A Guide To Biophysical Land Classification Sipiwesk 63P Split Lake 64A (SE¼) Manitoba

NORTHERN
RESOURCE
INFORMATION
PROGRAM

Prepared by

Canada-Manitoba Soil Survey

and

Department of Mines, Natural Resources and Environment

Technical Report No. 79-2

A GUIDE

TO

BIOPHYSICAL LAND CLASSIFICATION

SIPIWESK, 63P

and

S.E. 1/4 OF SPLIT LAKE, 64A

MANITOBA

MARCH, 1979

BY

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PREFACE

The Northern Resource Information Program has been implemented as a cooperative venture between the Canada-Manitoba Soil Survey and the Planning Branch of the Manitoba Department of Mines, Natural Resources and Environment. This program is designed to provide basic data concerning land and land-related resources in northern and eastern Manitoba.

A system of inventory known as a "biophysical land classification" was employed to objectively describe various attributes of land such as soil, surficial deposits, landforms, permafrost and water. By keying on such relatively permanent environmental characteristics, the inventory will remain useful over a long period of time. Interpretation of this basic information for environmental sensitivity, capability for wildlife, forestry, recreation, etc. is possible by relating it to more dynamic features such as vegetation and wildlife populations within an overall climatic framework.

The information obtained from the biophysical land classification is presented in this guide and in map form. The map and accompanying extended legend describe significant attributes of land and show the areal distribution pattern of these conditions.

This guide is written in two sections. Part I describes the survey methodology and concepts and rationale of the approach used in Manitoba. Part II is a general description of the area. The soil and vegetation information is only briefly described as the intention is mainly to provide an overview of the biophysical environment in a map area.

No attempt has been made to provide interpretations of the data for various kinds of land use. Detailed soil, vegetation and related landform data derived from the field program is on file with the Canada-Manitoba Soil Survey, Ellis Building, University of Manitoba. Assistance in the interpretation of this data for various uses can be obtained by consultation with the Soil Survey staff.

ACKNOWLEDGEMENTS

The biophysical land classification of the Sipiwesk, 63P and the S.E. 1/4 of the Split Lake map sheet areas was conducted jointly by the Canada-Manitoba Soil Survey and the Manitoba Department of Renewable Resources and Transportation Services, Planning Branch.

Field work was carried out in the summer of 1975 by G.F. Mills, H. Veldhuis, D. Forrester, R. Schmidt, R. Bukowsky, K. Dutchak and I. Thorleifson. Additional soil correlation was provided by R.E. Smith of the Canada-Manitoba Soil Survey.

The authors wish to express appreciation for the cooperation and assistance provided by the following persons and agencies:

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PART I

BIOPHYSICAL LAND CLASSIFICATION IN MANITOBA

1.0 INTRODUCTION

The objective of the present land classification, as with numerous other integrated ecological surveys, is to classify and map terrain in terms of landforms and surface deposits, vegetation, soils, drainage, permafrost, associated aquatic systems and climate. Such an inventory provides an ecologically sound basis for making land use decisions concerning forestry, agriculture, recreation, wildlife, community development and hydrology.

2.0 METHODOLOGY

Previous work in Canada has led to the establishment of a relatively uniform methodology for carrying out biophysical classifications. A hierarchy of four basic classification levels was proposed and defined by Lacate (1969) for the systematic description of terrain. These categories are defined as follows:

Land Region: an area of land characterized by a distinctive regional climate as expressed by vegetation. Mapping scales of 1:1,000,000 to 1:3,000,000 or smaller are used.

Land District: an area of land characterized by a distinctive pattern of relief, geology, geomorphology and associated vegetation. Mapping scales of 1:500,000 to 1:1,000,000 are used.

Land System: an area of land throughout which there is a recurring pattern of landforms, soils and vegetation. Mapping scales of 1:125,000 to 1:250,000 are used.

Land Type: an area of land on a particular landform segment having a fairly homogeneous combination of soils and chronosequence (i.e. successional development) of vegetation. Mapping scales of 1:10,000 to 1:20,000 are used.

The approach taken in Manitoba is patterned after that of Lacate but includes some modification in the definition of the Land Region. All four levels of classification have been used in the Manitoba approach. The basic product of our biophysical classification is a map depicting Land Systems at a scale of 1:125,000. The ground truth and sampling carried out to produce the Land System map is collected at the Land Type level. Land System units, in turn, have been grouped into Land Districts on the basis of general physiographic features. However, Land Districts can also be considered as subdivisions of a Land Region. It is emphasized that the boundaries for Land Districts and Land Regions become really meaningful only after a study of interrelationships in patterns of land types and land systems.

The relative inaccessibility throughout most of northern and eastern Manitoba has a major influence on the level of detail obtained in ground truthing. Ground truth data for a typical NTS map sheet is collected from an average of 120 sites in each map sheet, i.e. one site for every 140 to 170 square kilometers. Field notes on soils, vegetation and landforms at each site were recorded and representative samples of individual soil associations were collected for laboratory analyses.

Aerial photographs taken during the period 1953 to 1956, at a scale of 1:63,360, were used as the geographical base for sample site selection and for mapping terrain conditions. From field notes and air photo interpretation, boundaries of repetitive patterns of landforms, soils and vegetation (Land Systems) were delineated. These system boundaries were then transferred from the air photos onto a map manuscript at a scale of 1:125,000 (1 inch equals 2 miles).

It can be seen that such a reduced mapping scale will not permit, nor does the level of field studies warrant, the display of small individual areas having a narrowly defined range in landform, vegetation and soil conditions. The minimum size of most map units delineated at this scale includes a complexity of terrain conditions. Thus, users of biophysical maps should take into consideration the limitations of scale and the level of ground truth. At the 1:125,000 scale, biophysical maps are intended primarily as inventories for broad planning purposes.

3.0 THE LAND REGION - CONCEPT AND RATIONALE

The concept of Land Region as used in this study is changed only slightly from the definition proposed by Lacate (1969). Land Regions are broad areas of uniform climate identified not only on the basis of vegetation, but also by trends in soil development and permafrost conditions.

For instance, the High Subarctic Land Region in Manitoba is defined as a zone of regional climatic conditions which result in a pattern of forest cover interspersed with areas of treeless tundra, i.e. Forest-Tundra transition. This Land Region further exhibits permafrost conditions which are characteristic of the Continuous Permafrost Zone in terms of depth, distribution and surface expression. In addition, soil development and properties in this region are strongly influenced by permafrost which results from the cold climate. Thus, soil development, as it reflects regional climate, becomes a relevant factor in defining the Region. In conclusion, regional climatic zones are discernible by characteristics of vegetation, soils and permafrost development. These three factors and their interrelationship provide more reliable criteria for the establishment of Land Regions than those based on meteorological data alone. Land Regions of northern and eastern Manitoba, defined in terms aforementioned, are described in Section 4.0.

The degree of climatic uniformity observable in a Land Region favours the development of similar ecosystems on material having similar properties. For example, similar physiographic sites (i.e. those having the same landform, slope, parent soil material and drainage characteristics) may occur in several climatic regions. Within a region, these sites will support the same vegetation communities, but in other regions vegetation on the sites will be different. Thus, beach ridges in an Arctic Land Region support low growing shrubs and forbs, whereas beaches in the Boreal Region usually have dense growth of black spruce or jackpine. Soils display similar trends, as the kind and degree of development of soil profiles vary from region to region on similar physiographic sites. In areas of permafrost, the depth of the thawed layer, and the form and kind of surface expression of patterned ground also vary on similar sites between regions but remain relatively constant on comparable sites within a region (Zoltai et. al., 1973). Land Regions, therefore, describe broad areas where one can expect to find the same kinds of vegetation and soil associations on similar sites.

Because climatic change from one Land Region to another has such importance to the ecology of an area, the Land Region boundaries are also useful for establishing soil series and associations. The soils of each Land Region are subject to climatic conditions which influence not only the thermal regime of the soil but also the various biological and physical activities that take part in soil development. Soils developed on similar parent materials and drainage conditions but in different Land Regions are given different names to indicate that many of the associated ecologic conditions are dissimilar.

Whereas Land Regions are regions of similar climate-soil-vegetation conditions, their boundaries invariably spread over a transitional zone. A boundary line merely serves as a demarcation of where major ecological changes appear to be most pronounced. For this reason, a particular soil name or vegetation type may be applied in two adjacent Land Regions where site conditions are similar. This situation usually occurs within the limited area of a transition zone along the Region boundary. Changes in regional climate over greater distances will alter site conditions sufficiently to warrant new names for soil associations and vegetation types.

4.0 LAND REGIONS IN NORTHERN AND EASTERN MANITOBA

4.1 Introduction

The Land Region descriptions presented in this section provide a general overview of the climate and related biophysical conditions in northern and eastern Manitoba. The delineation and characterization of the Land Regions is based on a review of existing information on climate, vegetation, soils and permafrost as well as data collected during the current biophysical survey. For those map areas which are not yet studied in detail, Land Region boundaries and descriptions are subject to revision and change as new information becomes available.

Land Regions in northern and eastern Manitoba are shown in Figure 1. The orderly zonation of regions from south to north is a reflection of soil, vegetation and permafrost characteristics being influenced by climate. Zonation is complicated by the presence of local features such as large water bodies, valleys, extensive organic plains and north-south trending ridges. Some of these features favor development of soil-vegetation associations typical of adjacent Land Regions. Such atypical "outlier" associations were considered too small or insignificant to be delineated separately, but their presence should be recognized.

4.2 Selected Biophysical, Climatic and Vegetation Characteristics

In order to compare the Land Regions in the study area, a tentative summary of some of their biophysical properties is presented in Table 1. Pertinent meteorological data for the Land Regions are summarized in Table 2 and vegetation characteristics are summarized in Table 3. The broad vegetation zonation is after Rowe (1972); permafrost regime has been described by Brown (1970), and the soil characteristics are derived from exploratory surveys carried out by the Canada-Manitoba Soil Survey. An attempt has been made to describe the dominant vegetation according to soil type and soil moisture conditions. Local physiographic (site) conditions may change the local climate and hence vegetation development. Such conditions occur on steep south-facing slopes in protected valleys which may make the site warmer, or on north-facing slopes, exposed ridges, snow accumulation areas and in frost pockets, any of which may make the site colder. Sites which are not so influenced may be called normal or mesic, as the vegetation on them expresses the normal effect of the Regional climate (Hills, 1960).

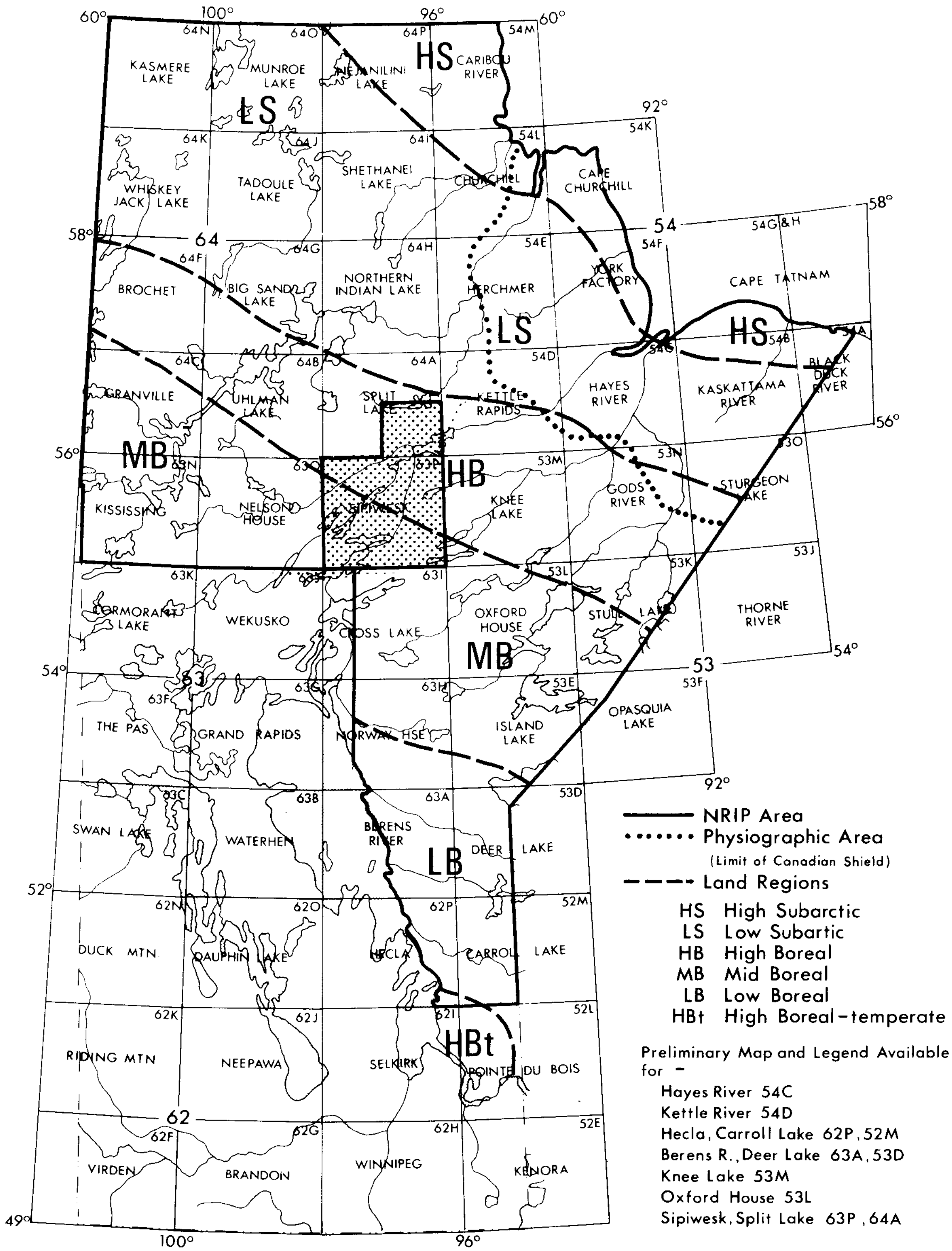


Figure 1 Land regions of Northern and Eastern Manitoba.

Table 1. Selected Biophysical Characteristics of Land Regions in Northern and Eastern Manitoba.

Land Region		Vegetation Zone[1]	Dominant Soils[2]	Organic Landforms	Permafrost Characteristics		
Symbol	Name				Regime[3]	Occurrence and Active Layer, cm	Pattern Ground and Degree of Disturbance
HS	High Subarctic	Forest-tundra transition	Turbic Cryosol Brunisols Organic Cryosol	Peat plateaus, palsas, minerotrophic palsas, peat polygons, fens	Continuous	Mineral soils: sand, nonfrozen; loam, 40-100+ Organic soils: forest peat 40-60, fen peat, non-frozen	Hummocks, sorted polygons, circles, stripes, nets; very active on all materials in all landscape positions except well drained sands
LS	Low Subarctic	Open coniferous forest	Brunisols, Luvisols Turbic Cryosol Organic Cryosol Organic	Peat plateaus, palsas, bog veneer, fens	Discontinuous, widespread	Mineral soils: sand, nonfrozen; loam, 40-100+; clay 30-100+ Organic soils: forest peat, 40-60, fen peat, non-frozen	Hummocks & mounds, very active in poorly drained depressions & lower slopes; scattered mounding and broad depressions on upper & mid slopes; all materials except sands
HB	High Boreal	Closed coniferous forest	Brunisols, Luvisols Turbic and Static Cryosol Organic Cryosol Organic	Peat plateaus, palsas, bog veneers, fens	Discontinuous, southern fringe, (north)	Mineral soils: sand, loam & clay, non-frozen except for poorly drained loam & clay, 40-100+ Organic soils: forest peat, 40-60, fen peat, non-frozen	Some hummocks and mounds in poorly drained depressions & lower slopes; apex & upper slope generally free of cryoturbation
MB	Mid Boreal	Closed coniferous forest	Luvisols, Brunisols Organic Cryosol Organic Static Cryosol	Peat plateaus, palsas, bog veneers, bog plateaus, blanket bog, fen	Discontinuous, southern fringe (south)	Mineral soils: non-frozen except for poorly drained clay, 60-100+ Organic soils: forest peat, 60-200, fen peat, non-frozen	Minor occurrence of mounds in depressions and on lower slopes
LB	Low Boreal	Mixed deciduous-coniferous forest	Brunisols, Luvisols, Gleysols, Organic	Bog plateau, flat bog, blanket bog, fens	Localized	Mineral soils: non-frozen Organic soils: non-frozen except for local occurrence of relict frost at 100-200 cm in forest peat	Absent
HBt	High Boreal-temperate	Mixed deciduous-coniferous forest	Luvisols, Brunisols, Gleysols, Organic	Bog plateau, flat bog, blanket bog, fens, swamps	Absent	Absent	Absent

[1] Rowe, J.S. 1972. Forest Regions of Canada, Department of the Environment, Canadian Forestry Service, Publ. No. 1300.
Ritchie, J.C. 1962. A Geobotanical Survey of Northern Manitoba, Arctic Institute of Northern Manitoba, Technical Paper No. 9.

