INTERIM REPORT ON THE SOILS INVENTORY OF THE AOSERP STUDY AREA

by

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for

ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM

Project LS 2.1

August 1979

The Hon. J.W. (Jack) Cookson
Minister of the Environment
222 Legislative Building
Edmonton, Alberta

and

The Hon. John Fraser
Minister of the Environment
Environment Canada
Ottawa, Ontario

Sirs:

Enclosed is the report "Interim Report on the Soils Inventory of the AOSERP Study Area".

This report was prepared for the Alberta Oil Sands Environmental Research Program, through its Land System, under the Canada-Alberta Agreement of February 1975 (amended September 1977).

Respectfully,

W. Solodzuk, P. Eng.
Chairman, Steering Committee, AOSERP
Deputy Minister, Alberta Environment

A.H. Macpherson, Ph.D
Member, Steering Committee, AOSERP
Regional Director-General
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INTERM REPORT ON THE SOILS INVENTORY OF THE AOSERP STUDY AREA

DESCRIPTIVE SUMMARY

BACKGROUND AND PERSPECTIVE

This research project has been designed to supply information on the location and extent of soils and landforms in the AOSERP study area by developing soil and geomorphological maps of identified high priority areas at a scale of 1:50 000 for field working maps, with final presentation of 1:250 000. The ecological or biophysical approach is being employed as it is useful in terrain mapping in inaccessible areas where aerial photograph interpretation is an important part of the study process.

This report reviews the progress made on a soils inventory of the AOSERP study area during 1978 and updates information presented in the previous interim report (Turchenek and Lindsay 1978, AOSERP Report 28). The legend for the mapping has been revised and this revision reflects additional field and laboratory information collected during 1978.

The soil inventory will be used to aid in the selection or expansion of research sites; to permit an estimate of the value and location of present resource (e.g., soil amendments for reclamation); to provide background information for land use planning and for future impact studies; and to provide a means of monitoring resource changes caused by disturbance. These maps and the ones prepared under the ecological habitat mapping project (LS 2.3.1) will be of great value to anyone involved with the AOSERP study area.

ASSESSMENT

The report "Interim Report on a Soils Inventory of the AOSERP Study Area" which was prepared by L.H. Turchenek and J.D. Lindsay (Research Council of Alberta, Soil Survey Division) has been reviewed and accepted by the Alberta Oil Sands Environmental Research Program.

In view of the value of the document, AOSERP Management has recommended that the report be published and made available to other AOSERP researchers and the public as soon as possible.

The report documents additional field and laboratory information gathered during 1978 and updates the information presented in the first interim report (Turchenek and Lindsay 1978, AOSERP Report 28). An updated map legend has been included together with the new maps produced to date at a scale of 1:50 000.

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ABSTRACT

Soil mapping of the AOSERP study area using the ecological or biophysical approach to land classification was continued in 1978. Work consisted of air photo interpretation, field checking, preparation of interim maps, and analysis of soil samples. About 150 townships were field checked during the summer field season, and samples were taken from 44 mineral and 20 organic soil profiles. Samples collected from 52 profiles during the 1977 field season were analyzed during 1978. Since the initiation of this project, about 700 soil samples have been collected for laboratory analysis. The number of interim maps produced to date, including 16 submitted with this report (but which will be published separately at a later date) is equivalent to 12 of the 1:50 000 National Topographic Services (NTS) sheets within the high priority area. With new field and laboratory data, the legend was revised and now describes 21 land systems. Significant findings include the occurrence of Solonetzic soils on the Dover Plains, and of extensive areas of permafrost in organic soils of the Birch Mountains Upland and the Dunkirk Plain.

ACKNOWLEDGEMENTS

Thanks are extended to Graeme Spiers for assistance during the 1978 field season, and to Darrell K. Skinner for assistance with map and report preparation.

This research project LS 2.1 was funded by the Alberta Oil Sands Environmental Research Program (AOSERP), a joint Alberta-Canada research program established to fund, direct and coordinate research into the effects of oil sands development on the renewable resources of the Athabasca oil sands.

1. INTRODUCTION

This report reviews the progress made on a soils inventory of the Alberta Oil Sands Environmental Research Program (AOSERP) study area (Figure 1) during 1978, and updates some of the information presented in the previous interim report (Turchenek and Lindsay 1978). The 1978 interim report should be consulted for background information on the use of soil maps. Additional information describing the land systems of the AOSERP area is presented in this report. Particular note should be made of revisions which have been made in the legend. The revised legend (Section 8.2), in respect to land systems, reflects the greater amount of information from both field and laboratory gathered during 1978. The updated legend should be used with all maps produced both prior to and after this date.

Work on the soils inventory project during 1978 consisted of field checking a considerable portion of the AOSERP study area, preparation of interim (1:50 000) maps, and analysis of soil samples. A portion of the summer field season was spent examining and sampling a peatland area, relatively intensively, in order to provide more detailed information on the chemical and physical properties of organic soils in relation to their classification and distribution. Some observations on permafrost in organic terrain are also reported. Laboratory analyses and field descriptions of samples collected during 1977 are presented in Appendix 8.1.

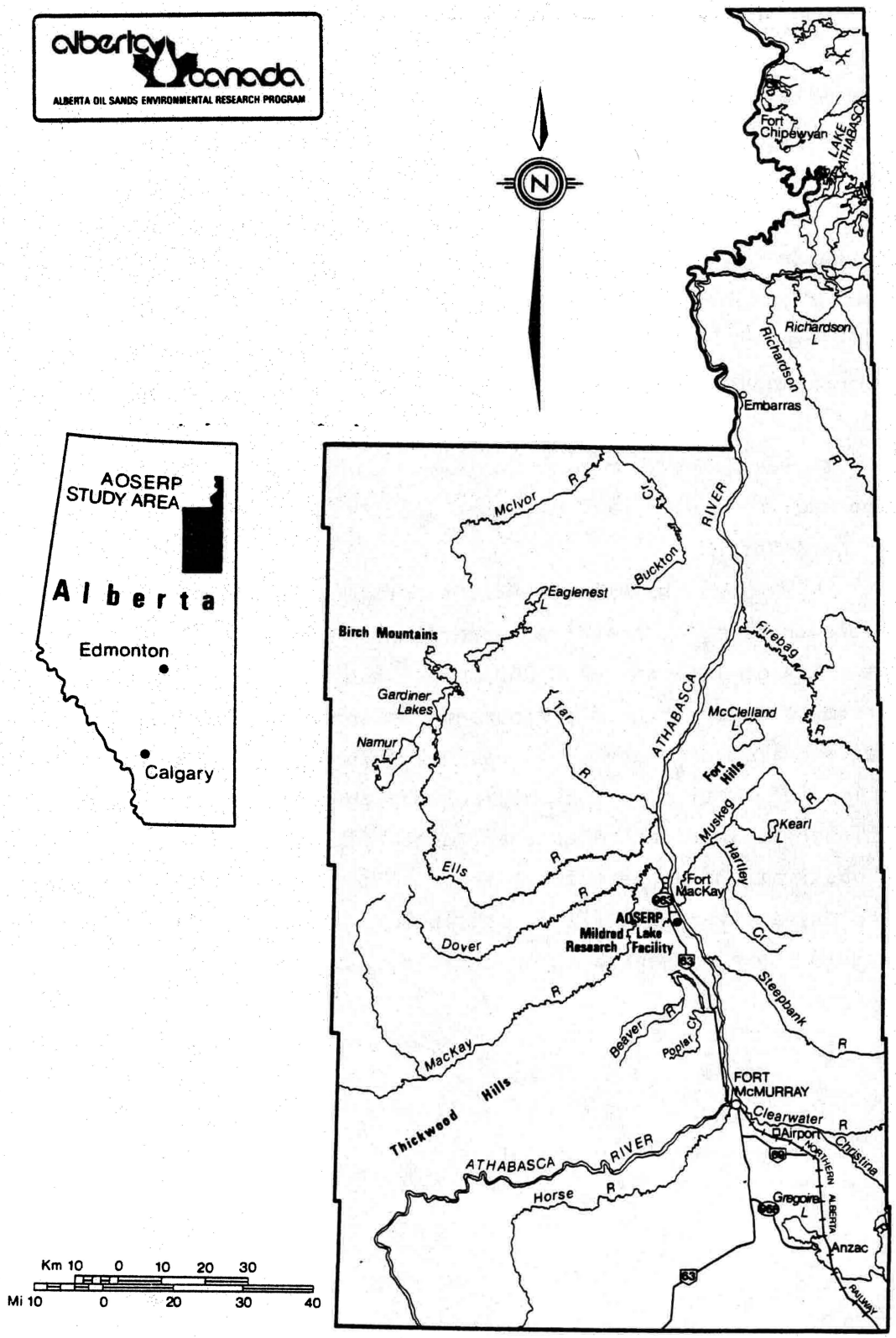

Figure 1. Location of the AOSERP study area.

2. RESUME OF CURRENT STATE OF KNOWLEDGE

Publications directly applicable to biophysical mapping of the AOSERP study area were cited in the interim report in early 1978. Three additional publications were helpful during the 1978 field season. One is the AOSERP Project LS 2.3 report "Ecological Habitat Mapping of the AOSERP Study Area: Phase I" (Thompson et al. 1978). The maps produced in this report are particularly useful as they provide landform and vegetation inputs, leaving soils information to be gathered for describing land systems in the area. The second report, which provides ecological information useful in mapping the Athabasca delta area, is "Landscape Classification and Plant Successional Trends: Peace-Athabasca Delta" (Dirschl et al. 1974). The third report, "Soil Survey of a Portion of the Syncrude Lease 17 Area, Alberta" (Twardy 1978) is accompanied by a soil map at a scale of 1:24 000.

