

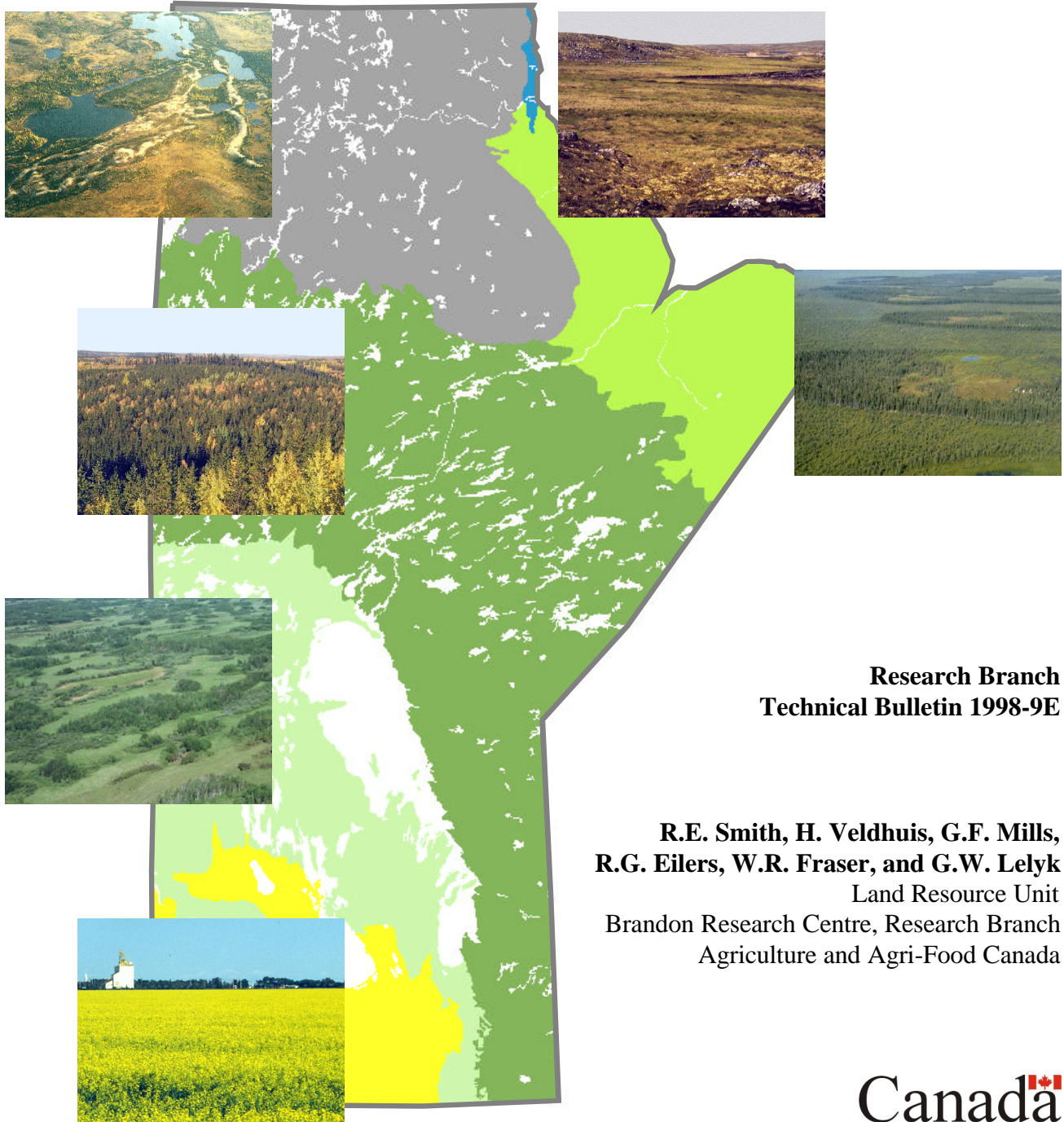


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Terrestrial Ecozones, Ecoregions, and Ecodistricts of Manitoba

An Ecological Stratification of Manitoba's Natural Landscapes



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Canada 

Boreal Plains Ecozone

The Boreal Plains Ecozone extends as a wide band from the Peace River area of British Columbia in the northwest to the southeastern corner of Manitoba. Unlike the neighbouring Boreal Shield, this ecozone is not strongly bedrock controlled, has few bedrock outcrops and has considerably fewer lakes than the Boreal Shield.



Climate

The climate of this ecozone is strongly influenced by continental climatic conditions and is typified by cold winters and moderately warm summers. The mean annual temperature ranges from between -2°C to 2.5°C. The mean annual precipitation increases from 300 mm in northern Alberta to 600 mm in southeastern Manitoba. The average number of effective growing degree-days over 5°C ranges from 1000 to 1200. The ecozone has a subhumid, moderately cold Cryoboreal soil climate.

Data from climate stations at The Pas and Steinbach represent respectively the northern and southern sections of the Manitoba portion of this ecozone.

Climate Data¹ (Annual Means) for the Manitoba portion of the Boreal Plains Ecozone

Station	Temperature (°C)	Precipitation			Degree-Days (>5°C)	Frost Free Period ² (days)
		Rain (mm)	Snow (cm)	Total (mm)		
The Pas A.	-0.3	323.3	170.2	451.9	1395.0	114.0
Steinbach	2.4	405.1	122.3	527.3	1771.0	114.0

¹ Canadian Climate Normals, 1960-1990. Atmospheric Environment Service, Environment Canada.

² Canadian Climate Normals, 1950-1980. Atmospheric Environment Service, Environment Canada.

Surficial Deposits and Landforms

The ecozone is underlain by Cretaceous shales and Palaeozoic limestones and dolomites. The landscape is a composite of nearly level to gently rolling plains consisting largely of hummocky and kettled to gently undulating morainal till deposits and level to depressional glaciolacustrine sediments. Surface materials are usually deep, tending to mask the underlying bedrock topography. Wetlands, including peatlands, cover between 20 to 50 percent of the ecozone.

Soils

The dominant soils of this ecozone are Luvisols, but in the southern portion, Dark Gray and Black Chernozems become more widespread. In the north, Brunisols and organic soils are increasingly more prominent.

Boreal Plains Ecozone

Vegetation

White and black spruce, jack pine and tamarack are the main coniferous species. Broadleaf trees, particularly white birch, trembling aspen and balsam poplar are most numerous in the transitional section leading to the Prairie Ecozone. Black spruce and tamarack increase strongly in dominance in the northerly sections of the ecozone.

Wildlife

Characteristic mammals in the Manitoba section of the ecozone include woodland caribou, white-tailed deer, moose, wapiti, coyote, black bear, marten, fisher, lynx and chipmunk. Representative birds include boreal owl, great horned owl, red-tailed hawk, blue jay, rose-breasted and evening grosbeak, Franklin's gull and brown-headed cowbird. White pelican, cormorant, herring gull, heron and tern are also prominent.

Land Use

Agricultural development has made inroads into the southern and northwestern areas of this ecozone. However, the principal use of this region remains the sustainable use of the forest resource for pulpwood and sawlogs. Hunting and trapping are also on-going activities, as are commercial fishing operations on the larger lakes. Tourism and recreation are growing industries and are centred primarily on water-oriented recreation and the use of provincial and national parks.

There are four ecoregions within the Boreal Plains Ecozone in Manitoba.

Boreal Plains Ecozone



The Boreal Plains Ecozone contains a large variety of landscapes. The two upper pictures are from the Cedar Lake Ecodistrict, part of the Mid-Boreal Lowland Ecoregion. The jack pine stand in the picture to the left is growing on deep, well-drained, extremely calcareous, sandy loam till. The picture above shows a site with extremely shallow soils. The soil material consists of shallow rubble over limestone bedrock. Wild fire is a common occurrence on both land types, but forest regeneration is much better on the site shown in the left picture.



The first of the two lower pictures shows an area in the Gypsumville Ecodistrict. A shrub fen (with some late spring snow remaining) is in the foreground, and mixed coniferous forest on higher till is seen in the background. Most of this ecodistrict consists of forested lands or peatlands, although some of the area has been cleared for the production of cereals and tame hay. The second picture shows the pothole landscape in the Swan River Ecodistrict west of the Riding Mountain Upland Ecodistrict.



Boreal Plains Ecozone

Plate BP1.

Carbonate bedrock. The Boreal Plains Ecoregion is underlain by dolomite and limestone in the northern and eastern sectors. These carbonate rocks are bordered to the west and south by a mixture of limestone, dolomitic and shale bedrock, while the uplands in the southwestern sector are underlain by shales. The carbonate rock was severely eroded by glacier ice. The materials were reworked and deposited as the characteristically high lime tills of the Interlake, and were mixed with shale materials and deposited as mixed tills in southwestern Manitoba. The carbonate rock is usually very strongly fractured, which allows for vertical and horizontal drainage.



Plate BP2.

Forest stand on high-lime till. The high-lime till is sandy loam to loam textured. Soil development is generally shallow due to the amount of free carbonates present, and the soils may still be calcareous in the surface. Forest growth is variable due to variation in carbonate levels, texture, drainage and depth to bedrock. In the Interlake stands are dominated by trembling aspen while farther north they consist of largely of black spruce and/or jack pine with varying admixtures of trembling aspen and white birch.





Plate BP3.

Ridge and swale landscape. Ridge and swale topography is common in the Interlake. The glaciers created this landscape of semi-parallel highs and lows. As the landscape pattern is perpendicular to the general slope of the land, the lows are very wet. The lows are dominated by sedge, meadowgrass and reed vegetation, while the ridges support trembling aspen, balsam poplar and a variety of shrubs.



Plate BP4.

Garter snakes in limestone sinkhole. Rainwater percolating through limestone bedrock results in the formation of sink-holes or caverns. Some of these sinkholes are used by garter snakes to hibernate below the frost-line. In spring they emerge to mate, and to migrate to the swales, where they hunt frogs and insects. Significant concentrations of garter snakes are found in sinkholes near Narcisse in the Manitoba Interlake region.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

Plate BP5.

Shallow Orthic Dark Gray Chernozemic soil on high-lime till. The soils on the high-lime till are generally very shallow and stony. High levels of free carbonates retard soil development, especially the movement of sesquioxides and clay.



Plate BP6.

Interlake landscape. Some of the high-lime till areas have been cleared for arable agriculture, but significant areas remain as forest and wetlands. Significant areas have reverted back to shrub-land after clearing. Cereal and hay production are major agricultural land uses, when soil drainage and stoniness are relatively favourable. Less favourable areas are commonly used for livestock grazing.



Plate BP7.

Mixed forest on Duck Mountain. The Porcupine Hills, and Duck and Riding Mountain ecodistricts contain some of the most productive forest stands in Manitoba. The forest consists predominantly of mixed stands of hardwoods and softwoods.



Plate BP8.

Orthic Gray Luvisolic soil on clayey till. Some glacial till deposits on the uplands are clay textured, and are derived from the local shale mixed with minor quantities of high-lime materials from the lowland plains. On well to imperfectly drained sites, the soils have distinct, well developed A and B horizons. They are very productive for forest growth.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

Plate BP9.

Orthic Gray Luvisolic soil on loamy till. Glacial till deposits on the slopes of the uplands consist of a mixture of materials derived from carbonate bedrock, shales and Precambrian bedrock. These productive forest soils are generally loamy, moderately well drained, moderately to strongly calcareous and contain moderate quantities of coarse fragments. As the soil developed under forest vegetation, carbonates have been leached from the upper part of the profile, resulting in a light gray, platy A horizon, underlain by a well-developed B horizon enriched in clay.



Plate BP10.

Louisiana-Pacific oriented fibreboard mill with stacks of trembling aspen wood. The establishment of the fibreboard mill in Minitonas creates a market for aspen wood in the Porcupine, Duck Mountain and surrounding areas. Until recently the market for trembling aspen wood was limited. Hardwood was often left standing after the softwood was removed. The increased demand for trembling aspen required new forest management strategies.



Plate BP11.

Mixed forest in the Interlake. The Interlake area supports extensive stands of trembling aspen mixed with white spruce, although forest growth is variable. Trembling aspen on high-lime till soils are often stunted with poor form. Forest growth is much better in areas with clayey and loamy glaciolacustrine surface sediments.



Plate BP12.

Clay loam textured glaciolacustrine sediments near Arborg in the Interlake. The level glaciolacustrine sediments in the southeastern sector are extensively used for arable agriculture. Crops are dominantly cereals, but also include canola and alfalfa.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

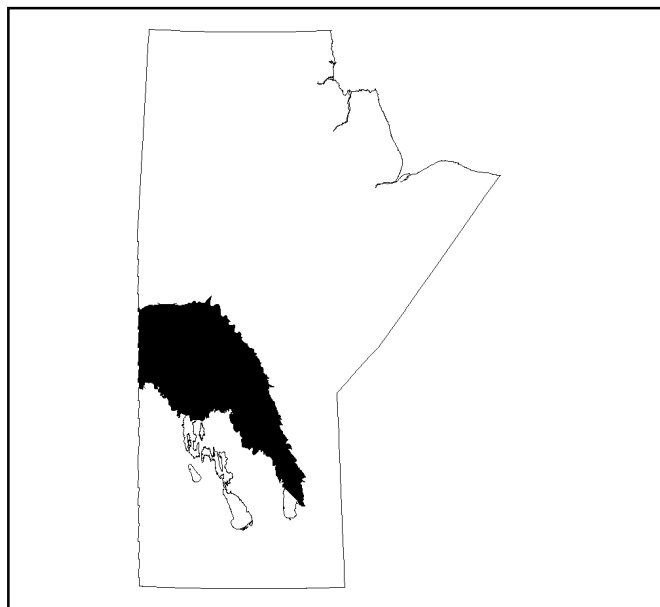
148. Mid-Boreal Lowland Ecoregion

The Mid-Boreal Lowland Ecoregion occupies the northern section of the low-lying Manitoba Plain from the western shore of Lake Winnipeg to the Cumberland Lowlands in Saskatchewan.

Climate

This ecoregion is part of the Subhumid Mid-Boreal Ecoclimatic Region that forms a continuous belt extending from Lac Seul in northwestern Ontario, across central Manitoba and Saskatchewan to the foothills of the Rocky Mountains in northern Alberta and the southern Yukon Territory. The ecoregion has short, moderately warm summers and long, cold winters. The mean annual air temperature ranges from -0.4°C to 1.2°C . The average growing season ranges from 162 to 172 days, and the number growing degree-days ranges from nearly 1300 to over 1500.

The average annual precipitation ranges from about 450 mm to about 575 mm. Precipitation varies greatly from year to year and is highest during the growing season. Average moisture deficits range from nearly 60 mm to about 125 mm. The region has a moderately cold to cold,



subhumid to humid, Cryoboreal soil climate.

Climate data from The Pas Airport and Grand Rapids Hydro is given below.

Selected Climate Data¹ for The Pas Airport

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr.
Temp. $^{\circ}\text{C}$	-21.4	-17.5	-10.0	0.5	8.7	14.8	17.7	16.4	9.9	3.5	-7.7	-18.0	-0.3
Precip. mm	16.6	15.1	21.0	26.2	33.6	63.1	69.1	65.0	58.3	37.5	26.6	19.8	451.9
Growing degree-days	0.0	0.0	0.0	24.0	138.0	294.0	395.0	352.0	155.0	37.0	1.0	0.0	1395.0

Selected Climate Data¹ for Steinbach

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr.
Temp. $^{\circ}\text{C}$	-19.8	-17.7	-9.1	0.5	8.3	14.9	18.8	17.5	11.2	4.0	-6.9	-16.6	0.5
Precip. mm	16.4	12.8	24.8	24.6	38.9	75.2	75.1	67.2	60.7	41.5	26.8	19.4	483.4
Growing degree-days	0.0	0.0	0.0	24.0	127.0	298.0	426.0	388.0	188.0	42.0	1.0	0.0	1494.0

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.

Surficial Deposits and Landforms

In Manitoba, this ecoregion is underlain by flat-lying, low relief Palaeozoic limestone rock and is covered almost entirely by glacial deposits of variable thickness. Lime-

stone bedrock is at or near the surface along escarpments, erosion channels and drumlinoid ridges. Lower and smoother than the Saskatchewan Plain to the west, this

plain has an elevation ranging from about 350 masl near the Saskatchewan border to 218 masl at Lake Winnipeg. Its surface is generally level with a distinct, north to south trending drumlinoid or ridged topographic pattern with slopes ranging from 1 to 5 percent.

Portions of this lowland plain have been smoothed over by the deposition of clays, silts and sands of glacial Lake Agassiz which have subsequently been covered by organic deposits in the form of poorly drained flat bogs and horizontal fens. More pronounced topography in the form of limestone domes with slopes ranging from 5 to 10 percent occur north of Clearwater Lake. Beaches marking the successively lower water levels of Lake Agassiz wind along the prominent The Pas Moraine and along a bare bedrock escarpment that lies north of Grand Rapids near the north-western shoreline of Lake Winnipeg.

The most northern part of the ecoregion lies within the discontinuous permafrost zone. Permafrost is patchy but widespread in peatlands. The widespread occurrence of collapse features (thermokarst) indicates that the permafrost is barely in equilibrium with the climate.

Large to very large lakes dominate the ecoregion including the northern basin of Lake Winnipeg, the northern half of Lake Winnipegosis, as well as Cedar, Moose, Cormorant, Clearwater and Athapapuskow lakes. The Saskatchewan and Carrot rivers are the major drainage ways. The ecoregion is part of a number of watersheds including those of the Minago, Hargrave and William rivers, which are all part of the Nelson River drainage system.

Soils

Eutric Brunisols on loamy glacial till, and shallow to deep Organic Mesisols and Fbrisols are co-dominant in the area. Other soils of significance include Gray Luvisolic soils that have developed on well to imperfectly drained, very stony, calcareous, loamy to clayey textured glacial till and on calcareous, stone-free, clayey and silty glaciolacustrine deposits.

Eutric Brunisols are present and are associated with ancient, subdued sandy beaches of former glacial Lake Agassiz. Limestone bedrock outcroppings, covered by rubble, are common throughout the ecoregion.

Vegetation

In Manitoba, this ecoregion is characterized by mixed boreal forest. Medium to tall, closed stands of black spruce, trembling aspen, balsam polar and jack pine are common on well to imperfectly drained clayey and loamy tills and glaciolacustrine deposits. Black spruce is the dominant species in older stands.

After fire, extremely overstocked stands of jack pine often develop on well drained sites, while on better sites, trembling aspen may be the dominant regeneration. Good mixed stands of black spruce, white spruce, balsam fir and trembling aspen may be found on suitable sites along lake shores and on alluvial deposits along rivers. Poorly drained soils support black spruce and shrub vegetation.

Vegetation in bogs consists of black spruce and ericaceous shrubs and mosses. Fens are dominated by sedges, brown mosses and varying amounts of swamp birch and tamarack.

Wildlife

Characteristic wildlife includes moose, black bear, wolf, lynx, red fox and snowshoe hare. This ecoregion also provides habitat for waterfowl including various ducks, geese, white pelican and cormorant. Other birds include various raptors, sandhill crane and ruffed grouse.

Land Use

The largest centres are The Pas and Grand Rapids. There are also a number of First Nation communities.

A significant part of the ecoregion, especially around Cedar Lake, was flooded as a result of the construction of the hydro-electric dam on the Saskatchewan River at Grand Rapids.

Significant pulpwood and local sawlog forestry provides employment in the ecoregion, with most of the pulpwood and timber being processed in the mill at The Pas. Water-oriented recreation, trapping and hunting are also important land uses. Servicing the tourist industry provides seasonal employment during the summer. Arable agriculture is limited to small holdings on clayey glaciolacustrine soils in the lowlands along rivers and streams, where drainage has been improved. Grains for livestock feed, oilseeds, and hay are the common crops.

There are fourteen ecodistricts that occur either wholly or in part within the Mid-Boreal Lowlands Ecoregion in Manitoba.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

663. Playgreen Lake Ecodistrict (5256 km²)

The Playgreen Lake Ecodistrict occupies an area in the northeastern corner of the Mid-Boreal Lowland Ecoregion and extends from the north shore of Lake Winnipeg to the northern border of the region.

Climate

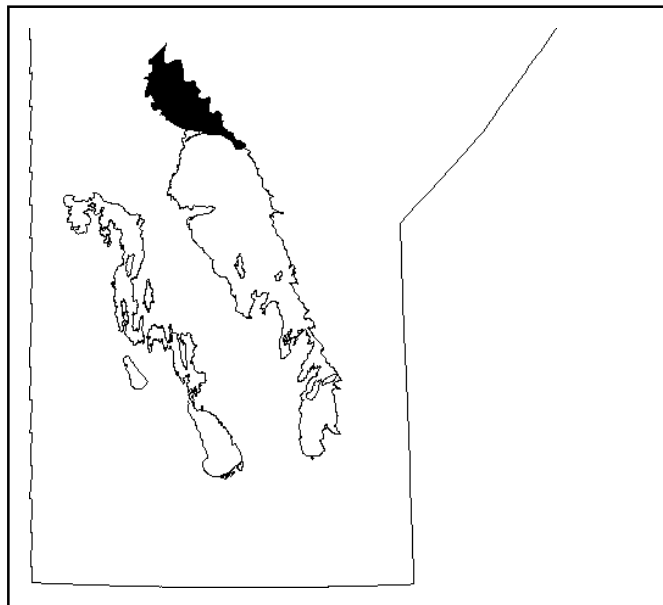
This ecodistrict is situated within the Subhumid Mid-Boreal Ecoclimatic Region in Manitoba. The mean annual temperature is 0.1°C, the average growing season is 162 days with about 1400 growing degree-days.

The mean annual precipitation is approximately 470 mm, of which one-quarter falls as snow. Precipitation varies greatly from year to year, and is highest from late spring through summer. The average annual moisture deficit is about 95 mm. The ecodistrict has a humid, cold to moderately cold, Cryoboreal soil climate.

There are no climate stations in this ecodistrict, but data from Wabowden (363. Sipiwesk Lake Ecodistrict) is relevant.