[2] The System of Soil Classification for Canada. 1978. In press. Canada Department of Agriculture.

[3] Brown, R.J.E. 1967b. "Permafrost in Canada" map Publ. by Div. of Bldg. Res., Nat. Res. Council (NRC 9769) and Geol. Surv. of Can. (Map 1246A).

Table 2. Climatic Characteristics of Land Regions in Northern and Eastern Manitoba.

Land Region		Mean Temperature, °C			Degree Days 5.5°C May 1-Sept. 30	Frost Free Days	Precipitation, mm		Soil Moisture Deficit, mm
Symbol	Name	Ann.	Jan.	July			Ann.	May 1-Sept. 30	
HS	High Sub-arctic	<-6.6	<-26.1	<16.0	500	60 to 75	340 to 450	210 to 270	10 to 20
LS	Low Sub-arctic	-6.6 to -4.9	-29.1 to -27.5	14.1 to 14.6	500 to 700	70 to 80	415 to 560	265 to 360	20 to 40
HB	High Boreal	-4.9 to -3.9	-27.5 to -26.3	14.6 to 15.8	700 to 900	80 to 90	415 to 560	265 to 360	20 to 60
MB	Mid Boreal	-3.9 to -1.1	-26.4 to -21.8	15.1 to 18.3	900 to 1250	90 to 100	420 to 555	260 to 350	50 to 75
LB	Low Boreal	-1.0 to 1.7	-22.8 to -19.8	18.0 to 19.5	1300 to 1445	100 to 116	410 to 535	250 to 355	25 to 75
HBt	High Boreal-temperate	<2.0	<17.1	<19.7	1330 to 1600	100 to 120	410 to 575	250 to 385	75 to 185

References:

1. Temperature and Precipitation normals, 1941-1970, Vol. 1 & 2. Atmospheric Environment Service, Environment Canada.
2. Frost Data, 1941-1970 by G.M. Hemmerick and G.R. Kendall. Atmospheric Environment Service, Environment Canada.
3. Economic Atlas of Manitoba (1960). T.R. Weir (Ed.), Manitoba Dept. of Industry and Commerce.

Table 3. Vegetation Characteristics of Land Regions in Northern and Eastern Manitoba*.

Land Region' Symbol	Land Region' Name	Physiographic Area	Dominant Vegetation Types: Normal Facies: Warmer-drier (south slopes, sand)	Normal-mesic (level-moderate slopes)	Cooler-wetter (north slopes, bottom lands)	Wet Facies: Impeded drainage (sloughs, kettles, marshes, organic plains)	Lakeshore	Alluvial (streamside)
HS	High Sub-arctic	Hudson Bay Lowland	Lichen tundra	Lichen tundra-heath	Lichen-moss tundra	Lichen heath palsas and polygonal peat plateaus/sedge cottongrass fens	Sedge-grass meadow/ larch-birch^{d} fens/ willow	Willow-birch^{d}-alder scrub
		Canadian Shield	Heath tundra-lichens-spruce^{b}	Heath tundra-lichens-birch^{d}	Willow-heath tundra	Lichen heath palsas and polygonal peat plateaus/sedge cottongrass fens	Rush-sedge meadows	Spruce^{w}/willow birch^{d}-alder scrub
LS	Low Sub-arctic	Hudson Bay Lowland	Spruce^{w} (jack-pine)	Open spruce^{b}-lichen-mosses	Spruce^{b}-lichen-larch-mosses	Open spruce^{b}-lichen-moss on palsas and peat plateau/ sedge-larch fens	Rush-grass meadow/ willow-alder	Spruce^{w}-poplar^{b}/willow-birch^{d}-alder scrub
		Canadian Shield	Spruce^{w} (jack-pine)	Open spruce^{b}-lichens	Open spruce^{b}-lichen moss	Spruce^{b}-larch bogs/spruce^{b}-lichen-moss peat plateau and palsa/sedge-larch cottongrass fens	Sedge meadow	Spruce^{w}/willow-birch^{d}-alder
HB	High Boreal	Hudson Bay Lowland	Spruce^{b} (jack-pine, poplar^{w})	Spruce^{b}-mosses (jackpine)	Spruce^{b}-mosses	Spruce^{b}-larch sphagnum bogs/ spruce^{b}-lichen-moss peat plateau/sedge-larch-birch^{d} fens	Sedge meadow	Spruce^{w}/willow birch^{d}/alder
		Canadian Shield	Spruce^{b} (jack-pine, poplar^{w}, birch^{w})	Spruce^{b} (jack-pine, poplar^{w}, birch^{w})	Spruce^{b}-mosses	Spruce^{b}-larch-sphagnum bogs/ spruce^{b}-lichen-moss peat plateau/sedge-larch-birch^{d} fens	Sedge meadow	Spruce^{w}/willow birch^{d}-alder
MB	Mid Boreal	Canadian Shield	Open spruce^{w}-fir^{b}-poplar^{w} (jackpine)	Spruce^{b}-fir^{b}-mosses	Spruce^{b}-mosses	Spruce^{b}-larch-moss bogs (bog veneer, plateau bogs, sloping bog, patterned fen) Spruce^{b}-birch^{w} palsas and peat plateau	Rush-sedge meadow	Sedge-grass meadow
LB	Low Boreal	Canadian Shield	Jackpine (poplar^{w}) (birch^{w})	Spruce^{w}-poplar^{w} (fir^{b}) (birch^{w})	Spruce^{b}-poplar^{w}	Spruce^{b}-larch bogs/ sedge-larch fens	Sedge-rush meadow	Spruce^{w}-poplar^{b}
HBt	High Boreal-temperate	Canadian Shield	Jackpine (poplar^{w}) (birch^{w})	Spruce^{w}-poplar^{w} (fir^{b}) (birch^{w})	Spruce^{b}-poplar^{w}	Spruce^{b}-larch bogs/ spruce-cedar bogs	Sedge-rush meadow	Spruce^{w}-poplar^{b}-ash^{g}

- = associated species or groups of plants / = different communities in same region (= successional communities

DOMINANT PLANT SPECIES

Common Name	Symbol	Scientific Name
Alder		Alnus crispa
Ash, green	ash^{g}	Fraxinus pennsylvanica
Birch, Dwarf	birch^{d}	Betula glandulosa
Birch, White or Paper	birch^{w}	Betula papyrifera
Cedar, white	cedar	Thuja occidentalis
Cottongrass		Eriophorum spp.
Heath	He	Various ericaceous shrubs, including species of Vaccinium, Arctostaphylos, & Kalmia
Fir	fir^{b}	Abies balsamifera
Larch		Larix laricina

DOMINANT PLANT SPECIES

Common Name	Symbol	Scientific Name
Lichens		Many species
Mosses		Many species
Pine, Jack	pine^{j}	Pinus banksiana
Poplar, Balsam	poplar^{b}	Populus balsamifera
Poplar, white (aspen)	poplar^{w}	Populus tremuloides
Sphagnum		Sphagnum spp.
Spruce, Black	spruce^{b}	Picea mariana
Spruce, White	spruce^{w}	Picea glauca
Willow		Salix spp.

* after S.C. Zoltai, unpublished manuscript.

PART II

SIPIWESK (63P) and S.E. 1/4 of SPLIT LAKE (64A) AREAS

1.0 GENERAL DESCRIPTION OF AREA

1.1 Location and Extent

The Sipiwesk area covers some 14 058 km^2 (5 430 sq. miles) between latitude 55° to 56° north and longitude 96° to 98° west. The surveyed portion of the Split Lake area covers some 3 418 km^2 (1 320 sq. miles) between latitude 56° to 56°30' north and longitude 96° to 97° west. The location of the map area in Manitoba is shown in Figure 2.

1.2 History and Present Development

First recorded human activity in this region centered around the exploration inland from Hudson Bay and the early fur trade of the 1700's. The Nelson and Grass Rivers served, to some extent, as trade routes between Hudson Bay and the interior; however, most of the furs and other goods were moved along the Hayes River and upper portion of the Nelson River bypassing the Sipiwesk and Split Lake map areas.

These areas formed part of Rupert's Land, the region in which "The Governor and Company of Adventurers of England trading into Hudson's Bay" had exclusive fur trading rights. In 1876 this region was organized into the District of Keewatin and in 1912 incorporated into the Province of Manitoba.

First development of the areas commenced with the construction of the Hudson Bay railway from The Pas to Churchill. Construction was started in 1911 and was completed in 1929. Although the railway traverses the Sipiwesk map sheet area from southwest to northeast, economic importance to the area was slight. Two small communities, Thicket Portage and Pikwitonei developed along the tracks.

A great boost in economic development and a tremendous increase in various activities were brought about by the discovery in 1956 of a large high-grade deposit of nickel ore at the present site of Thompson. Construction of a mining and smelter complex commenced in 1957. To provide electricity for the complex and town site, the Kelsey hydro-electric generating station was built at Grand Rapid on the Nelson River. A spur line built from Thompson links the city with the Hudson Bay railway at Sipiwesk. Provincial road 391 provides a highway connection with southern Manitoba as well as Lynn Lake to the northwest. The City of Thompson grew in leaps and bounds to a population of over 22 000 in the early to mid-seventies. Recent decline in mining activities has resulted in a sharp drop in population figures. Although the major economic activity in Thompson depends on the mining industry, the city serves as a transportation, communication and service centre for much of northern Manitoba.

The Split Lake area is largely undeveloped and contains only one permanent settlement in the form of the Split Lake Indian Reservation. This settlement has been linked recently with Thompson via the provincial road under construction from Thompson to Gillam.

Most of the Sipiwesk and Split Lake area is forested, and although many stands are of commercial value, especially in the western half of the Sipiwesk map sheet, to this date commercial exploitation has not taken place to any great extent. However, large tracts of land are included in the timber berths of the Manitoba Forest Resources complex at The Pas.

The Sipiwesk and Split Lake areas provide extensive habitat for moose and, to some extent,

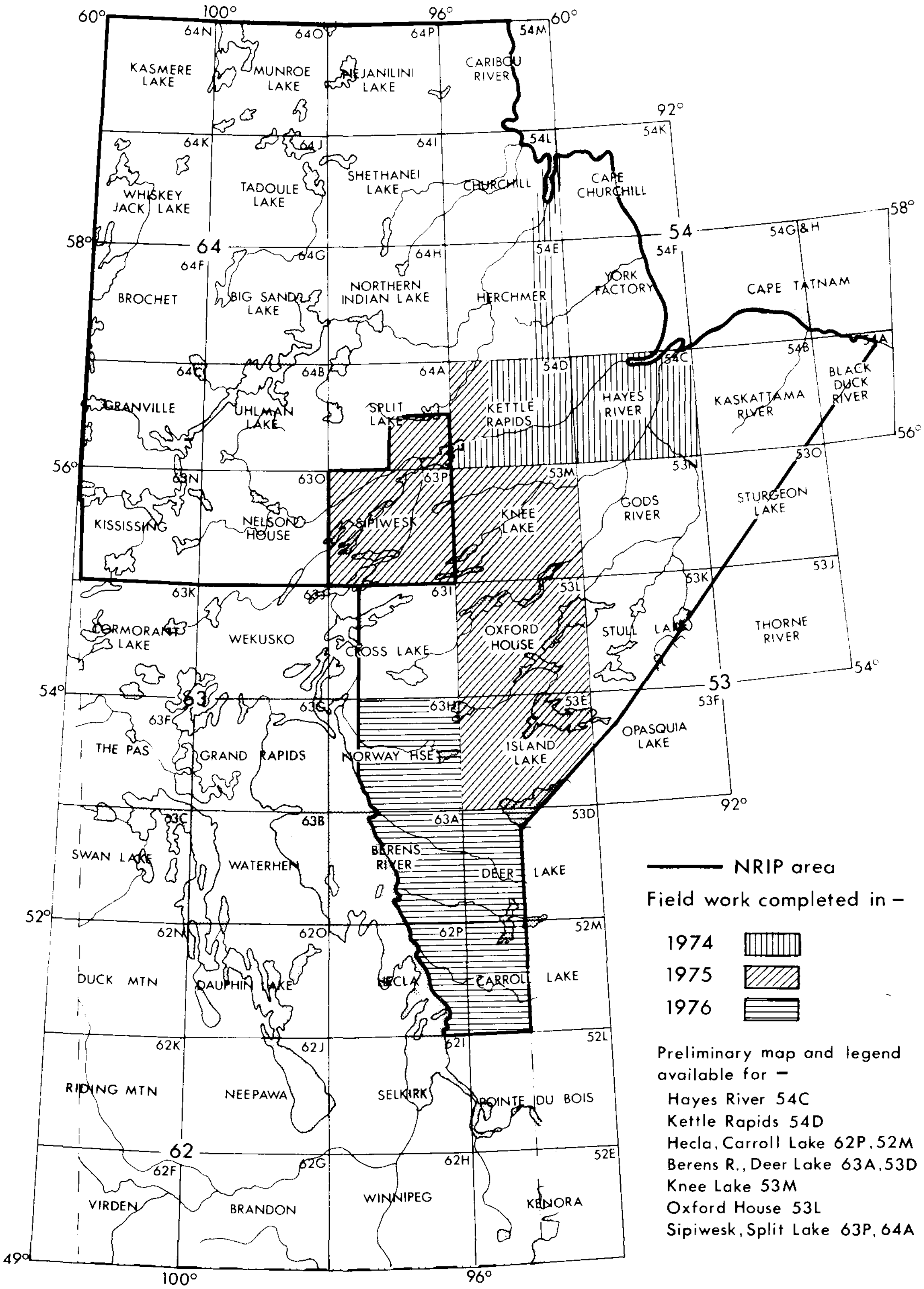


Figure 2 Location and status of Northern Resource Information Program project area.