3. MATERIALS AND METHODS

Methodology in the soils inventory is based on the ecological or biophysical approach, as described in the 1978 interim report. Mapping consists of air photo interpretation, field checking and sampling, and preparation of maps on 1:50 000 National Topographic Sheets. Because NTS maps are available for only a portion of the study area, the base maps used for the remaining area will be 1:63 000 forest cover maps expanded to 1:50 000 and showing only planimetry and hydrology.

Field work during 1978 emphasized examination and sampling of organic soils which cover a considerable portion of the AOSERP study area. A specific objective of this work was to determine differences in physical and chemical properties of different peat types, and to determine relationships among peat landforms, peat depths, and permafrost occurrence and appearance on aerial photographs. Physical and chemical properties of peat, peat depth, and occurrence of permafrost are factors important in the classification of organic soils and, therefore, in mapping organic land systems. These factors could also have important land use implications. Accurracy in air photo interpretation of peatlands is dependent on relating vegetation communities, from which chemical and physical properties of soil can be inferred to some extent, and organic landforms, from which depth and permafrost can be inferred once the relationships are established. For example, an area of black spruce vegetation appearing even-toned on an air photo is likely to be a horizontal bog with deep fibric peat soils. A similar bog area with white speckles or numerous small water bodies is usually indicative of a peat plateau with collapse scars in permanently frozen, deep, fibric peat. Very light toned areas, often ribbed, are fens. These usually consist of deep, mesic peat of sedge and grass origin. It has been shown that bog (moss) peat soils have low pH (about 3 to 4) whereas fen peats are near neutral (Kong et al. in prep.). Samples were taken to determine whether these pH differences, and other properties, apply throughout the AOSERP study area.

All sites examined were accessible only by helicopter. Peat depths were determined using an Oakfield probe with extensions to 4 m. Samples were taken with a bucket auger at intervals to a depth of 200 cm, or to mineral soil. An auger was used to sample frozen peat; however penetration and sampling at depth were achieved at few sites because the auger tended to become frozen in by water percolating into the hole from the surface.

Field descriptions included landform, vegetation, and peat composition using the von Post scale for fiber, root, wood, and moisture contents, and for degree of humification (Stanek and Silc 1977).

Water samples were taken at the surface of the water tables and at 1 m depth to determine pH, conductivity, and, in some samples, contents of N, P, K, Ca, and Mg. Analyses to be conducted on peat samples are as follows: rubbed and unrubbed fiber contents; maximum water holding capacity; bulk density; ash content; pH; cation exchange capacity; exchangeable cations; total N; and total C. methods of analyses have been described by Kong et al. in prep.

A large peatland area of about two townships (Tp 89-R16- and 17-W4) showing several organic landform and peat types was selected for relatively intensive study. The purpose of this study was to obtain more detailed information on relationships among peatland properties referred to above. Infrared false colour air photos were obtained for detailed air photo interpretation. Sampling was carried out as described above.

Of the soil forming factors, climate is particularly important in considering the distribution of permafrost in the AOSERP study area. Climatic data from the fall of 1976 onward were obtained from the AOSERP Air System Data Acquisition Project (A.S. Mann, pers. comm.) and long-term data from Alberta Environment (1971).

4. RESULTS AND DISCUSSION

4.1 DESCRIPTION OF ECOLOGICAL UNITS

A map of the land subregions and districts in the eastern half of the AOSERP study area was presented in the 1978 interim report. Based on further field checking and air photo interpretation, the entire AOSERP study area was further subdivided as shown in Figure 2. Land districts which were not described in the interim report, the Dunkirk and Hangingstone plains, are described below. Both are in the Mixedwood Subregion.

4.1.1 Land Districts

The Dunkirk Plain is a westward continuation of the Dover Plain, but has been separated on the basis of surficial deposits, climate, and predominant soils. The area lies between the Thickwood Hills Upland and the Birch Mountains Upland, rising from about 500 m adjacent to the Dover Plain to about 600 m adjacent to the Birch Mountains. Relief is very low, this likely being a major factor in development of extensive wetlands throughout the area. Dominance of organic soils in this district is a major differentiating factor between the Dunkirk and Dover plains. Orthic Gray Luvisols have developed on the better drained portions of the area. Permafrost is common where black spruce-sphagnum moss bogs have developed. Along with the Birch Mountains Upland, much of the Dunkirk Plain lies in the zone of permafrost in organic soils outlined by Lindsay and Odynsky (1965). Glacial till is the main surficial deposit. Underlying deposits are shales and sandstones of the Grand Rapids Formation, and shales of the Labiche Formation.

The Hangingstone Plain area was previously included in the Stony Mountain Upland, but is now separated on the basis of relief, elevation, and differences in materials. The elevation range is approximately 450 to 600 m above mean sea level. Relief is low. Surficial deposits consist mainly of glacial till of the

Horse River type, whereas that on the Stony Mountain Upland is mainly of the Kinosis type (Bayrock and Reimchen 1974). Shales of the Cretaceous Labiche Formation underlie the district.

4.1.2 Land Systems

Four new land systems recognized in 1978 and described in the revised map legend accompanying this report are the Surmount, Livock, Chipewyan, and Mamawi land systems.

Surmount is the dominant land system of the Stony Mountain Upland. It consists mainly of Orthic Gray Luvisols developed on glacial till. However, the parent material consists of two types of till in most places. The surficial material is similar to the medium-textured Kinosis till (Bayrock and Reimchen 1974). A dark-coloured and shale-rich basal till is usually found within 1 m below the surficial till.

The Livock land system bears some similarity to the Dover system. However, the Gray Luvisol soils are developed on medium textured glaciolacustrine veneers rather than on fine- and very fine textured glaciolacustrine and mixed lacustrine deposits.

The Chipewyan and Mamawi land systems describe respectively the relatively wet (Gleysolic) and dry (Regosolic) soils of the Athabasca Delta Plain district.

Revisions and additions have also been made to the Kenzie land system. Field checking has shown that, in deep moss peats, permafrost often occurs in significant proportions. Fibric Organic Cryosols, therefore, have been added to the Kenzie 1 description. Field work in the Dunkirk Plain and Birch Mountain Upland has shown that Cryosols are dominant in organic soils in many areas. Therefore, Kenzie 3 was established to describe this type of land system.

Because the Cryosolic order of soils was not described in the interim report, a brief description from "The Canadian System of Soil Classification" (CSSC 1978) is given here.

Legend

I. Mixedwood Subregion
   a. Dover Plain
   b. Stony Mountain Upland
   c. McMurray Lowland
   d. Algar Plain
   e. Thickwood Hills Upland
   f. Clearwater Plain
   g. Muskeg Mountain Upland
   h. Hangingstone Plain
   i. Dunkirk
   j. Birch Mountain Upland

II. Upper Mackenzie Subregion
   a. Embarras Plain
   b. Calumet Plain
   c. Athabasca Delta Plain

III. Athabasca South Subregion
   a. Fort Hills Upland
   b. Richardson Hills Upland
   c. Firebag Hills Upland

IV. Northwestern Transition Subregion
   a. Kazan Upland

——————— subregion boundary

——————— district boundary

Figure 2. Land subregions and districts of the AOSERP study area.

continued....