Physiography and Drainage

The wide-spread, nearly level peatland that makes up a large part of this ecodistrict is an extension of the peatlands found in the Norway House Ecodistrict. This peatland extends northward from the north end of Lake Winnipeg between Playgreen, Kiskittogisu and Kiskitto lakes to the east and Hargrave Lake to the west. The ecodistrict has a mean elevation of about 256 masl, and elevations range from about 300 masl near Hargrave Lake to 213 masl near Playgreen Lake. Regional relief falls at the rate of about 1.1 m per km. Long (more than 150 m), smooth slopes range from level to less than 5 percent. Local relief of 0.5 to 2 m occurs along former Lake Agassiz beaches, while some of the creeks and rivers have carved 5 to 10 m deep channels.



Soils

Deep to shallow, moderately decomposed Mesisolic organic soils are dominant and have some potential for arable agriculture if drainage could be economically implemented.

The ecodistrict lies within the discontinuous permafrost zone. Patches of permafrost occur throughout, but are confined to peatlands. Collapse scars marking the location of former frozen peat plateau and palsa bogs are common features near Limestone Bay.

Gray Luvisols and Gleysols are associated with clayey glaciolacustrine sediments, while Eutric Brunisols are associated with relic beaches.

Lack of natural drainage and poor heat conductance properties of peat soils are the major soil problems.

Vegetation

The vegetation on the peatlands varies with peatland type. Bogs generally support stunted black spruce with ericaceous shrubs and mosses dominated by sphagnum species. Fens are generally dominated by sedges and brown mosses and contain varying quantities of shrubs such as swamp birch and stunted tamarack trees.

Uplands have vegetation that varies with drainage, soil texture and fire history. Black spruce is widespread, but following forest fires, jack pine and, to a lesser extent, trembling aspen, become major forest components. Wet uplands have black spruce and moss vegetation with shrubs such as willow and alder.

Water

The principal sources of water are lakes, streams and creeks. Variable quality groundwater can also be obtained from shallow sand and gravel aquifers associated with till, beach and inter-till outwash and glaciolacustrine deposits. Development of wells is poor from Lower Silurian and Ordovician limestone bedrock formations. Limestone aquifers consist of fractured rock and both water quantity and quality are variable.

Land Use

There are no communities in this ecodistrict.

Most of the soils are not well suited to, and are not used for, arable agriculture. Most of the land is public land and portions are leased out for pulpwood and sawlog forestry. Hunting, trapping and water-oriented recreation are other important land uses. The habitat is important for wildlife and waterfowl breeding habitat.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

664. Namew Lake Ecodistrict (1373 km²)

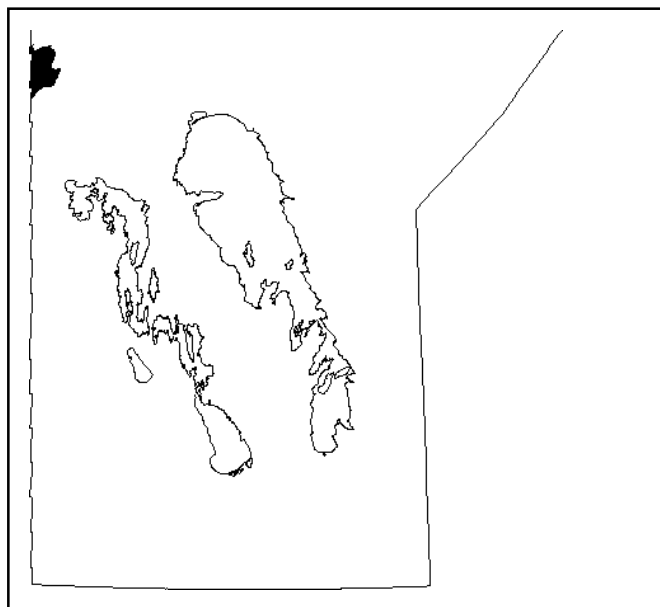
The Namew Lake Ecodistrict straddles the border with Saskatchewan. It is situated in the northwestern corner of the Manitoba portion of the Mid-Boreal Lowland Ecoregion, but only about one-fifth of the ecodistrict lies within Manitoba.

Climate

This ecodistrict occurs in a cooler subdivision of the Mid-Boreal Ecoclimatic Region in west-central Manitoba and is characterized by short, moderately warm summers and long, very cold winters. The mean annual temperature is -0.4°C, the average growing season is 162 days, and the number of growing degree-days is about 1320.

The mean annual precipitation is approximately 475 mm, of which more than one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the year is about 85 mm. The district has a humid, cold to moderately cold, Cryoboreal soil climate.

The ecodistrict has a long-term climate station at Wanless, but data is incomplete after 1980.



Selected Climate Data¹ for Wanless

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	-1.2	15.4	12.8	16.7	-24
Precip. mm (equiv.)	451.6	189.7	277.2	64.4	17.6
Rain/Snow (mm/cm)	315.5/137.4	189.4/0.3	274.8/2.8	64.4/0.0	0.0T/18.2
Growing degree-days >5°C	1254.0	933.0	1198.0	356.0	0.0

¹ Canadian Climate Normals, 1951-1980. Atmospheric Environment Service, Environment Canada.

Physiography and Drainage

In Manitoba, the Namew Lake Ecodistrict extends from the The Pas Moraine between the Saskatchewan River and Lake Athapapuskow westward to the Saskatchewan border. Relief is terminated abruptly on the southeast by steep morainic deposits that rise 10 to 15 m above the surrounding area. Glacial deposits throughout the area can vary in thickness from less than 10 cm on limestone bedrock outcrops, to more than 30 m. The ecodistrict slopes gently eastward at the rate of about 1.0 m per km. Elevations range from 300 masl at the Saskatchewan border to 261 masl at Rock Lake near its eastern edge. The mean elevation is about 274 masl.

Local relief within this relatively level to undulating shallow glaciolacustrine plain occurs along river banks and lake shores and ranges from 2 to 3 m. Moderately long slopes (50 to 150 m) range from level to less than 5 per cent.

Most of the ecodistrict lies within the Saskatchewan River watershed which is part of the Nelson River drainage system. The Goose River and a number of creeks drain several large lakes, including Namew and Athapapuskow lakes.

Soils

The mineral soils are co-dominantly well to imperfectly drained Gray Luvisols on calcareous, clayey glaciolacustrine deposits, and Eluviated Eutric Brunisols and Gray Luvisols associated with well to imperfectly drained till ridges and uplands. The till is extremely to very strongly calcareous, very cobbly to gravelly, loam to clay-loam textured and water-worked. Soil profile development on these materials is very shallow (usually less than 15 cm deep).

Extensive areas of poorly to very poorly drained, shallow to deep, slightly to moderately decomposed (fibric to mesic) organic soils - and sporadic Organic Cryosols where permafrost is present - are found throughout the district.

Poor soil structure, lack of natural drainage, excess amounts of stones and cobbles, and high lime content associated with the till soils are the major limitations to agricultural use of the soils.

Vegetation

The vegetation reflects the drainage, soil materials and the relatively northern location. Black spruce is dominant as a result of predominance of organic and poorly drained clayey soils, and is associated with ericaceous shrubs and mosses. Upland vegetation varies with drainage, texture and fire history. Jack pine is dominant on coarser textured upland burn sites and is associated with ericaceous shrubs, alder, herbs, mosses and lichens. Other sites may support trembling aspen with shrubs and herbs. Favourable sites, especially on mineral soils along creeks and rivers, may have forest stands with black spruce, white spruce, jack pine and trembling aspen.

Water

Approximately 20 percent of the ecodistrict is shallow ponds, lakes, rivers and streams, which are the principal sources of water. Variable quality groundwater may be extracted from shallow sand and gravel aquifers associated with till, beach and inter-till outwash and deposits. Development of wells is poor from dominantly Silurian bedrock formations. Limestone aquifers consist of fractured rock and both water quantity and quality are variable.

Land Use

There are no communities in the ecodistrict.

The ecodistrict is used for the production of pulpwood and some timber. A limited portion of the clayey soils are cultivated for cereal grains, alfalfa seed and hay crops. Most of the land is public land and some of it is leased as native pasture and hay. The ecodistrict provides important wildlife and waterfowl breeding habitat.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

665. Cormorant Lake Ecodistrict (4199 km²)

The Cormorant Lake Ecodistrict is located in the most northern part of the Mid-Boreal Lowland Ecoregion in Manitoba.

Climate

This ecodistrict is in a warmer subdivision of the Subhumid Mid-Boreal Ecoclimatic Region in Manitoba. Its climate is marked by short, moderately warm summers and long, very cold winters. The mean annual temperature is -0.4°C, the average growing season is 165 days, and the number of growing degree-days is about 1300.

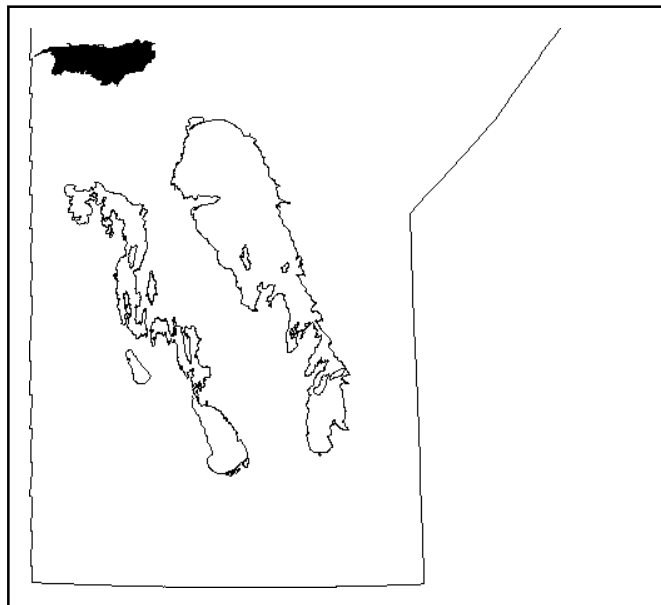
The mean annual precipitation is approximately 455 mm, of which more than one-quarter falls as snow. Precipitation varies greatly from year to year, and is highest from late spring through summer. The average moisture deficit over the year is about 110 mm. The district has a humid, cold to moderately cold, Cryoboreal soil climate.

There are no climate stations in this ecodistrict. Climatic data from Wanless (664. Namew Lake Ecodistrict) and Flin Flon Airport (358. Flin Flon Ecodistrict) has some relevance.

Physiography and Drainage

The Cormorant Lake Ecodistrict borders on the Canadian Shield at Reed Lake on the north and extends south to Clearwater Lake. It is bordered on the west by the The Pas Moraine and the Namew Lake ecodistricts, and on the east by the lowlands of the Playgreen Lake Ecodistrict.

The ecodistrict is a hummocky morainal plain covered by thin, discontinuous glacial till veneers. Most of the glacial deposits vary in thickness from less than 10 cm on limestone bedrock outcrops to more than 30 m. Elevations range from about 300 masl in the western sector to about 263 masl along the shore of Hargrave Lake in the east. The ecodistrict slopes gently eastward at the rate of approximately 0.5 m per km. Moderately long (50 to 150 m), hummocky slopes range from 5 to about 10 percent in subdued upland areas, while long slopes (over 400 m) ranging from level to 0.5 percent occur on organic terrain.



The ecodistrict is drained by a number of creeks and rivers. The most northern and eastern sectors are part of the Grass River-Burntwood River watershed, while the remainder is part of the Saskatchewan River watershed. All are part of the Nelson River drainage system.

Soils

The dominant soils in the Cormorant Lake Ecodistrict are well to imperfectly drained Eluviated Eutric Brunisols that have developed on veneers and blankets of extremely calcareous, very cobbly to gravelly, loamy textured, water-worked glacial till and cobbly to gravelly beach deposits. Soil profile development is very shallow (usually less than 15 cm thick).

Poorly to very poorly drained peaty Gleysolic soils and slightly to moderately decomposed (fibric to mesic) organic soils are widespread and cover extensive areas. Cryosolic soils are associated with widespread patches of permafrost occurring in peatlands. Minor areas of Gray Luvisolic soils that have developed on glaciolacustrine sediments occur near the margins of lakes.

Excessive amounts of stones and cobbles, shallow rooting depth to bedrock and poor natural drainage are the major soil problems.

Vegetation

Vegetation on the uplands varies with fire history. Jack pine is the dominant species after fire, with areas of trembling aspen regenerating on favourable sites. Black spruce becomes dominant with time and is associated with shrubs such as alder and ericaceous shrubs. Ground cover varies from moss to herbs and forbs.

Bog peatlands support stunted black spruce with dwarf birch and ericaceous shrubs and mosses, while fens have sedges, brown mosses and varying amounts of swamp birch, alder, willow and stunted tamarack.

Water

The principal source of water is the variable quality groundwater available from sand and gravel shallow aquifers associated with till, beach and inter-till outwash and glaciolacustrine deposits. Lakes and ponds comprise about 5 percent of the ecodistrict and provide surface sources of water. Development of wells is poor from Silurian bedrock formations. Limestone aquifers consist of fractured rock and both water quantity and quality are variable.

Land Use

There are no settlements in the ecodistrict.

Most of the soils are not suitable to, and are not used for, arable agriculture. The clayey, Gray Luvisolic soils and organic soils have some potential for arable agriculture. All of the land is public land and significant areas are leased for pulpwood and sawlog forestry. Other uses include hunting, trapping and water-oriented recreation. The habitat is important for wildlife and waterfowl breeding.

Beaver pond and lodge



Beavers occur throughout most of the province, except in the far north. Beavers build dams to create ponds sufficiently deep so that the winter supply of green branches stored on the pond bottom will remain accessible under the ice. Beavers build dens in river banks or they may build lodges, constructed of mud and sticks, with underwater exits. The dams can cause flooding of large areas, especially where the terrain is level. The construction of dams in ditches may cause flooding of nearby roads. As trapping of beavers has decreased in recent years, their numbers have increased in many areas.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

666. Cedar Lake Ecodistrict (10 359 km²)

The Cedar Lake Ecodistrict lies immediately north of the The Pas Moraine.

Climate

This ecodistrict is located in a warmer subdivision of the Subhumid Mid-Boreal Ecoclimatic Region in Manitoba. The climate is characterized by short, moderately warm summers and long, very cold winters. The mean annual temperature is from 0.3°C, the average growing season is 163 days, and the number of growing degree-days is about 1400.

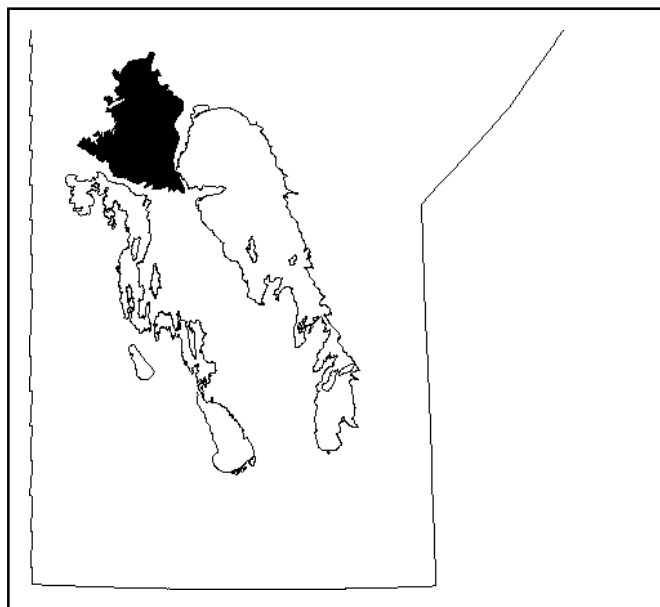
The mean annual precipitation is approximately 475 mm, of which one-quarter falls as snow. Precipitation varies greatly from year to year, and is highest from late spring through summer. The average yearly moisture deficit is about 80 mm. The ecodistrict has a humid, cold to moderately cold, Cryoboreal soil climate.

The data from the climate station at Grand Rapids Hydro, which is located in the southeast corner of the ecodistrict, is relevant, but more so for the southern than the northern sector of the ecodistrict.

Selected Climate Data¹ for Grand Rapids Hydro

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	0.5	17.1	14.4	18.8	-19.8
Precip. mm (equiv.)	483.4	217.5	317.1	75.1	16.4
Rain/Snow (mm/cm)	65.8/116.2	217.0/0.5	312.6/4.2	75.1/0.0	16.4/0.0T
Growing degree-days >5°C	1494.0	1111.0	1427.0	426.0	0.0

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.



Physiography and Drainage

The Cedar Lake Ecodistrict consists of a nearly level, low relief limestone bedrock plain covered by thin, discontinuous glacial till veneers. Two large lakes, Cedar Lake and Moose Lake, cover approximately 40 percent of the ecodistrict.

Elevations lie generally between 274 to 244 masl, with a mean elevation of about 259 masl. Some localized limestone outcrops have elevations exceeding 284 masl. The ecodistrict slopes very gently at about 0.6 m per km. However, rapid relief changes occur locally along steeply slop-

ing escarpments in the eastern section. Long (>150 m), smooth slopes range from level to less than 5 percent. Small diameter sinkholes with nearly vertical walls are a locally common occurrence on flat limestone bedrock exposures.

Drainage is largely toward the lakes which form part of the Saskatchewan River drainage system. However the most eastern part drains directly into Lake Winnipeg through a number of creeks.

Soils

Limestone bedrock dominates the ecodistrict. Significant areas of well to imperfectly drained Eluviated Eutric Brunisols are present. These soils have developed on very thin veneers of extremely calcareous, very cobbly to gravelly, loamy water-worked glacial till and cobbly to gravelly beach deposits. Most of the glacial deposits vary in thickness from less than 10 cm on limestone bedrock outcrops to about 100 cm. Soil profile development is very shallow (usually less than 15 cm deep).

Small areas of Gray Luvisolic soils that have developed on clayey glaciolacustrine sediments occur near the margins of lakes. Poorly drained, peaty Gleysolic soils and shallow, slightly to moderately decomposed Fibrisolic to Mesisolic Organic soils are local soil inclusions.

Excessive amounts of stones and cobbles, and shallow rooting depth to bedrock are the major soil problems.

Vegetation

Jack pine is widespread due to the droughtiness of many sites and the frequency of forest fires. Older jack pine stands have a layer of ericaceous shrubs, such as blueberry, bearberry and rock cranberry and a ground cover of mosses and lichens with minor grasses and herbs. Clayey glaciolacustrine deposits support black spruce, trembling aspen, alder, willow and herbs and mosses.

In bog peatland the vegetation is stunted black spruce, ericaceous shrubs and mosses, while on fens and peatlands, sedges, brown mosses, swamp birch and stunted tamarack are the dominant vegetative components.

Possibly the most northern occurrence of eastern white cedar was around Cedar Lake. However, its distribution may have been affected by flooding.

Water

Approximately 45 percent of this ecodistrict is surface water which provides the principal source of water. Variable-quality groundwater is also available from shallow sand and gravel aquifers associated with till, beach and inter-till outwash and lacustrine deposits. Silurian limestone aquifers consist of fractured rock and both water quantity and quality are variable.

Land Use

The population lives primarily in Grand Rapids, which is the largest settlement in the district, and in the Grand Rapids and Easterville First Nation communities.

The ecodistrict has been strongly affected by the construction of the Manitoba Hydro dam at Grand Rapids, which caused considerable flooding around Cedar and Moose lakes, extending the size of these lakes significantly.

Most of the land is public land and leased for pulpwood and limited sawlog forestry. The large lakes support a limited commercial fishery, while a more extensive fishery is conducted on Lake Winnipeg by fishers from Grand Rapids. Other land uses are hunting, trapping and water-oriented recreation. The ecodistrict provides important moose and waterfowl habitat.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

667. Summerberry Ecodistrict (4199 km²)

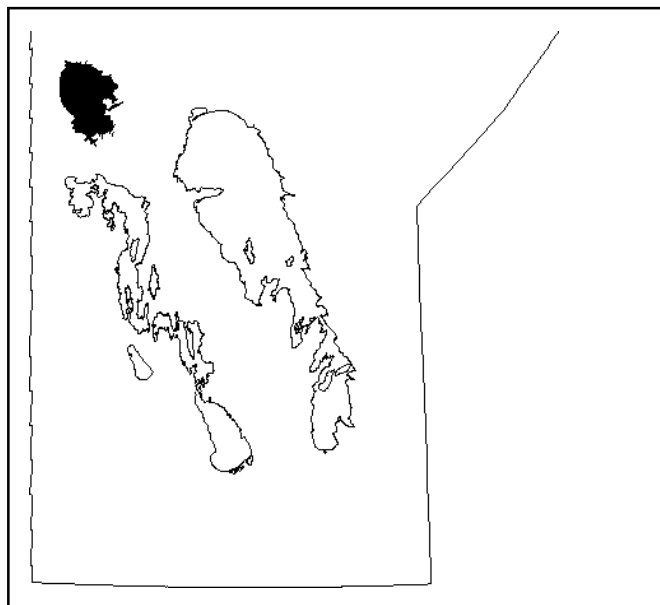
The Summerberry Ecodistrict is situated between the The Pas moraine to the west and Cedar Lake and Moose Lake to the east.

Climate

This ecodistrict lies within a warmer subdivision of the Mid-Boreal Ecoclimatic Region in west-central Manitoba. The climate is characterized by short, moderately warm summers and long, very cold winters. The mean annual temperature is -0.3°C, the average growing season is 163 days with about 1300 growing degree-days.

The mean annual precipitation is approximately 450 mm, of which more than one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the year is nearly 95 mm. The ecodistrict has a humid, cold to moderately cold, Cryoboreal soil climate

The climate station at The Pas Airport is located in the east-central sector of the ecodistrict.



Selected Climate Data¹ for The Pas Airport

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	-0.3	16.3	13.5	17.7	-21.4
Precip. mm (equiv.)	451.9	197.2	289.1	69.1	16.6
Rain/Snow (mm/cm)	323.3/170.2	196.9/0.3	282.2/7.1	69.1/0.0	0.1/24.0
Growing degree-days >5°C	1395.0	1041.0	1334.0	395.0	0.0

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.