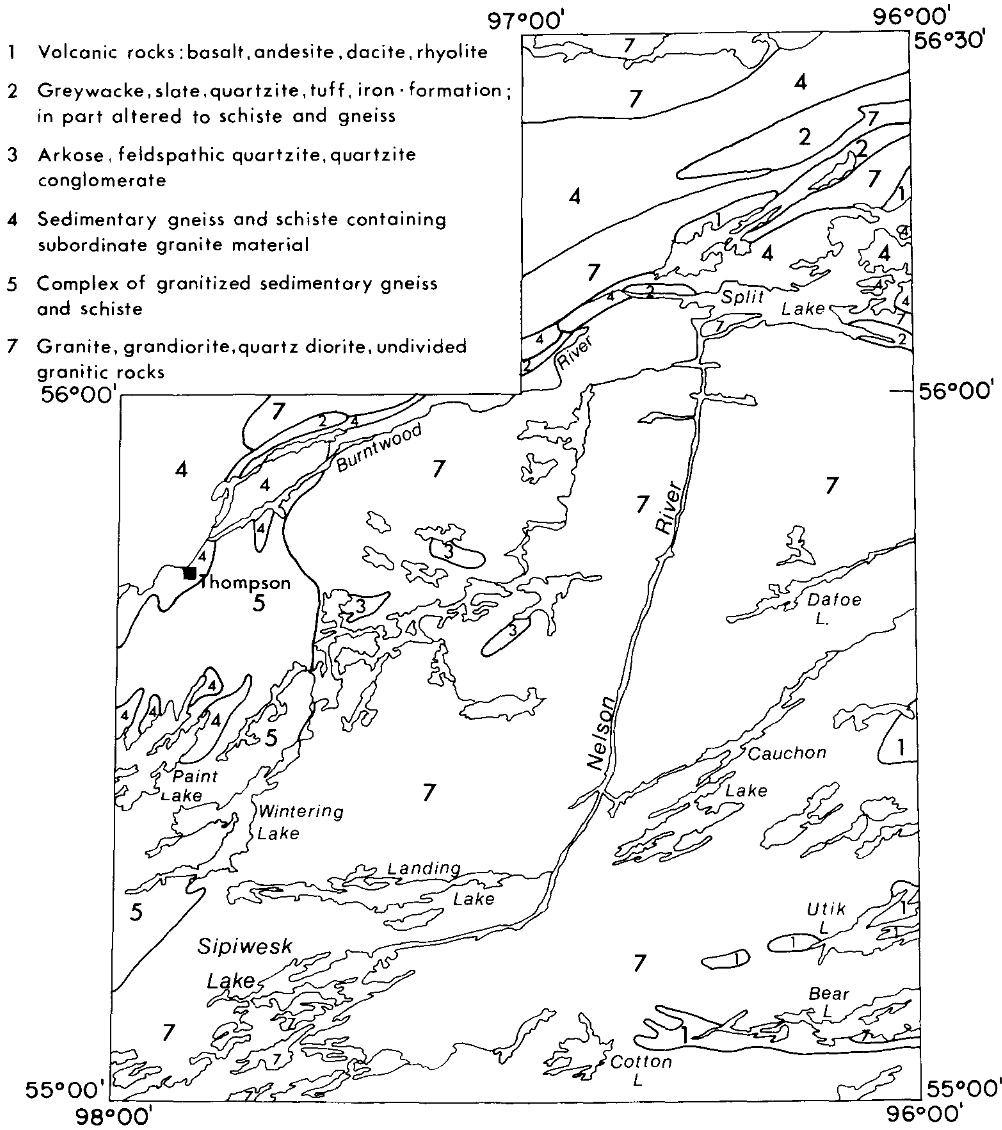


Figure 3 Bedrock formations of the Sipiwesk and Split Lake area
Source – Geological Map of Manitoba Map 65 – 1
Manitoba Mines Branch

for caribou. This resource is harvested through hunting by local people and by an increasing number of hunters from other areas. Waterfowl nesting capacity is scattered along waterways, lakes and ponds. Habitat for beaver and muskrat exists throughout the area and some trapping of these furbearers is done by local people. Commercial fishing takes place mainly on Split Lake.

Although most of the area reamins relatively inaccessible, the construction of the major roads and some short secondary ones to various lakes has opened up large areas for recreation. The Paint Lake area to the south of Thompson and the area around Mystery Lake to the north are heavily used by local residents as well as tourists. Sport fishing, boating and camping are most common forms of recreation enjoyed.

1.3 Bedrock Geology

The bedrock formations of the Sipiwesk and Split Lake areas are shown in Figure 3. These rock types are Precambrian in age and belong to the Superior and Churchill Geological Provinces. The boundary between these two provinces, along which the important Thompson nickel belt occurs, lies north and parallel to the Hudson Bay railway (Davies, et al. 1962). Approximately 85 percent of the map area is underlain by granitic rock. Only minor areas of volcanic rocks occur in the southeast corner of the Sipiwesk area. Areas of metamorphic rocks (dominantly gneiss and schist) occur on the west side of the Sipiwesk area and in the Split Lake area.

1.4 Glaciation and Surface Deposits

Although the map area lies entirely within the Severn and Kazan Upland Divisions of the Canadian Shield Physiographic Region (Bostock 1970), the surface deposits encountered have been influenced also by the Paleozoic carbonate bedrock of the Hudson Bay Lowland to the northeast. Information on the surface geology of the Sipiwesk and Split Lake areas has been compiled in map form by the Geological Survey of Canada (Klassen, R.W. and J.A. Netterville 1973; J.A. Netterville and R.W. Klassen 1973). An overview of the major glacial features and surface deposits in the map area is shown in Figure 4.

During mid and late Pleistocene times, this portion of the Shield was subjected to repeated erosion by ice. The orientation of glacial flutings, drumlins and eskers in an east-west and northeast-southwest direction together with regional studies of associated moraine features, indicate that the last ice movement in most of the map area was from an easterly and northeasterly direction. In the extreme north of the Split Lake map area and on the west side of the Sipiwesk area the direction of movement was from north to south. Drumlins and ground moraine blankets and veneers form a significant part of the mineral surficial deposits only in the eastern half of the Sipiwesk and in the extreme eastern portion of the Split Lake area. In the remainder of the map area these till deposits either are not present, occur in localized areas or are covered by blankets and veneers of lacustrine sediments. The moderately to strongly calcareous till found in the map area is largely derived from the limestone and dolostone bedrock formations within the Hudson Bay Lowland. The till contains variable amounts of rock fragments derived from the Shield bedrock. The proportion of materials from the Shield tends to increase to the west and southwest as distance from the carbonate source increases, resulting in a coarser textured and less calcareous till.

Following deglaciation, the area was covered by various stages of Glacial Lake Agassiz. These waters washed and eroded most of the topographic highs resulting in concentrations of stony and bouldery lags and local areas where the till is coarser in texture than that observed at non-eroded sites. At the same time, clayey to silty textured lacustrine sediments were laid down in various thicknesses throughout the area. The deposits are usually thick and clayey in texture in the western portion of the Sipiwesk map sheet but become thinner to the east where they often are restricted to topographic lows, depressions and lower slopes of gently sloping till areas. The lacustrine sediments in the Split Lake area are clayey in texture in the southern portion but become siltier in texture near the large esker-kame complex that forms the dominant surficial deposit along the northern boundary of the Split Lake area.

In addition to the prominent esker-kame complex in the Split Lake area, a major deposit of glaciofluvial outwash and ice contact materials is found north of Thompson. This deposit is deep and ranges in texture from silt to gravel and boulders. It is characterized by hummocky and ridged topography pitted with sharply defined kettle holes, the larger ones water filled. Various smaller ice contact deposits, mainly in the form of eskers, are found throughout the eastern half of the Sipiwesk map sheet area. The surface form of most ice contact deposits in the map area has been modified (smoothed and rounded) by the waters of Glacial Lake Agassiz.

Throughout the map area, depressions, flat lying terrain and extensive areas characterized by gentle slopes are covered by deep to shallow organic deposits. The deeper bogs are usually frozen (peat plateaus, palsas), while bog veneers contain localized permafrost. The occurrence of permafrost in organic materials and poorly drained clays increases with latitude.

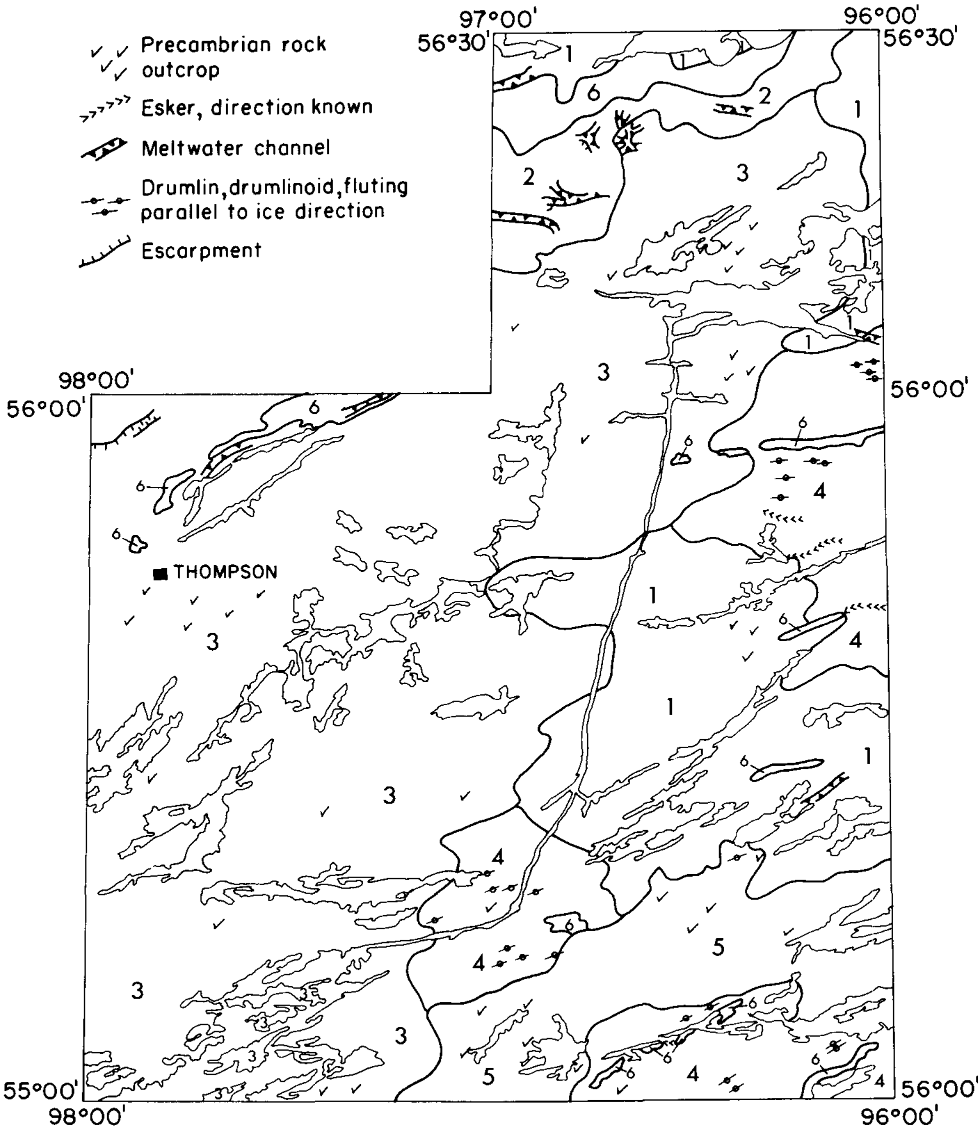
1.5 Land Regions

The northeast half of the Sipiwesk and all of the Split Lake area occurs in the High Boreal Land Region. The remainder of the area lies within the Mid Boreal Land Region (Figures 1 and 5). Selected biophysical, climatic and vegetation characteristics of these Regions are described in Part I, Section 4, of this Guide.

The soils of the Sipiwesk and Split Lake areas are classified in the Luvisolic, Brunisolic, Gleysolic, Organic and Cryosolic soil orders (C.S.S.C. 1978).

The dominant vegetation in most of the map areas is closed coniferous forest. The western half of the Sipiwesk map sheet area is classified in the Nelson River Forest Section of the Boreal Forest Region (Rowe 1972). The remainder of the Sipiwesk area and most of the Split Lake area lie within the Northern Coniferous Forest Section, while the northern fringe of the Split Lake area is classified in the North Western Transition Section of the Boreal Forest Region.

The map areas occur in the southern fringe of the Discontinuous Permafrost Zone (Brown 1976b). The High Boreal Land Region occupies the northern portion of this Zone and the Mid Boreal Region the south.



1	Undulating to level calcareous loamy till moraine overlain largely by lacustrine clay veneers; minor Precambrian rock outcrops, bogs and some fens occupy very gently sloping to depressional terrain
2	Gently sloping deep lacustrine clay and silt deposits dissected by numerous meltwater channels; widespread bogs and fens
3	Undulating to gently sloping lacustrine clay blankets and veneers underlain by hummocky Precambrian rock; bog and some fens occupy very gently sloping to depressional areas
4	Gently to moderately sloping calcareous till moraine with lacustrine clay veneers in depressions and on some lower slopes; organic deposits (bogs and fens) on lower slopes and in depressions
5	Undulating to gently sloping calcareous loamy till plain largely overlain by lacustrine clay veneers; frequent Precambrian outcrops; bogs and some fens occupy very gently sloping to depressional terrain
6	Hummocky and ridged sandy to silty glaciofluvial ice contact deposits; some gravel and local stony and bouldery areas

Figure 4 Surficial deposits, glacial features and ice movement in the Sipiwesk and Split Lake area.

2.0 LAND DISTRICTS

Physiographic characteristics and the distribution of surficial deposits throughout the Sipiwesk map area and the southeast quarter of the Split Lake map area are recognized in ten land districts delineated in Figure 5 and on the accompanying biophysical map. Descriptions of the land districts are presented in the following section. Descriptions in summary form are given in Table 4. Soil and vegetation characteristics encountered in each land district are best examined through study of the biophysical map and legend.

2.1 Hunting Lake Land District

The Hunting Lake Land District occurs in the Split Lake map area, occupying the central portion of the area studied to date. Elevations in the district range from 275 m a.s.l. along its northern boundary with the Little Limestone Land District to approximately 200 m a.s.l. in the southern and eastern area. The surface of the district slopes gently to the south but overall drainage within the district is in a north-east direction. The surface of the district is smooth, gently to very gently sloping, except for those areas close to the Little Limestone Land District which are dissected by channels and gullies of various sizes. Although the district is underlain by Precambrian bedrock, outcrops are very few and relief is only slightly influenced by the bedrock configuration.

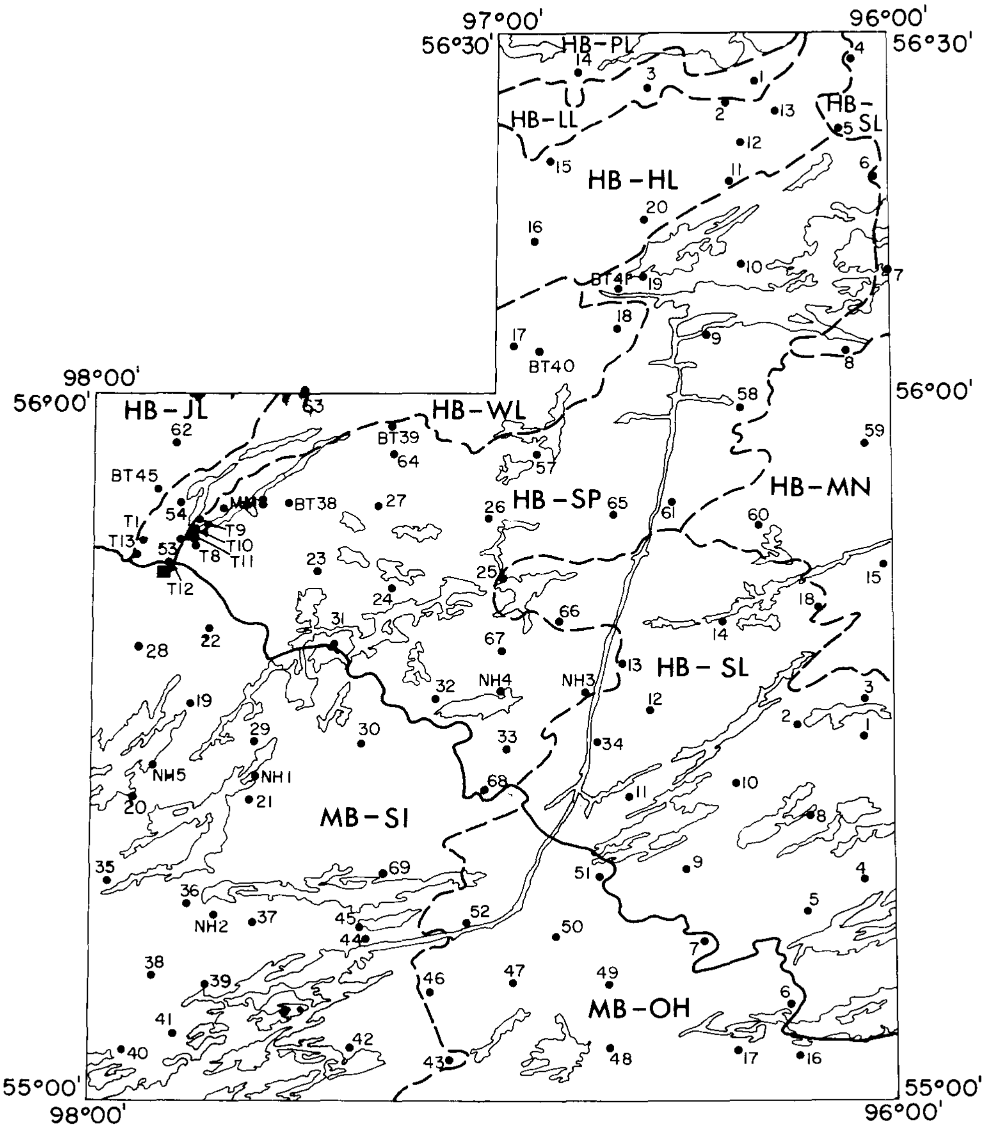
Mineral surface materials consist dominantly of strongly to very strongly calcareous, loam to clay textured lacustrine sediments. The deposits in the northern half of the district consist of loams and silts often with thin clay overlays. The depth of clay textured lacustrine materials increases to the south.