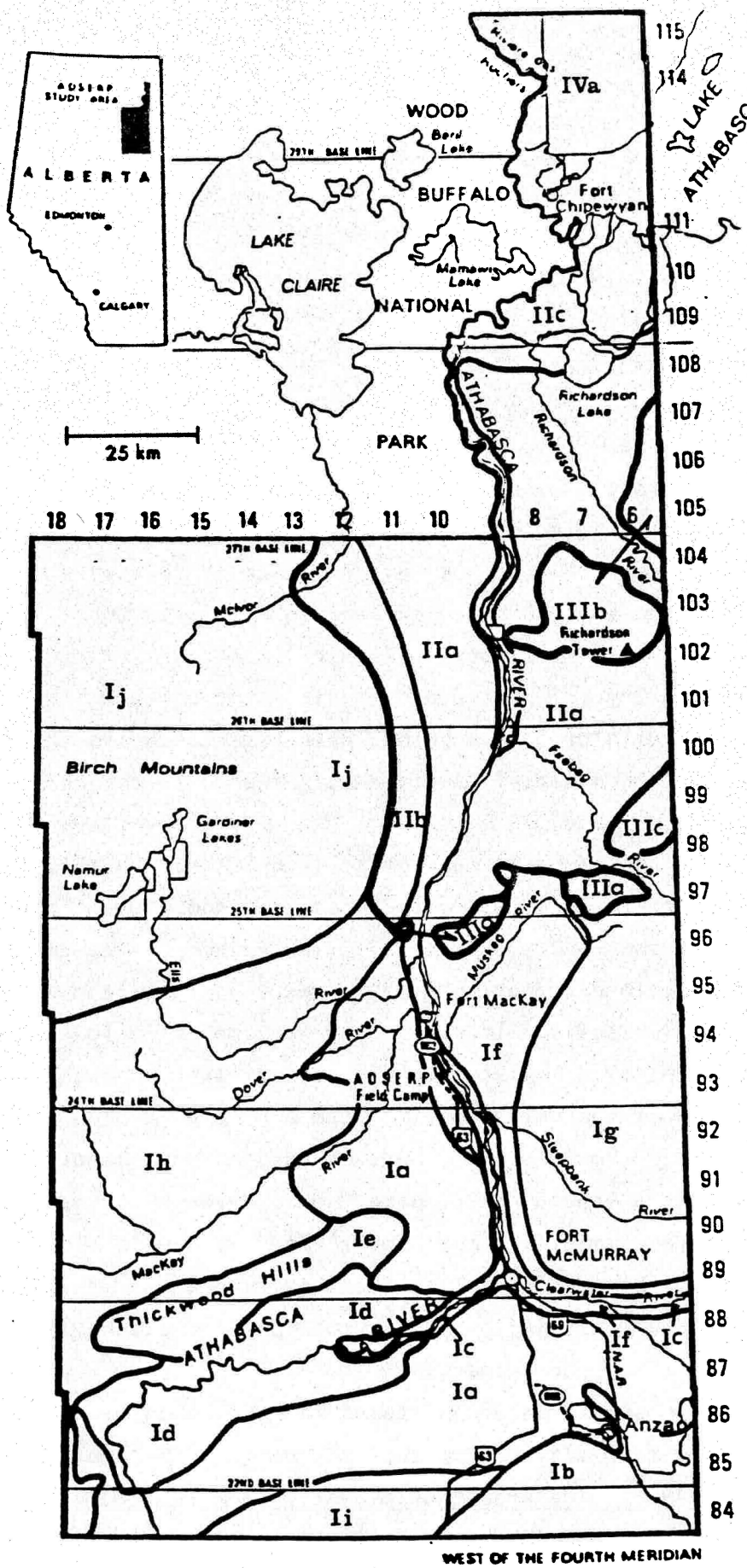

Figure 2. Concluded.

Cryosolic soils are formed in either mineral or organic materials that have permafrost either within 1 m of the surface or within 2 m if more than one third of the pedon has been strongly cryoturbated, as indicated by disrupted, mixed, or broken horizons. They have a mean annual temperature below 0°C. The Cryosolic order is divided into three great groups of which only one, the Organic Cryosol, extends from the subarctic into the Boreal forest within which the AOSERP study area lies.

Organic Cryosols have developed principally in organic materials containing more than 17% C by weight in the surface layer. They are more than 40 cm thick, or more than 10 cm over a lithic contact, or more than 10 cm thick over an ice layer that is at least 30 cm thick. Permafrost occurs within 1 m of the surface. The Fibric Organic Cryosol has been the main subgroup recognized in the study area. Soils of this subgroup have organic layers thicker than 1 m, and the material is dominantly fibric in the control section below a depth of 40 cm.

It should be noted that soil names used in this project (AOSERP Project LS 2.1) are not the same as those used in a recent soil study of the Syncrude Lease 17 (Twardy 1978). The two studies were conducted independently and as a result different names were used for similar soils. This may lead to some confusion for users of the two reports. Therefore, in order to clarify nomenclature, a correlation of the soil names for the projects is shown in Table 1.

Note should also be made of changes in a mapping convention and a land district name used previously. Maps published in 1978 use the symbol Bv (bog veneer) for the Kenzie 2 land system. To conform to the landform classification system of the Canada Soil Survey Committee (1978), the symbol Bb (bog blanket) will replace Bv in all other maps produced.

The second change pertains to separation of the Point Brule Lowland land district on the soil map of NTS sheet 74E/11 produced in 1978. The area thus mapped is now regarded to be the southern limit of the Athabasca Delta Plains land district.

Table 1. Correlation of soil group names used in "Soil survey of a portion of the Syncrude Lease 17 area, Alberta" with land system names used by AOSERP Project LS 2.1.

Syncrude Name	AOSERP Name
McMurray	Dover
Mildred Lake	Algar
Blackmud	Mildred
Gunderson	Bitumount
Lodge	Mildred or Ruth
Kenzie 1, 2	Kenzie 2
Kenzie 3	Kenzie 1
Eaglesham 1, 2	none
Eaglesham 3	Eaglesham 1

4.2 OCCURRENCE OF PERMAFROST IN ORGANIC SOILS IN RELATION TO CLIMATE

Permafrost in organic soils of the AOSERP study area is dominant in the Kenzie 3 land system which occurs mainly in the Birch Mountains Upland and Dunkirk Plain land districts. Lindsay and Odynsky (1965) studied the distribution and some characteristics of a frozen layer in organic soils across Alberta, north of 54° North Latitude. They divided the area into three broad zones based on persistence of a frozen layer in these soils. Two of these zones occur within the study area. The first includes the Birch Mountains Upland, the Dunkirk Plain, and the Kazan Upland. In this zone, a frozen condition was found at 90% of the inspection sites, at an average depth of 56 cm. In the second zone, which includes the remainder of the study area, 60% of the sites had a frozen layer. The first zone was considered to be a permafrost zone, but the second was called a climafrost zone (after Radforth 1962) in which ice is temporary, but lasts more than one year.

Zoltai (1971) has mapped the southern limit of permafrost in peatland in Manitoba and Saskatchewan, the boundary agreeing well with that of Lindsay and Odynsky. Zoltai's analysis of weather station data indicated that permafrost-affected peat landforms occur in organic terrain where the mean annual air temperature is less than 0°C.

Examination of climatic data, particularly temperature and precipitation, may help to explain occurrences of permafrost in the AOSERP study area. A summary of temperature data from various points (Table 2) shows that mean summer temperatures at the Birch Mountain, Legend, Buckton, and Edra lookouts in the Birch Mountains are about 2°C lower than at other points such as Fort McMurray. Similarly, mean annual temperature at Fort Chipewayan is about 2°C lower than at Fort McMurray (-1°C). The data from these different areas correspond well with the permafrost zones of Lindsay and Odynsky (1965).

Table 2. Averages of monthly and annual temperatures from stations in the AOSERP study area (°C).

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Algar LO[a,b]	-	-	-	-	7	12	14	13	7	-	-	-	-
Anzac[c]	-18	-14	-11	4	9	13	17	14	9	3	-5	-13	1
Birch Mountain LO[e]	-16	-3	-6	-1	-	-	11	9	8	2	-11	-21	-
Birch Mountain LO[a]	-	-	-	-	6	11	14	13	7	-	-	-	-
Bitumount LO[e]	-18	-4	-5	6	12	15	15	11	10	4	-11	-22	-
Bitumount LO[a]	-	-	-	-	9	14	17	14	-	-	-	-	-
Buckton LO[a]	-	-	-	-	6	10	13	12	-	-	-	-	-
Edra LO[a]	-	-	-	-	6	11	14	13	-	-	-	-	-
Ells LO[e]	-	1	-	-	11	14	14	10	8	2	-11	-22	-
Ells LO[a]	-	-	-	-	8	13	16	14	-	-	-	-	-
Fort Chipewyan[a]	-26	-22	-14	-3	7	13	16	15	8	1	-11	-21	-3
Legend LO[a]	-	-	-	-	9	11	13	15	-	-	-	-	-
Fort McMurray[a]	-22	-17	-9	1	9	13	16	14	9	3	-8	-17	-1
Grande LO[a]	-	-	-	-	8	13	16	14	-	-	-	-	-
Mildred Lake[e]	-23	-18	-12	4	9	15	17	15	10	3	-7	-9	0
Muskeg LO[e]	-20	-4	-	6	11	14	14	10	8	3	-11	-22	-
Muskeg LO[a]	-	-	-	-	7	12	15	13	8	-	-	-	-
Richardson LO[e]	-19	-5	-7	5	12	15	16	12	10	4	-9	-23	-
Richardson LO[a]	-	-	-	-	9	14	17	15	9	-	-	-	-
Stony Mountain LO[e]	-	-	-	-	-	-	-	-	7	4	-10	-20	-
Stony Mountain LO[a]	-	-	-	-	8	12	15	13	8	-	-	-	-
Tar Island[d]	-17	-17	-9	8	13	16	17	18	13	2	-5	-16	2
Thickwood LO[e]	-17	-2	-6	0	-	-	-	9	9	4	-10	-21	-
Thickwood LO[a]	-	-	-	-	8	13	15	14	8	-	-	-	-

[a] 1941-1970 averages, Alberta Environment (1970)

[b] LO - Lookout

[c] 1974-1976 averages

[d] 1976 only

[e] 1977 data from AOSERP Air System - Data Acquisition Project

The number of degree-days above 5°C within the study area is lowest in the Birch Mountains, at less than 1800, compared to approximately 2000 in the remainder of the area (Longley 1968). Mean annual snowfall (1931 to 1960) is also slightly higher at 152 cm in the Birch and Stony Mountains than in the remainder of the area.

The effects of climate on vegetation and subsequent peat formation appear to be such that thick deposits of moss peat, with high insulating properties, form in areas such as the Birch Mountain Upland. This feature, combined with higher precipitation and longer spring thaw periods (due to lower temperatures), may be sufficient to explain permafrost distribution in the study area. Definite conclusions, however, cannot be made without further detailed studies.

