46	82	835	1	41	4	78	24 Apr	27 Oct	186	60	13	34	22
L.2	Ottawa	45	76	260	1	42	4	80	17 Apr	27 Oct	193	63	16	34	23
L.3	Drummondville	46	72	270	2T & 1P	42	4	79	18 Apr	27 Oct	192	62	18	40	23
L.4a	La Tuque	47	73	551	3T & 1P	39	– 4	78	29 Apr	20 Oct	174	60	18	36	21
L.4b	Barrage Mercier	47	78	775	2T & 1P	38	– 2	78	23 Apr	18 Oct	178	59	17	36	21
L.4c	Maniwaki	46	78	570	3T & 1P	40	– 3	80	21 Apr	20 Oct	182	60	16	33	21
L.4d	Huntsville	45	79	951	1	42	5	79	19 Apr	26 Oct	190	61	15	37	22
L.4e	Sudbury	47	81	1121	9	38	1	75	27 Apr	18 Oct	174	59	15	32	21
L.5	Sherbrooke	45	72	595	1	43	7	78	18 Apr	30 Oct	195	62	18	39	22
L.6	Edmundston	47	68	500	1T & 2P	39	0	76	26 Apr	19 Oct	176	58	19	39	21
L.7	Roberval	48	72	335	3T & 1P	37	– 8	75	30 Apr	17 Oct	170	59	14	29	20
L.8	Earlton	48	80	805	3T & 6P	36	– 8	76	1 May	14 Oct	166	58	16	31	21
L.9	Bear Island	47	80	964	6	38	– 4	77	28 Apr	21 Oct	176	59	16	32	21
L.10	Sault Ste. Marie	46	85	620	9T & 6P	40	8	76	26 Apr	26 Oct	183	58	17	39	21
L.11 East	Thunder Bay	48	89	644	7	37	– 3	75	30 Apr	16 Oct	169	57	16	29	20
Central	Atikokan	49	92	1284	1	35	–13	79	27 Apr	13 Oct	169	57	14	23	21
West	Kenora	50	94	1345	7	38	– 7	77	27 Apr	15 Oct	171	60	14	24	21
L.12 East	Emo	49	94	1106	1	36	–10	79	24 Apr	16 Oct	175	59	16	26	21
West	Sprague	49	96	1072	1	35	–11	79	25 Apr	14 Oct	172	59	14	22	22

Selected Climatic Data for Forest Sections — Concluded

Forest Section	Station	Location			Climatic Data Category	Mean Annual Temp.	Jan. Av. Daily Min. Temp.	July Av. Daily Max. Temp.	Av. Date Mean Temp. Rises to 42°F	Av. Date Mean Temp. Falls to 42°F	Av. No. of Days Mean Temp. 42°F and Above	Mean Temp. May to Sept.	Mean Rainfall May to Sept.	Mean Annual Precip.	Annual P.E.
		Lat.	Long.	Elevation											
Acadian Region															
A.2	Fredericton	46°	67°	130'	1	42°F	6°F	78°F	20 Apr	25 Oct	188	60°F	16"	44"	22"
A.3	Moncton	46	65	40	1	41	7	78	24 Apr	25 Oct	184	59	15	38	22
A.4	Woodstock	46	68	150	2T & 1P	42	3	80	20 Apr	26 Oct	189	61	14	32	22
A.5a	Yarmouth	44	66	136	7T & 1P	45	21	69	19 Apr	15 Nov	210	58	17	50	22
A.5b	Ecum Secum	45	62	73	3T & 6P	42	15	67	2 May	5 Nov	187	55	21	56	21
A.7	Saddeck	46	61	25	6	43	17	74	28 Apr	7 Nov	193	58	18	49	21
A.8	Charlottetown	46	63	74	1	43	13	75	26 Apr	4 Nov	192	60	17	43	23
A.9	Saint John	45	66	100	1	43	13	70	22 Apr	3 Nov	195	58	19	50	22
A.10	McAdam	46	67	459	1	41	5	77	21 Apr	24 Oct	186	59	16	44	21
A.11	Mt. Uniacke	45	64	520	2T & 1P	42	12	75	26 Apr	1 Nov	189	58	18	52	21
A.12	Annapolis Royal	45	65	75	1	45	18	76	16 Apr	10 Nov	208	60	17	46	22
A.13	Nappan	46	64	25	1	42	10	75	24 Apr	29 Oct	188	59	15	40	21
GRASSLAND															
Sask	Swift Current	50	108	2677	3T & 6P	39	0	79	22 Apr	17 Oct	178	59	10	15	23
B.C.	Kamloops	51	120	1132	3T & 6P	48	17	86	23 Mar	4 Nov	226	65	4	10	26

Satellite view of Canada.