The surface of the district is dominated by organic terrain. Because of the gentle slopes in most of the area, drainage is poor particularly away from the channels and gullies, resulting in the accumulation of organic materials. Thin (1 m), hummocky, forest peat deposits in the form of bog veneers cover gently sloping areas. Permafrost is common in better drained and deeper peat hummocks, especially when shaded (see Figure 6). Deep organic deposits in the form of complex associations of peat plateaus, collapse scars, horizontal and patterned fens have developed in poorly drained level to depressional areas.

A number of small to medium sized lakes occur in the district. Shorelines are generally smooth, having oblong to round configurations. Drainage of the district is easterly through a poorly developed subparallel to linear drainage pattern. Most drainage waters are carried by the Hunting and Clay Rivers. This land district occupies portions of the Burntwood River Lower and the Gull Lake Major Drainage Divisions of the Nelson River Watershed.

2.2 Jock Lake Land District

A small portion of the Jock Lake Land District occurs in the northwest corner of the Sipiwesk map area. The remainder of the district extends into the Nelson House (630) and Split Lake (64A) map sheets. Elevations within the Sipiwesk portion of the district range from approximately 240 m a.s.l. in the north to 200 m a.s.l. in the east. Topography throughout the district is gently to moderately undulating and is controlled by underlying Precambrian bedrock. Mineral surface deposits consist almost exclusively of deep, calcareous, clay textured, lacustrine sediments which are broken occasionally by outcrops of the underlying bedrock. The lacustrine sediments consist of clay to heavy clay materials which become



LAND REGIONS

HB High Boreal

MB Mid Boeal

LAND DISTRICTS

HL Hunting Lake
JL Jock Lake
LL Little Limestone
MN Moose Nose
PL Pelletier Lake
SI Stephens Lake
SP Split Lake
WL Witchai Lake

OH Oxford House
SI Sipiwesk

Figure 5 Land Districts and Location of Ground Truth Sites in the Sipiwesk and Split Lake Map Area.

siltier with depth.

Lower slopes, very gently sloping, and level to depressional terrain is usually covered by organic deposits. Very gently sloping terrain is characterized by thin (<1 m), hummocky, forest peat deposits in the form of bog veneers. Permafrost is very common in somewhat better drained, deeper peat hummocks. The proportion of frozen soils in these organic landforms increases with increase in latitude. Level, and particularly depressional areas are characterized by complex associations of permanently frozen peat plateaus, non-frozen collapse scars, and patterned and horizontal fens.

Drainage of the district is rather poorly developed. A few small to medium sized lakes occur, characterized by smooth and rounded to oval shorelines. Surface drainage is good in areas with steeper relief and close to drainageways of which the Odei River is the major one. The district occupies part of the Burntwood River Lower and Nelson House Major Drainage Divisions of the Nelson River Watershed.

2.3 Little Limestone Land District

The Little Limestone Land District consists of a prominent glaciofluvial esker-kame complex, oriented in an east-west direction through portions of the Kettle Rapids (54D) and Split Lake (64A) map areas. Elevations within the Split Lake portion of the district range from approximately 225 m a.s.l. along lower slopes to over 300 m a.s.l. in some central areas. Topography throughout the district is moderately to strongly rolling and hummocky with generally moderately steep, fairly long slopes. Relief and topographic expression in the district are locally enhanced by small, steep sided, kettle holes, sharply ridged eskers, sandy textured plateaus with deflated surfaces, local duned areas, and occasional deep gullied side slopes (see Figure 7).

The district consists mainly of deep, calcareous, loam to fine sand textured deposits and local areas of sand and/or gravel. Although most of the materials encountered are of glaciofluvial origin (outwash and ice-contact), minor areas of silt and clay textured lacustrine sediments occur. These lacustrine sediments are often buried along the lower slopes of the district where thin layers of glaciofluvial materials have been redistributed by wind and water erosion. In poorly drained depressions and on lower, very gentle slopes organic deposits in the form of bog veneers and, to some extent, peat plateaus can be found.

Drainage is generally good to very good, especially in coarse textured areas and areas with strong relief. The district forms the drainage divide between the Nelson and Churchill River Watersheds, hence the northern portion lies within the Little Churchill River Division of the Churchill River Watershed, while the southern portion is part of the Gull Lake Division of the Nelson River Watershed.

2.4 Moose Nose Land District

The Moose Nose Land District occupies the extreme southeast corner of the Split Lake map area, the northeast corner of the Sipiwesk map area and portions of the Kettle Rapids (54D) and Knee Lake (53M) map areas. Elevations within the Split Lake and Sipiwesk parts of the district range from approximately 210 m a.s.l. in the south to about 180 m a.s.l. along its northern margin. The surface of the district slopes gently to the northeast and is characterized by gently sloping to moderately sloping drumlinized terrain of low to moderate relief. The drumlinized pattern is oriented in a near east-west direction and provides local relief within the district (see Figure 8).

The till found on the drumlin ridges is dominantly a strongly to extremely calcareous, loam to silt loam textured, stony material. Its composition varies because of water working and erosion in shallow glacial lakes. Erosion and sorting has been most severe on the higher drumlin crests resulting in concentrations of boulders, stone lags, and coarser textures than found in non-modified areas on lower slopes or at greater depths in the soil.

Gently sloping to level and depressional portions of the drumlinized terrain are covered with clayey textured lacustrine veneers and blankets. The calcareous lacustrine sediments are discontinuous and only partially cover the underlying till (see Figure 8). Shallow to deep organic deposits form a near continuous cover over the lacustrine sediments and the lower slopes of gently sloping till areas. Bog veneers, consisting of thin (1 m), hummocky, forest peat commonly occur on very gently sloping terrain. Hummocks of thicker, better drained peat and/or shaded areas are usually frozen (see Figure 5). Level to depressional interdrumlin areas are characterized by deep organic deposits occurring as complexes of perennially frozen peat plateaus and very wet, non-frozen, collapse scars, patterned and horizontal fens (see Figures 8 and 10).

Surface drainage conditions in this land district vary over short distances from well to imperfectly drained drumlin crests and lower slopes to poorly drained interdrumlin areas containing deep organic deposits and numerous lakes. The lakes are small to medium in size and are distributed uniformly throughout the district. The shorelines are generally smooth with an oblong to oval configuration. Drainage is generally northeastward through a poorly connected subparallel to linear drainage pattern. Drainage waters from this district are in the Fox River Division of the Hayes River Watershed and the Gull Lake and Arnot Division of the Nelson River Watershed.

2.5 Oxford House Land District

A portion of the Oxford House Land District occurs in the southeast corner of the Sipiwesk map area. The remainder of this land district is found to the south and east in the Cross Lake (63I), Oxford House (53L) and Knee Lake (53M) map areas. The surface of the district, sloping very gently both to the north and to the east, is characterized by moderately to weakly developed drumlinized and hummocky terrain. The drumlin and drumlinoid features are oriented in a northeast to southwest direction. Relief in the district is low to moderate and elevations range from 200 m a.s.l. to 240 m a.s.l. with some isolated areas having elevations up to 270 m a.s.l. Relief, especially in hummocky areas, is partly due to the configuration of the underlying Precambrian bedrock which occurs at the surface only infrequently. Areas of till and/or clay veneer overlying bedrock are most widespread.

The drumlin ridges in this land district consist dominantly of calcareous, loam to silt loam textured, stony till. Much of the till is extremely stony and coarse textured (sandy loam) because of water working of the drumlin crests and upper slopes. The till becomes coarser and less calcareous to the west because of increasing amounts of Shield derived materials incorporated in the till.

Mid and lower slope positions in the drumlinized terrain commonly have veneers and blankets of calcareous, clay textured lacustrine sediments overlying the till. Level and depressional areas between drumlin ridges are characterized by deeper lacustrine clays covered by deep organic deposits.

Table 4. Land Districts of the Sipiwesk Map Area (63P) and Split Lake Map Area (64A).

Land District		Physiographic Characteristics			Soil Characteristics			Drainage and Hydrologic Characteristics	
Symbol	Name	Elevation m a.s.l.	Surficial Deposits	Topography and Landforms	Soil Association or Complex	Dominant Subgroup	Subdominant Subgroup	Soil Drainage	Hydrology*
HL	Hunting Lake	200-275	Extensive shallow to deep organic deposits.	Gently sloping, thin (<1 m) bog veneers on lower slopes and on very gently sloping terrain, underlain by clay to silt textured lacustrine sediments.	Isset Lake Complex Jacam Complex	Terric Mesic Organic Cryosol	Terric Fibric Mesisol	Poor	Many small meandering creeks. Small to medium sized lakes in the southern and eastern areas. Drainage is poorly developed, small lakes connected by subparallel rivers and creeks. Drainage somewhat better developed adjacent to river and creek channels. Drainage from the district is provided by the Hunting and Clay Rivers. Major Drainage Division: Gull Lake (5UF) Burntwood River, lower (5TG) Drainage Direction: Easterly within the Nelson River system
				Level to depressional areas characterized by peat plateaus and	Crying Lake Complex	Mesic Organic Cryosol	Fibric Organic Cryosol	Imperfect to poor	
				Patterned and horizontal fens.	Machiewin Complex	Typic Mesisol	Typic Mesisol, sphagnic phase	Very poor	
			Deep, calcareous loam to silt textured lacustrine sediments in the north with shallow to deep, calcareous clay textured lacustrine sediments underlain by silty sediments in the central and southern areas.	Very gently undulating to near level blankets dissected by gullies and minor channels.	Moak Lake	Gleyed Gray Luvisol	Rego Gleysol, peaty phase	Imperfect to poor	
					Baldock	Gleyed Gray Luvisol	Rego Gleysol, peaty phase	Imperfect to poor	
					Arnot Siding	Gleyed Solonetzic Gray Luvisol	Orthic Gleysol, peaty phase	Imperfect to poor	
JL	Jock Lake	200-240	Deep, calcareous, clay textured lacustrine deposits overlying Precambrian bedrock.	Gently to moderately undulating blankets with minor areas of veneers.	Arnot Siding	Solonetzic Gray Luvisol	Gleyed Solonetzic Gray Luvisol	Moderately well to imperfect	Few, small to medium sized lakes. Some rivers and creeks. Drainage is poorly developed as runoff waters collect in numerous depressions which are slowly drained by meandering creeks. Along larger rivers, drainage is better developed. Drainage from the district is provided by the Odei River. Major Drainage Division: Burntwood River, lower (5TG) Nelson House (5TF) Drainage Direction: Northeasterly within the Nelson River system
			Shallow to deep organic deposits.	Gently sloping, thin (<1 m) bog veneers on lower slopes, underlain by clayey lacustrine sediments.	Isset Lake Complex	Terric Mesic Organic Cryosol	Terric Fibric Mesisol	Poor	
				Level to depressional areas between lacustrine uplands characterized by peat plateaus. and	Crying Lake Complex	Mesic Organic Cryosol	Fibric Organic Cryosol	Imperfect to poor	
				Minor small patterned and horizontal fens.	Machiewin Complex	Typic Mesisol	Typic Mesisol, sphagnic phase	Very poor	
LL	Little Limestone	225-300	Extensive deep loam to sand and gravel glaciofluvial deposits.	Prominent east to west trending, moderately to strongly rolling and hummocky esker-kame complex (extends for a considerable distance east into the Kettle Rapids map area-54D).	Gillam	Eluviated Eutric Brunisol	Gleyed Eluviated Eutric Brunisol	Well to imperfect	The district forms the drainage divide between the Nelson and Churchill Rivers Watershed. Drainage is generally good because of highly permeable materials and steepness of slopes. Some small kettle lakes. Major Drainage Division: Little Churchill River (6FC) Gull Lake (5UF) Drainage Direction: Northern part, northeasterly within the Churchill River system; Southern part, southerly within the Nelson River system
					Little Limestone	Eluviated Eutric Brunisol		Well to very well	

Table 4 (continued)

Land District		Physiographic Characteristics			Soil Characteristics			Drainage and Hydrologic Characteristics	
Symbol	Name	Elevation m a.s.l.	Surficial Deposits	Topography and Landforms	Soil Association or Complex	Dominant Subgroup	Subdominant Subgroup	Soil Drainage	Hydrology*
MN	Moose Nose	180-210	Deep, calcareous loam to silt loam stony till. Coarser textures and more stony areas occur on eroded hummock crests and drumlin ridges.	Gently to moderately sloping drumlin fields oriented in an east-west direction.	Billard	Eluviated Eutric Brunisol	Gleyed Eluviated Eutric Brunisol	Well to imperfect	Numerous small to medium size, oblong to oval lakes. Drainage is poorly developed; lakes connected by subparallel linear to meandering rivers and creeks. Drainage from the district is provided by the Dafoe and Aiken Rivers. Major Drainage Division: Fox River (4AF) Gull Lake (5UF) Arnot (5UE) Drainage Direction: Easterly within the Hayes River system; Northerly within the Nelson River system
			Widespread shallow to deep organic deposits.	Gently sloping, thin (<1 m) bog veneers on lower slopes, underlain by clayey lacustrine sediments.	Isset Lake Complex	Terric Mesic Organic Cryosol	Terric Fibric Mesisol	Poor	
				Level to depressional interdrumlin areas characterized by peat plateaus and	Crying Lake Complex	Mesic Organic Cryosol	Fibric Organic Cryosol	Imperfect to poor	
				Patterned and horizontal fens.	Machiewin Complex	Typic Mesisol	Typic Mesisol, sphagnic phase	Very poor	
			Thin, clay textured lacustrine veneer and blankets underlain by loam till; very minor extent.	Level to depressional interdrumlin areas and lower slopes of drumlin ridges.	Kettle Rapids	Orthic Gleysol, peaty phase	Gleyed Gray Luvisol	Poor to imperfect	
OH	Oxford House	200-270	Deep, calcareous loam to silt loam stony till. Coarse textured (sandy loam), very stony materials occur on eroded drumlin crests. The till becomes coarser and less calcareous to the west.	Gently to moderately sloping drumlinized moraine oriented in northeast to southwest direction.	Breland	Eluviated Eutric Brunisol	Gleyed Eluviated Eutric Brunisol	Well to imperfect	Numerous, small and medium sized lakes; drainage is dominantly poorly developed; water bodies drain via a poorly connected parallel to subparallel pattern of rivers and creeks. Drainage waters are removed from the district by the Nelson River and via Bear Lake and the Bigstone River. Major Drainage Divisions: Gull Lake (5UF) Cross Lake (5UD) Fox River (4AF) Drainage Direction: Northwesterly within the Nelson River Watershed and Easterly within the Hayes River Watershed
					Simonhouse	Eluviated Eutric Brunisol	Gleyed Gray Luvisol	Well to imperfect	
			Shallow to deep clayey textured lacustrine sediments underlain by loam textured till.	Very gently sloping to near level lacustrine veneers and blankets on mid and lower drumlin slopes and interdrumlin areas.	Walker River	Gleyed Gray Luvisol	Orthic Gleysol, peaty phase	Imperfect to poor	
			Widespread shallow to deep organic deposits.	Gently sloping thin (<1 m) bog veneer on lower slopes, underlain by clayey lacustrine sediments.	Nichols Lake Complex	Terric Mesic Organic Cryosol	Terric Fibric Mesisol	Poor	
				Level to depressional peatlands and interdrumlin areas characterized by peat plateaus and	Nekik Lake Complex	Mesic Organic Cryosol	Fibric Organic Cryosol	Imperfect to poor	
				Patterned and horizontal fens.	Rock Island Complex	Typic Mesisol	Typic Mesisol, sphagnic phase	Very poor	
			Minor areas of deep calcareous, loam to sandy and gravelly glaciofluvial deposits.	Small to medium eskers and kames oriented in a northeast to southwest direction.	White Mud	Eluviated Eutric Brunisol	Gleyed Eluviated Eutric Brunisol	Well to imperfect	
					Joint River	Eluviated Eutric Brunisol		Rapid to well	