Physiography and Drainage

The Summerberry Ecodistrict, situated in the lower Saskatchewan River Delta, is a nearly level lowland of scrolled, recent alluvial deposits and horizontal fens that extends eastward from the The Pas moraine to South Moose and Cedar lakes.

Elevations range from 257 masl to 253 masl. The ecodistrict slopes very gently from west to east at the rate of about 0.1 m per km. Some local relief is provided by till hillocks ranging in height from 0.5 m to 2.0 or 3.0 m above the surrounding delta. Meandering levees are 1.0

to 2.0 m high and about 90 to 360 m wide. Slopes range from level in the lowlands to less than 5 percent on till hillocks. Natural drainage is very slow. The entire ecodistrict is part of the Saskatchewan River drainage system.

Soils

The dominant soils are poorly to very poorly drained, shallow to deep, moderately decomposed Mesisolic Organic soils developed on uniform, moderately decomposed sedge peat. Significant areas of peaty, calcareous, loamy to clayey textured Rego Gleysols and Rego Humic Gleysols occur on recent alluvium. Local areas of Gray Luvisols that have developed on extremely to very strongly calcareous, very cobbly to gravelly, loamy to clay-loam textured, water-worked glacial till and thin clayey glaciolacustrine deposits also occur.

Lack of natural drainage is the major soil problem. The excessive amounts of stones and cobbles associated with the till soils is an additional problem.

Vegetation

As a large part of the ecodistrict consists of fens, the vegetation is mostly sedges, brown mosses and stunted and clumped black spruce and tamarack, associated with varying amounts of shrubs such as swamp birch, willow and alder.

On clayey till uplands the vegetation is dominated by black spruce, white spruce, and trembling aspen mixed with small areas of jack pine. Shrub layer and ground cover vegetation changes with tree cover. The coniferous stands have mosses as dominant groundcover, while the groundcover in trembling aspen stands is mostly forbs and herbs. Distribution of the shrub layer is varied, but includes alder and willow, especially on wetter sites.

On floodplains and levees, the vegetation is largely deciduous. Tree cover is dominated by balsam poplar, elm, ash, trembling aspen and white birch, with only minor occurrences of black spruce and white spruce.

Water

The principal source of water is the Saskatchewan River. Water is also available from shallow ponds and lakes that occupy about 20 percent of the delta. Variable-quality groundwater may be obtained from shallow sand and gravel aquifers associated with till, beach and inter-till outwash and deposits. Development of wells is poor from dominantly Silurian bedrock formations. Limestone aquifers consist of fractured rock and both quantity and quality of water are variable.

Land Use

Opaskwayak Cree Nation (The Pas) and Mosakahiken Cree Nation are the only communities in the ecodistrict.

A limited extent of the soils in the Rahls Island area of the ecodistrict is cultivated for the production of cereal grains, oil seeds and hay crops. Most of the land is public land and a significant portion is leased for native pasture and hay. The ecodistrict provides important moose and waterfowl breeding habitat.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

668. The Pas Moraine Ecodistrict(4253 km²)

The The Pas Moraine Ecodistrict arches in a belt of varying width from the Long Point area on Lake Winnipeg in the east, to the northwestern sector of the Manitoba portion of the Mid-Boreal Lowland Ecoregion.

Climate

This ecodistrict lies within a warmer subdivision of the Subhumid Mid-Boreal Ecoclimatic Region in Manitoba. The climate is characterized by short, moderately warm summers and long, cold winters. The mean annual temperature is 0.1°C, and the average growing season is 166 days with about 1370 growing degree-days.

The mean annual precipitation is approximately 470 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the year is about 90 mm. The ecodistrict has a humid, cold to moderately cold, Cryoboreal soil climate.

The ecodistrict has no climate stations. The data from Grand Rapids Hydro (See 666. Cedar Lake Ecodistrict) and The Pas Airport (See 667. Summerberry Ecodistrict) is valid for the eastern and western section respectively.

Physiography and Drainage

The The Pas Moraine Ecodistrict consists largely of the The Pas Moraine, which is the most prominent topographical feature within the Mid-Boreal Lowland Ecoregion in Manitoba. The feature is a curvi-linear, drumlinized moraine that extends from Long Point on Lake Winnipeg westward between Lake Winnipegosis and Cedar Lake, terminates at The Pas and Rocky Lake on the northwest.

The ecodistrict crests along its southern and western edges where the elevation drops from 305 masl to about 255 masl. Its mean elevation is about 279 masl. Southwest-northeast oriented drumlin ridges, ranging from about 400 to 800 metres wide, are separated by variable-sized swales or depressions up to about 800 metres wide. After the continental glacier melted about 7000 to 8000 years ago, the surface of this drumlinized end moraine was modified by wave action and by icebergs scouring the ridges as glacial Lake Agassiz retreated.

Wave action has created local textural differentiation on



this drumlin-swale landscape. The ridges are more coarse textured and have cobbles and gravels, especially on their apexes. The depressions contain finer textured sediments of glaciolacustrine origin. Iceberg scouring has created clearly visible intersecting micro-grooves or flutes that are usually curvi-linear in form.

Slopes in the ecodistrict range from 50 to 100 m long in the steeper parts and vary from 5 percent to 15 percent in some locations. The organic terrain has long slopes that range from level to 1 percent. The ecodistrict slopes gently northeast at approximately 1.0 m per km. Local relief in the ridge and swale terrain is approximately 0.5 to 3 m, while strongest relief is found along the south face of the moraine where it reaches approximately 25 m.

Most of the ecodistrict is part of the Saskatchewan River watershed, but part drains south into the Lake Winnipegosis drainage system, which is part of the Dauphin River watershed.

Soils

Shallow to deep, moderately decomposed Mesisolic Organic soils are dominant. Organic soils are in part underlain by clayey glaciolacustrine sediment. The soils on well to imperfectly drained ridges are dominantly Gray Luvisols and Eutric Brunisols that have developed on extremely to very strongly calcareous, very cobbly to gravelly, loamy to clay textured, water-worked glacial till and beach gravels. The end moraine deposits are generally deep and may extend several tens of metres to bedrock.

Lack of natural drainage, poor thermal conductance properties of the organic soils, excess amounts of stones and cobbles, and an irregular topographic pattern that runs perpendicular to the general regional slope contribute to the soil problems.

Vegetation

The vegetation is dominated by bog and fen vegetation. Although most bogs support stunted black spruce stands, some bog areas support medium growth, closed stands. The understory varies from swamp birch and ericaceous shrubs with sphagnum moss to alder and feather mosses. Fens are generally dominated by sedges and brown mosses and varying quantities of swamp birch and tamarack.

The till areas support a forest of varying quantities of black spruce, white spruce, white birch and trembling aspen. On favourable, usually south-facing slopes with seepage, tree growth can be very good.

One of the most northerly occurrences of eastern white cedar in Manitoba is located along the south side of Long Point.

Water

The principal source of water is variable-quality groundwater from shallow sand and gravel aquifers associated with till, beach and inter-till outwash and glaciolacustrine deposits.

Land Use

The Chemawawin First Nation community is the only settlement in the ecodistrict.

Most of the land is public land and leased for pulpwood and limited sawlog forestry. Other land uses include hunting and trapping. The area provides important habitat for wildlife including moose, black bear, various members of the weasel family, and woodland caribou.

Long Point



Long Point is the most eastern extension of the The Pas Moraine. The picture is taken from atop the moraine looking southeast towards Lake Winnipeg over the black spruce-covered lowlands bordering the moraine.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

669. Saskatchewan Delta Ecodistrict (1537 km²)

The Saskatchewan Delta Ecodistrict straddles the border with Saskatchewan and occupies the west-central part of the Manitoba portion of the Mid-Boreal Lowland Ecoregion. Only about one-fifth of the ecodistrict lies within Manitoba.

Climate

This ecodistrict is located in a warmer subdivision of the Mid-Boreal Ecoclimatic Region in west-central Manitoba. The climate is characterized by short, moderately warm summers and long, very cold winters. The mean annual temperature is -0.3°C, the average growing season is 166 days with about 1300 growing degree-days.

The mean annual precipitation is approximately 450 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year, and is highest from late spring through summer. The average yearly moisture deficit is about 125 mm. The ecodistrict has a humid, cold to moderately cold Cryoboreal soil climate.

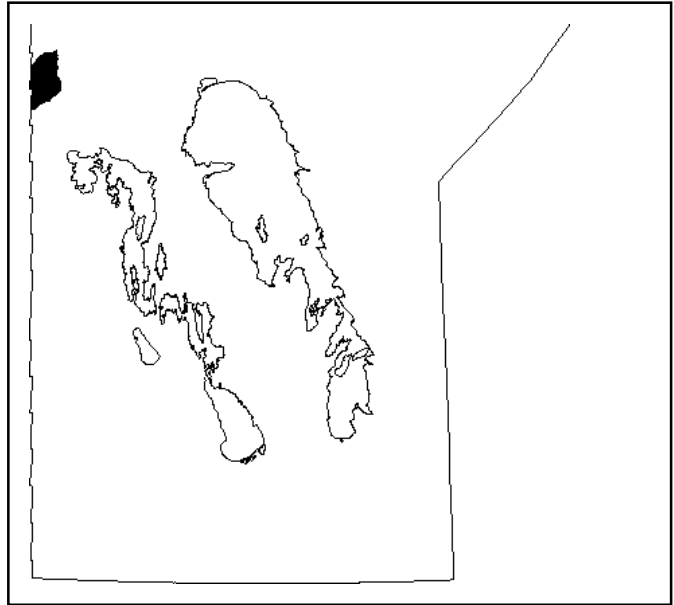
There are no climate stations in the Manitoba portion of the ecodistrict. However, data from the station at The Pas Airport is valid (See 667. Summerberry Ecodistrict).

Physiography and Drainage

The Saskatchewan Delta Ecodistrict extends westward from the The Pas Moraine, between the Saskatchewan and Pasquia rivers to Delta in Saskatchewan.

Topographically, this depressional ecodistrict is terminated abruptly on the east by the The Pas Moraine which rises 12 to 22 m above the delta. Elevations in the flood plain range from 264 masl at the Saskatchewan border to 259 masl at its eastern edge, falling at the rate of about 0.3 m per km. Its mean elevation is about 261 masl.

The unconsolidated materials are generally deep to very deep and composed of varying deposits. Alluvial sediments often overlie glaciolacustrine sediments, which in turn rest on glacial till, which may rest on limestone bedrock or possibly glaciofluvial gravels. The whole sequence can be over 100 m thick in some locations, or less than a few metres thick where bedrock is close to the surface.



The most significant relief within the western section is provided by drumlin-like till hillocks, which are elongated in a northwest-southeast direction. These hillocks rise from 2 to 20 m above the surrounding plain and have slopes of less than 5 percent.

Meandering levees within the flood plain are significant low-relief features, that are 0.6 to 2.0 m in height and range from 90 to 360 m in width. Levees along the contemporary Carrot and Pasquia rivers range from 1.2 m to 3.0 m high and from 180 m to 700 m wide. Slopes range from level on alluvial sediments to about 2 percent on levees.

Natural drainage of this plain is very slow because of its nearly level to depressed topography and is worsened by the levees which impede drainage into the natural waterways. The construction of ditches has improved drainage in some areas of the Manitoba portion of the ecodistrict.

The ecodistrict is part of the Saskatchewan River drainage system.

Soils

The dominant soils are poorly to very poorly drained, peaty, calcareous, loam to clay textured Rego Gleysols and Rego Humic Gleysols. Areas of poorly to very poorly drained, shallow to deep, slightly to moderately decomposed Fibrisolic and Mesisolic Organic soils become more prevalent in the western section.

Soils on well to imperfectly drained till ridges in the area are dominantly Eluviated Eutric Brunisols and Gray Luvisols. These soils have developed on extremely to very strongly calcareous, very cobbly to gravelly, loam to clay-loam textured, water-worked glacial till. Soil profile development is very shallow - usually less than 15 cm deep.

Lack of natural drainage is the major soil problem. Soil salinity is a problem in some locations. Excessive amounts of stones and cobbles associated with the till soils are also a limitation.

Vegetation

The ecodistrict is dominated by vegetation associated with the poorly to very poorly drained areas. Clumped willows, swamp birch and scattered balsam poplar are found on poorly drained and imperfectly drained sites, and stunted black spruce and tamarack, sedges and rushes in the very poorly drained peat areas.

In the natural state, levees supported balsam poplar, trembling aspen, elm, Manitoba maple, green ash, white birch, white spruce and balsam fir. Fire and logging has removed most of the conifers. Till upland areas have balsam poplar, trembling aspen, white spruce, jack pine and balsam fir.

Water

The principal sources of water are the rivers and streams that border on and flow through the ecodistrict, and from shallow ponds and lakes that occur within the delta. In Manitoba, surface water comprises about 8 percent of the ecodistrict. Variable-quality groundwater is also available from shallow sand and gravel aquifers associated with till, beach and inter-till outwash deposits. Well development is poor from dominantly Silurian bedrock formations as limestone aquifers consist of fractured rock and both water quantity and quality are variable.

Land Use

The town of The Pas is the largest settlement in the ecodistrict and serves as a trade, service and administrative centre for the ecodistrict and surrounding area. The Opaskwayak Cree Nation is the other community in the ecodistrict.

In Manitoba, only a limited portion of the alluvial soils is cultivated for cereal grains, oilseeds and hay crops. Much of the land in the area is public land and leased out for native pasture and hay. The ecodistrict provides important moose and waterfowl breeding habitat.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

670. Grand Rapids Ecodistrict (1760 km²)

The Grand Rapids Ecodistrict borders Lake Winnipeg and extends from just north of the mouth of the Saskatchewan River to Limestone Bay.

Climate

This ecodistrict is located in a warmer subdivision of the Subhumid Mid-Boreal Ecoclimatic Region in Manitoba. The climate is characterized by short, moderately warm summers and long, very cold winters. The mean annual temperature is 0.5°C and the average growing season is 163 days with about 1420 growing degree-days.

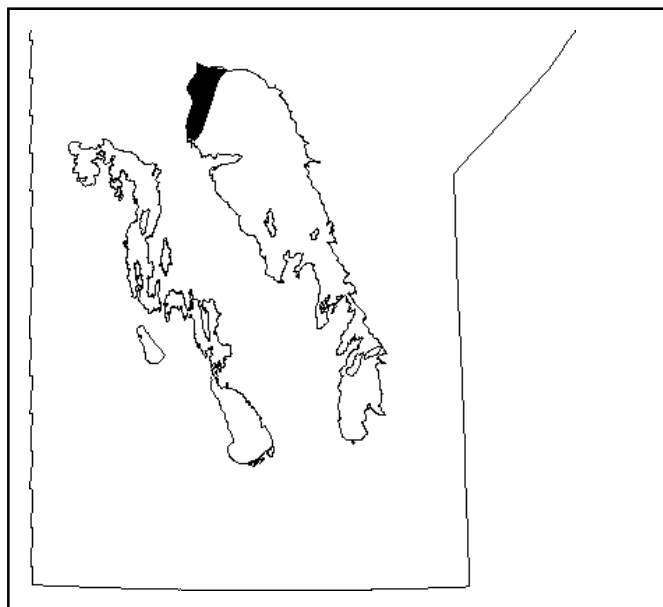
The mean annual precipitation is approximately 480 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the year is slightly over 80 mm. The ecodistrict has a humid, cold to moderately cold, Cryoboreal soil climate.

There is no climate station in the ecodistrict, but the station at Grand Rapids Hydro (666. Cedar Lake Ecodistrict) is located adjacent to the most southern extension of the ecodistrict; therefore the data is more relevant for the southern than for the northern part.

Physiography and Drainage

The nearly level, peatland-dominated Grand Rapids Ecodistrict is located along the northwestern shoreline of Lake Winnipeg from just north of the mouth of the Saskatchewan River to Limestone Bay at the north end of Lake Winnipeg. The ecodistrict has a mean elevation of about 244 masl. The ecodistrict's western boundary is marked by a prominent 25 m high limestone escarpment which separates it from the adjacent Cedar Lake Ecodistrict.

Local relief (0.5 to 2.0 m, and occasionally higher) occurs along meandering creeks that flow through the ecodistrict and along the shoreline of Lake Winnipeg. Subdued uplands include alluvial soils along creeks, some clayey and loamy glaciolacustrine and till deposits and relic beaches along Lake Winnipeg. Included in the ecodistrict are two islands in Lake Winnipeg. Eagle Island is dominated by bogs and gravelly beaches, while the larger Selkirk Island is a mixture of bogs, deep loamy till and shallow till veneers over limestone bedrock.



Soils

Deep to shallow, moderately decomposed Mesisolic Organic soils developed on sedge peat are the dominant soils. These soils have some potential for arable agriculture. Mesisolic Organic soils on moderately to well decomposed forest peat are significant inclusions. Eutric Brunisols, Gray Luvisols and Gleysols occur throughout and are associated with the minor mineral uplands. Sporadic patches of permafrost occur in the northern section.

Lack of natural drainage and poor heat conductance properties of organic soils are the major soil problems in the area.

Vegetation

The vegetation is dominated by communities associated with peatlands. Bog peatlands have generally stunted black spruce, ericaceous shrubs and moss vegetation. Stands are more closed and somewhat taller than farther north. Fen peatlands usually have sedge, brown mosses and varying quantities of swamp birch and stunted tamarack. Uplands support vegetation dominated by black spruce and jack pine. More favourable sites may also support white spruce and trembling aspen. A shrub layer of willow and alder is often quite widespread.

Water

On the whole, about 65 percent of the surface area of the ecodistrict is water due to the inclusion of a portion of Lake Winnipeg, which accounts for about 50 percent of the area. Lakes and streams and creeks form the principal source of water. Variable-quality groundwater is available from shallow sand and gravel aquifers associated with till, beach and inter-till outwash and lacustrine deposits. Well development is poor from fractured Lower Silurian and Ordovician limestone bedrock.

Land Use

There are no communities in the ecodistrict.

Virtually all of the land is public land and portions are leased for pulpwood and sawlog forestry. Other important uses are hunting, trapping and some water-oriented recreation. The area provides important moose and waterfowl breeding habitat.

Most of the ecodistrict has been included in a recently-created provincial park.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

671. Narrows Islands Ecodistrict (3251 km²)

The Narrows Islands Ecodistrict is mostly water and encompasses a large portion of Lake Winnipeg.

Climate

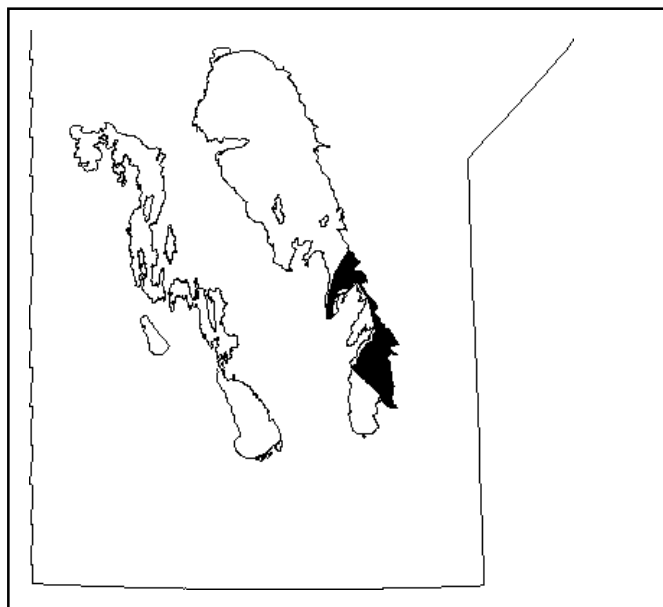
This ecodistrict is situated in the more humid and cooler subdivision of the Low Boreal Ecoclimatic Region in southern Manitoba. The climate is characterized by short, moderately warm summers and long, very cold winters. The climate of the islands, which form the land portion of the district, is affected to a greater degree by the moderating effect of the lake than the surrounding mainland. The figures described below are derived from climate stations based on the mainland, and therefore the data is only moderately relevant. The mean annual temperature is about 1.2°C, and the average growing season is 172 days with about 1500 growing degree-days.

The mean annual precipitation is approximately 560 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the year is nearly 60 mm. The district has a humid, cold to moderately cold, Cryoboreal soil climate.

Physiography and Drainage

The Narrows Islands Ecodistrict is situated in the Narrows area of Lake Winnipeg, which separates the southern basin of the lake from the much larger northern basin. The land portion is made up of a number of islands, which include the larger Hecla, Black and Deer islands off the eastern shore of the Grindstone Point area. Hecla Island is joined to the mainland by a causeway at Grassy Narrows. Moose, Little Moose, Black Bear, Matheson, Tamarack and Little Tamarack islands and a number of very small islands lie further north within Fisher Bay.

Mean elevations of the islands range from lake level at about 217 masl to about 235 masl. The low-relief topography of the islands is generally level to hummocky, reflecting the nature of the underlying Ordovician limestone bedrock.



The islands in Fisher Bay consist mostly of thin, loamy, water-worked till over limestone bedrock which is partially covered by clayey glaciolacustrine sediments. The more southerly islands are primarily clayey and loamy glaciolacustrine materials, covered in part by peat. However, Black Island is largely water-worked, stony, sandy till. On the extreme eastern shores of Black and Deer islands, surface deposits consist mainly of siliceous sandy deposits originating from quartzose sandstone.

Soils

Clayey Gray Luvisolic soils developed on the well to imperfectly drained hummocky till ridges which are covered with a variable layer of glaciolacustrine clay are dominant on the islands in Fisher Bay. Significant areas of poorly drained, shallow Mesisolic and Fibrisolic Organic soils and peaty Gleysolic clayey soils occur on Hecla Island and in level depressions on most of the other islands. Sandy Gray Luvisolic and Dystric Brunisolic soils are dominant on Black Island and on the east end of Deer Island.

Excessive amounts of stones and cobbles, irregular topography and lack of natural drainage, particularly on Hecla Island, contribute to the soil problems.

Vegetation

Vegetation is varied. On imperfectly and moderately well drained sites, stands of black and white spruce, often mixed with trembling aspen, balsam fir and white birch are dominant. Common understory species are hazel, mountain maple and snowberry. On poorly drained and organic soils, black spruce is dominant.