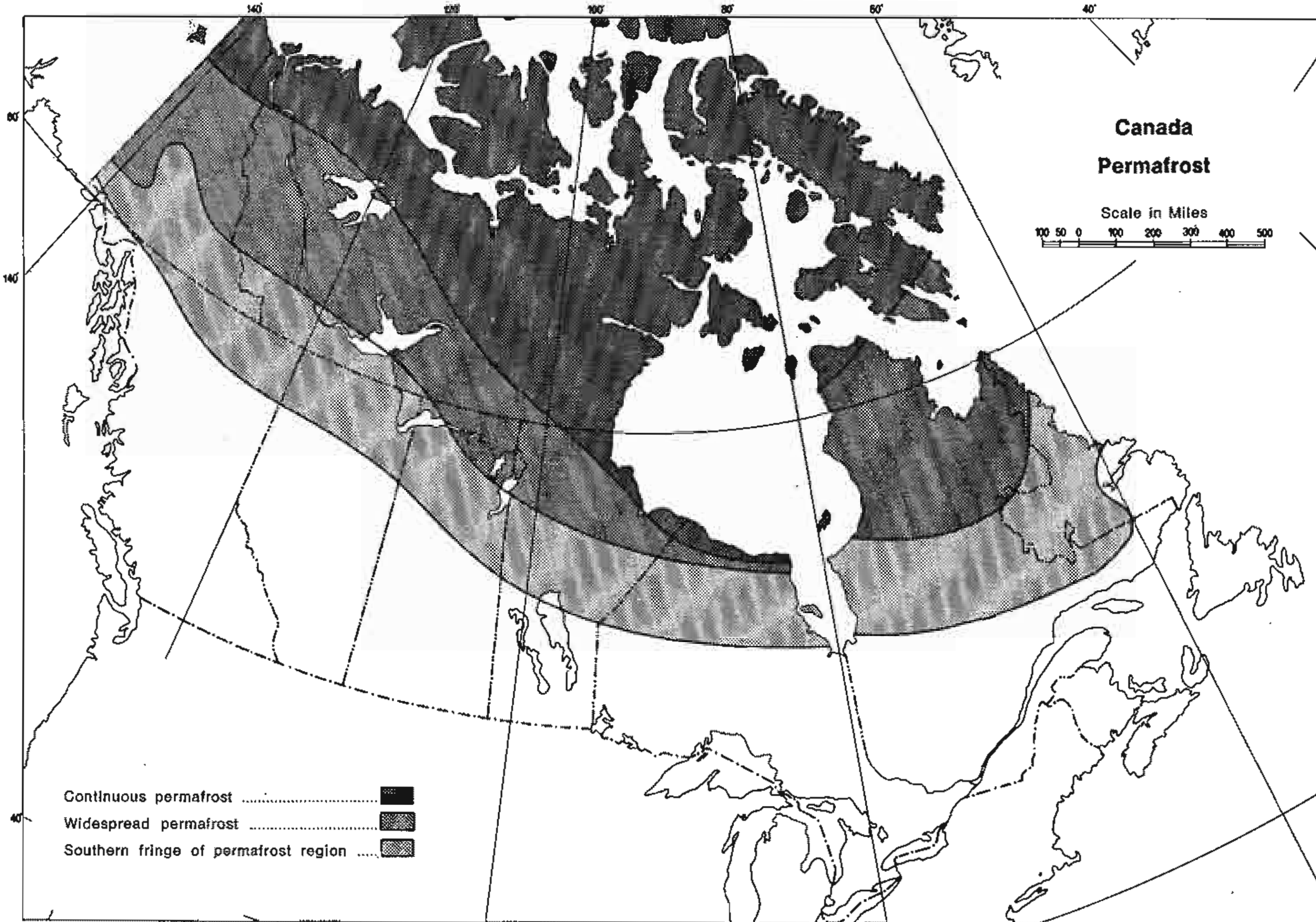


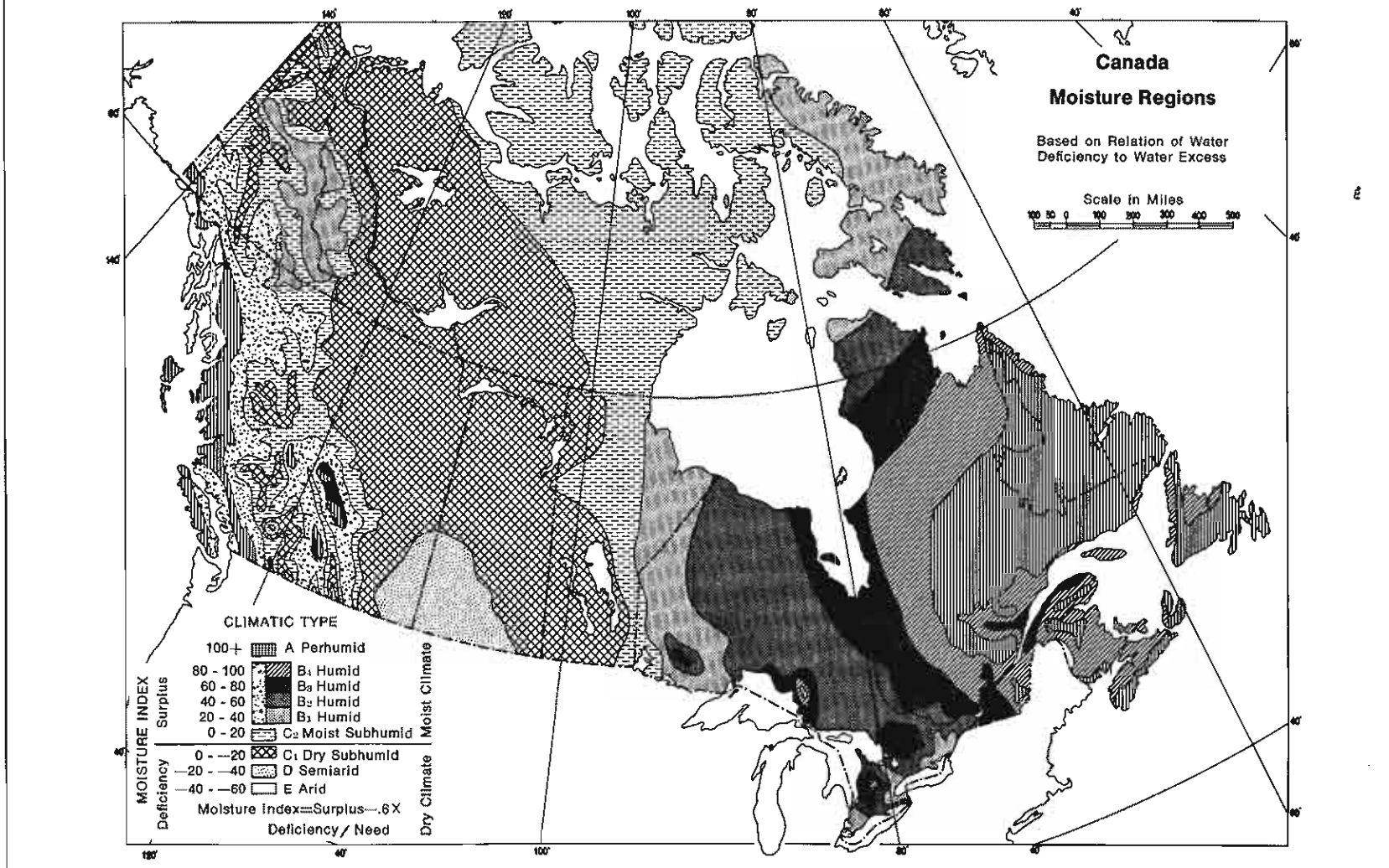
Maps are presented to illustrate three of the important climatic characteristics of the country: permafrost, moisture regions and length of the growing season.