Table 4 (continued)

Land District		Physiographic Characteristics			Soil Characteristics			Drainage and Hydrologic Characteristics	
Symbol	Name	Elevation m a.s.l.	Surficial Deposits	Topography and Landforms	Soil Association or Complex	Dominant Subgroup	Subdominant Subgroup	Soil Drainage	Hydrology*
PL	Pelletier Lake	220-240	Extensive shallow to deep organic deposits.	Gently sloping thin (<1 m) bog veneers on lower slopes, usually underlain by clay to silt loam textured lacustrine sediments.	Isset Lake Complex Jacam Complex	Terric Mesic Organic Cryosol	Terric Fibric Mesisol	Poor	Few, small and some large lakes. Drainage is poorly developed. Small lakes are connected by sub-parallel meandering creeks. Drainage from district provided by Little Churchill River.
				Level to depressional areas of peat plateaus and	Crying Lake Complex	Mesic Organic Cryosol	Fibric Organic Cryosol	Imperfect to poor	Major Drainage Division: Little Churchill River (6FC)
				Horizontal fens.	Machiewin Complex	Typic Mesisol	Typic Mesisol, sphagnic phase	Very poor	Drainage Direction: Northeasterly within the Churchill River Watershed
			Deep to moderately deep calcareous clay grading into silty textured lacustrine sediments. Calcareous loamy till occurs at depths of 1 to 3 meters.	Gently undulating to nearly level blankets with minor areas of veneers.	Baldock	Gleyed Gray Luvisol	Orthic Gleysol, peaty phase	Imperfect to poor	
SI	Sipiwesk Lake	180-210	Deep (>1 m) to shallow (<1 m) calcareous clay textured lacustrine sediments overlying Precambrian bedrock.	Moderately to strongly undulating lacustrine blankets and	Wabowden	Solonetzic Gray Luvisol	Gleyed Solonetzic Gray Luvisol	Well to imperfect	Many small sized oval and rounded lakes with smooth shorelines. The medium and large lakes have irregular rock controlled shorelines.
				Lacustrine veneers.	Warren Landing	Solonetzic Gray Luvisol, lithic phase	Gleyed Solonetzic Gray Luvisol, lithic phase	Well to imperfect	Drainage is moderately good adjacent to large lakes and streams but is poor in the remainder of the area. Drainage from the district is via the Burntwood, Grass and Nelson Rivers.
			Widespread, shallow to deep organic deposits.	Gently sloping thin (<1 m) bog veneers on lower slopes, underlain by clay textured lacustrine sediments.	Nichols Lake Complex	Terric Mesic Organic Cryosol	Terric Fibric Mesisol	Poor	Major Drainage Divisions: Burntwood River, lower (5TG) Grass River, lower (5TD) Cross Lake (5UD)
				Level to depressional areas of peat plateaus and	Nekik Lake Complex	Mesic Organic Cryosol	Fibric Organic Cryosol	Imperfect to poor	Drainage Direction: Northeasterly within the Nelson River Watershed
				Patterned and horizontal fens.	Rock Island Complex	Typic Mesisol	Typic Mesisol, sphagnic phase	Very poor	
			Minor Precambrian bedrock outcrops.	Local occurrences of hummocky and ridged rock outcrops associated with thin, discontinuous veneers of clayev lacustrine sediments.	Flatrock Complex	Orthic Gray Luvisol, lithic phase	Gleyed Gray Luvisol, lithic phase	Well to imperfect	
SL	Stephens Lake	190-220	Shallow to deep calcareous, clay textured lacustrine sediments, underlain by loam textured till.	Very gently undulating to near level veneer and blankets, broken by occasional outcrops of water worked till and/ or Precambrian bedrock.	Kettle Rapids	Gleyed Gray Luvisol	Rego Gleysol, peaty phase	Imperfect to poor	Many small to medium sized oval and rounded lakes with smooth shorelines. Several large lakes with irregular rock controlled shorelines. Drainage is moderately good adjacent to larger lakes but poor in the remainder of the area.
			Water worked and eroded loam to silt loam till; (stonier, coarse textured sandy loam areas occur on eroded hummock crests).	Gently undulating to hummocky moraine.	Billard	Eluviated Eutric Brunisol	Gleyed Eluviated Eutric Brunisol	Well to imperfect	Drainage from the district is provided by the Nelson and Dafoe Rivers and by several large lakes through the Bigstone River. Major Drainage Division: Arnot (5UE) Fox River (4AF)
			Widespread shallow to deep organic deposits.	Gently sloping thin (<1 m) bog veneer on lower slopes, underlain by clayey lacustrine sediments.	Isset Lake Complex	Terric Mesic Organic Cryosol	Terric Fibric Mesisol	Poor	Drainage Direction: West and north within the Nelson River Watershed; Easterly within the Hayes River Watershed
				Level to depressional peatlands characterized by peat plateaus and	Crying Lake Complex	Mesic Organic Cryosol	Fibric Organic Cryosol	Imperfect to poor	
				Horizontal and patterned fen complexes.	Machiewin Complex	Typic Mesisol	Typic Mesisol, sphagnic phase	Very poor	
			Minor areas of Precambrian bedrock outcrops.	Local occurrences of hummocky rock outcrops associated with thin, discontinuous veneers of loam till deposits and clayey lacustrine sediments.	Carriere Complex	Eluviated Eutric Brunisol, lithic phase	Orthic Gray Luvisol, lithic phase	Rapid to poor	

Table 4 (continued)

Land District		Physiographic Characteristics			Soil Characteristics			Drainage and Hydrologic Characteristics	
Symbol	Name	Elevation m a.s.l.	Surficial Deposits	Topography and Landforms	Soil Association or Complex	Dominant Subgroup	Subdominant Subgroup	Soil Drainage	Hydrology*
SP	Split Lake	170-215	Deep (>1 m) to shallow (<1 m) calcareous, clay textured lacustrine sediments overlying Precambrian bedrock.	Gently to moderately undulating lacustrine blankets and Lacustrine veneers.	Arnot Siding	Solonetzic Gray Luvisol	Gleyed Solonetzic Gray Luvisol	Well to imperfect	Many small to medium sized oval and rounded lakes with smooth shorelines. Several large lakes with irregular, bedrock controlled shorelines. Except for areas adjacent to large lakes and rivers, the district is poorly drained. Drainage from the district is via the Nelson River. Major Drainage Divisions: Gull Lake (5UF) Arnot (5UE) Grass River, lower (5TD) Burntwood River, lower (5TG) Drainage Direction: Northeasterly within the Nelson River Watershed
					Split Lake	Solonetzic Gray Luvisol, lithic phase	Gleyed Solonetzic Gray Luvisol, lithic phase	Well to imperfect	
			Widespread shallow to deep organic deposits.	Gently sloping thin (<1 m) bog veneer on lower slopes underlain by clayey lacustrine sediments.	Isset Lake Complex	Terric Mesic Organic Cryosol	Terric Fibric Mesisol	Poor	
				Level to depressional peatlands characterized by peat plateaus and	Crying Lake Complex	Terric Mesic Organic Cryosol	Terric Fibric Organic Cryosol	Imperfect to poor	
				Horizontal and patterned fen complexes.	Machiewin Complex	Typic Mesisol	Typic Mesisol, sphagnic phase	Very poor	
			Minor Precambrian bedrock outcrops.	Local occurrences of hummocky and ridged rock outcrops associated with thin, discontinuous veneers of clayey lacustrine sediments.	Carriere Complex	Orthic Gray Luvisol, lithic phase	Gleyed Gray Luvisol, lithic phase	Very well to poor	
WL	Witchai Lake	170-220	Deep, calcareous, loam to sand textured and gravelly glaciofluvial deposits.	Prominent northeast to southwest trending, moderately to strongly rolling glaciofluvial ridge in southwestern portion of district.	Gillam	Eluviated Eutric Brunisol	Gleyed Eluviated Eutric Brunisol	Well to imperfect	Few small to medium sized lakes. Some large lakes with irregular bedrock controlled shorelines. Drainage better developed adjacent to lakes and streams in the coarser textured areas. The remainder of the district is poorly drained by meandering creeks. Drainage from the district is via the Burntwood and Grass Rivers. Major Drainage Division: Burntwood River, lower (5TG) Grass River, lower (5TD) Drainage Direction: Northeasterly within the Nelson River Watershed
					Little Limestone	Eluviated Eutric Brunisol		Rapid to well	
			Deep (>1 m) to shallow (<1 m), calcareous clay textured lacustrine sediments overlying Precambrian bedrock and shallow (<1 m) calcareous, clay textured lacustrine sediments overlying silt and silt loam textured lacustrine sediments and loamy glaciofluvial deposits.	Gently to moderately undulating blankets and veneers.	Arnot Siding	Solonetzic Gray Luvisol	Gleyed Solonetzic Gray Luvisol	Well to imperfect	
					Split Lake	Solonetzic Gray Luvisol, lithic phase	Gleyed Solonetzic Gray Luvisol, lithic phase	Well to imperfect	
				Gently undulating veneers.	Baldock	Gleyed Gray Luvisol	Rego Gleysol, peaty phase	Imperfect to poor	
					Burntwood	Gleyed Gray Luvisol	Orthic Gray Luvisol	Imperfect to well	
			Widespread deep to shallow organic deposits.	Gently sloping, thin (<1 m) bog veneers on lower slopes and on very gently sloping terrain, underlain by clay textured lacustrine sediments.	Isset Lake Complex	Terric Mesic Organic Cryosol	Terric Fibric Mesisol	Poor	
				Level to depressional areas characterized by peat plateaus and	Crying Lake Complex	Mesic Organic Cryosol	Fibric Organic Cryosol	Imperfect to poor	
				Horizontal and patterned fens.	Machiewin Complex	Typic Mesisol	Typic Mesisol, sphagnic phase	Very poor	
			Minor areas of deep, calcareous loam to silt loam stony till.	Gently to moderately sloping hummocky moraine.	Billard	Eluviated Eutric Brunisol	Gleyed Eluviated Eutric Brunisol	Well to imperfect	

Organic deposits on the gently sloping lower slopes are thin (<1 m), with hummocky microrelief and a discontinuous occurrence of permafrost. The incidence of permafrost in these landforms is less than in bog veneers farther to the north. Level to depressional areas are characterized by deep organic deposits usually found in complexes of frozen and non-frozen organic landforms. The perennially frozen peat plateaus show increasing evidence of permafrost degradation in the form of collapse scars as compared to areas in the High Boreal region to the north. Poorly drained fens, both patterned and horizontal, are associated with the peat plateaus.

Drainage conditions in the Oxford House Land District are similar to that encountered in other areas with drumlinized and hummocky terrain. Well and imperfectly drained conditions occur on crests and midslopes. Poorly drained areas are found on lower slopes and between hummocks and drumlins. The district contains numerous small and medium sized lakes which usually have smooth, round to oval shaped, shorelines. Some large lakes also occur in the district and have irregular, often bedrock controlled, shorelines. The only major waterway in the district is the Nelson River which traverses the district in the northwest corner. Surface drainage of the district is fairly poor because of a poorly connected parallel to subparallel drainage pattern. The district covers part of the Cross Lake and Gull Lake Divisions of the Nelson River Watershed and part of the Fox River Division of the Hayes River Watershed.

2.6 Pelletier Lake Land District

The Pelletier Lake Land District occupies the northernmost part of the Split Lake area mapped to date. Most of the district lies north of the area covered on the biophysical map. Elevations in the mapped part of the district decrease from approximately 240 m a.s.l. along its southern margin to about 220 m a.s.l. along the shore of Pelletier Lake. The surface of the district thus slopes gently to the north. Although the district is underlain by Precambrian bedrock, outcrops are few and relief is only slightly affected by the bedrock configuration.

Mineral surface materials consist dominantly of gently undulating, calcareous, clay to silt loam textured lacustrine deposits. The texture of the sediments becomes coarser with depth and in some areas, the silty materials occur at the surface. The silt to loam textured materials are derived from glaciofluvial deposits in the Little Limestone Land District to the south. The lacustrine sediments are generally shallow (probably less than 3 m thick) and overlie calcareous loamy till; local areas of lacustrine deposition may be deep.

Most of the area is poorly drained, resulting in the accumulation of extensive organic deposits. On lower slopes and on very gently sloping terrain, thin (<1 m), hummocky, forest peat deposits in the form of bog veneers are very common (see Figure 6). The incidence of permafrost in hummocks is high and even areas of very shallow peat accumulation may contain permafrost. In depressions and on level terrain deep organic complexes in the form of peat plateaus and fens have developed. Poorly drained, non-frozen collapse scars are associated with the perennially frozen peat plateaus. Small areas of very poorly drained organic deposits in the form of horizontal and patterned fens occupy parts of the lower lying terrain.

Only a limited number of small lakes occur in addition to the larger Pelletier and Waskaiowaka Lakes. The shores of small lakes and parts of the shorelines of large lakes are smooth and rounded. Drainage waters from the district are in the Little Churchill River

Division of the Churchill River Watershed.

2.7 Sipiwesk Land District

The Sipiwesk Land District occupies the southwestern quarter of the Sipiwesk map area. The remainder of the district extends into the Nelson House (63O), Wekusko (63J) and Cross Lake (63I) map areas. Elevations within the Sipiwesk part of the district range from approximately 210 m a.s.l. to about 180 m a.s.l. The surface of the district slopes in a northeasterly direction and is characterized by moderately to strongly undulating terrain in the western part and gently to moderately undulating terrain in the eastern part. Relief of the district is strongly influenced by the surface configuration of underlying Precambrian bedrock. Although the total area of exposed bedrock is small, its effect on drainage and drainage system development is pronounced.

Calcareous clay textured, lacustrine sediments are the dominant mineral surface deposits found in the district. These sediments range in depth from very thick (up to 30 m) to very shallow (1 m) (see Figure 9). They are often varved at some depth below the surface and may become siltier with depth, especially when shallow over bedrock.