Feather mosses are the dominant groundcover on wet mineral soils, while sphagnum mosses are dominant on organic soils. Very poorly drained fens have sedge, brown moss, sedge and tamarack vegetation. On drier till ridges and former beaches, jack pine often forms pure stands, due in part to site conditions and in part to fire history.

Red pine stands on Black Island are the most northerly in Manitoba.

Water

The principal source of water is Lake Winnipeg. Variable-quality groundwater is also available from shallow sand and gravel aquifers associated with glacial till, beach and inter-till outwash deposits, and from the Winnipeg formation of sandstone on Black and Deer islands. Well development from underlying Ordovician limestone bedrock aquifers are variable both in water quantity and quality.

Land Use

There are no permanent communities in the ecodistrict.

Both the mineral and organic soils have some potential for arable agriculture. Most of the ecodistrict is public land where water-oriented recreation, hunting and trapping are dominant uses. Hecla Island is a provincial park and provides significant habitat for moose, deer, black bear, small mammals, songbirds, raptors and many species of waterfowl. Black Island is a source of silica sand.

Marsh



Marshes are wetlands with shallow water that usually fluctuates daily, seasonally or annually due to tides, evaporation, groundwater recharge, or seepage losses. Parts of a marsh may fall dry at times. Marshes are important habitat for breeding and staging waterfowl, and as nurseries for a wide variety of aquatic life from insects to fish. Marshes occur throughout Manitoba. The two largest marshes in southern Manitoba are Netley Marsh on the southern end of Lake Winnipeg, and Delta Marsh at the southern end of Lake Manitoba. Oak Hammock Marsh, north of Winnipeg, is the largest restored marsh in Manitoba.

est marshes in southern Manitoba are Netley Marsh on the southern end of Lake Winnipeg, and Delta Marsh at the southern end of Lake Manitoba. Oak Hammock Marsh, north of Winnipeg, is the largest restored marsh in Manitoba.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

672. Overflowing River Ecodistrict (2904 km²)

The Overflowing River Ecodistrict straddles the border with Saskatchewan. About half of the ecodistrict lies within Manitoba.

Climate

This ecodistrict lies within a cooler subdivision of the Mid-Boreal Ecoclimatic Region in west-central Manitoba. The climate is characterized by short, moderately warm summers and long, very cold winters. The mean annual temperature is -0.2°C, the average growing season is 167 days and the number of growing degree-days is slightly over 1300.

The mean annual precipitation is approximately 450 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the growing season is about 125 mm. The ecodistrict has a humid, cold to moderately cold, Cryoboreal soil climate.

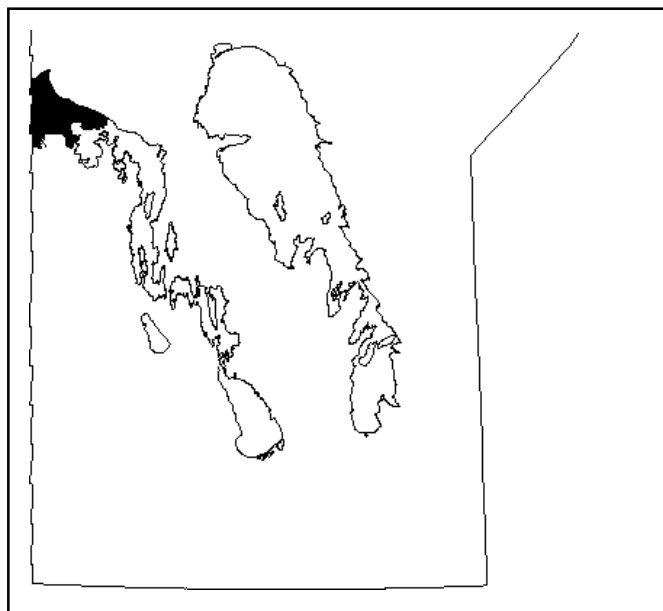
There are no climate stations in the ecodistrict. The nearest is the station at The Pas Airport (668. The Pas Moraine Ecodistrict), which is relevant.

Physiography and Drainage

The Overflowing River Ecodistrict is a smooth, level area bounded by the Pasquia Hills on the northwest and the Porcupine Hills on the south. These uplands rise 400 to 500 m above this lowland plain while the The Pas Moraine to the northeast extends to an approximate maximum of 38 m above the plain.

Elevations range from 305 masl at the Saskatchewan border to about 266 masl along the Overflowing River near Dawson Bay, which forms the eastern edge of the ecodistrict. The land surface slopes gently to the east at the rate of about 1.0 metre per km. Relief along river banks and lake shores ranges from 2.0 to 3.0 m. Long slopes, largely over 150 m long, have inclines that range from almost level to less than 2 percent.

Surficial deposits are dominantly shallow and deep organic materials. The peat materials are derived from sedges, brown mosses and sphagnum mosses and are un-



derlain by calcareous, loamy to clayey glaciolacustrine and till deposits. Most of the peatlands are in the form of flat bogs, which have generally a thick, slightly decomposed sphagnum peat surface layer. An extensive area of horizontal and patterned fens occurs between Overflow Bay and the The Pas Moraine. This is an area of shallow and deep, moderately decomposed fen peat.

Moderately well to poorly drained subdued uplands of glaciolacustrine and till deposits occur throughout the ecodistrict.

Drainage in the ecodistrict is generally slow. Most of the drainage is provided by the Overflowing River, and a number of small creeks. Most of the ecodistrict is part of the Lake Winnipegosis watershed, while the northern sector is part of the Saskatchewan River watershed, which are both part of the Nelson River drainage system.

Soils

The dominant soils are poorly to very poorly drained, shallow to deep, slightly decomposed Fibrisols and moderately decomposed Mesisols. On well to imperfectly drained till ridges in the area, soils are dominantly Eluviated Eutric Brunisols and Gray Luvisols that have developed on extremely to very strongly calcareous, slightly cobbly to very cobbly to gravelly, loamy to clay-loam water-worked glacial till. Soil profile development is very shallow (usually less than 15 cm thick). Gray Luvisols and Dark Gray Chernozems are associated also with clayey glaciolacustrine and till sediments.

Lack of natural drainage and poor thermal conductance properties limit the usefulness of organic soils. Excessive amounts of stones and cobbles associated with the till soils are a major problem, but the limited areas of clayey glaciolacustrine and clayey, less stony till deposits have potential for arable agriculture.

Vegetation

The vegetation in the ecodistrict is dominated by peatland vegetation. Black spruce is widespread and is associated with bog peatlands. Black spruce growth varies from closed, medium-tall stands to open, stunted stands, depending on drainage and depth of sphagnum peat. Generally, bog peatlands that are somewhat raised and contain moderately well decomposed forest peat in the surface layers support the better stands. However, large areas are dominated by black spruce, sphagnum moss and ericaceous shrub vegetation.

The fens are dominated by sedges, brown mosses and varying amounts of shrubs such as swamp birch and willow. Tamarack occurs in varying quantities as well.

The uplands are dominated by stands of black spruce mixed with varying quantities of balsam fir, white birch, trembling aspen and jack pine, with a varying understory of shrubs such as alder, willow and hazel, ericaceous shrubs and a ground cover varying from feather mosses to herbs and forbs.

Water

The principal source of water is the Overflowing River, as well as water from the shallow bays of Lake Winnipegosis. Very limited quantities of variable-quality groundwater are available from shallow aquifers of sand and gravel associated with till, beach and inter-till outwash and deposits. Well development is poor from dominantly Silurian bedrock formations. Limestone aquifers consist of fractured rock and yield water of variable quantity and quality.

Land Use

There are no communities in the ecodistrict.

Limited pulpwood forestry is conducted in the ecodistrict. Most of the land in the area is public land. The ecodistrict is important as moose habitat, and as habitat for water-fowl breeding.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

674. Pelican Lake Ecodistrict (5458 km²)

The Pelican Lake Ecodistrict is situated in the south-central part of the Mid-Boreal Ecoregion.

Climate

This ecodistrict is located in a warmer subdivision of the Subhumid Mid-Boreal Ecoclimatic Region in west-central Manitoba. The climate is characterized by short, moderately warm summers and long, cold winters. The mean annual temperature is 0.7°C, and the average growing season is 171 days with about 1400 growing degree-days.

The mean annual precipitation is approximately 490 mm of which less than one-third falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the year is nearly 100 mm. The ecodistrict has a humid, cold to moderately cold, Cryoboreal soil climate.

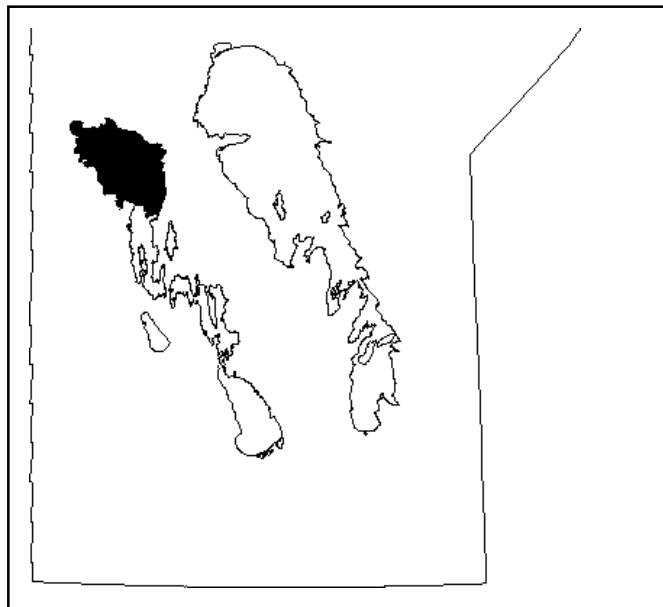
The climate, especially on the two peninsulas, is to some extent influenced by the expanse of Lake Winnipegosis bordering it.

There are no climate stations in the ecodistrict. The nearest stations are at Swan River (717. Swan Lake Ecodistrict), The Pas Airport (668. The Pas Moraine Ecodistrict), and at Grand Rapids Hydro (666. Cedar Lake Ecodistrict). Data from these stations is only moderately relevant to this ecodistrict.

Physiography and Drainage

The Pelican Lake Ecodistrict encompasses the northern part of Lake Winnipegosis. The land area of the ecodistrict includes Birch Island and two wide peninsulas bordered by Lake Winnipegosis. The ecodistrict is basically a nearly level plain with a mean elevation of about 229 masl.

The land surface has a prominent north-south trending drumlinoid or ridge and swale topographic pattern. The fluted ridges, ranging from about 400 to 800 m wide, are separated by variable-sized swales or depressions up to 800 m wide. Glacial deposits can vary in thickness from less than 10 cm, where limestone bedrock outcrops, to more than 30 m. Level peatlands are prominent.



Following the retreat of the continental glacier, the surface of this ridged till plain was covered by glacial Lake Agassiz and subsequently modified by wave action and by icebergs scouring the ridges. The scouring by icebergs resulted in the formation of strongly intersecting micro-grooves or flutes that are usually curvi-linear in form. Wave action has resulted in local textural differentiation. The drumlinized ridges tend to have a coarser texture and are cobbly and gravelly, while the depressions generally have a finer texture.

The ecodistrict slopes very gently northeastward at approximately 0.6 m per km. Local relief is subdued with ridge to swale relief generally in the range of 0.5 to 3.0 m. Slopes range from level to less than 5 percent.

Drainage is generally in a northeasterly direction reflecting surface configuration. Most drainage is by creeks flowing into bays of Lake Winnipegosis. The ecodistrict is part of the Lake Winnipegosis watershed, which is part of the Nelson River drainage system.

Soils

On well to imperfectly drained ridges, soils are dominantly Eluviated Eutric Brunisols that have developed on extremely to very strongly calcareous, very cobbly to gravelly, loamy to clay-loam water-worked glacial till. Soil profile development is very shallow and is usually less than 15 cm deep. Significant areas of poorly drained peaty Gleysolic soils occur in the swales. Shallow, slightly to moderately decomposed (fibric to mesic) organic soils are significant soil inclusions.

Excessive amounts of stones and cobbles, an irregular topographic pattern that runs perpendicular to the general regional slope and lack of natural drainage contribute to the soil problems.

Vegetation

The vegetation on the uplands and ridges is a mixture of black and white spruce, trembling aspen, balsam fir and white birch. Wetter areas have increasing amounts of black spruce and balsam poplar. Jack pine is present on drier sites. The understory consists of shrubs such as alder and hazel. Groundcover varies from feather mosses to herbs and forbs, with the former more prevalent under coniferous stands and the latter more often associated with deciduous stands.

Low-lying areas are dominated by sedges with varying amounts of herbs and forbs and some shrub. Peatlands vary from bogs with black spruce and sphagnum mosses to fens with sedge, tamarack and swamp birch.

Water

The principal sources of water are Pelican Lake and the bays of Lake Winnipegosis. Approximately 45 percent of the ecodistrict is covered by water, when all lakes, including parts of Lake Winnipegosis, ponds, rivers and creeks are included. Variable-quality groundwater is also available from shallow aquifers of sand and gravel associated with till, beach and inter-till outwash and glaciolacustrine deposits. Well development from underlying Silurian bedrock aquifers varies greatly both in terms of water quantity and quality.

Land Use

The Sapotaweyak First Nation (Shoal Lake) community is the only settlement in the ecodistrict.

Most of the land is public land and a significant portion is leased out for native pasture and hay. The ecodistrict provides important moose and waterfowl breeding habitat.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

675. Chitek Lake Ecodistrict (2886 km²)

The Chitek Lake Ecodistrict is situated in the south-central part of the Mid-Boreal Lowland Ecoregion. It is bordered on the west by Lake Winnipegosis, on the north by the The Pas Moraine, and extends east almost to Lake Winnipeg.

Climate

This ecodistrict lies within a warmer subdivision of the Subhumid Mid-Boreal Ecoclimatic Region in Manitoba. The climate is characterized by short, moderately warm summers and long, cold winters. The mean annual temperature is 0.5°C, the average growing season is 166 days, and the number of growing degree-days is about 1420.

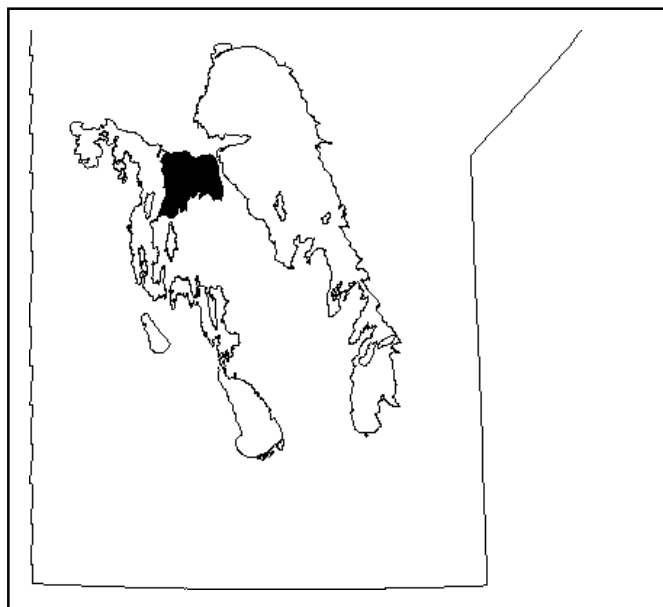
The mean annual precipitation is approximately 480 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the year is about 60 mm. The district has a humid, cold to moderately cold, Cryoboreal soil climate.

There are no climate stations in the ecodistrict. The nearest is Grand Rapids Hydro (666. Cedar Lake Ecodistrict). Data from this station is only moderately relevant.

Physiography and Drainage

The Chitek Lake Ecodistrict is generally a plain with a mean elevation of about 259 masl. The ecodistrict has a subdued north-south trending drumlinoid or ridge and swale topographic pattern. The fluted ridges, ranging from about 400 to 800 m wide, are separated by variable-sized swales or depressions up to 800 m wide. Glacial deposits can vary in thickness from less than 10 cm, where limestone bedrock outcrops, to more than 30 m. Slopes range from level to less than 5 percent. Regional relief is approximately 0.6 m per km, while local relief from ridge to swale is approximately 0.5 to 3 m. Level peatlands are prominent.

Drainage is slow due to the flatness of the terrain and the impediment caused by the ridge and swale topography perpendicular to the overall slope of the land. The drainage system is poorly developed and the creeks tend to drain in a north to northeasterly direction.



The western part of the ecodistrict lies in the Lake Winnipegosis watershed, while the eastern part lies in the Long Point watershed. Both are part of the Nelson River drainage system.

Soils

The dominant mineral soils are Gray Luvisols that have developed on well to imperfectly drained clayey till ridges, and Eutric Brunisols that have developed on extremely to very strongly calcareous, very cobbly to gravelly, loamy textured water-worked glacial till. A significant area of Mesisols, developed on woody forest peat, occurs in the centre of the ecodistrict. Local areas of poorly drained, peaty Gleysolic soils and shallow, slightly to moderately decomposed (fibric to mesic) organic soils are soil inclusions in the swales.

Excessive amounts of stones and cobbles, irregular topographic pattern that runs perpendicular to the general regional slope and lack of natural drainage contribute to the soil problems.

Vegetation

Forest stands on uplands and ridges are generally a mixture of black spruce, jack pine and trembling aspen. The species composition varies with drainage and fire history. Well drained sites with coarse textured soils, and sites recovering from fire, usually have stands with, or dominated by, jack pine. Favourable sites, especially those along waterways and lakes, may have a significant component of white spruce.

The shrub understory varies with drainage and soil texture as well. The more moist sites have willow and red-osier dogwood dominant in the shrub layer, while drier sites have alder and hazel shrub. Ericaceous shrubs are often associated with stands dominated by conifers. Feather mosses are widespread in coniferous stands, while forbs and herbs are more associated with deciduous stands.

The peatlands are dominantly level and consist of complexes of peat plateau bogs and horizontal and water track fens. The bogs have black spruce, sphagnum moss and ericaceous shrub vegetation, while the fens have sedge, tamarack and swamp birch vegetation.

Water

The principal source of water is variable-quality groundwater from shallow aquifers of sand and gravel associated with till, beach and inter-till outwash and glaciolacustrine deposits. Numerous lakes and ponds also provide surface sources of water. Well development from Silurian limestone bedrock aquifers are variable both in terms of quantity and quality.

Land Use

There are no settlements in the ecodistrict.

The clayey textured, Gray Luvisolic till soils and some organic soils have some potential for arable agriculture. Most of the land is public land and leased out for limited pulpwood and sawlog forestry. Other land uses are hunting and trapping. Limited water-oriented recreation takes also place. The ecodistrict provides extensive habitat for moose, deer, black bear, small mammals, songbirds and waterfowl.

White Pelicans



White pelicans nest on some low islands in Kaweenakunik (Kawinaw) Lake. The left photo shows a pelican nursery, consisting of a group of young pelicans of approximately the same age. The right photo shows adult pelicans and gulls wheeling around. The latter feed on dead pelican chicks and spoiled eggs.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

676. Sturgeon Bay Ecodistrict (21 213 km²)

The Sturgeon Bay Ecodistrict consists of a land area that extends along the west side of Lake Winnipeg from Wicked Point in the north to Fisher Bay in the south, and an extensive area consisting of most of the North Basin of Lake Winnipeg, including Reindeer, Berens and Commissioner islands and some smaller islands.

Climate

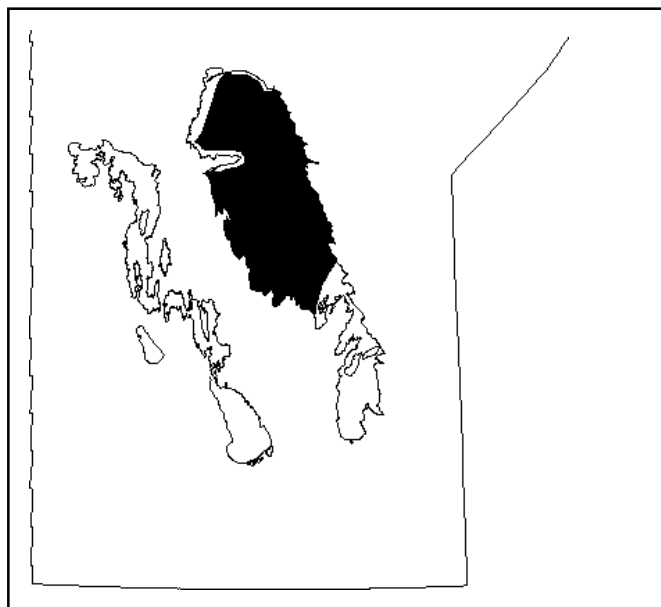
This ecodistrict lies within a warmer subdivision of the Subhumid Mid-Boreal Ecoclimatic Region in Manitoba. The climate is characterized by short, moderately warm summers and long, cold winters. The mean annual temperature is 0.3°C, the average growing season is 166 days, and the number of growing degree-days is about 1430.

The mean annual precipitation is approximately 510 mm, of which slightly more than one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the year is around 70 mm. The ecodistrict has a humid, cold to moderately cold, Cryoboreal soil climate.

The proximity of Lake Winnipeg has a moderating effect on the climate, especially along the shore and on the islands and peninsulas. There are no climate stations in the ecodistrict.

Physiography and Drainage

The Sturgeon Bay Ecodistrict has a mean elevation of about 259 masl. The eastern half has a prominent north-south trending drumlinoid or ridge and swale topographic pattern. The fluted or grooved ridges, ranging from about 400 to 800 m wide, are separated by variable-sized swales or depressions up to 800 m wide. Following the retreat of the continental glacier, the ecodistrict was covered by glacial Lake Agassiz and consequently, the surface of this level to ridged till plain was modified by wave action and by icebergs scouring the ridges. Wave action has resulted in local textural differentiation. The drumlinized ridges tend to have a coarser texture and are more cobbly and gravelly, while the depressions have finer textured sediments. Iceberg scouring has produced strongly intersecting micro-grooves or flutes that are usually curvi-linear in surface form.