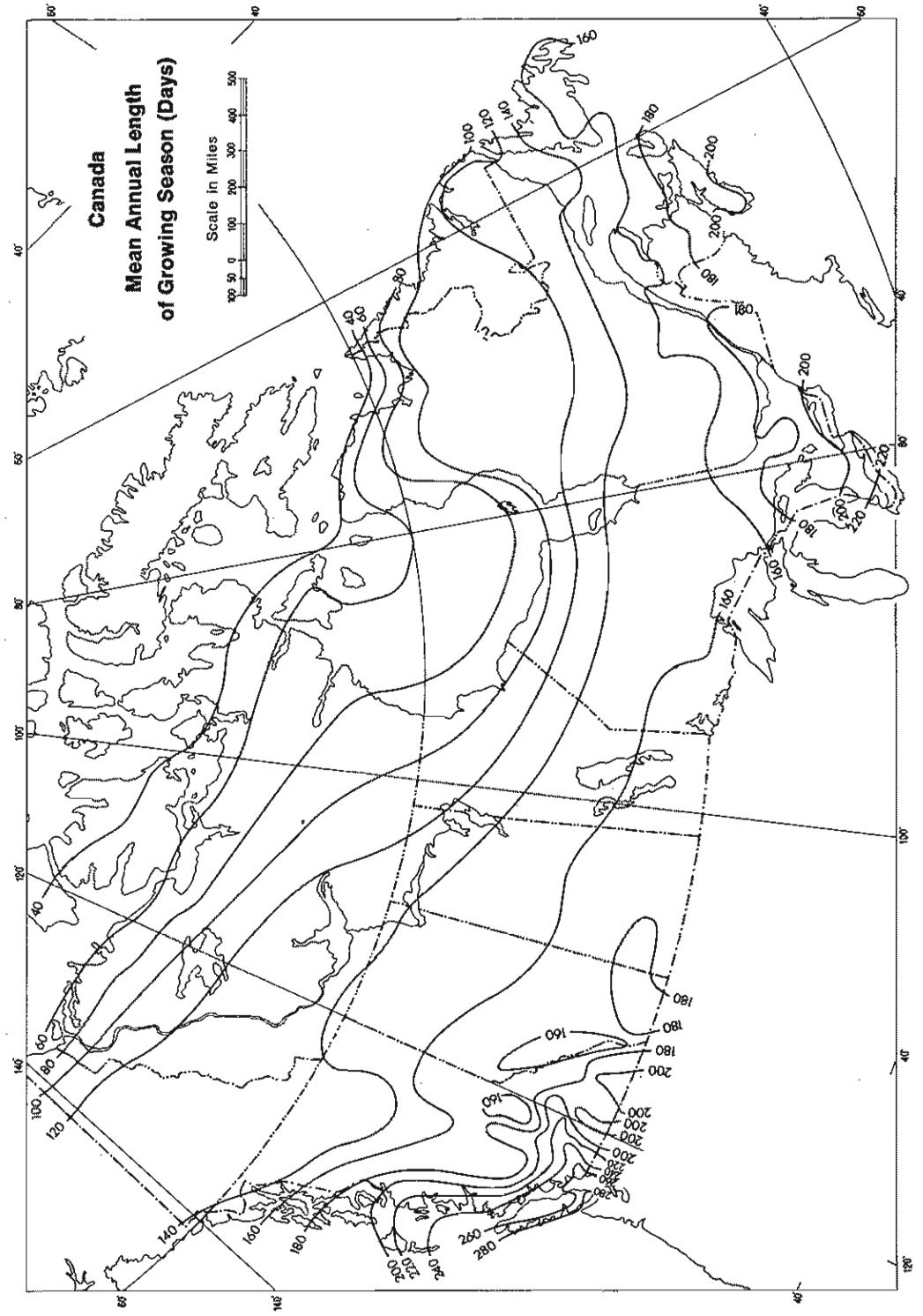
Permafrost. Source: Brown, R. J. E. 1967. Permafrost in Canada. Canada Department of Energy, Mines and Resources, Geological Survey and National Research Council, Division of Building Research, Publication No. NRC 9769.