On moderate slopes and crests surface drainage is good, but on lower slopes and in gently sloping and level to depressional terrain drainage is slow to very slow, resulting in the accumulation of organic material. Deep organic deposits are found in depressional to level terrain, often between bedrock controlled and/or lacustrine uplands. Bog veneers, consisting of thin (1 m) hummocky, forest peat commonly occur on very gentle and lower slopes (see Figures 9 and 6). Discontinuous permafrost is a characteristic of this kind of terrain, and is usually found under better drained, deeper peat hummocks. Deep organic deposits occur as complexes of peat plateaus and patterned and/or horizontal fens. Degradation of permafrost in the organic terrain increases and the proportion of frozen soils decreases in southern portions of the district. Collapse scars both on the edge as well as in the centre of peat plateaus become more extensive to the south.

Surface drainage conditions in this district vary from well drained crests to poorly drained depressions over relatively short distances. Areas of pronounced topography and terrain close to lakes and waterways are characterized by generally good drainage conditions. In the remaining areas drainage is usually imperfect to very poor. The many large lakes in the district have irregular, bedrock-controlled shorelines. Small lakes are numerous in the district and fairly evenly distributed. The smaller lakes often have smooth, rounded to oval shorelines.

The northern portion of the district forms part of the Burntwood and Grass Rivers Lower Drainage Divisions. The southern portion is drained by the Nelson River and is part of the Cross Lake Drainage Division. The entire district lies within the Nelson River Watershed.

2.8 Split Lake Land District

The Split Lake Land District occurs in both of the Sipiwesk and Split Lake map areas. Elevations in the district range from 215 m a.s.l. in the west to 170 m a.s.l. in the north. The general slope of the land is in a northeasterly direction. The surface of the district is characterized by gently to moderately undulating terrain with occasional strongly undulating to strongly hummocky areas. The underlying Precambrian bedrock creates most of the relief in the district, but blankets and veneers of unconsolidated surface materials mask or strongly reduce the bedrock topography (see Figure 9).

Calcareous, clay textured, lacustrine sediments form the dominant mineral surface deposit. These sediments are in the form of near continuous blankets and veneers, broken only occasionally by bedrock outcrops. The lacustrine sediments are usually varved at some depth below the surface and often become siltier with depth, especially when shallow over bedrock. Much of the lacustrine sediments are covered by shallow to deep organic deposits. On lower slopes and on gently undulating terrain, bog veneers consisting of thin (<1 m) hummocky, forest peat deposits are common (see Figure 9). Permafrost is frequent in better drained, well developed peat hummocks or in well shaded portions of these landforms. Depressional and level terrain is covered by deep organic accumulations characteristic of peat plateaus, collapse scars, patterned and horizontal fens. Permafrost is discontinuous, occurring mainly in soils on the peat plateaus.

Surface drainage conditions in this district vary over relatively short distances, from well drained crests to poorly drained depressions. In areas with steeper relief, and in areas close to lakes and waterways drainage is generally good. In the remainder of the district, drainage is usually imperfect to very poor; large lakes like Split Lake and Natawahunan Lake have irregular, bedrock controlled shorelines. Small and medium sized lakes usually have smooth, rounded to oval shorelines. Drainage waters are carried by the Nelson, Burntwood and Grass Rivers and their tributaries.

The northern half of the district forms part of the Gull Lake and the Arnot Major Drainage Division; the remaining area is part of the Grass and Burntwood River Lower Divisions, all within the Nelson River Watershed.

2.9 Stephens Lake Land District

The Stephens Lake Land District occupies the east-central portion of the Sipiwesk map area, a small area along the east side of the Split Lake map area, and extensive portions of the Knee Lake (53M) and Kettle Rapids (54D) map areas.

Only the Sipiwesk portion of the district is discussed in this Guide, as the description of the Stephens Lake Land District contained in the Kettle Rapids (54D) Guide applies to the Split Lake area as well.

Within the Sipiwesk map area the district elevations range from approximately 190 m a.s.l. in the northwest to about 220 m a.s.l. in the south; however, most of the area lies between 200 and 210 m a.s.l. The surface slope of the district does not show any particular trend; part of the district sloping gently east, other parts sloping west and north. The topography consists of dominantly gently undulating to level and depressional terrain, broken by scattered hummocky areas of slightly higher and more rugged relief. Clayey textured lacustrine sediments, extensive organic deposits and loamy till deposits dominate the surface of the district. Small hummocky and ridged glaciofluvial deposits add some local relief to the landscape. Precambrian bedrock underlies the district at relatively shallow depths (5 m), and controls, to a large extent, the relief of the district. Rock outcrops are locally frequent, but the total area of exposed bedrock is minor.

The till materials found throughout this land district are very strongly to extremely calcareous, stony, and sandy loam to silt loam in texture; loam to silt loam being dominant. Surface occurrences of till are not widespread because blankets and veneers of calcareous clayey lacustrine sediments are fairly extensive and continuous in this district (see Figure 10).

Lacustrine sediments in this district are shallow (<3 m) and in most areas, underlain by loamy till, although lacustrine veneers over bedrock occur. Lacustrine sediments are found on lower slopes of hummocky terrain, and upper and mid slopes of gently undulating terrain. The clayey sediments are deeper in level to depressional areas but are usually covered with organic deposits (see Figure 10).

Some of the till deposits and extensive areas of lacustrine sediments are covered with organic deposits. Shallow (1 m), hummocky organic materials in the form of bog veneers cover the lower slopes of gently undulating terrain. These areas are characterized by discontinuous permafrost, which usually occurs in better drained peat hummocks and in shaded areas (see Figure 6). Level to depressional areas scattered throughout the land district are covered with deep organic deposits consisting of imperfectly drained, perennially frozen peat plateaus in association with poorly drained non-frozen fens.

Drainage is moderately well developed in areas close to large lakes and waterways, but is poorly developed in areas with only small to medium sized lakes. The large lakes have generally irregular, usually bedrock-controlled, shorelines; medium and small sized lakes usually have smooth, rounded to oval shorelines. The Nelson River flows through the western edge of the district; the eastern part of the district eventually drains into the Bigstone River in the Knee Lake map area. The western and northern portions of the district lie within the Arnot Division of the Nelson River Watershed. Southern and eastern portions lie within the Fox River Division of the Hayes River Watershed.

2.10 Witchai Lake Land District

The Witchai Lake Land District trends northeasterly along the Burntwood and Odei Rivers through both the Sipiwesk and Split Lake map areas. Elevations range from 220 m a.s.l. in the south to 170 m a.s.l. in the northeast. The northern half of the district slopes to the northeast and is characterized by gently to moderately undulating terrain, occasionally broken by bedrock outcrops, till ridges and hummocks. The southern part of the district is dominated by gently and strongly undulating to hummocky and ridged glaciofluvial deposits.

The glaciofluvial deposits are calcareous and range in texture from silt loam and fine sand to gravelly and cobbly materials. Areas with pronounced ridged and hummocky relief are often coarser in texture; gently sloping lower aprons are usually finer in texture. These lower slopes are often covered by silt to clay textured lacustrine veneers and blankets. Wet depressions and poorly drained level terrain are characterized by organic deposits in the form of bog veneers. These bog veneers consist of thin (<1 m), hummocky forest peat, containing discontinuous permafrost. Better drained, well developed hummocks and shaded areas are perennially frozen. Deeper organic deposits associated with complexes of peat plateaus and horizontal and patterned fens are found in depressional to level areas of clayey textured lacustrine blankets underlain by glaciofluvial sands and silts.

The northeastern half of the district consists dominantly of lacustrine sediments, in the form of blankets and veneers, overlying Precambrian bedrock. These lacustrine deposits are generally clay textured at the surface, becoming siltier with depth. Topography is gently to moderately undulating except close to rivers and lakes where slopes can be very steep. Most of the relief in this part of the district is due to the surface configuration of the

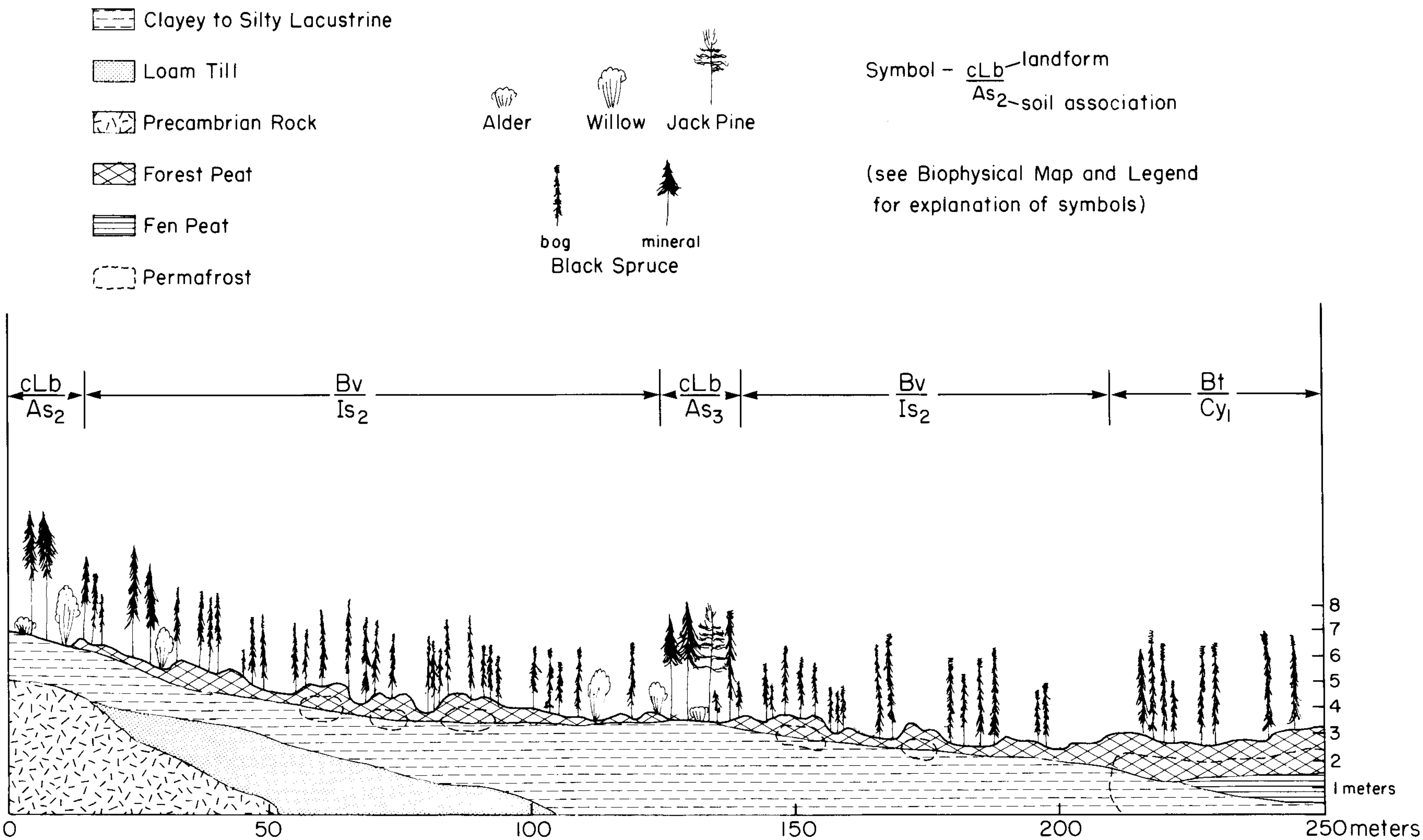


Figure 6 Cross-section through a bog veneer area. These areas consist of a veneer of organic materials(ussually 40-100 cm thick) overlying clayey lacustrine sediments. Hummocks consist of fibric sphagnum peat overlying mesic forest peat and often contain permafrost, especially in the High Boreal Land Region.
(Drawing largely based on data from sites 63P-75 No3 and 14 ; vegetation not to scale)

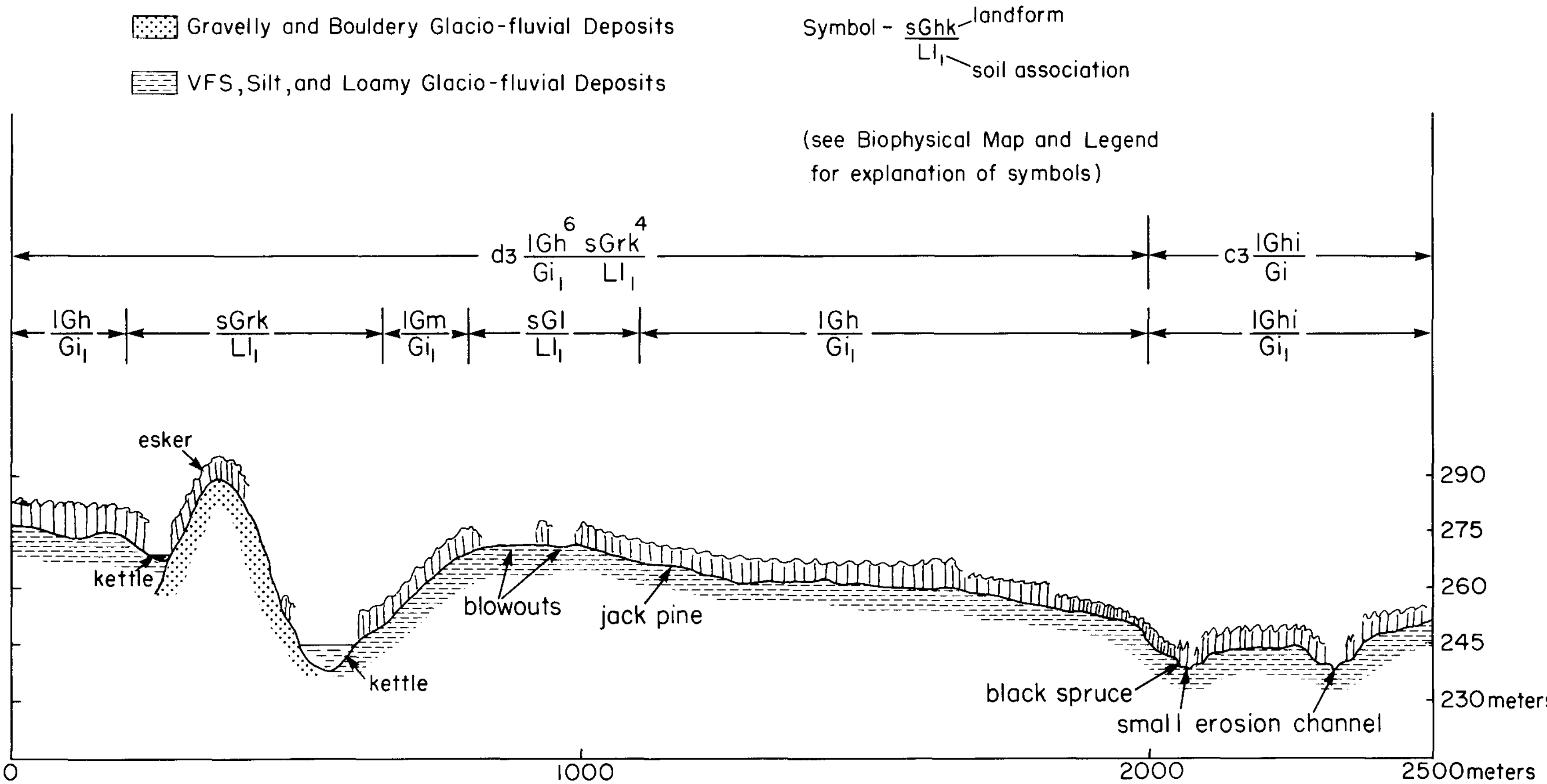


Figure 7 Cross-section through portion of Little Limestone Land District
Materials consist of loamy, sandy to gravelly glacio-fluvial deposits (eskers and kames)
Vegetation is dominantly jack pine (often burned) with sometimes heavy alder shrub cover.