The area slopes gently northeastward to Lake Winnipeg at approximately 0.6 m per km. Local relief (ridge to swale) is approximately 0.5 to 3.0 m. Slopes are generally gentle and range from level to less than 5 percent. Level peatlands dominate the west half of the ecodistrict.

Drainage is slow due to the surface topography. As a result, a large portion of the ecodistrict is covered by shallow to deep fibric and mesic peat. Most peatlands are flat bogs and peat plateau bogs, but a considerable area consists of horizontal fen and water track fen. The ecodistrict is drained by a number of creeks and rivers which generally drain in a northeasterly direction. The ecodistrict lies in the Lake Winnipeg South watershed division, which is part of the Nelson River drainage system

Soils

Very poorly drained shallow to deep, moderately decomposed (Mesisols) organic soils are dominant. Significant areas of very poorly drained sphagnum Fibrisols occur between Sturgeon Bay and Kinwow Bay. Local soils that occur on well to imperfectly drained ridges in the area are dominantly Eluviated Eutric Brunisols that have developed on extremely to very strongly calcareous, very cobbly to gravelly, loamy to clay textured water-worked glacial till.

Excessive amounts of stones and cobbles, an irregular topographic pattern that runs perpendicular to the general regional slope and lack of natural drainage contribute to the soil problems.

Vegetation

Due to the extensive amounts of shallow and deep peatlands and poorly drained mineral soils with a peaty surface, black spruce is the dominant tree. The black spruce is associated with bogs and transitional bogs and poorly drained mineral soils. Growth on the bogs is generally less vigorous than on the mineral soils, but good growth can be encountered on peatlands consisting of mesic forest peat. The associated vegetation varies from sphagnum and feather mosses, ericaceous shrubs such as Labrador tea, leatherleaf and bog rosemary, swamp birch on bogs, to sedges, mosses, tamarack and willow on transitional bogs. Fens have vegetation dominated by tamarack, sedges, brown mosses, willow and swamp birch shrub, and occasionally some black spruce.

The uplands have a varied vegetation reflecting differences in drainage, soil texture and fire history. Stands are generally mixed with varying quantities of black spruce, jack pine, trembling aspen and white spruce. Shrubs include willow and red-osier dogwood on wetter sites and ericaceous shrubs on dry sites. Feather mosses are common as groundcover in coniferous stands. Herbs and forbs are the dominant ground cover in deciduous stands, which generally have a hazel shrub layer.

Water

The principal source of water is variable-quality groundwater from shallow aquifers of sand and gravel associated with till, beach and inter-till outwash and glaciolacustrine deposits. Numerous lakes and ponds provide sources of surface water in the eastern half of the ecodistrict. Surface water, which includes most of the north basin of Lake Winnipeg, comprises over 80 percent of the ecodistrict. Silurian limestone bedrock aquifers are variable both in water quantity and quality.

Land Use

The Dauphin River and Jackhead First Nations are the only communities in the ecodistrict.

The till and organic soils have some potential for arable agriculture. All of the land is public land and leased for pulpwood and sawlog forestry. Other uses are hunting and trapping. Water-oriented recreation is not well developed due to the lack of settlements. The ecodistrict provides extensive habitat for moose, deer, black bear, small mammals, songbirds and waterfowl.

Boreal Plains Ecozone

Mid-Boreal Lowland Ecoregion

677. Grindstone Ecodistrict (2382 km²)

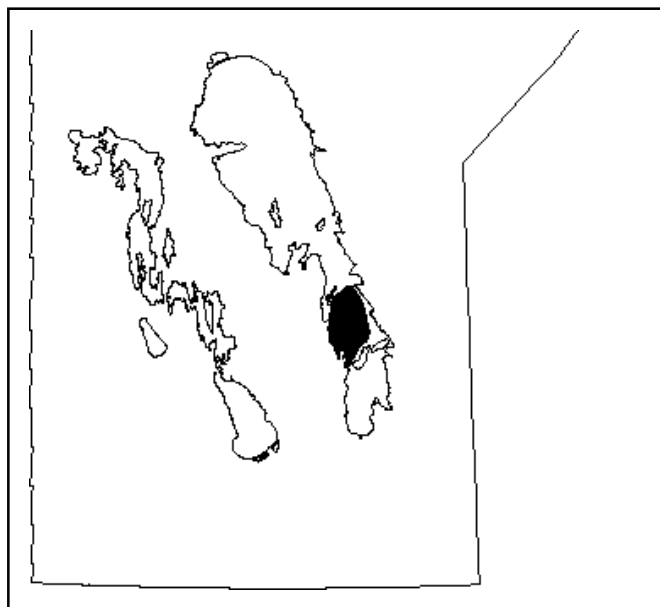
The Grindstone Ecodistrict consists of a land area along the west shore of Lake Winnipeg and part of the Lake Winnipeg Narrows area.

Climate

This ecodistrict lies within the more humid and cooler subdivision of the Low Boreal Ecoclimatic Region in southern Manitoba. The climate is characterized by short, warm summers and long, cold winters. The mean annual temperature is about 0.9°C, the average growing season is 171 days, and the number of growing degree-days is around 1470.

The mean annual precipitation is approximately 580 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average yearly moisture deficit is around 50 mm. The ecodistrict has humid, cold to moderately cold, Cryoboreal soil climate.

Climate is moderated by the proximity of Lake Winnipeg. As the Pine Dock climate station is located near Lake Winnipeg, the data is probably somewhat less representative of the inland area to the west.



Selected Climate Data¹ for Pine Dock

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	1.0	17.3	14.5	18.9	-20.0
Precip. mm (equiv.)	610.0	248.4	369.8	71.4	32.0
Rain/Snow (mm/cm)	428.7/181.6	248.4/0.0	365.0/4.7	71.4/0.0	0.0T/32.0
Growing degree-days >5°C	N	1128.9	1484.9	431.9	N

¹ Canadian Climate Normals, 1951-1980. Atmospheric Environment Service, Environment Canada.

Physiography and Drainage

The Grindstone Ecodistrict is a plain with a mean elevation of about 229 masl. On the mainland portion, and to some extent in the remainder of the ecodistrict, the surface has a moderate north-south trending, drumlinoid or ridge and swale topographic pattern. The ridges, ranging from about 400 to 800 metres wide, are separated by variable sized swales or depressions up to 800 m wide. Glacial deposits in the area can vary in thickness from less than 10 cm, where limestone bedrock outcrops, to well over 10 metres.

Following the retreat of the continental glacier, the ecodistrict was covered by glacial Lake Agassiz. During this time, the surface of the plain was modified by wave action and by icebergs scouring the ridges. Iceberg scouring has produced strongly intersecting micro-grooves or flutes that are usually curvi-linear in surface form. Wave action has caused the ridges to have coarse textures with very cobbly and gravelly surfaces. The depressional ar-

as have finer textured sediments, as the lower portions of the till plain and depressions are covered by clayey sediments deposited by glacial Lake Agassiz.

Slopes are generally gentle and range from level to less than 5 percent. Regional relief over the ecodistrict changes approximately 0.6 m per km. Local relief (ridge to swale) is approximately 0.5 to 3.0 m.

Due to its topographic characteristics, most of the ecodistrict is poorly drained. As a result, the ecodistrict is extensively covered by peatlands. For example, the area around Moose Lake is dominated by extensive level peatland. The peatlands consist of flat bogs, some raised bogs and horizontal fens.

Drainage is provided by a number of creeks draining into Lake Winnipeg. The ecodistrict lies within the Lake Winnipeg watershed division, which is part of the Nelson River drainage system.

Soils

Typic (deep) Fibrisols developed on sphagnum moss peat dominate in the ecodistrict. Significant other organic soils include Typic (deep) Mesisols developed on sedge and brown moss peat. Extensive areas of Terric (shallow) Fibrisols and Mesisols developed on a variety of peat materials also occur as significant inclusions.

Upland soils are well drained Eluviated Eutric Brunisols on very strongly to extremely calcareous loamy till, imperfectly drained Gray Luvisols, and Dark Gray Chernozems on strongly calcareous, clayey, glaciolacustrine sediments which frequently overlie till at shallow depth. Significant areas of poorly drained, clayey, peaty Gleysolic soils occur in the swales and along the edges of peatlands.

Excessive amounts of stones and cobbles, an irregular topographic pattern that runs perpendicular to the general regional slope and lack of natural drainage contribute to the soil problems.

Vegetation

The vegetation is dominated by that associated with the peatlands. Stunted black spruce, ericaceous shrubs and sphagnum moss is the dominant vegetation on the bogs in the Moose Lake area. Sedge, tamarack and swamp birch are the dominant vegetation associated with shallow and deep fens. On clayey soils, trembling aspen with white spruce, and understories of alder, hazel and red-osier dogwood are common. Trembling aspen, jack pine and white spruce, with a variety of shrubs, grasses and herbs are found on well drained till areas.

Water

The principal source of water is variable-quality groundwater from shallow aquifers of sand and gravel associated with till, beach and inter-till outwash and deposits. Good quality water can be obtained from Lake Winnipeg. Well development from Silurian limestone bedrock aquifers is variable both in water quantity and quality.

Land Use

There are only a couple of hamlets along the shore of Lake Winnipeg.

The mineral and organic soils have some potential for arable agriculture. Much of the land is public land and leased for pulpwood and sawlog forestry. Other land uses include hunting and trapping. The Grindstone Point area of the ecodistrict is part of provincial recreational park, and has significant cottage development which is tied to water-oriented recreation. The ecodistrict provides habitat for moose, deer, black bear, small mammals, songbirds and waterfowl.

Boreal Plains Ecozone

Boreal Transition Ecoregion

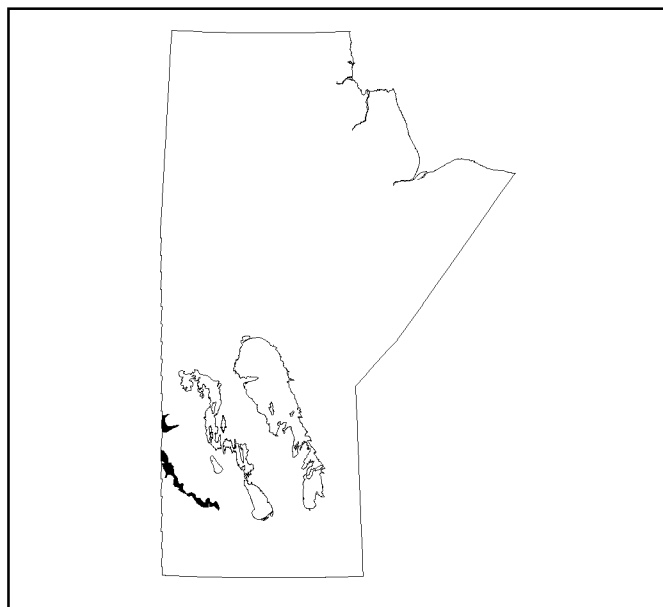
149. Boreal Transition Ecoregion

In Manitoba, the Boreal Transition Ecoregion consists of a narrow belt of wooded upland bordering Riding Mountain, Duck Mountain and part of the gap between Duck Mountain and Porcupine Hills. It forms a portion of the extensive deciduous forest belt that extends from southeastern Manitoba to the Peace River in north-central Alberta. The ecoregion presents a mosaic of farmland and forest, and marks the southern limit of closed boreal forest and the northern advance of commercial arable agriculture in the prairie provinces.

Climate

In Manitoba, this ecoregion is part of the Subhumid Low Boreal Ecoclimatic Region which is characterized by short, warm summers and long, cold winters. The mean annual air temperature is around 0.6 °C, the mean growing season varies with elevation but averages 171 days, and the number of growing degree-days is around 1400.

The average annual precipitation is about 480 mm. Precipitation varies greatly from year to year and is highest during the growing season. The average yearly moisture



deficit is about 150 mm. The ecoregion has a subhumid, moderately cold, Cryoboreal to subhumid, cool, Boreal soil climate.

The only climate station in the ecoregion was at Roblin.

Selected Climate Data¹ for Roblin

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr.
Temp. °C	-21.7	-17	-10.2	1.9	10.2	14.8	17.5	16.1	10.0	4.0	-6.9	-16.4	0.2
Precip. mm	26.6	16.6	23.9	20.7	48.0	79.4	65.8	52.0	66.8	31.5	24.6	20.8	476.7
Growing degree-days	0.0	0.0	0.4	31.4	171.8	296.1	387.4	345.8	161.5	48.6	1.3	0.0	1444.3

¹ Canadian Climate Normals, 1951-1980. Atmospheric Environment Service, Environment Canada.

Surficial Materials and Landforms

In Manitoba, this upland is comprised of Cretaceous shale, which is covered almost entirely by thick, kettle to hummocky, calcareous glacial till and fluvio-glacial deposits. In Manitoba, this region encircles the prominent uplands comprising the Mid-Boreal Uplands Ecoregion and ranges in elevation from 350 masl in the gap between Duck Mountain and Porcupine Hills to 640 masl along the boundary with Riding Mountain. Associated with the rough topography of the morainic deposits are a large number of small lakes, ponds and sloughs occupying shallow depressions. These are especially common in the area south of Riding Mountain.

Soils

Well drained Dark Gray Chernozemic soils are predominant and associated with all types of deposits. Local areas of Gray Luvisols also occur in these uplands and are generally associated with clayey till and glaciolacustrine sediments, especially those found at the higher elevations. Other soils are peaty Gleysols and Organic Mesisols found in low-lying areas.

Vegetation

A closed cover of tall trembling aspen with secondary quantities of balsam poplar and an understory of mixed herbs and tall shrubs is the predominant vegetation. White spruce and balsam fir are the climax species but are not well represented because of forest fires and logging. Water-filled depressions and poorly drained sites are usually covered with sedges, willow, some black spruce and tamarack.

Land Use

In Manitoba, this ecoregion remains for the most part in its native state. Limited production of spring wheat, other cereals, oilseeds and hay crops are characteristic in other portions of the region. Native hay and pasture are more prevalent on the steeper slopes. The ecoregion provides habitat for white-tailed deer, black bear, moose, ruffed grouse, beaver, coyote, rabbit and waterfowl.

There is only one ecodistrict within the Boreal Transition Ecoregion in Manitoba.

Boreal Plains Ecozone

Boreal Transition Ecoregion

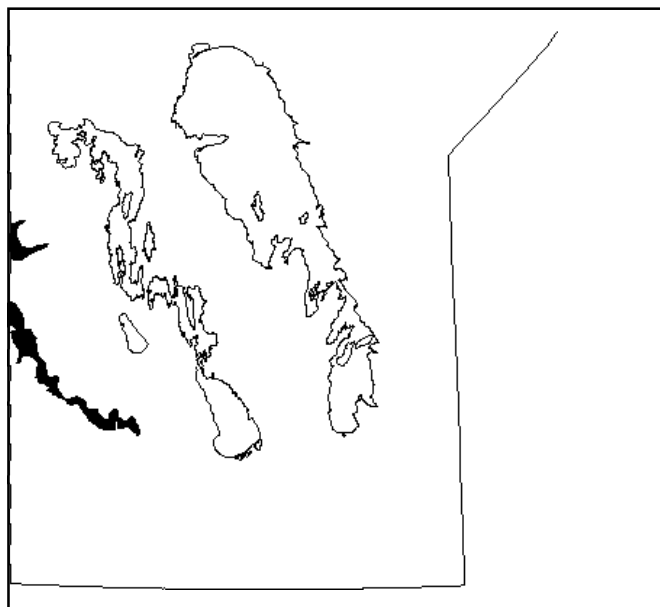
709. Swan River Ecodistrict (3015 km²)

In Manitoba, the Swan River Ecodistrict coincides with the same area as the Boreal Transition Ecoregion and consists of a belt bordering Riding Mountain and Duck Mountain and part of the erosional gap between Duck Mountain and Porcupine Hills. The ecodistrict extends well into Saskatchewan and slightly less than half of the total area is in Manitoba.

Climate

This ecodistrict lies within a cooler subdivision of the Low Boreal Ecoclimatic Region in Manitoba. The climate is characterized by short, warm summers and cold winters. The mean annual air temperature is 0.6°C, the mean growing season is 171 days, and the average number of growing degree-days is around 1400.

The mean annual precipitation is approximately 480 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year and peaks in early summer. The average yearly moisture deficit is about 150 mm. The district has a subhumid, moderately cold, Cryoboreal soil climate.



The only climate station in the ecodistrict was at Roblin, which is now closed. Climate data from the station at Swan River is also valid for the district, especially for the area between the Duck Mountain and Porcupine Hills (See 717. Swan Lake Ecodistrict).

Selected Climate Data¹ for Roblin

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	0.2	16.1	3.7	17.5	-21.7
Precip. mm (equiv.)	476.7	197.2	312.0	65.8	26.6
Rain/Snow (mm/cm)	351.1/124.0	197.2/0.0	306.2/5.5	65.8/0.0	0.0/25.7
Growing degree-days >5°C	1444.0	1029.0	1363.0	387.0	0.0

¹ Canadian Climate Normals, 1951-1980. Atmospheric Environment Service, Environment Canada.

Physiography and Drainage

The Swan River Ecodistrict is a narrow wooded upland belt bordering Riding Mountain, Duck Mountain and Porcupine Hills, and extends westward into Saskatchewan. Within Manitoba, elevations of this hummocky morainal upland range from about 580 to 610 masl along the boundary with Riding and Duck mountains to about 350 m in the gap between Duck Mountain and Porcupine Hills. Slopes within the upland are moderately steep, ranging from 5 to about 15 percent, and range in length from 50 to 100 m. Local relief in the upland exceeds 30 m in some places.

Parts of the ecodistrict are dissected with deep channels and gullies. Some are tributary to the Swan River in the erosional gap between Duck Mountain and Porcupine Hills. The Shellmouth, Assiniboine, Birdtail and Minnedosa (Little Saskatchewan) rivers and Boggy Creek, course south and southeasterly from Duck Mountain and Riding Mountain. Portions of these rivers are deeply incised and relief along these portions exceeds 60 m.

Drainage is provided by the rivers listed, which belong primarily to two drainage divisions. The northern sector is part of the Dauphin River division, while the area south of Riding Mountain lies in the Assiniboine division. Both divisions are part of the Nelson River drainage system.

Soils

Well drained Chernozemic Dark Gray soils that have developed on calcareous, loamy to clayey textured glacial till predominate. Chernozemic Dark Gray soils also occur on fluvio-glacial deposits and on sandy relic beaches. Local areas of well drained Gray Luvisols, generally associated with clayey till and pockets of glaciolacustrine sediments, occur at higher elevations. Poorly drained peaty Gleysolic soils and shallow (Terric), moderately decomposed organic soils occur in depressions which are widespread in some parts of the ecodistrict.

Vegetation

A closed cover of tall trembling aspen with secondary quantities of balsam poplar and an understory of mixed herbs and tall shrubs is the predominant vegetation. White spruce and balsam fir are the climax species but are not well represented because of logging and wildfires. Water-filled depressions and poorly drained sites are usually covered with sedges, willow, some black spruce and tamarack.

Water

The principal sources of water are variable quality groundwater and surface water from the numerous rivers and creeks emanating from the uplands. The groundwater occurs primarily in shallow, stratified, sandy and gravelly surface deposits and sandy and gravelly aquifers associated with till and inter-till deposits. Because of the variable concentrations of salt, well development is variable from the Swan River bedrock formation, which underlies the glacial deposits. In this formation, salt concentrations in water from sources 30 to 60 m below the surface may exceed 4000 mg/l.

Land Use

Kenville, Durham and Benito are small agriculture-based communities in the northern sector. In the southern sector there are several settlements of which the towns of Roblin and Erickson are the largest.

Gently sloping land is used for the production of spring wheat, other cereal grains, oil seeds and hay crops. More steeply sloping farmland is used for livestock pasture and native hay. Forest resources are used for wood pulp and local sawlog forestry. Wetlands are important breeding habitat for waterfowl. Wooded valleys provide habitat for deer, wapiti, black bear, many small mammals and song-birds.

Shell River Valley



The Shell River Valley is a large glaciofluvial meltwater channel originating in the Duck Mountain Upland (Ecodistrict 715). The west facing valley wall is a patchwork of vegetation communities. Shrubs and hardwoods occur in the gullies and on the lower slopes, and grass and herb vegetation occur on the exposed, drier ridges and upper slopes.

Boreal Plains Ecozone

Mid-Boreal Uplands Ecoregion

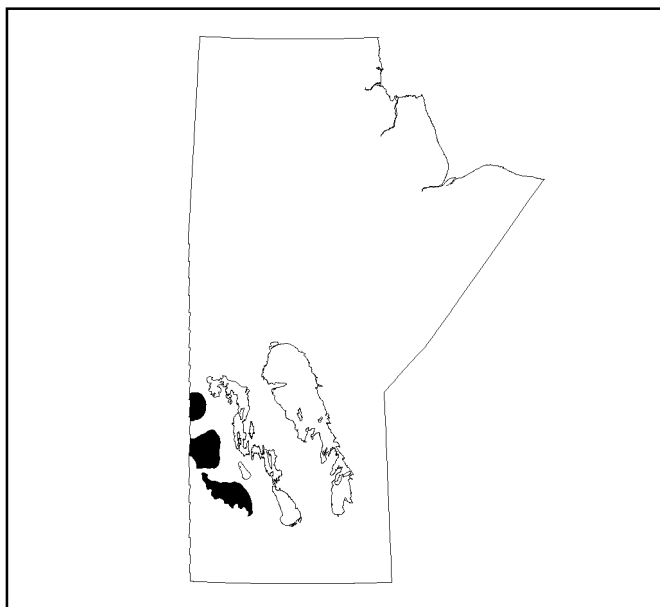
152, 153, 154. Mid-Boreal Uplands Ecoregion

The Manitoba portion of the Mid-Boreal Uplands Ecoregion occurs as three separate elevated uplands along the Manitoba Escarpment known as the Porcupine Hills, Duck Mountain and Riding Mountain.

Climate

These three uplands are part of the extensive Subhumid Mid-Boreal Ecoclimatic Region that extends from Lac Seul in northwestern Ontario, across central Manitoba and Saskatchewan to the foothills of the Rocky Mountains in northern Alberta and southern Yukon Territory. The climate is marked by short, warm summers and long, cold winters. The mean annual air temperature ranges from 0.4 to 1.2°C. The average growing season is about 173 days, while the number of growing degree-days ranges from about 1400 to 1500.