Moisture regions. Source: Sanderson, M. 1948. The climate of Canada according to the new Thornthwaite Classification. Scientific Agriculture 28:501-517.
Note: Moisture indices are based on the relation between water deficiency, surplus and need (potential evapotranspiration). The ratio of water deficit to need gives an index of aridity; the ratio of water surplus to need a humidity index. Thornthwaite's moisture index is obtained by subtracting six-tenths of the aridity index from the humidity index. Positive indices denote moist climates; negative indices denote dry climates. The vertical column in the legend shows that the four B climates in the Rocky Mountains were not differentiated on the map.

Mean annual length of growing season (days). Source: Atlas of Canada, 1957. Canada Department of Mines and Technical Surveys, Geographic Branch, Ottawa.
Note: The length of a growing season is based on the average number of days between the date the mean daily temperature exceeds 42°F in the spring and falls below 42°F in the autumn.


Canada
Permafrost
Scale in Miles
100 50 0 100 200 300 400 500
Continuous permafrost
Widespread permafrost
Southern fringe of permafrost region
140°
120°
100°
80°
60°
40°


Canada
Moisture Regions
Based on Relation of Water Deficiency to Water Excess
Scale in Miles
100 50 0 100 200 300 400 500
CLIMATIC TYPE
MOISTURE INDEX
Surplus
Deficiency
Moist Climate
Dry Climate
100+ A Perhumid
80 - 100 B4 Humid
60 - 80 B3 Humid
40 - 60 B2 Humid
20 - 40 B1 Humid
0 - 20 C2 Moist Subhumid
0 - —20 C1 Dry Subhumid
—20 - —40 D Semiarid
—40 - —60 E Arid
Moisture Index=Surplus—.6 X Deficiency / Need


Canada
Mean Annual Length
of Growing Season (Days)
Scale in Miles
100 50 0 100 200 300 400 500

Maps are presented to illustrate three of the important physiographic characteristics of the country: physiographic regions, major soil zones and regions, and elevations.

Major physiographic regions. Source: Atlas of Canada, 1957. Canada Department of Mines and Technical Surveys, Geographic Branch, Ottawa.

Canadian Shield. Precambrian rock (largely granite, quartzite and other siliceous rocks) covered with a shallow layer of stony sandy till; knob and ridge topography (500-2,000 feet elevation) with an extensive network of streams, lakes, ponds, bogs and localized lacustrine clay deposits.

Arctic Archipelago. An extension of the Canadian Shield but with lowlands underlain by limestone and shale, generally low relief — although an extensive mountain range (8,000 feet) occurs in the east islands — marine beaches, shallow lakes and boggy lowlands.

Hudson Bay Lowland. Unconsolidated glacial and post-glacial deposits underlain by Palaeozoic limestone over Precambrian rock; poorly drained, abounding in bogs, shallow lakes.

Interior Plains. Precambrian rock overlain by limestones, shales and sandstones that gradually increase in depth from east to west. (i) Manitoba Lowlands — 1st prairie steppe, a lake plain (750 feet) bounded on the west by the Manitoba escarpment. (ii) Saskatchewan Plains — 2nd prairie steppe, rolling till plain (1,600 feet) and lacustrine clay deposits, numerous sloughs and deep broad valleys bordered on the west by the Missouri Coteau. (iii) Alberta Plains — 3rd prairie steppe, strongly rolling till plain (2,500 feet) interspersed with broad spillways and lacustrine clay deposits. (iv) Mackenzie Lowlands — extensive muskeg interspersed with low rugged mountain ranges and localized delta formations.

Cordillieran. Consists of two major mountain ranges — Rocky Mountains (12,000 feet) composed of sedimentary rocks and Coast Mountains (9,000 feet) composed of granitic rocks — separated by minor mountain ranges, deep valleys, high plateaus (covered with glacial tills) and low altitude plains.

Appalachian. Mountainous, comprising a number of rolling plateaus composed of Precambrian and/or sedimentary rocks (4,000 feet) separated by deep valleys and rolling to undulating lowlands underlain with sedimentary rocks and covered with till and alluvial deposits.

Great Lakes — St. Lawrence. Plain, gently sloping Palaeozoic dolomite, sandstone, limestone and shales overlain by deep glacial till and post-glacial lacustrine and alluvial deposits.

Major soil zones and regions. Source: Munroe, E., 1956. Canada as an environment for insect life. Canadian Entomologist 88(7):372-476.

Canadian Shield. (i) Southern Division—a mixture of rock, organic (peat, swamp), podzolic, luvisolic and brunisolic soils; characterized by shallow layers of stony, sandy till (<10 feet deep) over Precambrian rock. Gray luvisols are common on fine-textured material with low to high lime content in the southern half, eutric brunisols in the north and west; humo-ferric podzols and dystric brunisols on coarse, medium and silty sands with low to very low base content; humic gleysols and organic soils in poorly drained areas. (ii) Subarctic Division — a mixture of rock, frozen organic (peat) and sporadically frozen brunisolic and gleysolic soils; weak soil profile development. (iii) Arctic or Tundra Division — frozen regosols and gleysols; organic soils are uncommon, and permafrost lies near the surface.