4.3 SOIL-DRAINAGE-VEGETATION RELATIONSHIPS

A chart of vegetation types that occur most commonly on different soil types and drainage regimes, within the various land systems, was presented in the 1978 interim report. A revised chart is presented in Table 3. The revisions were made to include new land systems and to change the symbolization to conform with that used by Project LS 2.3 (Thompson et al. 1978). The LS 2.3 vegetation scheme is based on the AOSERP Project VE 2.2 report of Stringer (1976). The legend for the vegetation classification is reproduced in Table 4, but the LS 2.3 report (Thompson et al. 1978) should be consulted for complete descriptions.

4.4 AREA MAPPED TO DATE

During the 1978 field season, the northern portion of the high priority area extending to Lake Athabasca and all of the medium priority area were field checked and sampled. The total area mapped to date is shown in Figure 3. About 95 hours of helicopter time were used during a total of about 50 days in the field. An average of two to three sites per township were examined. Forty-four mineral soil profiles were sampled. About 85 organic

Table 3. Soil-drainage-vegetation relationships in the AOSERP study area.

Soil	Eluviated Dystric Brunisol/Eluviated Eutric Brunisol	Orthic Gray Luvisol	Cumulic Regosol Orthic Regosol	G.E.D.B.,[b] G.E.E.B., G.G.L., G.C.R., G.R.	Peaty Gleysols	Terric Mesisol Terric Fibrisol	Typic Mesisol Typic Fibrisol Fibric Mesisol
Drainage / Land System	Very Rapid and Rapid	Well to Moderately Well	Moderately Well to Imperfect	Imperfect	Poor	Poor to very poor	Very Poor
Heart	2c[a]			1b 2b	3b		
Mildred	2c[a] 2aM 2aA			1b 2b	3b		
Firebag	2c[a] 2aM 2aA			1b 2b	3b		
Kearl	2c[a] 2aM 2aA			1b 2b	3b		
Ruth Lake	2c[a] 2aM 2aA	2aM[a] 2aA[a]		1b 2b	3b		
Kinosis		2aM[a] 2c 2aA		1b 2b	3b		
Surmount		2aM[a] 2b		1b 2b	3b		
Horse River		2aM[a] 2aA		1b 2b	3b		
Legend		2c[a] 2b 2aM[a]		1b 2b	3b		
Livock		2aM[a] 2aC		1b 2b	3b		
Dover		2cA[a] 2aM[a]		1a 1b	1b 3b		
Buckton		2aC 2aM	2aC[a] 2aM[a]	1b 2b	1b 3b		
Namur			2aC[a] 2aM	1b 2b	1b 3b		
McMurray			2aC[a] 1a 2aM	1a[a] 1b[a]	1b 3b		
Mamawi					1b		
Bitumount	2c 2aM			1b 2b	1b[a] 3b[a]		
Steepbank		2aM		1b 2b	1b[a] 3b[a]		
Algar		2aM		1a 1b	1b[a] 3b		
Kenzie						3b[a] 3c	3b 3d 3c
Eaglesham						3b 3c	3a[a] 3d

[a] dominant, or one of dominants, in system.

[b] G.E.D.B. = Gleyed Eluviated Dystric Brunisol; G.E.E.B. = Gleyed Eluviated Eutric Brunisol; G.G.L. = Gleyed Gray Luvisol; G.C.R. = Gleyed Cumulic Regosol; G.R. = Gleyed Regosol.

Table 4. Vegetation legend for ecological habitat mapping at the AOSERP study area. (Reprinted from Thompson et al. 1978).

VEGETATION LEGEND		POSSIBLE COMPONENTS VISIBLE ON FALSE COLOR INFRARED PHOTOGRAPHY
1.	BOTTOMLAND & RIPARIAN COMMUNITIES	
a.	BOTTOMLAND & REPARIAN FOREST	balsam poplar aspen poplar white spruce willow alder paper birch
b.	DECIDUOUS SHRUB	willow alder dwarf birch immature aspen paper birch
2.	UPLAND COMMUNITIES	
	UNDIFFERENTIATED (Usually Complex)	deciduous shrub on burned over sites aspen poplar tall willow alder balsam poplar paper birch
a.	WHITE SPRUCE-ASPEN FOREST 2aA aspen 2aM mixed 2aC coniferous	white spruce aspen jack pine
b.	MIXED CONIFEROUS	black spruce jack pine white spruce
c.	JACK PINE	jack pine black spruce white spruce aspen
d.	UPLAND OPEN	grasses, low herbs and shrubs
3.	WETLAND COMMUNITIES	
	UNDIFFERENTIATED (Complex)	
a.	FEN COMMUNITIES	sedges, rushes low scattered shrubs tall shrubs
b.	BLACK SPRUCE BOG FOREST	black spruce, sphagnum mosses
c.	SEMI-OPEN BLACK SPRUCE, TAMARACK BOG FOREST	black spruce, tamarack, sphagnum mosses sedges, rushes
d.	LIGHTLY FORESTED TAMARACK AND OPEN MUSKEG	tamarack, black spruce, low shrubs sphagnum mosses
4.	BURN	
5.	NON-VEGETATED	recent slides, slumps with sparse vegetation (unclassified)

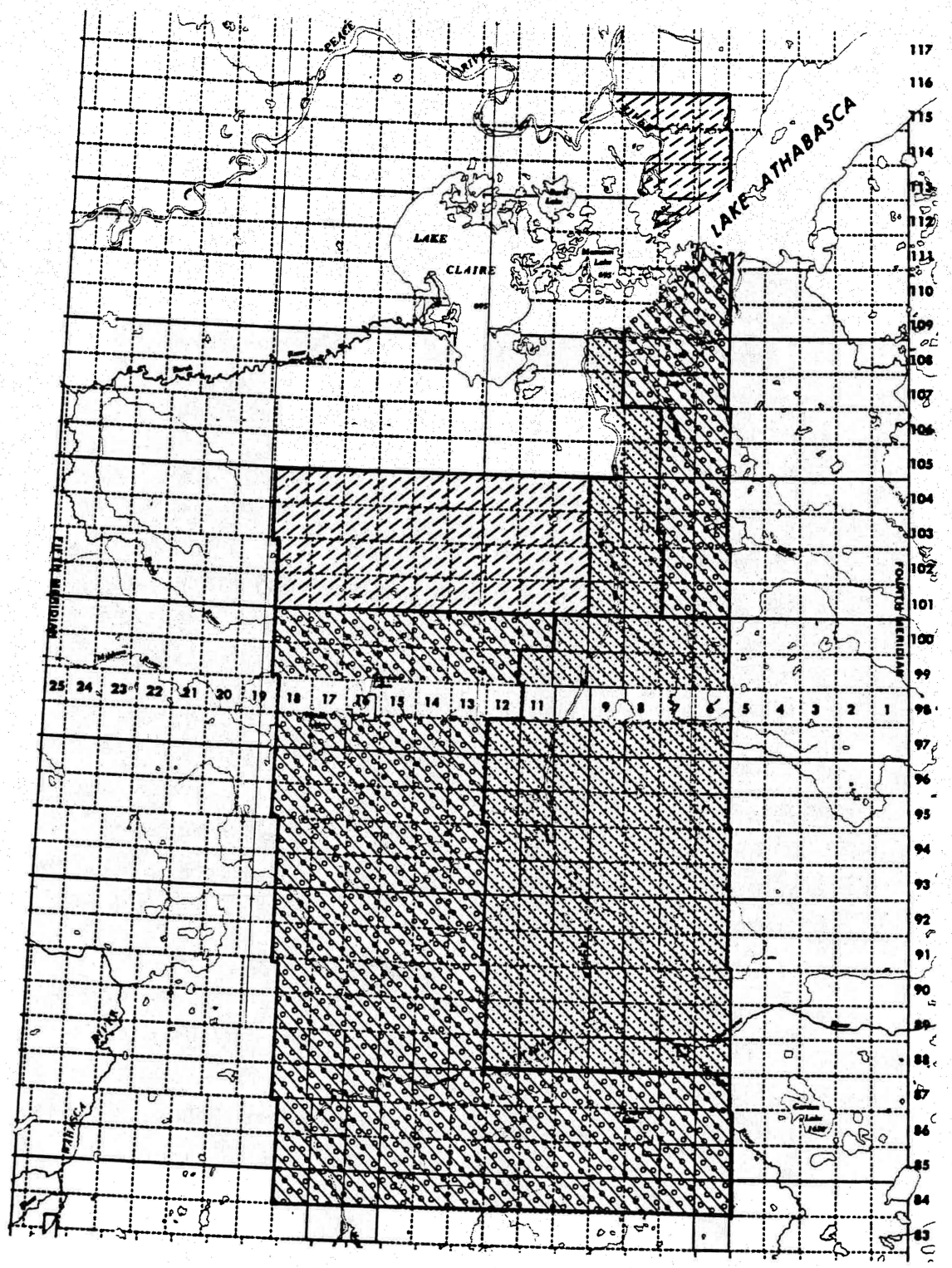

Figure 3. Area mapped and classified to the end of 1978.

soil sites were examined, water samples being taken from each. Peat samples were taken at 20 sites. Thirty of the water sampling sites and 10 of the peat sampling sites were in the intensive study area (Section 3). The remainder were taken at various locations throughout the study area.

Of approximately 305 townships in the study area, 124 were field checked prior to 1978, 149 were checked during 1978, and 32 remain to be mapped.