The average annual precipitation is around 500 mm. It varies greatly from year to year and also varies greatly across the uplands. Precipitation is highest during the growing season. Average yearly moisture deficits range from less than 100 mm to over 130 mm. The regions have a moderately cold to cold, subhumid to humid Cryoboreal soil climate.



The only continuous long-term climate station in Manitoba is located at Wasagaming on the Riding Mountain Upland. Data from this station is relevant for that area, but not for the uplands farther north. The station at Birch River is located a short distance outside the Porcupine Hills and at a lower elevation, but is probably still moderately relevant for this most northern component of the ecoregion.

Selected Climate Data¹ for Wasagaming

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr.
Temp. °C	-20.0	-16.0	-9.2	1.3	8.9	13.8	16.5	14.9	9.2	3.0	-7.2	-16	0.0
Precip. mm	18.6	18.4	2.2	33.4	45.8	82.4	70.9	72.9	58.7	36.7	23.2	21.8	508.0
Growing degree-days	N	0.0	0.1	N	N	263.0	356.0	310.0	N	29.3	N	N	N

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.

Selected Climate Data¹ for Birch River

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr.
Temp. °C	-21.2	-16.3	-10.2	1.9	9.9	14.7	17.5	15.9	10.2	4.9	-6.4	-16.1	0.4
Precip. mm	19.3	23.6	35.3	32.3	33.0	77.2	58.4	57.5	45.5	26.6	35.5	30.3	474.5
Growing degree-days	0.0	0.0	0.2	36.2	165.1	293.5	386.7	338.9	162.0	56.9	2.2	0.0	1441.7

¹ Canadian Climate Normals, 1951-1980. Atmospheric Environment Service, Environment Canada.

Surficial Materials and Landforms

In Manitoba, this ecoregion occupies the higher parts of the Riding Mountain (405 to 720 masl), Duck Mountain (the highest upland at 540 to 830 masl) and Porcupine Hills (400 to 780 masl). These Cretaceous shale outliers occur along the dip slope of the Manitoba Escarpment and are covered entirely by kettled and dissected, deep, loamy to clayey textured glacial deposits. Overlying some of these glacial deposits are clayey glaciolacustrine sediments and coarse textured and gravelly glaciofluvial deposits. Depressional areas may contain shallow to deep, largely moderately decomposed peat materials. Slopes range from about 10 to over 30 percent. Associated with the topographically rougher, morainal deposits are a large number of small lakes, ponds and sloughs occupying deep to shallow depressions.

Drainage for these upland areas is multi-directional via creeks draining into larger rivers skirting the uplands. Although these uplands are part of many smaller watersheds, at a broader level, the south half of Riding Mountain upland is part of the Assiniboine River watershed, and the northern half is part of the Dauphin River watershed. Both the Duck Mountain and Porcupine Hills uplands are part of the Dauphin River watershed. Both watersheds are part of the Nelson River drainage system.

Soils

Well drained Gray Luvisolic soils are dominant in the ecoregion and are associated with moderately calcareous, fine loamy to clayey till and the more limited calcareous clayey glaciolacustrine sediments. Significant inclusions are peaty phase Humic Gleysols, and shallow to deep Organic Mesisols in poorly drained depressions. Eutric Brunisols and Dark Gray Chernozems are associated with coarse textured to gravelly glaciolacustrine deposits.

Vegetation

This mixed forest ecoregion is characterized by medium to tall closed stands of trembling aspen and balsam poplar and extensive white spruce, balsam fir and black spruce stands occurring throughout, but especially as stands in later successional stages. Jack pine occurs throughout, but generally is more prevalent on drier sites while white birch is locally significant. Deciduous species tend to be more abundant in the more southerly Duck and Riding mountains sections. Deciduous and mixed stands generally have diverse understories of shrubs and herbs, while coniferous stands tend to promote feather moss-dominated groundcover. Cold and poorly drained fens and bogs respectively support tamarack and black spruce stands of varying densities.

Wildlife

The uplands comprising the ecoregion provide extensive and good quality habitat for many species of wildlife. Wapiti, moose, black bear, wolf, lynx, snowshoe hare and beaver are common throughout. Several species of raptors, including bald eagle, and many species of songbirds are present. Wetlands provide habitat for ducks and geese.

Land Use

Most of these uplands are held as national park land (Riding Mountain), and as provincial park and forest reserve land (Duck Mountain and Porcupine Hills). Sawlog forestry has a long history in the Duck Mountain and Porcupine Mountain areas. The use of trembling aspen for the manufacture of oriented strandboard is a recent additional use of the forest resource. Recreation in the form of cottaging is generally concentrated around the lakes, and is associated with water recreation such as boating, fishing and water skiing. Recreational, and to some extent, subsistence hunting, are additional land uses. These areas are generally not used for agriculture.

There are three ecodistricts within the Mid-Boreal Uplands Ecoregion in Manitoba.

Boreal Plains Ecozone

Mid-Boreal Uplands Ecoregion

714. Porcupine Hills Ecodistrict (2045 km²)

The Porcupine Hills Ecodistrict straddles the border with Saskatchewan. Only about one-fifth of the ecodistrict is located within Manitoba.

Climate

This ecodistrict is located in a cooler, more humid subdivision of the Mid-Boreal Ecoclimatic Region in Manitoba. The climate is characterized by short, warm summers and long, cold winters. Because of the topography of the district, precipitation, temperature and growing season length vary considerably from area to area. The higher elevations tend to be cooler and wetter than the lower slopes. The mean annual air temperature is about 0.4°C, the mean growing season is 169 days, and the number of growing degree-days is about 1320.

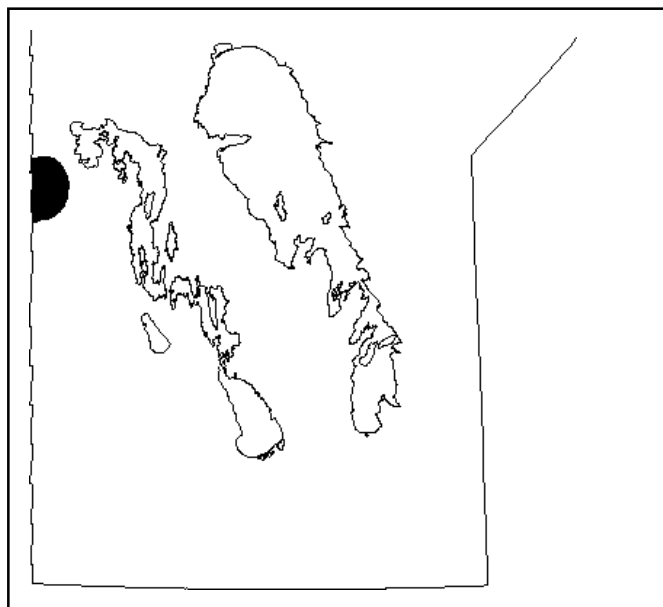
The mean annual precipitation is around 480 mm, of which less than one-third falls as snow. Precipitation varies greatly from year to year, but peaks in early summer. The average yearly moisture deficit is about 130 mm. The ecodistrict has a humid, cold, Cryoboreal soil climate.

The ecodistrict has no climate station. Therefore the above data, extrapolated from a station at a lower elevation, may underestimate total precipitation and overestimate the growing season length and number of growing degree-days.

Physiography and Drainage

The Porcupine Hills Ecodistrict is the northernmost of the three upland outliers that comprise the Mid-Boreal Uplands Ecoregion within Manitoba. It occurs along the dip slope of the Manitoba Escarpment and extends westward into Saskatchewan. The elevations of this hummocky moraine-covered upland range from about 400 masl along its boundary with the Manitoba Plain to about 760 masl at its highest point.

The Porcupine Hills Ecodistrict is characterized by steep southeast, east and northeast faces that rise about 300 m from their base at 400 masl to an elevation of 700 masl within a span of about 4 to 6 km. The upland dips westward at the rate of about 3.9 m per km. Local slopes within the ecodistrict range from 15 to over 30 percent, and are



from 50 to more than 100 m in length. Local relief within the hummocky till areas exceeds 30 m in some places. The slopes along the edge of the upland, especially the steep faces on the eastern side, are dissected with many deep channels and gullies. Local relief along portions of these valleys exceeds 60 m.

Drainage is multi-directional. Many creeks and small rivers drain the ecodistrict into rivers flowing in the surrounding area. The Whitefish River in the southwest and the Steeprock River in northeast are some of the larger drainage ways. The ecodistrict is part of the Dauphin River drainage division, which is part of the Nelson River drainage system.

Soils

Well drained Gray Luvisolic soils developed on calcareous, loamy to clayey textured glacial till are dominant. Gleyed Gray Luvisols are widespread on lower slopes and in depressions and grade into local areas of poorly drained Luvic Gleysols and some peaty Gleysols. Mesic and Fibric organic soils occur locally in depressions as well. Well drained Dark Gray Chernozemic soils also occur, but are limited to dry sites.

Vegetation

The vegetation of this ecodistrict is characterized by a mixture in varying proportions of deciduous and coniferous species. As the ecodistrict is the most northern of the three districts in Manitoba, the coniferous component is somewhat stronger than in the other two districts.

Before logging and recent major fires affected the forest cover over significant areas, old stands of tall, well-grown white spruce and balsam fir were widespread throughout the ecodistrict. As a result of these disturbances, trembling aspen and some balsam poplar, and jack pine on drier sites, are now much more widespread and dominate the forest cover over significant acreages. White birch is dominant locally, especially on slopes along the east face. Black spruce is confined largely to wet, poorly drained localities and bog peatlands. Understory vegetation and ground cover vegetation varies with stand mixture and site quality.

Water

The principal source of water is surface water from the many lakes and ponds throughout the district. Significant supplies of variable quality groundwater are available from small sandy and gravelly aquifers in the glacial till, inter-till and glacial outwash deposits. The shale bedrock underlying the till yields very little water.

Land Use

There are no settlements in the ecodistrict.

Most of the Porcupine Hills Ecodistrict is not well suited to arable agriculture. This public land has been retained for forestry, hunting and water oriented recreation. Limited areas around the southern periphery of the area are used for the production of cereal grains, oil seeds and hay crops. Portions of the steeply sloping valleys and benchlands are used for livestock pasture and native hay. The ecodistrict provides extensive habitat for wildlife such as moose, elk and black bear. Other wildlife includes wolf, marten and snowshoe hare. Wetlands are important breeding habitat for waterfowl.

Porcupine Hills



The Porcupine Hills are extensively covered with a mixture of hardwoods and softwoods. Some of the best white spruce stands in the province were found on this upland, before logging and wildfire diminished their distribution.

Boreal Plains Ecozone

Mid-Boreal Uplands Ecoregion

715. Duck Mountain Ecodistrict (4866 km²)

The Duck Mountain Ecodistrict straddles the border with Saskatchewan, with only a small portion lying outside Manitoba.

Climate

This ecodistrict is located in a cooler, more humid subdivision of the Mid-Boreal Ecoclimatic Region belt in Manitoba. The climate is characterized by short, moderately warm summers and long, cold winters. Because of the topography of the district, temperature, precipitation and frost free period vary significantly from area to area. The higher elevations tend to be cooler and wetter than the lower slopes. The mean annual air temperature is about -0.3°C, the mean growing season is 174 days, and the number of growing degree-days is about 1500.

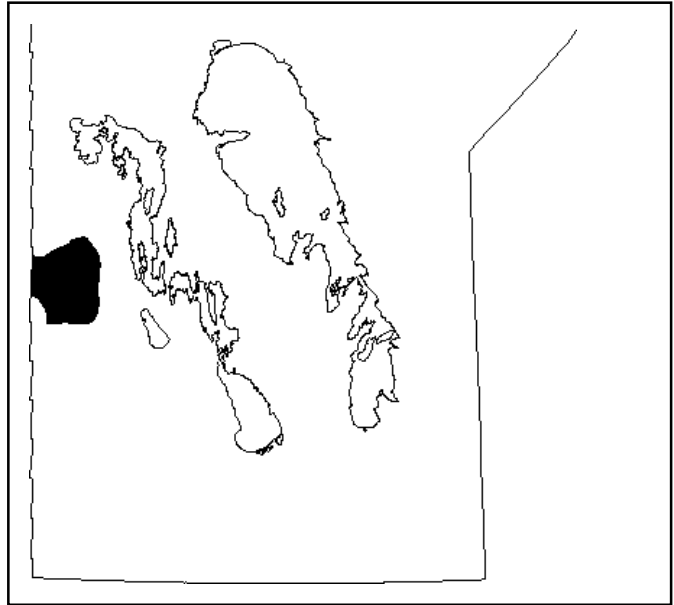
The mean annual precipitation is approximately 500 mm, of which nearly one-quarter falls as snow. Precipitation varies greatly from year to year and peaks in early summer. The average yearly moisture deficit is about 135 mm. The ecodistrict has a humid, cold, Cryoboreal soil climate.

Since there is no climate station in the ecodistrict, the above climate data is an estimate derived from stations in the surrounding area and is adjusted accordingly. Precipitation may be underestimated while the number of growing degree-days may be overestimated.

Physiography and Drainage

Situated on the Manitoba Escarpment, the Duck Mountain Ecodistrict reaches the highest elevation of the three upland outliers forming the Mid-Boreal Upland Ecoregion in Manitoba.

Elevations of this hummocky, moraine-covered upland range from about 450 masl along its eastern base to 831 masl at Baldy Mountain, the highest point on this upland and the highest point in Manitoba. The area dips westward from Baldy Mountain at the rate of about 3.1 m per km. Slopes range from 10 to about 15 percent, but are locally much steeper. Slope lengths range from 50 to more than 100 m. Local relief in areas with stronger hummocky topography exceeds 30 m.



This upland has steep faces along its eastern and northern boundaries that overlook the Manitoba Plain some 550 to 300 m below. Elevations rise 150 to 250 m over 4 to 6 kms along broken slopes. These areas are also dissected with many deep channels and gullies and local relief along portions of these valleys exceeds 60 m.

The most widespread surficial deposits are loamy to clayey till materials. Other clayey sediments include glaciolacustrine materials which can be found in depressions and also covering some upland till materials. Gravelly and sandy glaciofluvial materials are limited in extent. Alluvial deposits are found along the many rivers and creeks. Peatlands are largely small basin bogs, but shore fens are also present.

Drainage from this ecodistrict is multi-directional through the many creeks and rivers which drain into rivers flowing through the lowlands around the ecodistrict. The Shell River in the southwest and the Favel River in northern sector are two of the larger drainage ways. The western sector of the ecodistrict is part of the Assiniboine River drainage division and the remainder is part of the Dauphin River division. Both are part of the Nelson River drainage system.

Soils

Well to imperfectly drained Gray Luvisolic soils developed on calcareous, loamy to clayey textured glacial till dominate the ecodistrict. Gray Luvisols are also associated with calcareous, clayey glaciolacustrine sediments. Local areas of well drained Dark Gray Chernozems are found on sandy areas, especially in the southwestern sector, while poorly drained Luvic Gleysolic soils occur in and around depressions.

Shallow (Terric) and deep (Typic), moderately well decomposed Mesisols are found on peat deposits formed in poorly drained, small and medium sized basins, that are generally underlain by clayey glaciolacustrine sediments. Calcareous, sandy and gravelly glaciofluvial deposits support Eutric Brunisols on the higher upland, but support Chernozemic Dark Gray soils in the western sector.

Vegetation

The vegetation is characterized by a mixture of deciduous and coniferous species in varying proportions. This ecodistrict has a higher component of trembling aspen, balsam poplar and white birch than the Porcupine Hills to the north.

Before logging and recent major fires affected the forest cover significantly, old stands composed of tall, well grown white spruce and balsam fir were widespread. As a result of these disturbances, trembling aspen and some balsam poplar, and jack pine on drier sites, mixed with younger white spruce, now form the dominant forest cover over extensive areas.

Some of the forest stands in the Duck Mountain Ecodistrict are the fastest growing forest stands in the province. White spruce and trembling aspen can attain diameters of 90 cm or more and heights of 30 m on favourable sites.

White birch is locally widespread, especially in areas along the east face. Black spruce is confined largely to wet, poorly drained localities and to the few bog peatlands, but it is also found in mixtures with white spruce and trembling aspen on moist sites. Understory vegetation and ground cover vegetation vary with stand mixture and site quality and aspect. North facing slopes on fine textured

soils have more moss under coniferous stands, while south and west facing slopes have hazel shrub and herbs under mixed forest stands.

Water

The principal source of water is the numerous lakes and ponds found throughout the ecodistrict. Significant supplies of variable quality groundwater are found in small sandy and gravelly aquifers in the glacial till, inter-till and glacial outwash deposits as well. The shale bedrock underlying the till yields very little water.

Land Use

The only settlements in the ecodistrict are the hamlets of Boggy Creek and San Clara on the west side.

Most of the land is not well suited to arable agriculture due to climate and steepness of slopes. Therefore, most of the ecodistrict has been retained as the Duck Mountain Provincial Forest Reserve and Duck Mountain Provincial Park.

Sawlog forestry is carried out throughout the ecodistrict. The importance of trembling aspen as a forest resource has increased significantly since the establishment of an oriented strandboard factory in the Swan River area.

Cottage development, associated with water-oriented recreation such as boating and fishing, is extensive around some lakes and is expanding. Other recreational activities in the district include camping and hunting.

Limited sections along the periphery of the ecodistrict are used for the production of cereal grains, oil seeds and hay crops. The steeply sloping valley walls, benchlands and poorly drained alluvial soils are used for livestock pasture and native hay.

The ecodistrict provides extensive and varied habitat for many species of wildlife. Elk (wapiti), moose, white-tailed deer and black bear are common species in the district. Other wildlife includes members of the marten family, beaver, snowshoe hare, various raptors, jays and many species of songbirds. The wetlands are important breeding habitat for waterfowl.

Boreal Plains Ecozone

Mid-Boreal Uplands Ecoregion

716. Riding Mountain Ecodistrict (4700 km²)

The Riding Mountain Ecodistrict is the most southerly of the three uplands comprising the Mid-Boreal Uplands Ecoregion in Manitoba. This ecodistrict is totally confined to Manitoba.

Climate

This ecodistrict is situated within a more humid and cooler outlier or subdivision of the Mid-Boreal Ecoclimatic Region within Manitoba. The climate is characterized by short, warm summers and long, cold winters. The precipitation, temperature and length of growing season vary significantly from area to area because of the topography. The mean annual air temperature is 1.2°C, the mean growing season is 173 days, and the number of growing degree-days is about 1400.

The mean annual precipitation is about 500 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year and peaks in early summer. The average yearly moisture deficit is nearly 100 mm. The ecodistrict has a humid, cold, Cryoboreal soil climate.

Selected Climate Data¹ for Wasagaming

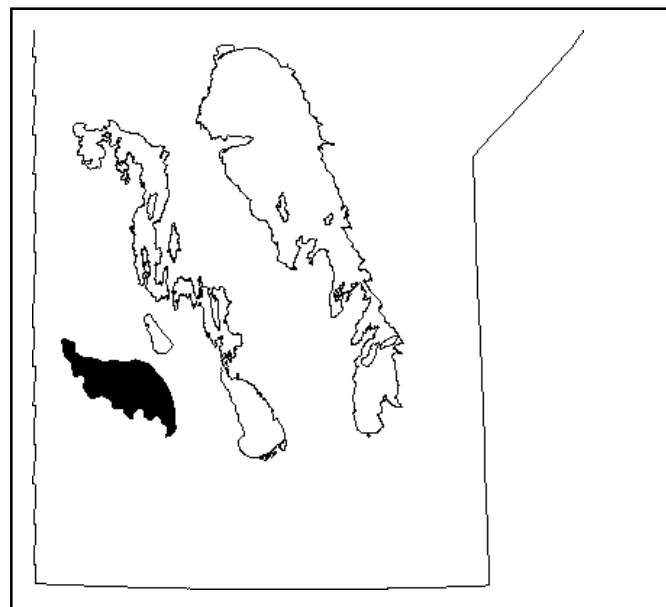
	Year	June-Aug	May-Sept	July	Jan
Temperature °C	0.0	15.1	12.7	16.5	-19.7
Precip. mm (equiv.)	508.0	226.2	330.7	70.9	18.6
Rain/Snow (mm/cm)	376.9/134.9	226.2/0.0T	327.3/3.5	70.9/0.0	19.6/0.0T
Growing degree-days >5°C	N	928.8	N	356.0	N

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.

Physiography and Drainage

Located on the dip slope of the Manitoba Escarpment, the Riding Mountain is the southernmost of the three wooded uplands that comprise the Mid-Boreal Uplands Ecoregion in Manitoba.

Elevations of this hummocky moraine-covered upland range from about 450 masl to 716 masl at its highest point. Slopes within the upland are moderately steep, ranging from 5 to about 15 percent and range in length from 50 to 100 m. Local relief may exceed 30 m. The ecodistrict is dissected by many deep channels and gullies, particularly



The only long-term climate station is located at Wasagaming in the southern part of the ecodistrict.

along its steeply sloping eastern and northern faces that overlook the Manitoba Plain some 300 to 400 m below. Local relief along portions of these valleys exceeds 60 m.

Drainage is multi-directional through many small rivers and creeks. The Ochre River in the northeast, Vermillion River in the north-central and Birdtail Creek in the southwest are some of the larger drainage ways. The northern part lies in the Dauphin River drainage division while the remainder is part of the Assiniboine River drainage division. Both divisions are part of the Nelson River drainage system.

Soils

Well drained Gray Luvisolic soils developed on calcareous, loamy to clayey textured glacial till are dominant in the ecodistrict. Local areas of well drained Chernozemic Dark Gray, poorly drained peaty Gleysolic soils and shallow (Terric), moderately decomposed (Mesisols) organic soils also occur.