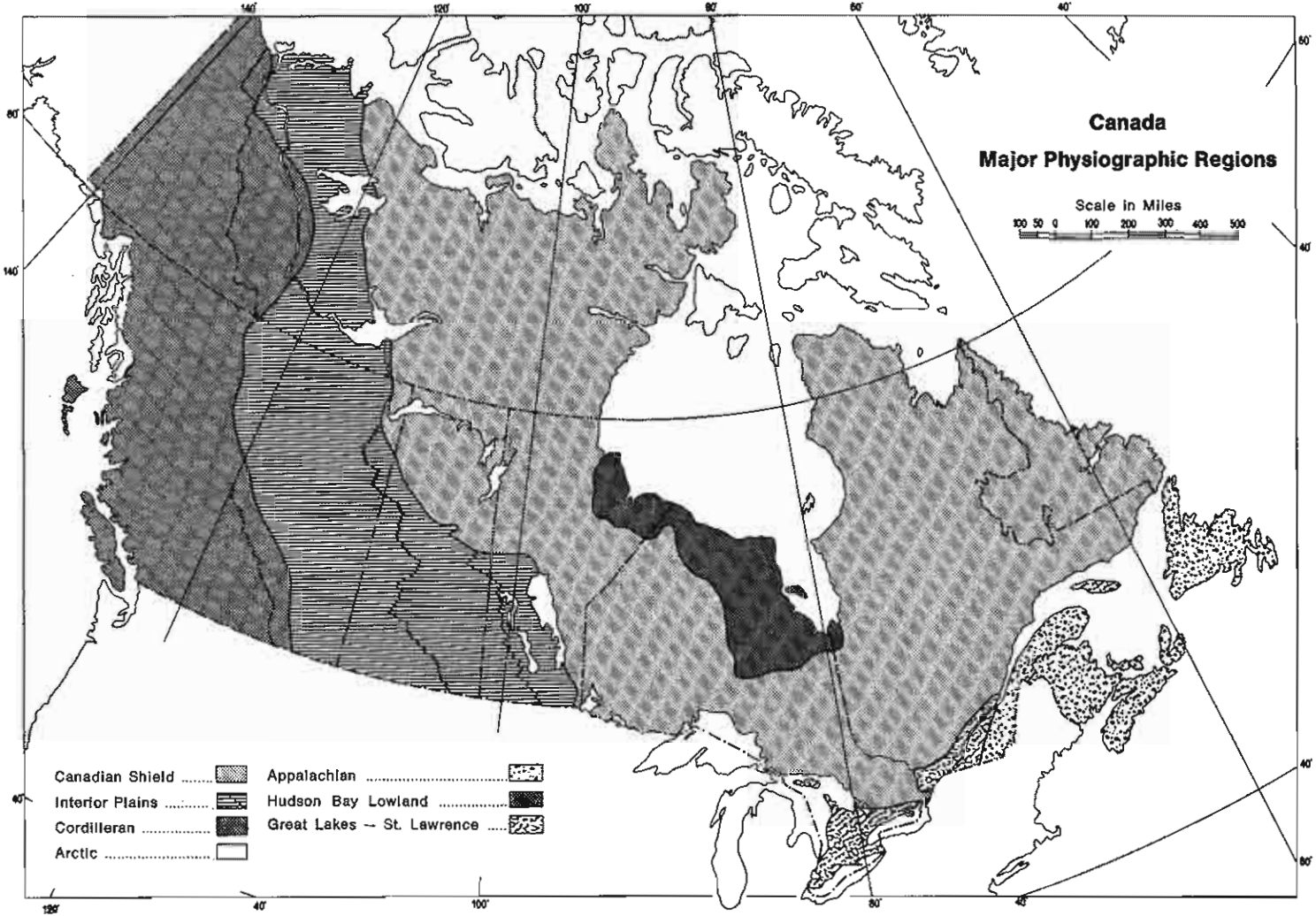
Interior Plains. A wide variety of soil types which occur in distinct geographical zonation and include: brown, dark brown, black and dark gray chernozems, gray luvisols and eutric brunisols.

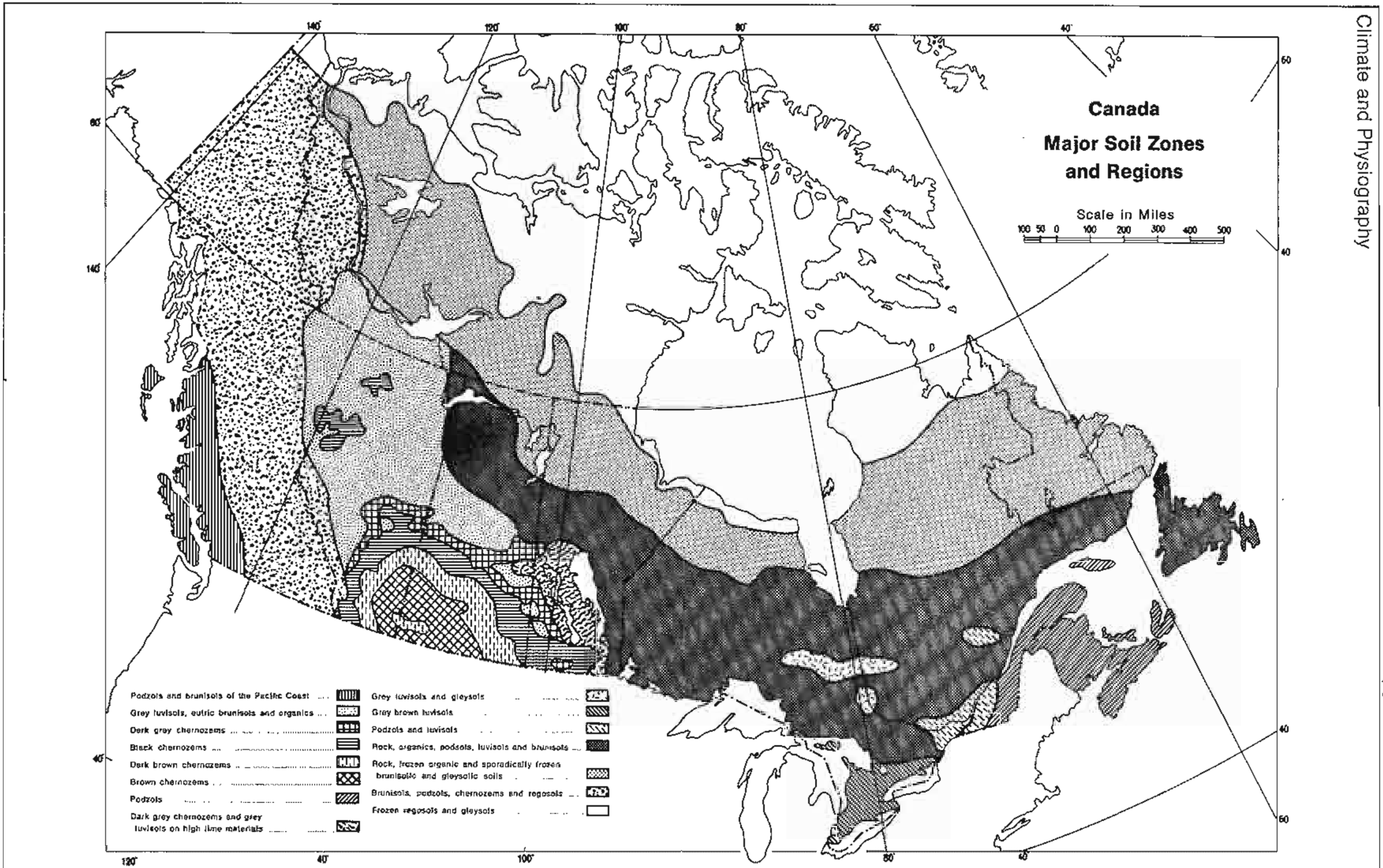
Cordilleran. The soils, mostly derived from till, are highly variable; altitudinal zonation plays a significant role in the complex soil pattern. In the Pacific coastal region, dystric brunisols and humo-ferric podzols occur widely. In the central interior plateau, gray luvisols predominate; in the dry interior brown, dark brown and black chernozems may be found. Large areas of rock, regosols and alpine brunisols are found at the higher elevations.