Because black and white air photos were not available for the area north of township 100, infrared false colour transparencies (1:50 000) of imagery taken for AOSERP during 1977 were obtained for air photo interpretations. Unlike black and white air photos, infrared transparencies are difficult to use in the field to aid navigation and location of sites. In areas of infrared coverage only, forest cover maps and 1:50 000 NTS maps were used for these purposes.

Infrared false colour transparencies at a scale of 1:30 000 were also obtained for two strips flown in the Dunkirk Plain area. Some of these were used for air photo interpretation of a peatland area selected for relatively intensive study (Section 3). Results of this study are not reported here as laboratory analyses of peat and water samples will not be completed until the spring of 1979. However, analyses completed to date, such as pH and fiber contents, have confirmed descriptions of Kenzie and Eaglesham land systems, as presented in the previous legend, and have permitted some revisions to be made, as presented in the updated legend accompanying this report.

Maps published to date are: NTS sheets 74D/11, 12, 13, 14 and 74E/3 and 4, submitted with the 1978 interim report; 74E/5, 6, 11, and 12, submitted in May 1978; 74D/6, 7W, 10W, 15W and 74E/2W, 7W, submitted in January 1979; 74E/10W, 15W, 14 and 74L/2W, 3, 5E, 6, 7W, 10W, 11 submitted in August 1979.

4.5 SOIL DESCRIPTIONS AND ANALYSES

Descriptions and analyses of soils which were sampled in 1977 are presented in Appendix 8.1. The sample sites are shown in Figure 4. Engineering test data for subsoils of the profiles described were presented in the interim report. The analyses have revealed some interesting properties of soils and deposits in the study area.

Exchangeable calcium to sodium ratios were less than 10 in many of the soils sampled from the Dover Plain. Soils with Ca:Na ratios below 10 are classified in the Solonetzic Soil order. Those found in the study area are Gray Solodized Solonetz and Solonetzic Gray Luvisol soils. Some sites examined were saline below the solum. Physically, these soils are similar to Orthic Gray Luvisols and many land use interpretations are also likely to be similar. The Solonetzic soils are presently included in the Dover land system but will be separated under a new name on the final land system map.

Analyses have also shown that the surficial deposits skirting the Muskeg Mountain and Thickwood Hills Upland are mixed lacustrine deposits, containing stones and till-like layers, originally described by Bayrock and Reimchen (1974) and McPherson and Kathol (1977). In the Muskeg Mountain area, these were previously recognized as glacial till and were included in the Kinosis land system. However, particle size analyses have shown that these deposits are quite different, the mixed lacustrine materials being somewhat finer (e.g. compare analyses of Sites 13 and 15). It is likely that, on the final map, Orthic Gray Luvisols on these types of deposits on both sides of the river will be placed in the Dover system. There is a further justification for separation of the Solonetzic soils on the basis of type of material; the mixed lacustrine deposits are mainly fine loamy, fine silty and fine clayey, whereas the glaciolacustrine deposits on which Solonetzic soils have developed are mainly fine clayey (35 to 60% clay) and very fine clayey (more than 60% clay).

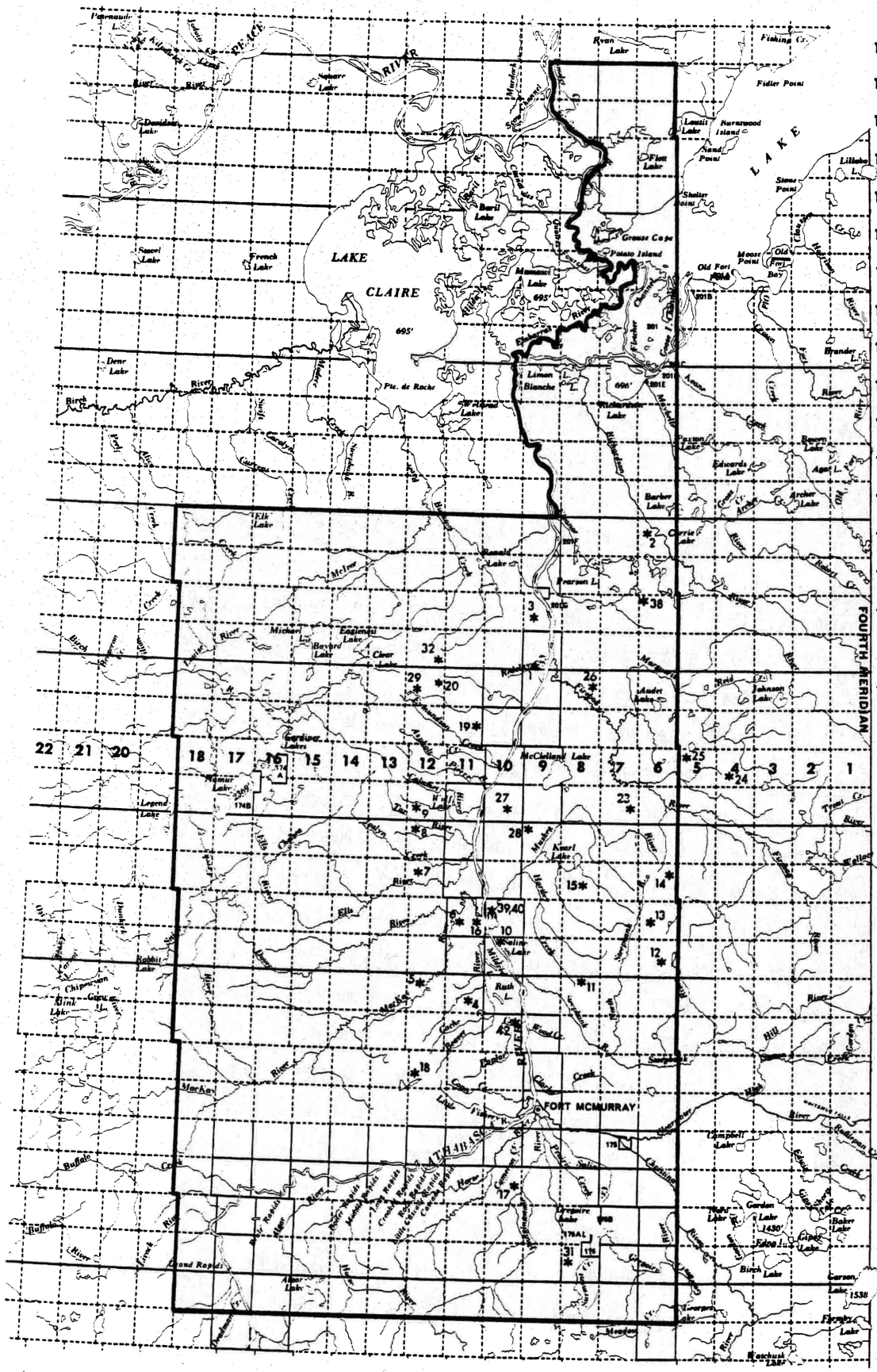

Figure 4. Locations of soil sampling sites in 1977.

The genetic material described for each soil profile in Appendix 8.1 has a texture as well as a genetic component. The textural description is based on particle size classes for family groupings of soils (CSSC 1978). The textural description is a composite particle size class of all layers between the 25 and 100 cm depths, or from the top of the Bt or Bm horizon to 100 cm. This scheme for description of soil material is being introduced here experimentally as a basis for naming of units being mapped.

5. CONCLUSIONS AND RECOMMENDATIONS

About 150 townships in the AOSERP high and medium priority areas were field checked and sampled during 1978. The total to date is about 275 townships, leaving about 30 to complete in 1979. The legend was revised and now contains descriptions of 21 land systems.

A sampling program and analyses of samples were continued in 1978. A portion of a large peatland area was examined in relative detail to obtain information which would aid in the air photo interpretation and mapping of peatlands in the area. It was found that permafrost was common in the organic soils of the Birch Mountain Upland and the Dunkirk Plain. Elsewhere, permafrost occurred more sporadically.

A table of soil-drainage-vegetation relationships was updated to include new land systems and to conform to the vegetation classification scheme used by AOSERP Project LS 2.3.

Laboratory analyses have revealed soil features which were not readily apparent in the field. This demonstrates how new information is continually obtained during the course of a survey, and points to the need to emphasize that all maps produced on 1:50 000 base maps in this project are interim in nature and that several modifications may be necessary in production of the final map. Users should be aware that, for the above reasons and due to the reconnaissance level of mapping in this project, no site specific information can be obtained from the maps produced.

6. FUTURE PLANS

The soils inventory project in the AOSERP study area requires continuation of field checking and production of maps during 1979-80.

Production of maps to complete the high priority area and those areas delineated in the 1978-79 contract (Gregoire Lake area; west Thickwood Hills area; Namur Lake area) is the highest priority at present. Maps will be presented to program management as drafting is completed during the first few months of 1979.

Only a few days of survey by helicopter will be required to complete field checking of the low priority area. However, several days will also be required to re-examine some areas where insufficient field data exist or where air photo interpretation and interpretation of laboratory analyses have been problematical. Additional samples may also be taken during 1979.

With regard to personnel, the project has employed one full time professional, L.W. Turchenek, and a summer student, G.A. Siers, during the last two years. In October 1978, a technical assistant, D.K. Skinner, was taken on full time to assist mainly in drafting maps. It is anticipated that the technical assistant will be required throughout 1979 to aid in production of the large number of maps covering the study area.