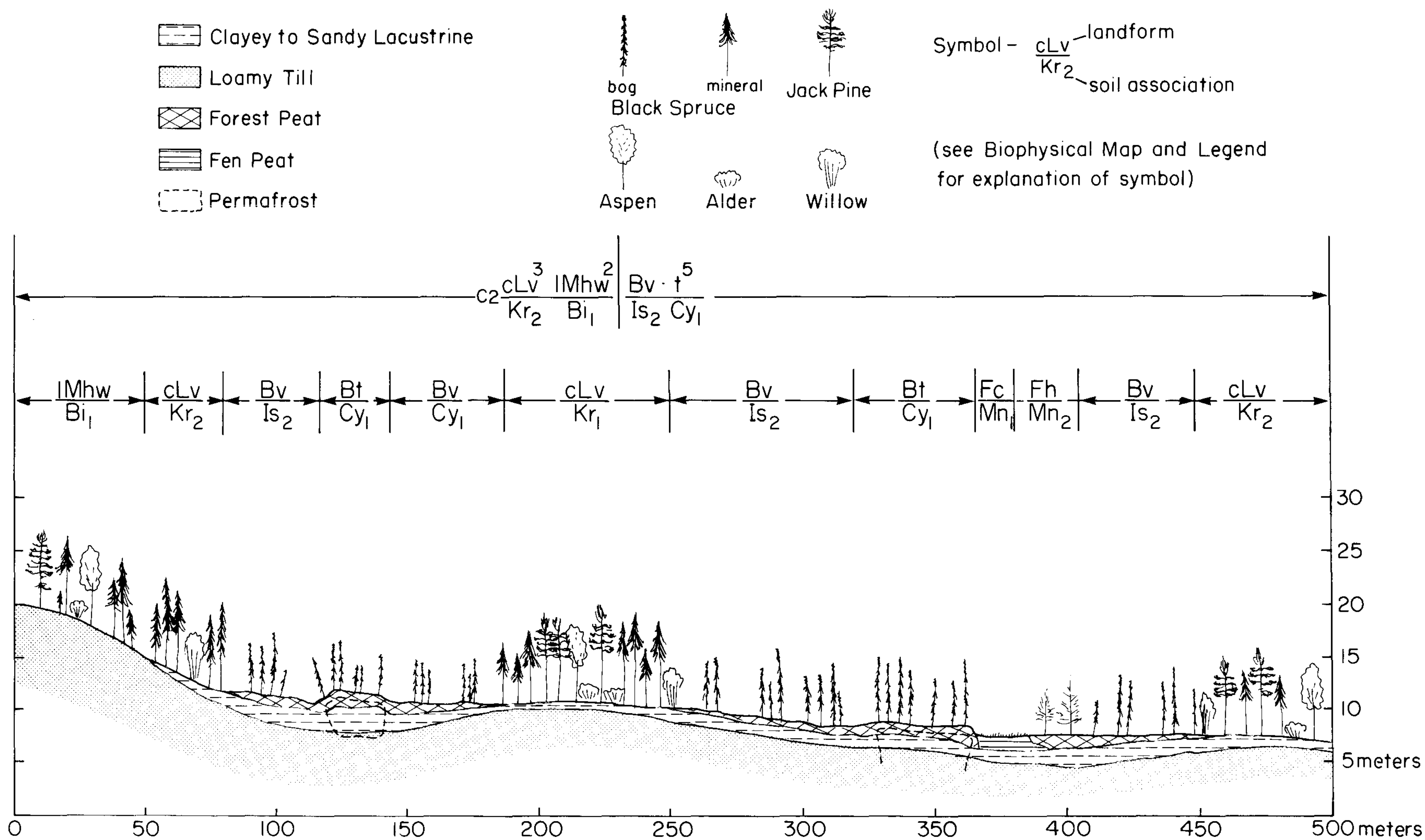


Figure 8 Cross-section through portion of hummocky ground moraine with clayey lacustrine veneers, bog veneers, ground moraine with clayey lacustrine veneers and bog veneers, peat plateaus and fens on lower slopes and in depressions (Stephens Lake Land District)
(Drawing based on data from sites 63P-75 No.1, 5 and 8; vegetation not to scale.)

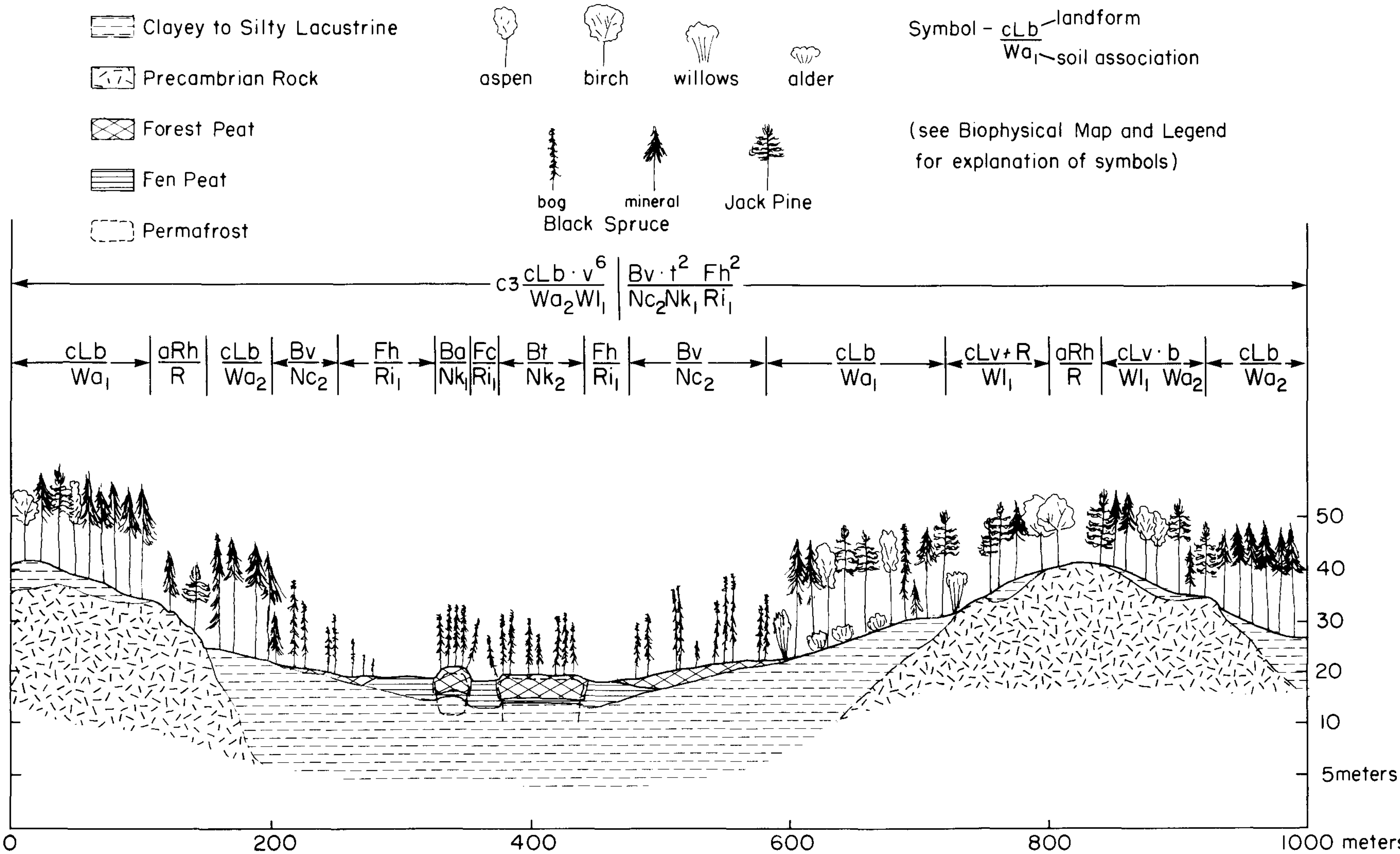


Figure 9 Cross-section through bedrock controlled hummocky to undulating terrain (Sipiwesk Land District). Clayey lacustrine sediments in the form of veneers and blankets; bog veneers overlying lacustrine sediments; organic complexes consisting of peat plateaus, palsas, collapse scars, and horizontal fens. (Drawing partially based on data from sites 63P75 No.19, 21, and 28; vegetation not to scale)

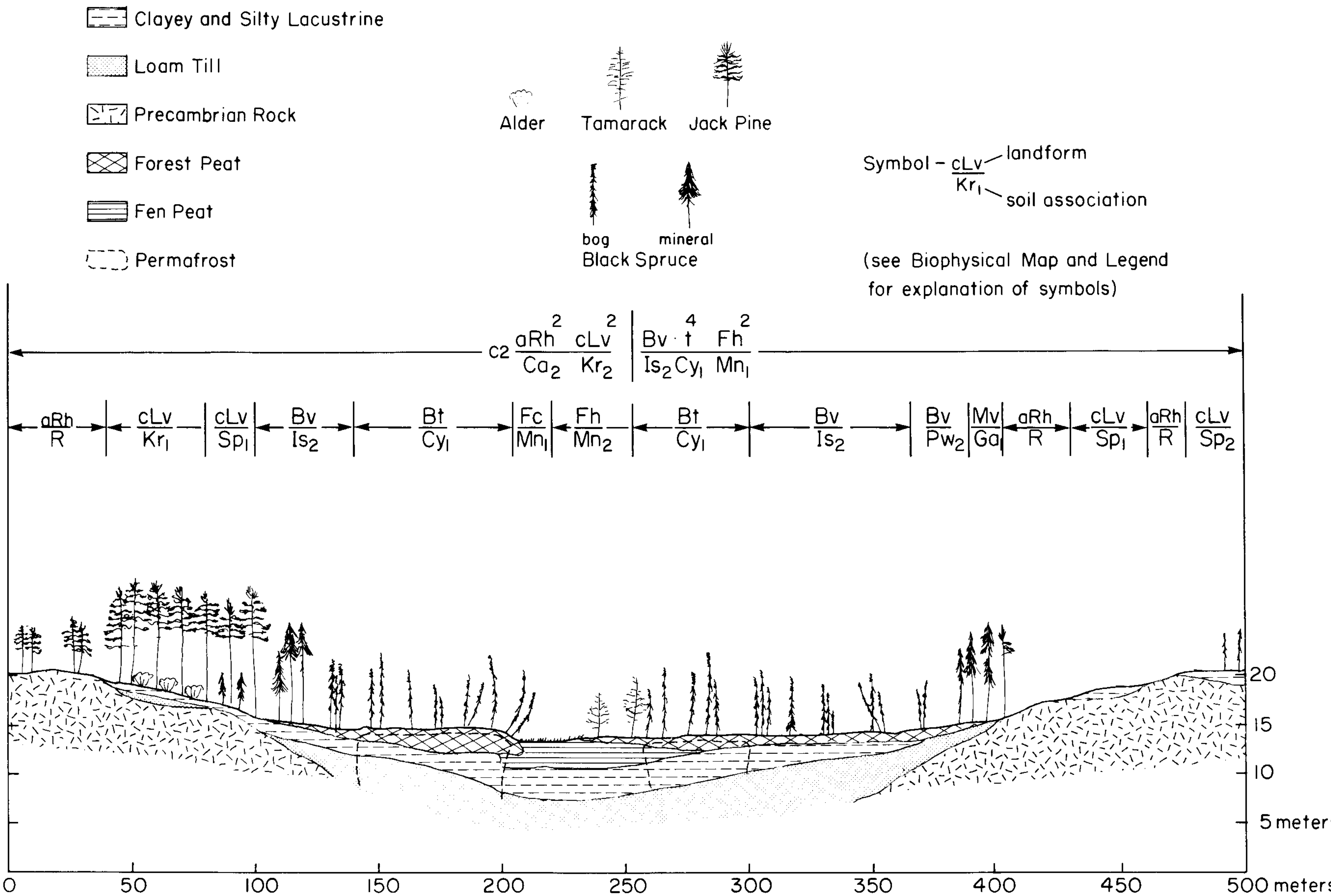


Figure 10 Cross-section through bedrock controlled hummocky terrain (Stephens Lake Land District). Clay lacustrine veneers over Precambrian bedrock and loamy till; bog veneers overlying lacustrine sediments; peat plateaus, collapse scars and horizontal fens. (Drawing partially based on data from sites 63P75 No.10 and 12; vegetation not to scale)

underlying bedrock. Bedrock occurs only occasionally at the surface, but is quite evident along river channels and lake shores.

Loamy to sandy till is found infrequently in the form of hummocks and ridges. The lower slopes of these till landforms are generally covered by lacustrine sediments.

Very gently sloping terrain is covered by discontinuously frozen bog veneers. Level to depressional terrain is characterized by deep organic deposits, occurring as complexes of peat plateaus and patterned and horizontal fens.

Drainage in the district is provided by the Burntwood and Odei Rivers and many creeks and lakes. Drainage is good on the coarse textured deposits and close to lakes and rivers, but is poor in other areas. The district lies within the Burntwood and Grass Rivers Lower Divisions of the Nelson River Watershed.

3.0 LAND SYSTEMS

The basic document of the biophysical land classification is the map and legend which depict land systems at a scale of 1:125,000. On the map, each map unit is equivalent to a land system or complex of land systems. The boundaries of most units are drawn initially on the basis of landform pattern and related surface deposits. The landform units are usually further refined in terms of topographic variation and patterns of soils, drainage condition and vegetation.

The various components (i.e. Land Systems or Land Types) of each map unit on the biophysical map are identified by symbols and their relative proportions indicated by deciles. The system of symbolization describing a map unit is explained on the map legend. Definitions of landform terminology are contained in Appendix 1. Soil-related terms are explained in Appendix 2.

The sites visited during field studies of the Sipiwesk and Split Lake map areas generally belonged to a portion of the landscape equivalent to a Land Type or complex of Land Types. The location of the detailed site investigations in these map areas is shown in Figure 5. Soil analysis, site descriptions and vegetation data from these sites are on file with the Canada-Manitoba Soil Survey, Ellis Building, University of Manitoba.

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A P P E N D I C E S

1.0 DESCRIPTIONS OF LANDFORMS (refer to Geomorphology Section on Map Legend)

BEDROCK CLASSES -

ACIDIC (aR): igneous intrusive or extrusive bedrock having more than 66 percent SiO_2.

BASIC (bR): igneous intrusive or extrusive bedrock having less than 66 percent SiO_2.

BEDROCK (R): A general term for the rock, usually solid, that is exposed or underlies unconsolidated surficial material. Types of bedrock encountered are grouped into "acidic, basic or carbonatic" classes.

CARBONATIC (cR): Sedimentary rocks containing large amounts of calcite and other carbonate materials.

UNDIFFERENTIATED (uR): a bedrock material where differentiation into a specific class is impractical or impossible.

BOG - see Genetic Organic Landform Classes

EROSIONAL MODIFIER -

CHANNELED (c): Modification of a deposit or feature by the cutting of channels and removal of material from along local drainage ways.

DEFLATED (1): Modification by erosive action of wind.

DISSECTED (i): A network of gullies, ravines, valleys and remnant flat-topped interstream ridges formed by stream erosion acting on a relatively even topographic surface.

ERODED (e): The production or modification of a landform by the action of streams, waves or glaciers.

WASHED (w): Landforms which have been modified in some manner by wave action are said to be washed. The process results in the sorting of surface materials or the formation of scattered minor beaches.

FEN - see Genetic Organic Landform Classes

GENETIC MINERAL LANDFORM CLASSES -

ALLUVIAL (A): accumulation of material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its flood plain or delta, or as a cone or fan at the base of a mountain slope.

COLLUVIAL (C): accumulation of any loose, heterogenous and incoherent mass of material or rock fragments (variable mixture of boulders to clay) deposited chiefly by mass-wasting, usually at the base of a steep slope or cliff.

EOLIAN (E): accumulation of deposits (sand and silt) whose constituents were transported (blown) and laid down by atmospheric currents, or of deposits produced or eroded by the wind.

GLACIOFLUVIAL (G): pertaining to the outwash deposits and landforms, produced by meltwater streams associated with and flowing from wasting glacier ice. Such stratified sediments, depending on the depositional environment, are classed as ice contact deposits or outwash sediments.