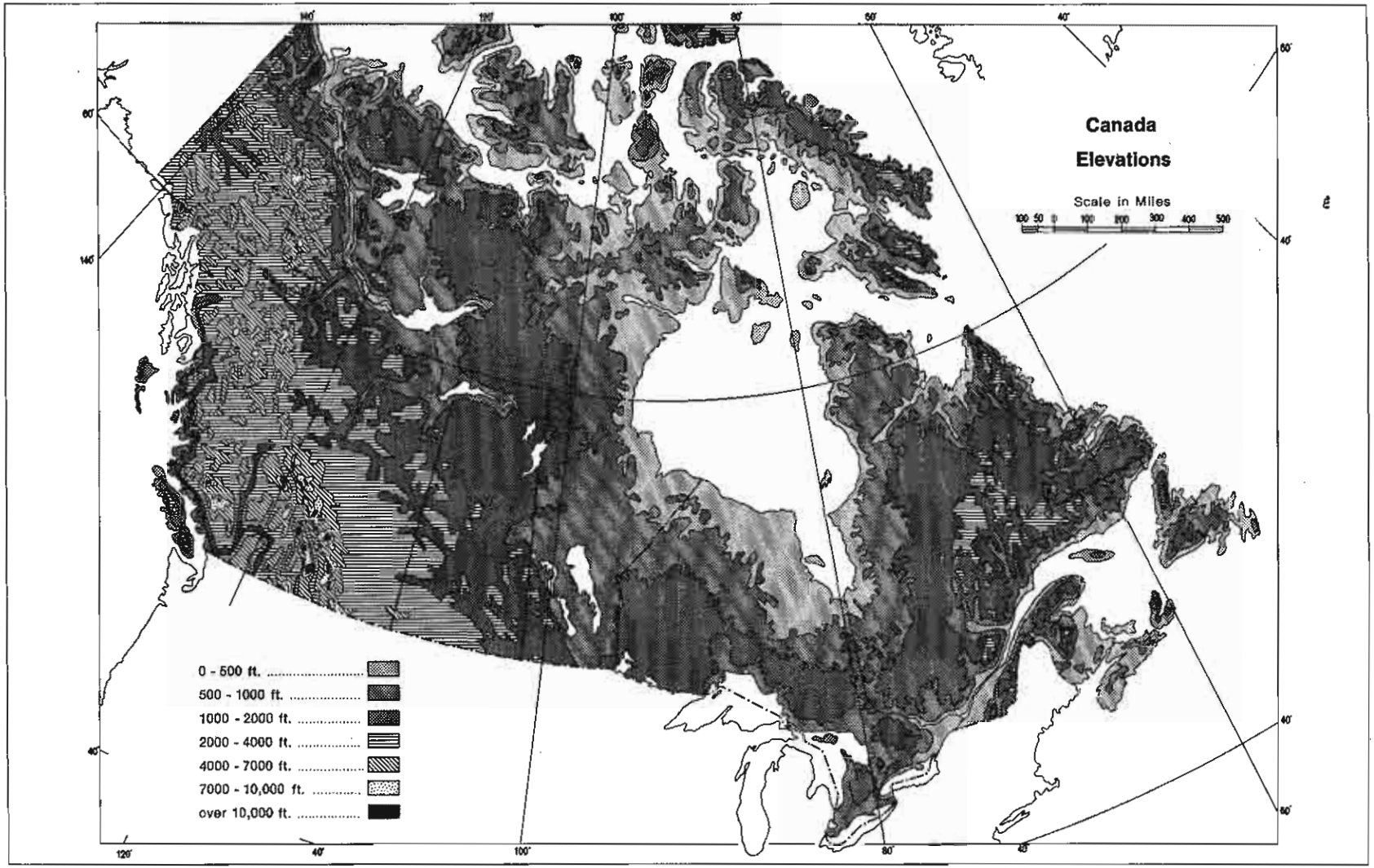
Appalachian. In the Atlantic Provinces podzolic soils predominate; in Newfoundland, large areas are also occupied by rock, and organic soils.