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8. APPENDICES

8.1 DESCRIPTIONS AND ANALYSES OF SOILS SAMPLED IN 1977

Site:	M77-1
Land System:	Mildred 1
Location:	NE 5-101-9-4
Classification:	Eluviated Eutric Brunisol
Landform:	
Genetic Material:	Glaciofluvial; sandy; overlying morainal
Surface Expression:	Inclined; very gentle slope
Site Features:	Mid-slope position; north aspect; well drained; high perviousness; moderately stony
Vegetation:	Jackpine/aspen-bearberry/rose (2c)

Profile Description:

LFH - 5 to 0 cm; slightly to moderately decomposed leaves and needles; plentiful, fine and medium, horizontal roots; clear wavy boundary.

Ae - 0 to 8 cm; grayish brown (10YR 5/2 d; 10YR 3/2 m); loamy sand; single grain; loose; few, very fine to medium and very few, coarse, horizontal roots; 20 to 30% coarse fragments; clear, wavy boundary.

Bm - 8 to 38 cm; brown (7.5YR 4/4 d; 7.5YR 3/3 m); sandy loam; single grain; soft; few, very fine to medium, oblique roots; 20 to 30% coarse fragments.

BCk - 38 to 105 cm; yellowish brown (10YR 5/8 d; 6.5YR 4/4 m); sand; single grain; loose; very few roots; 10 to 30% coarse fragments; numerous gravelly and cobbly tar sand fragments; abrupt, wavy boundary.

Ck - 105 to 111 cm; pale brown (10YR 6/3 d; 10YR 4/3.5 m); fine sand; single grain; soft; very few roots; less than 5% coarse fragments; abrupt, wavy boundary.

IICk1 - 111 to 119 cm; light reddish brown (5YR 6/2 d; 5YR 4/3 m); clay loam; massive; friable; very few roots; less than 10% coarse fragments; pink laminations; clear, wavy boundary.

IICk2 - 119 to 126 cm; pinkish gray (5YR 6/2 d; 5YR 4/3 m); silty clay loam; massive; friable; very few roots; less than 10% coarse fragments; clear, wavy boundary.

IIICk1 - 126 to 138 cm; pinkish gray (7.5YR 6/2 d; 7.5YR 4/2 m); loam; massive; friable; very few roots; less than 10% coarse fragments; pink bands; clear, smooth boundary.

IIICk2 - 138+ cm; brown (10YR 5/3 d; 10YR 3/3 m); sandy loam; massive; very friable; very few roots; less than 10% coarse fragments.

Table 5. Analysis: Site M77-1.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	4.9	5.3	33.03	1.46	23
Ae	81	1	10	25	36	9	17	2	1	4.6	5.5	2.79	0.09	31
Bm	75	2	16	25	26	6	9	16	9	5.7	6.2	2.55	0.06	43
BCk	98	tr	13	59	26	tr	1	1	-	7.2	7.4	0.14	0.01	14
Ck	96	5	7	9	64	11	2	2	-	7.2	7.8	-	-	-
IICk1	46	1	3	13	21	8	25	29	7	7.3	7.7	-	-	-
IICk2	7	-	-	-	-	-	60	33	5	7.4	7.7	-	-	-
IIICk1	47	tr	4	15	20	8	35	18	4	7.4	7.8	-	-	-
IIICk2	62	-	-	-	-	-	27	11	2	7.4	7.9	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-						
Ae	-	6.6	0.04	0.09	4.0	0.6	72						
Bm	-	4.8	0.3	0.1	6.7	2.3	100						
BCk	0.1	1.2	0.01	0.03	1.0	0.4	100						
Ck	2.3	-	-	-	-	-	-						
IICk1	12.0	-	-	-	-	-	-						
IICk2	4.2	-	-	-	-	-	-						
IIICk1	9.6	-	-	-	-	-	-						
IIICk2	8.9	-	-	-	-	-	-						

Site:	M77-2
Land System:	Mildred 1
Location:	SW 20-104-6-4.
Classification:	Eluviated Dystric Brunisol
Genetic Material:	Glaciofluvial; sandy
Surface Expression:	Undulating; gentle slopes
Site Features:	Mid slope position; east aspect; rapidly drained; high perviousness; non stony.
Vegetation:	Jackpine-lichen-bearberry (2c)

Profile Description:

LFH - 1 to 0 cm; slightly to moderately well decomposed needles and lichens; clear, smooth boundary.

Ae - 0 to 6 cm; gray (10YR 5/1 d; 10YR 3/1 m); sand; single grain; loose; plentiful, very fine to medium, horizontal roots; clear, broken boundary.

AB - 6 to 16 cm; very pale brown (10YR 6/3 d; 10YR 5/3 m); sand; single grain; loose; few, very fine to medium, oblique roots; clear, wavy boundary.

Bm - 16 to 30 cm; yellow (10YR 6/6 d; 10YR 4/6 m); sand; single grain; loose; few, very fine to medium, vertical roots; gradual, wavy boundary.

BC - 30 to 50 cm; very pale brown (10YR 6/4 d; 10YR 5/4 m); sand; single grain; loose; very few roots; gradual, smooth boundary.

C1 - 50 to 100 cm; pink (5YR 8/3 d; 5YR 6/3 m); sand; single grain; loose; very few roots; diffuse, smooth boundary.

C2 - at 110 cm; pink (5YR 8/3 d; 5YR 6/3 m); sand; single grain; loose; very few roots.

C3 - at 160 cm; pink (5YR 7.5/3 d; 5YR 6/3 m); sand; single grain; loose; very few roots.

Table 6. Analysis: Site M77-2.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	3.7	4.3	36.97	0.39	95
Ae	99	0	4	43	50	2	1	-	-	3.9	4.9	0.49	0.02	24
AB	97	tr	4	42	48	3	3	-	-	4.3	5.0	0.00	0.01	-
Bm	98	0	2	36	57	4	2	-	-	4.8	5.5	0.00	0.00	-
BC	99	0	4	49	43	3	1	-	-	5.0	5.6	-	-	-
C1	100	0	11	68	21	tr	0.5	-	-	4.9	5.8	-	-	-
C2	100	tr	11	54	33	tr	0.5	-	-	4.8	5.8	-	-	-
C3	100	0	5	60	34	tr	0.5	-	-	4.8	5.7	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-						
Ae	-	2.3	0.3	0.02	0.3	0.05	29						
AB	-	0.4	0.03	0.01	0.0	0.08	30						
Bm	-	0.5	0.0	0.01	0.0	0.08	18						
BC	-	0.3	0.01	0.01	0.0	0.03	17						
C1	-	0.2	0.0	0.01	0.0	0.03	25						
C2	-	0.1	0.04	0.0	0.0	0.03	100						
C3	-	0.1	0.0	0.01	0.07	0.03	100						

Site: M77-3
Land System: Mildred 1
Location: NE 8-102-9-4
Classification: Eluviated Dystric Brunisol
Landform:
Genetic Material: Glaciofluvial; sandy
Surface Expression: Terrace; nearly level
Site Features: Mid slope position; north aspect; well drained; high perviousness, non stony.
Vegetation: Jackpine-blueberry/cowberry/bearberry (2c)

Profile Description:

LFH - 4 to 0 cm; undecomposed to moderately decomposed needles and lichens; abundant, fine to medium, horizontal roots; clear, smooth boundary.

Ahe - 0 to 3 cm; dark grayish brown (10YR 3.5/2 d; 5YR 2.5/2 m); sand; single grain; loose; plentiful, very fine to coarse, horizontal roots; clear, wavy boundary.

Ae - 3 to 9 cm; brown (10YR 5/3 d; 10YR 3/3 m); loamy sand; single grain; plentiful, very fine to coarse, horizontal roots; very friable; gradual, wavy boundary.

AB - 9 to 17 cm; yellowish brown (10YR 5/4 d; 10YR 3/4 m); sandy loam; single grain; very friable; plentiful, very fine to medium, horizontal roots; gradual, wavy boundary.

Bm - 17 to 27 cm; yellowish brown (10YR 5/6 d; 10YR 3/6 m); sandy loam; weak, medium subangular blocky; very friable; few, very fine to medium oblique roots; gradual, smooth boundary.

BC - 27 to 51 cm; brownish yellow (10YR 5.5/7 d; 10YR 4/6 m); sand; single grain; loose; very few, very fine and fine, oblique roots; diffuse, smooth boundary.

C - 51+ cm; light yellowish brown (10YR 6/4 d; 10YR 4/3 m); sand, single grain; loose; very few roots.

Ck - at 100 cm; light yellowish brown (10YR 5.5/4 d; 10YR 4/4 m); sand; single grain; loose; very few roots.