Vegetation

The vegetation is characterized by a mixture of deciduous and coniferous trees in varying proportions. Before most of the ecodistrict was turned into a national park, logging removed many of the stands of tall, well grown, white spruce and balsam fir. As result of this disturbance, trembling aspen and some balsam poplar, and jack pine on drier sites, mixed with younger white spruce, now form the dominant forest cover over extensive areas. Some of the forest stands in the Riding Mountain are the fastest growing forest stands in the province. White spruce and trembling aspen can attain diameters of 90 cm or more and heights of 30 m on favourable sites. Black spruce, although only widespread in wet, poorly drained localities and in the few bog peatlands, is also found in mixtures with white spruce and trembling aspen on moist sites.

Understory vegetation and ground cover vegetation varies with stand mixture, site quality and aspect. North facing slopes on fine textured soils have more moss ground cover under coniferous stands, while south and west facing slopes have hazel shrub and herbs under mixed forest stands. In the western sector, drier conditions produce a vegetative cover consisting of forest groves or small stands of trembling aspen and white spruce intermixed with grassland on the driest parts.

Water

The principal source of water is the numerous small lakes and ponds in the ecodistrict. Significant supplies of variable quality groundwater are found in small sandy and gravelly aquifers in the glacial till, inter-till and outwash deposits. The shale bedrock underlying the till yields very little water.

Land Use

Most of this hummocky upland is occupied by the internationally renowned Riding Mountain National Park. The park provides many opportunities for land and water based recreation during the summer and is also a popular destination for winter camping, cross-country skiing and downhill skiing. Cottage development outside the park around small lakes is expanding.

Settlements are generally small. Wasagaming, located within the park, has a small permanent population, but grows considerably in the summer with cottagers and tourists. Onanole is another community in the ecodistrict. There is also one First Nation community in the ecodistrict - Keeseekoowenin.

Soils are not well suited to, and are not used for, arable agriculture because of climate and steepness of slopes.

The park and surrounding area also provide extensive and varied habitat for many species of wildlife. Elk (wapiti), moose, white-tailed deer and black bear are common. Wolf is also present, as are several species belonging to the marten family, beaver, snowshoe hare, coyote and red fox. Several species of raptors may be found in the ecodistrict, as well as spruce grouse, Canada jay and many songbird species. Wetlands are important breeding habitat for waterfowl.

Wapiti or elk



Elk are found in large numbers in the Riding and Duck Mountain areas. They occur in small numbers in areas such as Spruce Woods Provincial Park (Shilo Ecodistrict 757).

Boreal Plains Ecozone

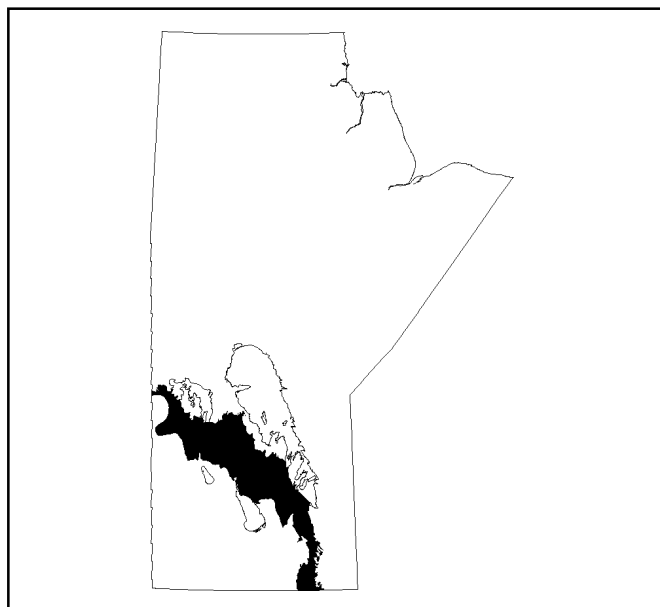
Interlake Plain Ecoregion

155. Interlake Plain Ecoregion

The Interlake Plain Ecoregion extends in a broad arc from the USA-Canada border at the southeastern edge of the Manitoba Plain, northwestward across the southern Interlake/Westlake region to the Saskatchewan border at Red Deer Lake. It is a mosaic of farmland and forest marking the southern limit of closed, mixed boreal forest and northern and eastern extent of commercial agriculture.

Climate

This ecoregion forms a portion of the extensive Subhumid Low Boreal Ecoclimatic Region that extends from southeastern Manitoba to the Peace River in north-central Alberta. The climate is marked by short, warm summers and fairly long, cold winters. In Manitoba, the mean annual air temperature ranges from 1.1 to 2.4°C, the average growing season varies from 173 to 184 days, and the number of growing degree-days ranges from about 1400 to 1700.



The average annual precipitation ranges from slightly less than 500 to near 525 mm, and varies greatly from year to year. Precipitation is highest during the growing season. Average yearly moisture deficits range from 85 to nearly 175 mm. The ecoregion is characterized by a subhumid, moderately cold to cold, Cryoboreal soil climate.

Climatic data for three stations are presented. The Steinbach station represents the southern part of the ecoregion, the Gypsumville station represents the central and northeastern portion, and the Swan River station represents the northwestern part. The data from the Gypsumville station only covers the period 1966 to 1980.

Selected Climate Data¹ for Gypsumville

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr.
Temp. °C	-20.7	-16.8	-8.7	1.9	10.1	15.1	18.0	16.3	11.1	4.3	-5.8	-16.1	0.7
Precip. mm	22.1	13.8	18.9	17.3	34.0	58.8	63.6	63.6	51.3	25.1	25.9	24.0	418.4
Growing degree-days	0.0	0.0	0.5	35.3	167.1	299.1	405.6	358.0	179.2	59.3	3.4	0.0	1507.5

¹ Canadian Climate Normals, 1951-1980. Atmospheric Environment Service. Environment Canada

Selected Climate Data¹ for Steinbach

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr.
Temp. °C	-18.0	-14.7	-6.7	3.9	11.5	16.7	19.5	18.1	12.1	5.8	-4.4	-14.3	2.4
Precip. mm	23.4	13.3	20.8	31.8	63.2	86.1	75.0	65.6	56.0	34.5	19.9	20.0	509.7
Growing degree-days	0.0	0.0	1.8	57.1	208.5	347.3	454.1	403.0	218.0	76.5	4.3	0.0	1771.0

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service. Environment Canada

Surficial Deposits and Landforms

Lying within the Manitoba Plain, this ecoregion is underlain by low relief, flat-lying Palaeozoic limestone rock and is lower and smoother than the Saskatchewan Plain to the west. The surface of the plain has an elevation rang-

ing from about 410 masl near the Manitoba Escarpment at its northwestern extreme to 218 masl at Lake Winnipeg. Its general surface form is that of a level to ridged lake terrace complex.

Selected Climate Data¹ for Swan River

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr.
Temp. °C	-18.8	-15.1	-7.9	2.5	10.6	16.0	18.5	17.1	10.9	4.7	-6.0	-15.5	1.4
Precip. mm	24.3	17.8	29.7	29.6	46.2	71.9	79.7	63.9	55.3	30.4	24.5	25.5	498.9
Growing degree-days	0.0	0.0	0.6	41.1	186.6	331.1	419.7	374.6	179.9	54.6	2.0	0.0	1590.0

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service. Environment Canada

Much of the Interlake/Westlake section has a distinct, low relief, north to south trending drumlinoid or ridge and swale topographic pattern with slopes that range from 1 to 3 percent. Surface deposits are comprised of extremely calcareous, very stony, water-worked loamy glacial till. The till materials are deep (>30 m) to very shallow (<20 m) over limestone bedrock.

East and southeast of this lowland region, the water-worked till has been smoothed over by thin, discontinuous veneers and blankets of sandy to clayey glaciolacustrine sediments as well as sandy to gravelly beach materials and bouldery near-shore deposits. Till-covered, thick, coarse textured fluvioglacial deposits also occur in places from Birds Hill south to the USA border. Limestone bedrock is at or near the surface of erosional remnants, scarps and drumlinoid ridges.

The ecoregion contains a number of large to very large lakes including lakes Winnipeg, Winnipegosis and Manitoba, as well as all of Waterhen, St. Martin and Red Deer lakes. Beaches marking successively lower water levels of glacial Lake Agassiz wind along the lower slopes of Duck Mountain and Porcupine Hills. The Red River flows through the area from the south into Lake Winnipeg, and the Swan and Red Deer rivers enter this plain from the escarpment in the northwest section of the region.

Soils

Well to imperfectly drained Chernozemic Dark Gray soils are predominant in the ecoregion. Significant inclusions are well to imperfectly drained Chernozemic Black soils, especially in the southern and northwestern parts of the ecoregion. These soils are associated with both the very to extremely calcareous, clayey glaciolacustrine overlays. Eutric Brunisols, shallow Gray Luvisols on till and some glaciolacustrine deposits, Organic Mesisols on the peatlands and peaty phase Humic Gleysols in transitional

areas occupy significant portions of the central and northern sections. The central portion is also characterized by locally widespread, very shallow Eutric Brunisols over limestone bedrock.

Vegetation

A closed cover of trembling aspen of varying quality with secondary quantities of balsam poplar and an understory of mixed herbs and tall shrubs is predominant. In the Interlake, trembling aspen stands are often of poor growth with poorly formed trees, likely due to the extreme calcareousness of the soils. White spruce and balsam fir are the climax species but are not widely represented because of fires. However, they do exhibit moderate to good growth through most of the ecoregion except on very dry sites or sites with very shallow soils. Open stands of medium to tall jack pine occur on dry, sandy sites. Water filled depressions and poorly drained sites are usually covered with sedges, willow, some black spruce and tamarack.

Wildlife

The ecoregion contains extensive habitat for white-tailed deer, black bear, moose, ruffed grouse, beaver, coyote, snowshoe hare and waterfowl. White-tailed deer populations have benefited from the development of arable agriculture which provides a varied habitat for this species.

Land Use

Production of spring wheat, other cereal grains, oilseeds and hay crops dominate the agriculture of the ecoregion on the more suitable glaciolacustrine soils. Native hay and pasture are more prevalent on the stony, glacial till soils of the Interlake and Westlake sections of the plain.

There are six ecodistricts within the Interlake Plain Ecoregion.

Boreal Plains Ecozone

Interlake Plain Ecoregion

717. Swan Lake Ecodistrict (7314 km²)

The Swan Lake Ecodistrict is located west of Lake Winnipegosis in the northwestern corner of the Interlake Plain Ecoregion and extends a short distance into Saskatchewan.

Climate

This ecodistrict lies within the more humid and cooler subdivision of the Subhumid Low Boreal Ecoclimatic Region in Manitoba. Summers are short and warm, while winters are cold. The mean annual temperature is 1.1°C, the average growing season is 174 days, and the number of growing degree-days is 1430.

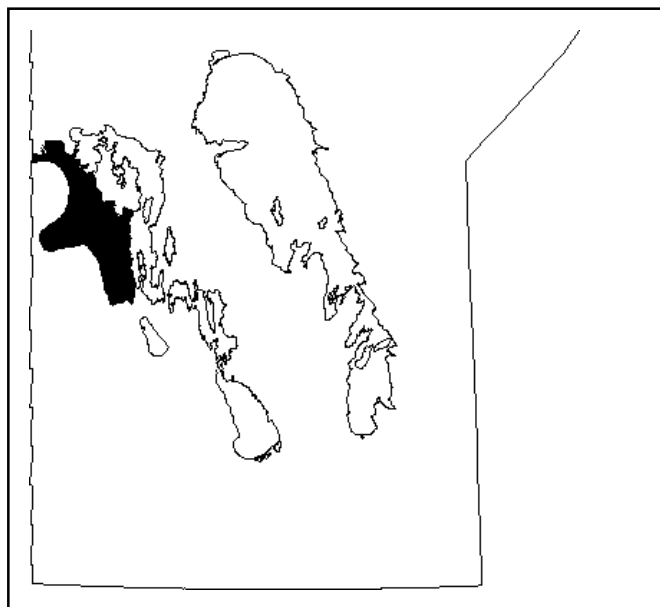
The mean annual precipitation is approximately 500 mm, of which nearly one-third falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the year is about 120 mm. The district has a humid, cold to moderately cold, Cryoboreal soil climate.

Data from the climate station at Swan River is valid for the area around Swan River and to the south, but is likely less representative of the most northern sector.

Selected Climate Data¹ for Swan River

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	1.4	17.2	14.6	18.5	-18.8
Precip. mm (equiv.)	498.9	215.5	317.0	79.7	24.3
Rain/Snow (mm/cm)	358.9/139.2	215.5/0.0	311.2/5.7	79.7/0.0	24.2
Growing degree-days >5°C	1590.0	1125.4	1491.9	419.7	0.0

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.



Physiography and Drainage

The Swan Lake Ecodistrict is situated east of (below) the Manitoba Escarpment (Kenville Escarpment). The mean elevation along the western boundary of the ecodistrict is about 290 masl and declines to about 255 masl along the shore of Lake Winnipegosis.

The ecodistrict is dominantly a smooth, level to very gently sloping alluvial and glaciolacustrine plain with slopes ranging from level to 2 percent. The slopes are gentle to the northeast at approximately 2.0 to 3.0 m per km. Local relief of approximately 3 to 5 m occurs along the Woody

and Swan rivers. Along the numerous meandering streams and creeks emanating from the Duck Mountain and Porcupine Hills, river bank erosion has resulted in local relief of 5 to 10 m. The ecodistrict is subject to flooding in spring and after heavy summer storms which causes further erosion of channels and roadside ditches that carry runoff from the escarpment.

The whole ecodistrict is part of the Dauphin River drainage division, which is part of the Nelson River drainage system.

Soils

Nearly all of the soils in the Swan Lake Ecodistrict are imperfectly drained, Gleyed Rego Black and Gleyed Dark Gray Chernozems that have developed on shallow, very strongly calcareous, sandy loam to clayey textured glaciolacustrine sediments and glacial till. Significant local areas of poorly drained peaty Gleysolic soils and shallow organic soils are found in depressional areas, while areas of imperfectly drained, Gleyed Regosols are found on alluvial sediments.

Vegetation

The dominant forest cover is trembling aspen and balsam poplar growing on well to imperfectly drained sites on glaciolacustrine and till deposits. These areas are also very suitable for agriculture, and consequently, the extent of forest cover has been severely reduced. Sandy areas support jack pine forests, while maple and green ash grow along rivers and on alluvial flats. White spruce is also present, but is more widespread on somewhat higher elevations and is often mixed with trembling aspen. Peaty areas generally have a vegetation of willow and sedges, but black spruce and tamarack are found on deeper and better developed peatlands.

Water

The principal sources of water are variable quality groundwater and surface water from Swan Lake, the Woody and Swan rivers and the numerous creeks and streams emanating from the escarpment. The groundwater is available from shallow, stratified, sandy and gravelly surface deposits and sandy and gravelly aquifers associated with till and inter-till deposits. Well development is variable from the Swan River bedrock formation because of variable concentrations of salt in these waters. This formation lies below the glacial deposits and at 30 to 60 m below the surface, and salt concentrations of water in this formation can exceed 4000 mg/l.

Land Use

There are several settlements in the ecodistrict. The town of Swan River is the largest and is the service centre for the ecodistrict and surrounding area. The settlement of Minitonas is expanding as a result of the recent establishment of an oriented strand board plant, which uses large quantities of trembling aspen from Duck Mountain and surrounding areas including the ecodistrict itself. Wuskwisipihk and Pine Creek are two First Nation communities in the ecodistrict.

Most of the soils in the Swan Lake Ecodistrict are cultivated for the production of spring wheat, other cereal grains, oil seeds and hay crops. Areas where drainage has not been improved are used for native pasture and hay. The wooded areas provide habitat for white-tailed deer, moose, black bear, ruffed grouse and songbirds.

Boreal Plains Ecozone

Interlake Plain Ecoregion

718. Waterhen Ecodistrict (11 423 km²)

The Waterhen Ecodistrict occupies the northeastern part of the Interlake Plain Ecoregion and encompasses the southern half of Lake Winnipegosis, the northern basin of Lake Manitoba and all of Waterhen Lake.

Climate

This ecodistrict lies in the more humid and cooler subdivision of the Subhumid Low Boreal Ecoclimatic region, which is characterized by short, warm summers and cold winters. The mean annual temperature is 1.1°C, the average growing season is 173 days, and the number of growing degree-days is 1500.

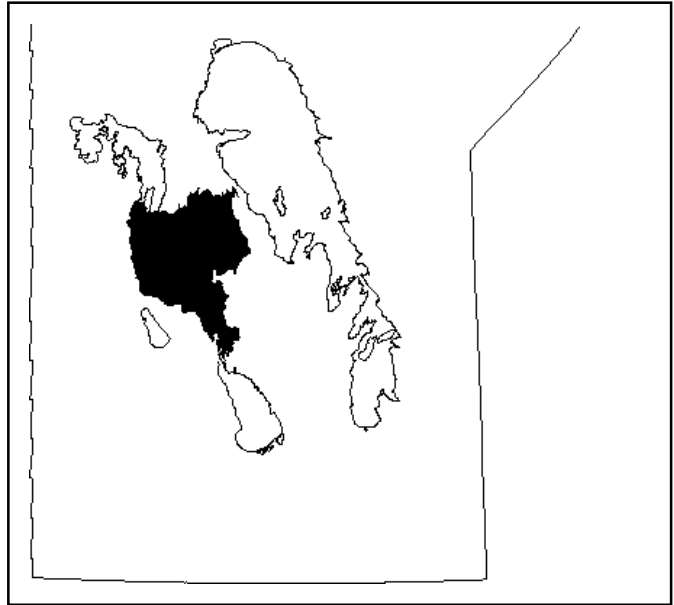
The mean annual precipitation is approximately 510 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year, and is highest from spring to early summer. The average moisture deficit over the year is nearly 90 mm. The ecodistrict has a humid, cold to moderately cold Cryoboreal soil climate.

The data from the now-closed station at Gypsumville (720. Gypsumville Ecodistrict) is relevant to the ecodistrict.

Physiography and Drainage

The ecodistrict extends from Lake Winnipegosis and Lake Manitoba on the west to near Lake Winnipeg on the east. It has a mean elevation of about 267 masl. The ecodistrict has a north-south trending drumlinoid or ridge and swale topographic pattern. The fluted ridges, ranging from about 400 to 800 m wide, are separated by variable sized swales or depressions up to 800 m wide.

Following the retreat of the continental glacier, glacial Lake Agassiz covered the ecodistrict and the surface of this gently undulating till plain was modified by waves and icebergs. Wave action resulted in local differentiation in the texture of surface materials with the ridges being more coarse textured and cobbly and gravelly, while the depressions are finer textured. Iceberg scouring created strongly intersecting micro-grooves or flutes that are usually curvi-linear in surface form. Slopes range from level to less than 5 percent.



The ecodistrict is a slight topographic high that slopes very gently eastward toward Lake Winnipeg and westward toward Lake Winnipegosis at a rate of approximately 0.6 m per km. Local relief from ridge to swale is approximately 0.5 to 3.0 m.

Natural drainage over most of the area is very poorly developed. The western section is part of the Dauphin River division, while the eastern section is part of the Lake Winnipeg South division. Both divisions are part of the Nelson River drainage system.

Soils

The soils on well to imperfectly drained ridges in the Waterhen Ecodistrict are dominantly Dark Gray Chernozems and Eutric Brunisols that have developed on extremely to very strongly calcareous, very cobbly to gravelly, loamy to clay loam water-worked glacial till. Soil profile development is very shallow (usually less than 15 cm thick). Significant areas of poorly drained peaty Gleysolic soils and shallow, slightly to moderately decomposed (fibric to mesic) organic soils occur in the swales. Glacial deposits can vary in thickness from less than 10 cm where limestone bedrock outcrops to more than 30 m.

Excessive amounts of stones and cobbles, an irregular topographic pattern that runs perpendicular to the general regional slope and lack of natural drainage contribute to the soil problems.

Vegetation

Vegetation varies from closed trembling aspen and balsam polar stands interspersed with white spruce on well to imperfectly drained till and glaciolacustrine sediments, to pure jack pine stands on dry sites. Forest stands dominated by white spruce and balsam fir may be found on favourable sites, including lake shores. The occurrence of conifers in the mixed stands increases with latitude.

Depressional areas have sedge and willow vegetation. Peatlands have tamarack and sedge vegetation on fens and black spruce and tamarack and mosses on bog and transitional bog peatlands..

Water

The principal source of water is the variable quality groundwater available from shallow sand and gravel aquifers associated with till, beach and inter-till outwash deposits. Well development is poor from Silurian bedrock formations. Bedrock aquifers made up of fractured limestone are variable both in water quantity and quality.

Land Use

There are several small communities in the ecodistrict including Waterhen and O-Chi-Chak-Ko-Sipi First Nations and Skownan and Crane River.

Only small portions of the soils are cultivated for spring wheat, other cereal grains, oil seeds and hay crops. Much of the land is public land and leased for native pasture and hay. The ecodistrict provides important wildlife habitat and breeding habitat for waterfowl.

Boreal Plains Ecozone

Interlake Plain Ecoregion

720. Gypsumville Ecodistrict (1291 km²)

The Gypsumville Ecodistrict occupies a small area in the north-central part of the Interlake Plain Ecoregion and encompasses Lake St. Martin.

Climate

This ecodistrict lies in the more humid and cooler subdivision of the Subhumid Low Boreal Ecoclimatic Region, and is characterized by short, warm summers and cold winters. The mean annual temperature is around 1.3°C, the average growing season is 173 days, and the number of growing degree days is about 1500.