Great Lakes — St. Lawrence. Soils consist principally of gray brown luvisols and humic gleysols.

Elevations. Source: Atlas of Canada, 1957. Canada Department of Mines and Technical Surveys, Geographic Branch, Ottawa.


Canada
Major Physiographic Regions
Scale in Miles
100 50 0 100 200 300 400 500
Canadian Shield
Interior Plains
Cordilleran
Arctic
Appalachian
Hudson Bay Lowland
Great Lakes -- St. Lawrence


Canada
Major Soil Zones and Regions
Scale in Miles
100 50 0 100 200 300 400 500
Podzols and brunisols of the Pacific Coast
Grey luvisols, eutric brunisols and organics
Dark grey chernozems
Black chernozems
Dark brown chernozems
Brown chernozems
Podzols
Dark grey chernozems and grey luvisols on high lime materials
Grey luvisols and gleysols
Grey brown luvisols
Podzols and luvisols
Rock, organics, podsols, luvisols and brunisols
Rock, frozen organic and sporadically frozen brunisolic and gleysolic soils
Brunisols, podzols, chernozems and regosols
Frozen regosols and gleysols


Canada
Elevations
Scale in Miles
100 50 0 100 200 300 400 500
0 - 500 ft.
500 - 1000 ft.
1000 - 2000 ft.
2000 - 4000 ft.
4000 - 7000 ft.
7000 - 10,000 ft.
over 10,000 ft.

Glossary

Association
A recurring plant community of characteristic composition and structure.

Bog
A wet peaty area, usually dominated by mosses (especially *Sphagnum*) and dwarf shrubs.

Bog, raised
The bog surface is convex in profile due to the more rapid accumulation of peat toward the centre than at the edges.

Bog, string
The bog surface shows a pattern of "strings" or peat ridges with intervening water-filled depressions.

Closed forest
A community completely dominated by the tree stratum due to density of the latter.

Colluvium
Poorly sorted surface material moved to the bases of slopes by gravity, frost action, soil creep and local wash.

Drumlin
Elongated "whale-back" ridge of glacial drift, moulded by moving ice and oriented in the direction of ice flow.

Ecotone
A transition area between two well-defined communities or zones of vegetation.

Esker
Long, winding ridge of stratified gravel or sand, laid down by meltwater channels in or under the glacial ice.

Fen
Grass, sedge or reed covered peatland, not as acid as bog and richer in nutrients, often with birch, willow or open tamarack cover.

Fen, patterned
Low fen peat ridges alternate with parallel wet hollows, the pattern developed parallel to the contour (at right angles to water movement) on gentle slopes.

Forest Region
A major geographic belt or zone which is characterized by a distinctive group of dominant tree species and by a distinctive appearance (physiognomy) of the general vegetation.

Forest Section
A geographic subdivision of the Forest Region, possessing an individuality which is expressed relative to other Sections in a distinctive patterning of vegetation and physiography; the unit of forest description in the present work.

Glacial drift
All materials transported and deposited by glacial ice or meltwater.

Glacial outwash
Materials swept out, sorted and deposited beyond the margin of the glacier by meltwater streams.

Gley
A soil characterized by gray colours and/or prominent mottles indicative of permanent or periodic poor drainage.

Hardwoods
Broadleaved deciduous trees.

Hardwoods, intolerant
Group of shade-intolerant, light-requiring, pioneer trees; usually meaning the poplars and white birches.

Hardwoods, tolerant
Group of relatively shade-enduring trees of eastern Canada; usually meaning sugar maple, yellow birch and beech.

Heath
A dense community of small-leaved, dwarf shrubs, usually of the heath family.

Kame
Hill or hummocky ridge of stratified sand or gravel deposited by meltwater in contact with the glacial ice.

Lichen-woodland
Subarctic forest in which the open ground between the trees is covered with light-coloured lichens.

Muck
Fairly well decomposed organic soil material relatively high in mineral content, dark in colour, and accumulated under conditions of imperfect drainage.

Muskeg
Organic terrain, especially bog with a sparse tree cover.

Peat
Unconsolidated soil material consisting largely of undecomposed or slightly decomposed organic matter accumulated under conditions of excessive moisture.

Permafrost
Perennially frozen ground.

Softwoods
Needle- or scale-leaved, coniferous trees.

Soil
The unconsolidated material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

chernozemic
Soils developed under cool, semi arid conditions having an upper mineral horizon (Ah) distinctively enriched with organic matter. Includes "brown", "dark brown", "black" (developed under grasses) and "dark gray" (dark soil, formerly grassland, slightly leached due to forest cover).

brunisolic
Weakly leached brownish soils with little differentiation of the profile horizons. Includes "melanic" and "eutric" on calcareous materials in eastern and western Canada respectively, and "sombric" and "dystric" on acidic materials, most commonly in eastern and western (B.C.) Canada respectively.

podzolic
Leached soils with an upper bleached mineral horizon (Ae) underlain by a horizon (Bf) in which accumulate oxides of iron and aluminium. Includes "humo-ferric" and "ferro-humic" (strongly acid, and may have an "iron pan" accumulation in the subsoil) and "humic" (with distinct accumulation of dark organic materials).

luvisolic
Leached soils with an upper bleached mineral horizon (Ae) underlain by a horizon (Bt) in which silicate clays accumulate. Includes "gray brown" and "gray", on moderately calcareous materials under tolerant hardwoods and boreal mixedwoods, respectively.

gleysolic
Poorly-drained soils developed in the presence of a high or strongly fluctuating water table, and usually with mottled subsoil. Includes "humic gleysol" (with a dark humus-rich Ah horizon), "gleysol" (with little or no Ah horizon), "eluviated gleysol" (with a mottled, finer-textured (Btg) subsoil) and peaty phases (with a surface accumulation of raw organic matter) of the previous three groups.

regosolic
Poorly-developed or immature soils with little differentiation, occurring on recent flood plain deposits, shifting dunes or very fine textured lacustrine deposits.

organic
Soils (peats and mucks) which have developed from organic deposits and are saturated for most of the year. No attempt has been made to identify organic soils by the three great groups based on relative degree of decomposition: "fibrisol", "mesisol" and "humisol".