(a) Ice contact deposits: these are found in kames, eskers and kame moraines. They are englacial materials deposited within, upon, or immediately adjacent to glacier ice. In addition to a distinctive surface form, ice contact deposits are characterized by extreme range and abrupt changes in grain-size, inclusions of till bodies and marked deformation of strata.

(b) Outwash sediments: they are proglacial deposits that include stratified materials, mainly well sorted sands and gravels deposited by streams usually in the form of fans, terraces and valley trains.

GLACIOLACUSTRINE (L): Materials deposited in glacial lakes; specifically, landforms and deposits composed of suspended materials transported by streams into lakes bordering a glacier which has since disappeared.

MORAINAL (M): accumulations of unsorted, unstratified glacial drift, predominantly till, deposited chiefly by the direct action of glacier ice in a variety of landforms that are primarily independent of control by the surface underlying the drift.

MARINE (W): Materials deposited in marine environments. These may form a blanket of deeper-water silts and clays, or occur as a series of marine nearshore features composed largely of gravels and sands and deposited as spits, bars and beaches.

UNDIFFERENTIATED (U): Deposits whose genesis cannot be determined from the available evidence, or mixtures of deposits resulting from the interaction of several genetic processes.

GENETIC ORGANIC LANDFORM CLASSES -

BOG (B): A bog is a peat-covered or peat-filled area, generally with a high water table. Since the surface of the peatland is slightly elevated, bogs are either unaffected or partly affected by nutrient-rich groundwaters from the surrounding mineral soils. The groundwater is generally acidic and low in nutrients (ombrotrophic). The dominant peat materials are sphagnum and forest peat, underlain, at times, by fen peat.

Categories of Bogs:

BOG PLATEAU (Bp): The height of these peat landforms varies from 0.5 to 1 meter and is due to greater peat deposition as compared to the surrounding wet fen areas. Bog plateaus are often teardrop shaped.

BOG VENEER (Bv): This type of bog occurs when a shallow peat (generally between 40-100 cm thick) covers slopes and to some degree, depressions and uplands. The surface topography is often micro-hummocky (sphagnum mounds). Permafrost is discontinuous in this type of bog, and most often found in the better developed mounds.

BOWL BOG (Bp): This type of bog has developed in topographic depressions and has a concave peat surface.

BLANKET BOG (Bl): This type of bog occurs when peat covers the uplands, slopes and depressions alike up to a considerable degree of slope.

FLAT BOG (Bf): This type of bog is a level peatland area having only slight differences in the level of its surface. Irregularities or slopes of the substratum are completely or almost completely masked by the peat deposit.

PALSA (Ba): A mound of peat with a frozen peat and/or mineral core, occurring in waterlogged, treeless or sparsely wooded fens. The height of a palsa is generally between 1 and 3 meters, while the width is in the order of some tens of meters.

PEAT MOUND (Bm): Permanently frozen treeless mounds (0.5 to 1 meter in diameter and about 30 to 50 cm high) which occur in water saturated fens.

PEAT PLATEAU (Bt): Peat plateaus are associated with permafrost and their height (approximately 1 m) is dominantly due to ice lens formation in the frozen core. Their sizes range from several hectares to tens of hectares.

POLYGONAL PEAT PLATEAU (By): These frozen organic landforms resemble peat plateaus as they are elevated about 1 m above the surrounding fen areas. The surface of this type of peat plateau is dominated by a polygonal pattern caused by ice wedge formation. The surface morphology resulting from ice wedge formation is expressed as a network of polygons having high, near level or slightly depressed centers. The outline of each polygon is marked by a polygonal trench often containing a wedge-shaped accumulation of ice.

FEN (F): A fen is a peat-covered or peat-filled area with a high water table, which is usually at the surface. The dominant materials are shallow to deep, well to moderately decomposed fen peat. The waters are mainly rich in nutrients (minerotrophic) and are derived from mineral soils. The peat materials are therefore higher in both nutrients and pH than the peats associated with bogs.

Categories of Fens:

COLLAPSE SCAR (Fc): These fen areas have developed as a result of melting of permafrost in organic landforms such as peat plateaus and palsas. The collapsed portion of the landform has a high water table and the collapsing edge may form a steep bank.

Characteristic are the leaning trees on the banks and submerged or partly submerged dead trees in the collapse area.

FLOATING FEN (Ff): This type of fen occupies areas over a shallow water surface. The fen vegetation forms a floating or quaking peat mat encroaching on a water surface.

HORIZONTAL FEN (Fh): This type of fen consists of extensive flat, low lying areas that show very slight differences in the level of the peat surface. The water table is usually at or close to the surface.

MINEROTROPHIC PALSA (Fm): This type of fen occurs mainly in the coastal area of the Hudson Bay Lowlands. These organic landforms have an elevated, slightly convex surface (due to ice lens formation in both the organic layers and the underlying minerals) and are generally surrounded by water saturated fens. The organic material is often layered with alluvial deposits.

PATTERNED FEN (Fp): This type of fen occupies very gently sloping areas and its characteristic feature is a pattern of ridges (strangs) and hollows (flarks). These sites are extremely wet throughout the summer.

SLOPING FEN (Fl): This type of fen occupies appreciably sloping areas and is often found in areas with higher water table. It is fed by seepage rather than by a distinctly localized outflow of spring water.

SWAMP (S): A swamp is a peat-covered or peat-filled area. The peat surface is level or slightly concave in cross section. The water table is frequently at or above the peat surface. There is strong water movement from margins or other mineral sources. The microrelief is hummocky, with many pools present. The waters are neutral or slightly acid. The dominant peat materials are shallow to deep mesic to humic forest and fen peat.

MORPHOLOGY AND SURFACE FORM CATEGORY -

APRON (a): An extensive, continuous, gently sloping and blanket-like deposit of unconsolidated material derived from an identifiable source such as the edge of a large esker or along fault scarps.

BLANKET (b): an extensive area of relatively thick (>1 m) surface deposits which subdue but do not completely mask the configuration of the underlying bedrock or deposit.

COMPLEX (x): a mixture of several morphologic units (the nature of this unit generally must be explained in written text).

DELTA (Δ): usually a triangular shaped area composed of stratified materials (ranging from coarse to fine) deposited by streams into large bodies of water.

DRUMLINIZED (d): Elongated, smooth, streamlined ridges with long axes parallel to the direction of ice movement.

FAN (f): A gently sloping, fan-shaped mass of detritus forming a section of a very shallow cone, commonly at a place where there is a noticeable change in gradient.

HUMMOCKY (h): Terrain having a broken, irregular surface with distinct knobs or mounds and depressions.

KETTLED (k): An area of glacial drift pitted with numerous steep-sided, bowl- or basin-shaped depressions that often contain lakes; surface drainage is generally deranged.

PLAIN (p): An area of comparatively flat, smooth, and level land having few or no prominent surface irregularities, but sometimes having a considerable unit tilt.

RIDGED (r): Terrain characterized by long, narrow elevations which may occur independently or in parallel or intersecting patterns. Ridges usually have sharp crests and steep sides.

ROLLING (m): Terrain having a smooth, regular surface with broad topographic lows and broad topographic highs. Slopes are usually more than 1 kilometer in length.

TERRACED (t): a long, narrow, relatively level or gently inclined surface bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope; a large bench or step-like ledge breaking the continuity of a slope.

UNDULATING (u): Terrain having a smooth, regular surface with broad shallow topographic lows and broad medium to subdued topographic highs. Slopes are usually less than 1 kilometer in length.

VENEER (v): an extensive area of thin (<1 m) unconsolidated surficial deposits which mask little of the configuration of the underlying bedrock or deposits.

TEXTURAL CATEGORIES -

CLAYEY (c): material less than 2 mm contains 35% or more clay by weight and particles 2 mm to 25 cm size are less than 35% by volume.
Includes heavy clay loam, heavy silty clay loam, sandy clay, silty clay, clay and heavy clay.

FRAGMENTAL (f): gravel, cobbles and boulders (2 mm to more than 25 cm) containing too little fine materials to fill the spaces larger than 1 mm.

LOAMY (l): material less than 2 mm contains less than 35% clay by weight and includes coarser materials up to very fine sand size. Particles of 2 mm to 25 cm size are less than 35% by volume.
Includes 2 main groups of texture:

(1) Light (less than 18% clay by weight):
sandy loam, fine sandy loam, loam, very fine sandy loam, loamy very fine sand, loam, silt loam, silt

(2) Heavy (18-35% clay by weight):
sandy loam, fine sandy loam, loam, very fine sandy loam, silt loam, sandy clay loam, clay loam, silty clay loam

SANDY (s): material less than 2 mm contains less than 18% clay and more than 70% sand exclusive of loamy very fine sand and very fine sand. Particles of 2 mm to 25 cm size are less than 35% by volume.
Includes sands and loamy sands.

SKELETAL (s): modifies the main textural categories containing more than 35% by volume of particles coarser than 2 mm size.

TOPOGRAPHIC EXPRESSION - refers to the physical features of a land district or land system such as those represented on a map, especially the relief and contours of the land.

RELIEF CLASS: Relief refers to elevations or inequalities of a land surface. Land having no unevenness or differences of elevation is called level; gentle relief is called undulating, strong relief, rolling and very strong relief, hilly. Six classes of local relief are applied to map unit separations and are intended to describe the average maximum relief condition. The classes of relief are designated by alpha symbols and defined as follows:

a	0-2 meters
b	3-5 meters
c	6-20 meters
d	21-50 meters
e	51-100 meters
f	100 meters

SLOPE CLASS: Six broad slope classes are defined to enable a quantification of the dominant (not necessarily most abundant) slopes within a mapped unit of local landform.

Class	Degrees	Percent	Description
1	0-2	0-5	level to very gently sloping
2	3-7.5	6-15	gently to moderately sloping
3	8-15	16-30	strongly sloping
4	16-30	31-60	very strongly to extremely sloping
5	30	60	steeply and very steeply sloping
6	Complex		

SWAMP: see Genetic Organic Landform Classes

2.0 GLOSSARY OF TERMS

ASSOCIATE, SOIL - A nontaxonomic but cartographic grouping of soils or land segments which combines related soils into units having similarity in geomorphic position, landform, edaphic and mechanical properties of soils (climate, drainage, particle size, etc.) and to some degree similarity in the geological nature of the soil materials and taxonomic classes.

ASSOCIATION, SOIL - A natural grouping of soil associates based on similarities in climatic or physiographic factors and soil parent materials. It may include a number of soil associates provided that they are all present in significant proportions.

CALCAREOUS SOIL - Soil containing sufficient calcium carbonate, (often with magnesium carbonate) to effervesce visibly when treated with hydrochloric acid.

CALCIUM CARBONATE EQUIVALENT - refers to the percent of carbonates in the soil expressed on the basis of calcium carbonate. Terms used to express the carbonate content of soils are:

noncalcareous	<1%
weakly calcareous	1-5%
moderately calcareous	6-15%
strongly calcareous	16-25%
very strongly calcareous	26-40%
extremely calcareous	> 40%

DECILE PORTION - A one-tenth portion. As used on the biophysical map, the symbol $\frac{lMd^6}{Bi_2} \Big| \frac{Bv^4}{Is_2}$ means that the loamy drumlinized moraine and the soils of the Billard association cover six-tenths and the bog veneer and the soils of the Isset Lake complex cover four-tenths of the map unit.

DRAINAGE (SOIL) - (1) The rapidity and extent of the removal of water from the soil by runoff and flow through the soil. (2) As a condition of the soil, it refers to the frequency and duration of periods when the soil is free of saturation.

EROSION - The wearing away of the land surface by detachment and transport of soil and rock material through the action of moving water, wind or other geological processes.

FIBER CATEGORY - Three main classes of fiber content are used to describe organic (peat) materials. The fiber classes are defined in terms of relative amounts of fiber (particles exceeding 0.15 mm in diameter) persisting in the organic soil material and its durability as it reflects the degree of decomposition of the material. Definition of the fiber classes are as follows:

FIBRIC: The least decomposed of all organic materials; there is a large amount of well-preserved fiber that is readily identifiable as to botanical origin. Fibers retain their character upon rubbing.

MESIC: Organic material in an intermediate stage of decomposition; intermediate amounts of fiber are present that can be identified as to their botanical origin.

HUMIC: Highly decomposed organic material; there is a small amount of fibers present that can be identified as to their botanical origin, fibers that are present can be easily destroyed by rubbing.

FIBRIC - see Fiber Category

GLEYED SOIL - An imperfectly or poorly drained soil in which the material has been modified by reduction or alternating reduction and oxidation. These soils have lower chromas or more prominent mottling or both in some horizons than the associated well drained soil.

HUMIC - see Fiber Category

MESIC - see Fiber Category

MOTTLE - Irregularly marked spots or streaks, usually yellow or orange but sometimes blue, interspersed with the dominant colour. Mottling in soils indicates poor aeration and lack of good drainage.

PARENT MATERIAL - The unaltered or essentially unaltered mineral or organic material from which the soil profile develops by pedogenic processes.

PERMAFROST - (1) Perennially frozen material underlying the solum. (2) A perennially frozen soil horizon.

PERMAFROST TABLE - The upper boundary of permafrost, usually coincident with the lower limit of seasonal thaw (active layer).

REACTION, SOIL - The acidity or alkalinity of a soil.

Acid reactions are characterized as follows:

extremely acid	pH below 4.5
very strongly acid	pH 4.5 to 5.0
strongly acid	pH 5.1 to 5.5
medium acid	pH 5.6 to 6.0
slightly acid	pH 6.1 to 6.5

Neutral reactions are from pH 6.6 to 7.3

Alkaline reactions are characterized as follows:

mildly alkaline	pH 7.4 to 7.8
moderately alkaline	pH 7.9 to 8.4
strongly alkaline	pH 8.5 to 9.0
very strongly alkaline	pH above 9.0

SOIL - The unconsolidated material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. Soil has been subjected to and influenced by genetic and environmental factors of: parent material, climate (including moisture and temperature effects), macro- and micro-organisms, and topography, all acting over a period of time.

SOLUM - The upper horizons of a soil above the parent material and in which the processes of soil formation are active. It usually comprises the A and B horizons.

TEXTURAL CATEGORIES - Three categories of texture are utilized to describe the nature of the mineral deposits associated with a landform. The texture classes within each category are estimated in terms of size and the distribution of primary particles. Significant inclusions of very coarse particles (gravel, cobbles and boulders) within a deposit are indicated by adding the term "skeletal" as a modifier to the symbol for a textural category.

Primary Particles

Name of Separate	Diameter, mm
Boulders, stones	$>$250
Cobbles	250-75
Gravel	75-2.0
Very coarse sand	2.0-1.0
Coarse sand	1.0-0.5
Medium sand	0.5-0.25
Fine sand	0.25-0.10
Very fine sand	0.10-0.05
Silt	0.05-0.002
Clay	Less than 0.002

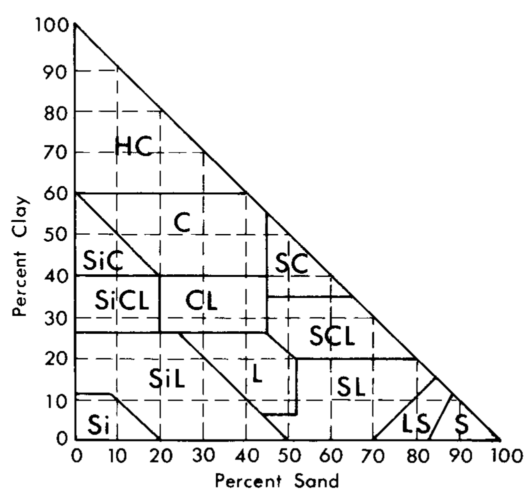

Figure 11. Particle size classes used in describing soil texture. Percentages of clay and sand in the main textural classes; the remainder of each class is silt.