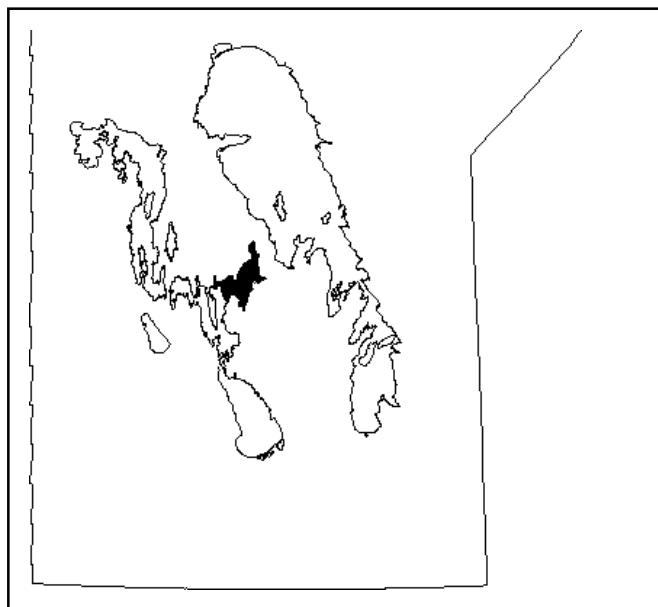
The mean annual precipitation is approximately 520 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average moisture deficit over the year is about 85 mm. The ecodistrict has a humid, cold to moderately cold, Cryoboreal soil climate.

Data from the now-closed station at Gypsumville is presented below.

Selected Climate Data¹ for Gypsumville

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	0.7	16.5	14.1	18.0	-20.7
Precip. mm (equiv.)	418.4	186.0	271.3	63.6	22.1
Rain/Snow (mm/cm)	301.3/102.1	185.9/0.1	270.1/1.7	63.6/0.0	0.2/20.0
Growing degree-days >5°C	1507.5	1062.7	1409.0	405.6	0.0

¹ Canadian Climate Normals, 1951-1980. Atmospheric Environment Service, Environment Canada.



Physiography and Drainage

The Gypsumville Ecodistrict occupies a small area surrounding Lake St. Martin between Lake Winnipeg and Lake Manitoba. Its mean elevation is about 251 masl.

The ecodistrict is a level to ridged till plain partly covered with a thin, discontinuous veneer of glaciolacustrine clay. Slopes range from level to 2 percent and are frequently less than 50 m long, although some slopes are as long as 150 m. The ecodistrict slopes gently northeastward at approximately 0.7 m per km from Lake St. Martin. The ecodistrict lies in the Dauphin River drainage division, which is part of the Nelson River drainage system.

Soils

Nearly all of the soils are imperfectly drained, Gleyed Dark Gray Chernozems that have developed on extremely to very strongly calcareous, loamy to clayey textured glacial till. Significant local areas of poorly drained peaty Gleysolic soils and areas of imperfectly drained, Gleyed Rego Chernozemic Black soils are found on very shallow, discontinuous, loamy to clayey glaciolacustrine veneers.

Stoniness and irregular patterns of imperfectly and poorly drained conditions contribute to soil problems.

Vegetation

The forest stands in the ecodistrict are a mixture of trembling aspen, balsam poplar and white spruce in varying quantities. Jack pine is prevalent on drier sites.

Water

The principal sources of water are variable quality groundwater and good quality surface water from Lake St. Martin. The groundwater is available from shallow, stratified, sandy and gravelly aquifers associated with till and inter-till deposits. Well development in the underlying Ordovician and Silurian limestone bedrock is poor because of variable concentrations of soluble salts in these aquifers.

Land Use

Little Saskatchewan, Fairford and Lake St. Martin are the First Nations communities in the ecodistrict. The settlement of Gypsumville serves as a service centre for the ecodistrict and adjacent areas.

Most of the soils are not cultivated, and those that are produce spring wheat, other cereal grains, oil seeds and hay crops. Limited areas where drainage has not been improved or where the soils are too cobbly and stony to cultivate are used for native pasture and hay. There is a limited forest industry.

The wooded areas provide wildlife habitat for white-tailed deer, black bear and ruffed grouse. Lake St. Martin is an important habitat for waterfowl breeding and migratory staging area.

Boreal Plains Ecozone

Interlake Plain Ecoregion

723. Ashern Ecodistrict (9121 km²)

The Ashern Ecodistrict occupies a major portion of the area generally referred to as the “Interlake”.

Climate

This ecodistrict lies in the more humid and cooler subdivision of the Subhumid Low Boreal Ecoclimatic Region, which is characterized by short, warm summers and cold winters. The mean annual temperature is 1.2°C, the average growing season is 175 days, and growing degree-days number about 1500.

The mean annual precipitation is approximately 510 mm, of which nearly one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from spring through early summer. The average moisture deficit over the year is about 100 mm. The ecodistrict has a humid, cold to moderately cold Cryoboreal soil climate.

The data from the climate station at Ashern is relevant for most of the ecodistrict.

Selected Climate Data¹ for Ashern

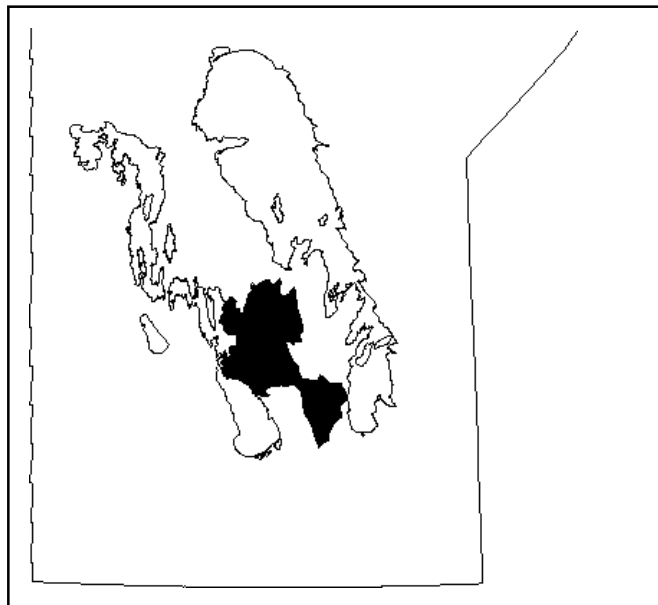
	Year	June-Aug	May-Sept	July	Jan
Temperature °C	1.1	16.9	14.5	18.3	-19.5
Precip. mm (equiv.)	483.2	215.1	319.2	65.3	18.9
Rain/Snow (mm/cm)	374.3/109.3	215.1/0.0T	314.7/4.7	65.3/0.0	0.1/18.8
Growing degree-days >5°C	1563.0	1092.8	1468.8	410.8	0.0

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.

Physiography and Drainage

The Ashern Ecodistrict is situated between Lake Manitoba to the west and Lake Winnipeg to the east and has a mean elevation of about 274 masl. The ecodistrict has a northwest-southeast trending, drumlinoid or ridge and swale topographic pattern. The fluted or grooved ridges range from about 400 to 800 m wide and have slopes that are usually less than 5 percent and range in length from 50 to over 200 m.

Following the retreat of the continental glacier, the surface of this gently undulating till plain was modified by wave action and by icebergs scouring the ridges as glacial Lake Agassiz retreated. Wave action has resulted in local differentiation in soil textures. The ridges are more coarse textured, cobbly and gravelly, and the depressions are finer



textured. Iceberg scouring formed strongly intersecting micro-grooves or flutes that are usually curvi-linear in surface form.

The ecodistrict is a slight topographic high, sloping very gently eastward toward Lake Winnipeg and westward toward Lake Manitoba at approximately 0.6 m per km. Local relief (ridge to swale) is approximately 0.5 to 3.0 m. Natural drainage is very poorly developed over most of the ecodistrict.

The western portion is part of the Dauphin River drainage division, while the eastern portion is part of the Lake Winnipeg South division. Both divisions are part of the Nelson River drainage system.

Soils

Soils situated on well to imperfectly drained ridges are dominantly Dark Gray Chernozems that have developed on extremely to very strongly calcareous, very cobbly to gravelly, loamy to clay loam water-worked glacial till. Soil profile development is very shallow (usually less than 15 cm). Glacial deposits in the area can vary in thickness from less than 10 cm where limestone bedrock outcrops, to more than 30 m. Significant areas of poorly drained peaty Gleysolic soils and shallow, slightly to moderately decomposed (fibric to mesic) organic soils occur in the swales.

Excessive amounts of stones and cobbles, an irregular topographic pattern that runs perpendicular to the general regional slope and lack of natural drainage contribute to the soil problems.

Vegetation

The forest stands in the ecodistrict are dominated by trembling aspen. Associated species are balsam poplar and white spruce. White spruce occurs largely interspersed in the trembling aspen stands, but also forms small pure stands. The white spruce distribution is much affected by forest fires. Poorly drained areas have willow, sedge and meadow grass vegetation. Much land has been cleared for agriculture, but some has reverted to shrub vegetation.

Tree quality is very much influenced by soil texture, soil depth and carbonate level. Generally, white spruce has better growth than trembling aspen on the same site. Trem-

bling aspen often shows poor growth and form, unless growing on good quality sites. Black spruce and to lesser extent, tamarack, form the vegetative cover in the bogs in association with swamp birch, ericaceous shrubs and sphagnum and other mosses. Willows and sedges, and to some extent tamarack, brown mosses and various herbs and forbs are dominant in fen peatlands.

Water

The principal source of water is variable quality groundwater available from shallow sand and gravel aquifers associated with till, beach and inter-till outwash deposits. Well development is poor from Silurian bedrock formations. Limestone aquifers are made up of fractured rock and both water quantity and quality are variable.

Land Use

Ashern and Eriksdale are the main service centres and Lake Manitoba is the First Nation community in the ecodistrict.

Only a limited, but significant, portion of the ecodistrict is cultivated for spring wheat, other cereal grains, oil seeds and hay crops. Much of the land is public land and leased out for native pasture and hay. The ecodistrict supports limited forestry, and provides important wildlife and waterfowl breeding habitat and migratory bird staging areas.

Ridge and swale topography



The ridges are well drained and have a vegetation cover of trembling aspen and various shrubs, while the poorly drained swales have sedge and reed vegetation.

Boreal Plains Ecozone

Interlake Plain Ecoregion

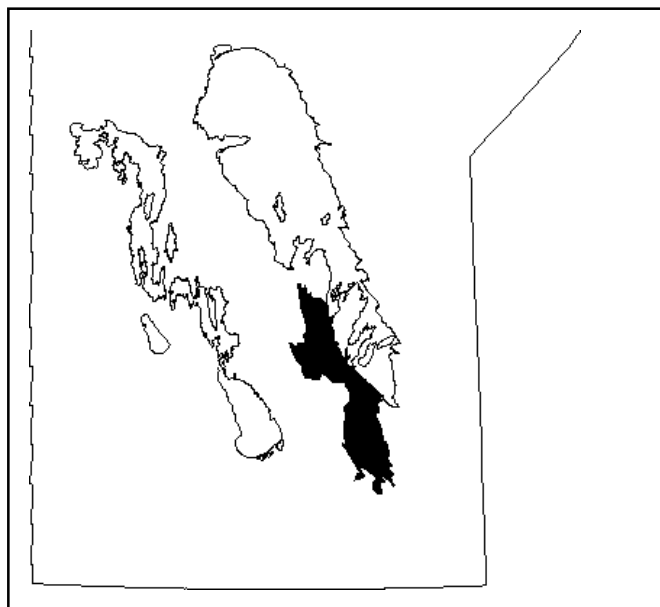
724. Gimli Ecodistrict (6978 km²)

The Gimli Ecodistrict is a generally north-south elongated area extending from north of Fisher Bay to southeast of Birds Hill.

Climate

This ecodistrict lies within the more humid and cooler subdivision of the Subhumid Low Boreal Ecoclimatic Region, which is characterized by short, warm summers and cold winters. The mean annual temperature is 1.4°C, the average growing season is 176 days, and the number of growing-degree days is about 1540.

The mean annual precipitation is about 520 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year and is highest from late spring through summer. The average annual moisture deficit is nearly 100 mm. The ecodistrict has a humid, moderately cold, Cryoboreal to subhumid, cool, Boreal soil climate.



The ecodistrict contains a number of climate stations. The station at Arborg represents the northern sector, the sta-

tion at Beausejour represents the southern sector and the now-closed Gimli station represents the area along Lake Winnipeg.

Selected Climate Data¹ for Arborg

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	0.9	16.9	14.3	18.4	20.2
Precip. mm (equiv.)	491.1	215.0	314.0	65.8	20.4
Rain/Snow (mm/cm)	380.8/110.1	215.0/0.0T	311.7/2.3	65.8/0.0	20.4/0.0T
Growing degree-days >5°C	1543.0	1099.1	1453.6	414.3	0.0

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.

Selected Climate Data¹ for Beausejour 2

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	1.6	17.8	15.3	19.1	-19.6
Precip. mm (equiv.)	539.2	228.5	342.9	69.2	25.9
Rain/Snow (mm/cm)	412.7/126.4	228.5/0.0	341.3/1.6	69.2/0.0	25.6/0.3
Growing degree-days >5°C	N	1173.5	1589	435.7	0.0

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.

Selected Climate Data¹ for Gimli Airport

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	1.6	17.6	14.8	19.0	-19.7
Precip. mm (equiv.)	545.3	231.1	336.4	75.0	25.1
Rain/Snow (mm/cm)	397.1/164.7	231.1/0.0	332.4/4.2	75.0/0.0	0.4/27.8
Growing degree-days >5°C	N	N	N	N	N

¹ Canadian Climate Normals, 1951-1980. Atmospheric Environment Service, Environment Canada.

Physiography and Drainage

The Gimli Ecodistrict lies along the southwestern shore of the south basin of Lake Winnipeg. It extends from Birds Hill in the south to the Fisher River Lowland near Dallas in the north. Its mean elevation is about 244 masl.

The ecodistrict is a level to depressional glaciolacustrine lowland and a gently undulating lake terrace, characterized by fluvio-glacial, shallow glaciolacustrine deposits and water-worked glacial till. Slopes range from long and nearly level in the lowlands to short and less than 2 per cent in the lake terrace areas.

West of Lake Winnipeg, slopes are very gentle at approximately 0.5 m per km eastward. The area south of Lake Winnipeg slopes very gently northward to Lake Winnipeg at a rate of less than 0.5 m per km. Netley Marsh on the south shore of Lake Winnipeg is a delta formed by the Red River. It has little relief, many channels and small water bodies enclosed by levees. A significant change of relief occurs at Birds Hill, a prominent, interlobate glaciofluvial and moraine complex which rises about 30 m above the surrounding area. Local relief in the order of 5 to 10 m occurs along portions of the Red, Icelandic and Fisher rivers as a result of river bank erosion.

The northern portion of the ecodistrict is part of the Lake Winnipeg South drainage division, while the portion south of Lake Winnipeg is part of the Red River drainage division. Both are part of the Nelson River drainage system.

Soils

Most of the lowland soils are poorly drained Peaty Gleysols and shallow organic soils. Soils in the lake terrace areas are dominantly well to imperfectly drained, Dark Gray Chernozems that have developed on extremely to very strongly calcareous, loamy to clayey textured, water-worked glacial till and shallow loamy, glaciolacustrine veneers. Gray Luvisols, which developed under forest vegetation, are found on loamy, sandy to gravelly materials on the Birds Hill upland. Marsh soils are dominant in the extensive marsh area just south of Lake Winnipeg.

Vegetation

Forest is dominated by stands and coppices of trembling aspen. White spruce is interspersed with some of the trembling aspen stands in the more northern sections of the ecodistrict. Manitoba maple, green ash, elm and

cottonwood dominate along the rivers, particular along the Red River. Depressional areas support sedges, meadow grasses and willows, while marsh areas are characterized by reed, cat tail and sedges.

The vegetation on Birds Hill reflects the somewhat higher elevation. Although deciduous trees are still prevalent, there is more white spruce, and there are also peatlands with black spruce, tamarack and eastern white cedar.

Water

The principal sources of water are variable quality groundwater from shallow, stratified sand and gravel aquifers associated with till and inter-till deposits, and surface water from Lake Winnipeg and the Red, Icelandic, and Fisher rivers. Well development in the underlying Ordovician limestone bedrock is poor because of variable concentrations of soluble salts in these aquifers.

Land Use

The major service centres are the city of Selkirk and the towns of Beausejour and Gimli. Besides a number of villages and hamlets, there are three First Nation communities - Fisher River, Peguis and Brokenhead Ojibway.

Except for Birds Hill, most of the soils in the southern lake terrace area are cultivated, while only those soils in the lowlands that have improved drainage are cultivated. Crops include spring wheat, other cereal grains, oil seeds and hay crops.

Areas where drainage has not been improved or where the soils are too cobbly and stony to cultivate are used for native pasture and hay. The wooded areas provide wildlife habitat for white-tailed deer, black bear, ruffed grouse, raptors and songbirds. Wetlands in the area are important for waterfowl breeding and migratory bird staging.

The ecodistrict provides many opportunities for recreation. The west shore of Lake Winnipeg has a large number of cottages. Most recreation is associated with beach and water sport activities. The Birds Hill area is a locally popular provincial park, providing camping, horseback riding, hiking and cycling in the summer and cross-country and downhill skiing in winter.

Boreal Plains Ecozone

Interlake Plain Ecoregion

726. Steinbach Ecodistrict (3583 km²)

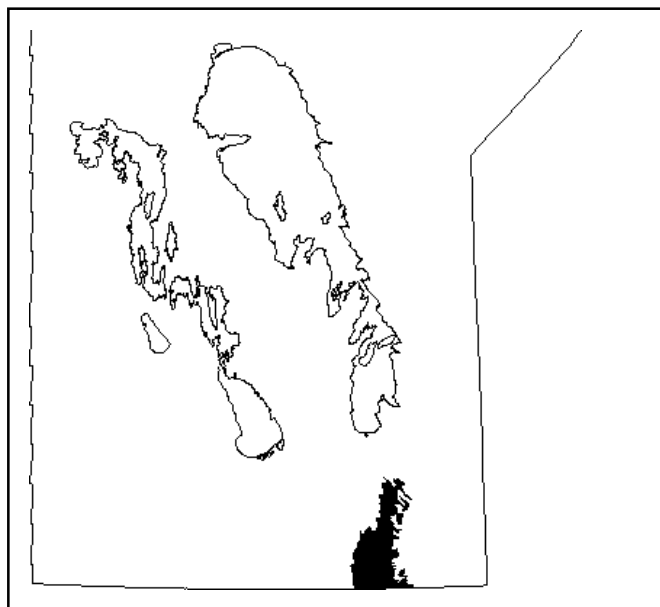
The Steinbach Ecodistrict is a north-south elongated area extending from the USA border to east of Winnipeg.

Climate

This ecodistrict lies within the more humid and cooler subdivision of the Subhumid Low Boreal Ecoclimatic Region in southern Manitoba. The climate is characterized by short, warm summers and cold winters. The mean annual temperature is 2.4°C, the average growing season is 184 days, with about 1700 growing degree-days.

The mean annual precipitation is approximately 510 mm, of which about one-fifth falls as snow. Precipitation varies greatly from year to year and is highest from spring to early summer. Average soil moisture deficit over the growing season is about 200 to 250 mm. The ecodistrict has a humid, moderately cold Cryoboreal to subhumid, cool Boreal soil climate.

The climate station at Steinbach is situated on the western border of the ecodistrict, but is relevant to the area.



Selected Climate Data¹ for Steinbach

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	2.4	18.1	15.6	19.5	-18.0
Precip. mm (equiv.)	509.7	226.7	345.9	83.3	23.4
Rain/Snow (mm/cm)	410.5/99.3	226.7/0.0	344.6/1.1	83.3	0.2/23.3
Growing degree-days >5°C	1847.0	1204.4	1630.9	454.1	0.0

¹ Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.

Physiography and Drainage

The Steinbach Ecodistrict is located within the southeastern lake terrace section of the Manitoba Plain. Its mean elevation is about 297 masl. The landform ranges from a smooth, level glaciolacustrine plain to a gently undulating, water-worked glacial till and glaciofluvial, terraced plain. Extensive areas consist of sandy glaciolacustrine veneers overlying extremely calcareous, cobbly and gravelly loamy till.

Slopes range from level to less than 5 percent and range in length from about 50 m to more than 150 m. The ecodistrict slopes gently at about 1.0 m per km northwestward from its eastern edge toward the Red River

in the central lowland area. Some change of relief, approximately 1.0 to 3.0 m, occurs along the leading edge of a series of sandy and gravelly ridged terraces throughout the area. Peatlands are common, especially along its eastern border, and consist mostly of fens and transitional bogs.

Major drainage ways are the Roseau River and some creeks draining towards the Red River. The ecodistrict is part of the Red River drainage division, which is part of the Nelson River drainage system.

Soils

Well to imperfectly drained soils are dominantly Dark Gray Chernozems that have developed on thin, variably calcareous, discontinuous, sandy to loamy glaciolacustrine veneers overlying extremely calcareous, loamy to clayey textured, water-worked glacial till. In the southwest, Black Chernozems are found on similar materials. In the eastern sector, imperfectly and well drained Luvisols are found on sandy deposits and till ridges respectively. Some Eutric Brunisols have also developed on sandy materials in the eastern sector. Most soils in the depression lowland areas are poorly drained peaty Gleysols and shallow to moderately deep, moderately decomposed organic Mesisols.

Vegetation

Vegetation is dominated by trembling aspen with some balsam poplar. Understoreys are normally willow and red-osier dogwood with a ground cover of grasses and herbs. Poorly drained areas have dominantly willow and sedge vegetation, while well drained sandy areas in the eastern sector have a jack pine cover.

The peatlands have generally fen vegetation dominated by sedges and reed grasses, and also varying willow shrub. Transitional bogs have generally clumped tamarack and black spruce, increasing moss ground cover interspersed with fen vegetation components.

Water

The principal source of water is variable quality groundwater available from small, sand and gravel aquifers associated with the glacial till, inter-till, beach and fluvio-glacial deposits. Limited supplies of variable quality groundwater under artesian pressure are available from Ordovician and/or Silurian limestone bedrock.

Land Use

There are many settlements in the ecodistrict, of which the towns of Steinbach and Ste. Anne are the major service centres. A significant percentage of the soils are cultivated as a result of improved drainage in lowland areas. Crops include spring wheat, other cereal grains, oil seeds and hay crops. Areas where drainage has not been improved or where the soils are too cobbly and stony to cultivate are used for native pasture and hay.

Wooded areas provide habitat for white-tailed deer, moose, black bear and ruffed grouse and a variety of other birds. Wetlands in the area are important habitat for waterfowl breeding and migratory bird staging areas.

Boreal Plains Ecozone

Interlake Plain Ecoregion