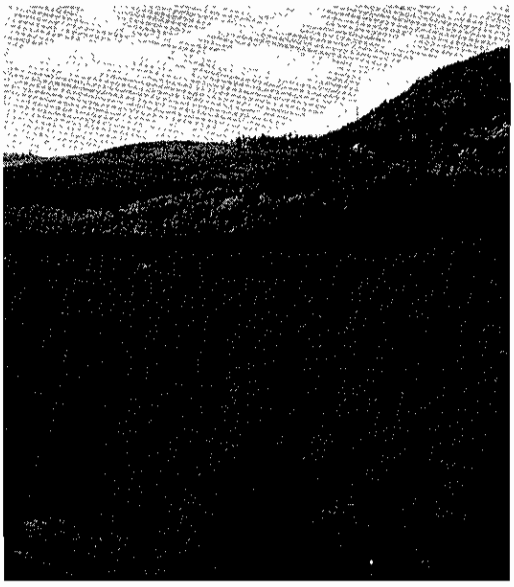
Subarctic forest
The northern part of the boreal forest, characterized by open stands of small conifers, chiefly black spruce, with abundant lichens on the ground.

Swamp
A wooded fen whose mucky substratum is intermittently flooded; peat accumulation is not characteristic.

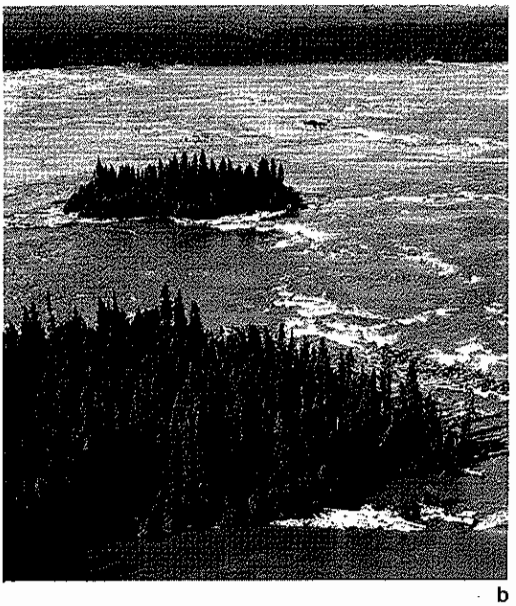
Till
Glacial deposits laid down directly by the ice with little or no transportation or sorting by water.

Tundra
The low, treeless vegetation of high latitudes and high altitudes, usually characterized by lichens, sedges and dwarf shrubs.

a Great Lakes-St. Lawrence Region (L.9).
b Boreal Region (B.23a).
c Acadian Region (A.9).
d Great Lakes-St. Lawrence Region (L.5).



a



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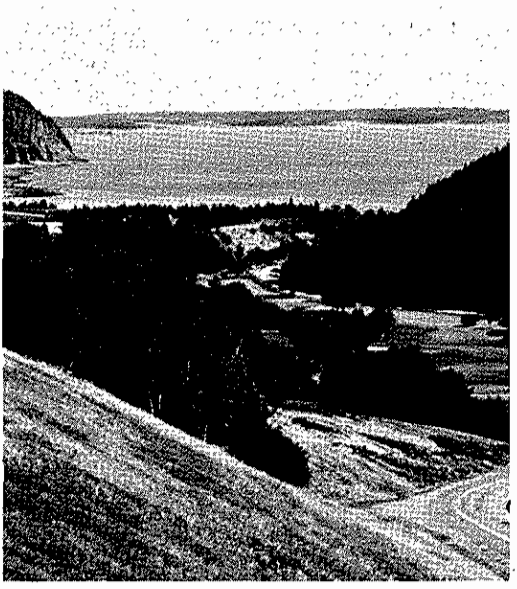
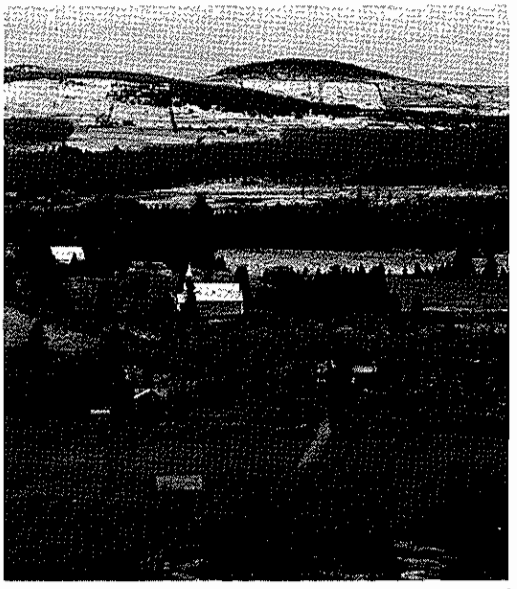


c



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