Table 7. Analysis: Site M77-3.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	5.4	5.0	36.42	1.05	35
Ahe	87	4	27	42	12	2	13	-	-	4.9	4.9	1.37	0.07	20
Ae	77	3	23	37	11	3	12	1	1	5.1	5.1	0.38	0.02	19
AB	64	4	19	28	9	4	33	3	2	4.8	4.8	0.40	0.03	13
Bm	69	2	16	31	15	5	26	5	3	4.6	4.6	0.38	0.02	19
BC	97	3	23	58	13	tr	3	-	-	4.8	4.8	-	-	-
C	98	6	39	41	12	tr	2	-	-	4.8	4.8	-	-	-
Ck	98	3	18	46	31	tr	2	-	-	5.1	5.1	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-						
Ahe	-	3.9	0.0	0.1	5.1	0.4	100						
Ae	-	1.3	0.0	0.06	1.8	0.4	100						
AB	-	4.4	0.02	0.06	1.8	0.4	52						
Bm	-	3.9	0.01	0.03	1.0	0.2	32						
BC	-	1.1	0.02	0.02	0.4	0.1	49						
C	-	0.8	0.01	0.01	0.3	0.05	46						
Ck	-	0.9	0.04	0.02	0.4	0.1	62						

Site:	M77-4
Land System:	Dover 1
Location:	NW 10-42-11-4
Classification:	Gray Solodized Solonetz
Landform:	
Genetic Material:	Glaciolacustrine; clayey with some pebbles and stones
Surface Expression:	Undulating, very gentle slopes
Site Features:	Almost level sample site; moderately well drained; medium to low perviousness; slightly stony.
Vegetation:	Aspen/white spruce-buffalo-berry/rose/bunchberry (2aA)

Profile Description:

LFH - 6 to 0 cm; dark brown; slightly decomposed L layer; moderately decomposed F layer with abundant fungal hyphae; very thin H layer; mainly aspen leaf origin; abundant, very fine to medium, horizontal and oblique roots; clear, smooth boundary.

Ae - 0 to 8 cm; light gray (10YR 6/1 d; 10YR 5/2 m) silt loam; strong, coarse, platy; firm; plentiful, very fine, oblique, inped and exped roots; clear, wavy boundary.

Bnt1 - 8 to 28 cm; light brownish gray (10YR 6/2 d; 10YR 4/2 m); heavy clay; strong, medium, round-topped columnar breaking to strong, medium, angular blocky; very firm; few, vertical and oblique, exped roots; gradual, smooth boundary.

Bnt2 - 28 to 46 cm; light brownish gray (10YR 6/2 d; 10YR 3/2 m); heavy clay; strong fine subangular blocky; very firm; very few, fine, vertical, exped roots; gradual, smooth boundary.

Ck1 - 46 to 84 cm; light brownish gray (10YR 6/2 d; 10YR 3/2 m); clay; moderate, fine, subangular blocky; very firm; few very fine to fine, vertical, exped roots; diffuse, smooth boundary.

Ck2 - 84 to 90 cm; light brownish gray (10YR 6/2 d; 10YR 3/3 m); clay; massive to weak, fine subangular blocky; very firm; very few roots; diffuse, smooth boundary.

Ck3 - 90 to 105 cm; light brownish gray (10YR 6/2 d; 10YR 4/3 m); clay loam; massive, very firm; very few roots; diffuse, smooth boundary.

Ck4 - 105 to 130 cm; light brownish gray (10YR 6/2 d; 10YR 3/3 m); clay loam; massive; very firm, very few roots; diffuse, smooth boundary.

Ck5 - 130 to 150 cm; light brownish gray (10YR 6/2 d; 10YR 3/3 m); clay; massive; very firm; very few roots.

Table 8. Analysis: Site M77-4.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	5.8	6.0	45.7	1.96	23
Ae	23	tr	2	8	8	5	60	17	3	4.9	5.5	1.49	0.07	21
Bnt1	4	tr	tr	1	2	tr	28	68	31	6.1	6.0	1.16	0.07	16
Bnt2	6	tr	tr	2	3	1	29	65	27	6.6	6.9	0.89	0.05	18
Ck1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ck2	23	tr	2	6	9	6	34	43	17	7.7	7.7	-	-	-
Ck3	26	tr	2	5	11	8	38	36	12	7.8	7.7	-	-	-
Ck4	36	tr	3	8	14	10	35	29	7	7.9	7.8	-	-	-
Ck5	17	tr	2	4	7	5	35	48	17	7.8	7.8	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-	-	-	-	-	-	-
Ae	-	8.9	0.9	0.3	4.1	1.7	79	0.6	40	34.0	0.1	2.4	1.2
Bnt1	-	26.6	6.8	0.4	16.4	10.4	100	1.3	60	14.6	0.03	3.4	3.1
Bnt2	-	22.8	7.1	0.3	15.6	10.0	100	2.5	61	31.9	0.03	7.1	6.6
Ck1	-	-	-	-	-	-	-	-	-	-	-	-	-
Ck2	5.0	-	-	-	-	-	-	2.6	56	22.8	0.1	5.5	4.6
Ck3	8.0	-	-	-	-	-	-	2.4	54	24.4	0.1	4.9	4.3
Ck4	5.7	-	-	-	-	-	-	2.5	51	26.3	0.2	4.6	3.9
Ck5	1.1	-	-	-	-	-	-	2.6	48	23.0	0.2	5.5	4.5

Site:	M77-5
Land System:	Dover 1
Location:	SE 28-92-12-4
Classification:	Gray Solodized Solonetz
Landform:	
Genetic Material:	Glaciolacustrine; clayey
Surface Expression:	Undulating; very gentle slopes
Site Features:	Almost level sample site; moderately well to imperfectly drained; medium to low perviousness; non stony.
Vegetation:	Aspen/white spruce-willow/bunchberry/ grasses (2aA)

Profile Description:

LFH - 6 to 0 cm; slightly decomposed leaves overlying moderately decomposed leaves permeated with fungal hyphae; abundant fine to medium, horizontal and oblique roots; clear, wavy boundary.

Aegj - 0 to 6 cm; light brownish gray (10YR 6/2 d; 10YR 4/2 m); silt loam; strong, coarse platy; friable; plentiful, very fine and fine, few medium, random, roots; very few coarse fragments; clear, wavy boundary.

ABgj - 6 to 11 cm; light brownish gray (10YR 6/2 d; 10YR 4/2 m); silty clay loam; irregular medium round tops breaking to weak, coarse platy; very firm; few, fine, vertical and oblique roots; gradual, irregular boundary.

Bnt1 - 11 to 24 cm; grayish brown (10YR 5/2 d; 10YR 3/2 m);clay; strong, medium columnar breaking to strong, medium sub-angular blocky; very firm; few, fine, vertical roots; gradual, smooth boundary.

Bnt 2 - 24 to 40 cm; light brownish gray (10YR 6/2 d; 10YR 3/3 m); clay; moderate, fine, subangular blocky; very firm; few, vertical roots; gradual, smooth boundary.

Ck1 - 49 to 90 cm; light brownish gray (10YR 6/2 d; 10YR 3/3 m); clay; weak, fine, subangular blocky; very firm; few, fine, vertical roots; pinkish bands; gradual, smooth boundary.

Ck2 - 90 to 135 cm; light brownish gray (10YR 6/2 d; 10YR 3/3 m); clay; massive; very firm; very few, very fine roots; pinkish bands.

Table 9. Analysis: Site M77-5.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	5.6	6.0	34.49	1.40	25
Aegj	14	tr	1	3	5	5	65	21	2	5.4	6.3	1.19	0.07	17
ABgj	15	tr	1	3	6	5	49	36	12	5.4	6.0	0.78	0.05	16
Bnt1	11	tr	1	2	4	4	31	58	25	6.0	6.2	0.78	0.04	20
Bnt2	13	tr	1	2	5	5	33	54	23	6.9	6.8	0.75	0.03	25
Ck1	11	tr	1	2	4	4	35	54	18	7.3	7.2	-	-	-
Ck2	9	tr	tr	2	4	3	36	55	17	7.5	7.5	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-	-	-	-	-	-	-
Aegj	-	8.6	0.4	0.2	7.2	5.6	100	0.4	40	-	-	-	-
ABgj	-	13.7	4.9	0.2	5.4	5.9	100	0.20	40	-	-	-	-
Bnt1	-	23.7	4.8	0.4	11.5	12.4	100	0.4	47	-	-	-	-
Bnt2	0.1	20.2	4.4	0.4	11.0	10.7	100	0.6	46	-	-	-	-
Ck1	2.3	17.5	4.1	0.4	21.1	9.8	100	0.6	51	3.4	0.04	1.9	1.6
Ck2	7.7	14.9	2.4	0.4	36.8	8.2	100	0.5	55	3.1	0.08	1.4	1.0

Site:	M77-6
Land System:	Dover 1
Location:	SW 17-94-11-4
Classification:	Gray Solodized Solonetz
Landform:	
Genetic Material:	Glaciolacustrine; clayey; overlying morainal
Surface Expression:	Undulating veneer; very gentle slopes
Site Features:	Upper slope position; north aspect; imperfectly drained; low perviousness; slightly stony
Vegetation:	Aspen/white spruce-various shrubs and herbs (2aA)

Profile Description:

LFH - 4 to 0 cm; very dark gray (10YR 3/2 d; 10YR 2/1 m); slightly decomposed leaves in L layer; leaves permeated by fungal hyphae in F layer; abundant, very fine and fine, few medium and coarse, horizontal and oblique roots; clear, wavy boundary.

Aegj - 0 to 3 cm; light gray (10YR 6/2 d; 10YR 4.5/2 m); silt loam; moderate, medium platy; friable; few, fine oblique and very few medium and coarse, oblique, roots; very few coarse fragments; clear, irregular boundary.

ABgj - 3 to 17 cm; light gray (10YR 7/2 d; 10YR 4.5/2 m); silt loam; weak, medium, round topped columnar breaking to moderate, medium, subangular blocky; very firm; very few, very fine to medium, oblique roots; very few coarse fragments; gradual, smooth boundary.

Bnt - 17 to 55 cm; pinkish gray (5YR 6/2 d; 5YR 4/3 m); heavy clay; strong, medium, columnar breaking to moderate, medium, subangular blocky; very firm; few very fine and fine, vertical roots; very few coarse fragments; gradual, smooth boundary.

BC - 55 to 70 cm; light brownish gray (10YR 6/2 d; 10YR 3/2 m); silt loam; weak, medium subangular blocky; firm; very few, fine roots; very few coarse fragments; gradual, smooth boundary.

IICk1 - 70 to 100 cm; grayish brown (10YR 5/2 d; 10YR 3/3 m); clay loam; massive; firm; very few, very fine roots; few coarse fragments; gradual, smooth boundary.

IICk2 - 100 to 120 cm; grayish brown (10YR 5/2 d; 10YR 4/2 m); silty clay loam; massive; firm; few coarse fragments; very few, very fine roots.

Table 10. Analysis: Site M77-6.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	4.9	6.0	15.34	0.89	17
Aegj	18	tr	3	5	5	5	63	19	1	5.2	6.2	0.74	0.04	18
ABgj	18	tr	2	5	6	5	58	24	2	5.3	6.3	0.77	0.05	15
Bnt	6	tr	tr	1	2	1	15	79	29	7.3	7.2	0.48	0.03	16
BC	20	tr	1	3	6	9	72	8	2	5.9	6.6	-	-	-
IICk1	28	tr	1	6	13	8	36	36	12	7.6	8.2	-	-	-
IICk2	9	0	tr	2	4	2	55	36	14	7.8	8.4	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-	-	-	-	-	-	-
Aegj	-	5.4	1.4	0.2	1.7	1.8	94	0.4	40	-	-	-	-
ABgj	-	6.5	2.6	0.2	1.8	2.4	100	0.5	40	-	-	-	-
Bnt	-	23.7	8.4	0.4	5.9	16.6	100	1.0	66	-	-	-	-
BC	-	8.1	0.02	0.3	5.6	1.0	85	0.3	40	-	-	-	-
IICk1	4.7	-	-	-	-	-	-	1.2	52	18.7	0.03	0.8	0.6
IICk2	4.8	-	-	-	-	-	-	1.0	67	14.6	0.03	0.9	0.7

Site:	M77-7
Land System:	Dover 1
Location:	NW 21-95-12-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Glaciolacustrine; clayey; overlying morainal
Surface Expression:	Undulating veneer; very gentle slopes
Site Features:	Upper slope position; west aspect, moderately well drained; medium perviousness; slightly stony
Vegetation:	Aspen/balsam poplar-willow/rose (2)

Profile Description:

LFH - 4 to 0 cm; dark gray (20YR 4/2 d; 10YR 2/1 m); slightly decomposed leaves in L layer; leaves permeated by fungal hyphae in F layer; plentiful, very fine to medium, random roots; clear, wavy boundary.

Ae - 0 to 4 cm; grayish brown (10YR 5/2 d; 10YR 3/3 m); silt loam; moderate, medium platy; friable; plentiful very fine and fine, few medium and coarse, random roots; less than 10% coarse fragments; gradual, irregular boundary.

AB - 4 to 8 cm; pale brown (10YR 6/3 d; 10YR 3/3 m); silt loam; weak, medium platy and weak, fine, subangular blocky; firm; few, very fine to medium, oblique roots; less than 10% coarse fragments; smooth boundary.

Bt - 8 to 29 cm; pale brown (10YR 6/3 d; 10YR 4/3 m); clay; moderate, medium, subangular blocky; firm; few, very fine to medium, oblique roots; less than 10% coarse fragments; gradual, smooth boundary.

BC - 29 to 48 cm; grayish brown (10YR 5/2 d; 10YR 3/3 m) clay; moderate, fine and medium, subangular blocky; firm; very few, very fine to medium, vertical roots; less than 10% coarse fragments; clear, smooth boundary.

IIBCk - 48 to 86 cm; brown (10YR 5/3 d; 10YR 3/3 m); clay; moderate, medium, subangular blocky; firm; very few, very fine to medium, vertical roots; 10 to 15% gravelly to stony fragments; gradual, smooth boundary.

IICk - 86 to 110 cm; grayish brown (10YR 5.5/2 d; 10YR 3/3 m); clay; massive; firm; very few roots; 10 to 15% gravelly to stony fragments.

Table 11. Analysis: Site M77-7.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	6.2	5.8	8.48	0.61	14
Ae	22	tr	1	4	10	7	35	43	17	7.9	8.1	0.87	0.02	44
AB	20	tr	1	4	7	7	57	23	17	6.3	7.0	0.98	0.06	16
Bt	21	tr	1	5	9	6	32	47	20	4.7	5.5	0.64	0.05	13
BC	22	tr	2	5	9	5	29	49	23	4.8	5.2	-	-	-
IIBCk	27	tr	2	6	12	6	32	41	20	6.8	6.9	-	-	-
IICk	23	tr	2	5	9	5	35	42	16	7.3	7.5	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-	-	-	-	-	-	-
Ae	-	-	-	-	-	-	-	1.1	52	-	-	-	-
AB	-	12.8	0.2	0.3	8.9	3.2	98	0.4	40	-	-	-	-
Bt	-	21.9	0.3	0.4	8.6	5.5	68	<0.2	40	-	-	-	-
BC	-	23.7	0.4	0.4	11.1	7.2	81	<0.2	46	-	-	-	-
IIBCk	2.8	19.9	0.8	0.3	29.0	7.3	100	0.4	47	1.7	0.02	2.5	1.4
IICk	8.5	15.5	1.2	0.4	41.8	7.8	100	0.4	52	2.0	0.04	1.7	1.1

Site:	M77-8
Land System:	Horse River 1
Location:	NW 29-96-12-4
Classification:	Orthic Gray Luvisol
Genetic Material:	Morainal; fine loamy
Surface Expression:	Undulating; very gentle slopes
Site Features:	Upper slope position; north aspect; moderately well drained; medium perviousness; slightly stony.
Vegetation:	Aspen/white spruce-rose/bearberry (2aA)

Profile Description:

LFH - 5 to 0 cm; slightly decomposed leaves in L layer; leaves permeated by fungal hyphae in F layer; abundant, very fine to coarse, horizontal and oblique roots; clear, wavy boundary.

Ae - 0 to 7 cm; light gray (10YR 7/2 d; 10YR 4.5/3 m); silt loam; moderate, medium platy; very friable; plentiful, very fine and fine, few medium and coarse, oblique roots; less than 10% coarse fragments; gradual, wavy boundary.

AB - 7 to 14 cm; pale brown (10YR 6/3 d; 10YR 4/3 d); loam; weak, medium platy to weak, medium subangular blocky; friable; plentiful, very fine to medium, oblique roots; 10 to 20% coarse fragments; gradual, wavy boundary.

Bt1 - 14 to 34 cm; brown (10YR 4.5/3 d; 10YR 3/3 m); clay; very weak, medium columnar breaking to strong, medium subangular blocky; very firm; few, very fine to medium, vertical roots; less than 10% coarse fragments; gradual, wavy boundary.

Bt2 - 34 to 48 cm; dark yellowish brown (10YR 4.5/4 d; 10YR 3/3 d); clay loam; moderate, fine subangular blocky; firm; few, very fine and fine, vertical roots; less than 10% coarse fragments; gradual smooth boundary.

BCk - 48 to 80 cm; pale brown (10YR 5.5/3 d; 10YR 3/3 m); loam; pinkish gray ped faces; moderate, fine subangular blocky; firm; very few, very fine and fine, vertical roots; less than 10% coarse fragments; gradual, smooth boundary.

Ck - 80 to 120 cm; brown (10YR 5/3 d; 10YR 3/3 m); pinkish gray ped faces; clay loam; weak, fine subangular blocky; firm; very few, very fine and fine, vertical roots; less than 10% coarse fragments.

Table 12. Analysis: Site M77-8.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	5.1	5.4	14.52	0.85	17
Ae	19	tr	2	3	5	8	70	11	-	4.3	5.4	0.73	0.04	18
AB	28	1	2	6	9	10	47	25	9	4.6	5.2	0.67	0.04	17
Bt1	22	1	2	5	7	7	30	48	28	5.8	5.9	0.95	0.05	19
Bt2	30	1	4	7	9	9	35	35	20	7.3	7.2	1.31	0.07	19
BCk	47	tr	4	12	15	16	39	14	9	7.7	7.8	-	-	-
Ck	31	1	2	5	10	13	37	32	19	7.7	7.9	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-	-	-	-	-	-	-
Ae	-	6.2	0.2	0.2	1.4	0.8	42	<0.2	40	-	-	-	-
AB	-	14.2	2.5	0.3	4.1	3.9	76	0.4	40	-	-	-	-
Bt1	-	28.7	6.1	0.4	11.8	10.4	100	1.4	57	-	-	-	-
Bt2	-	22.8	6.2	0.3	25.6	9.6	100	1.5	48	-	-	-	-
BCk	8.9	-	-	-	-	-	-	1.4	40	14.1	0.03	1.5	1.0
Ck	6.1	-	-	-	-	-	-	1.4	69	14.1	0.1	1.4	1.2

Site:	M77-9
Land System:	Dover 1
Location:	NW 17-97-12-4
Classification:	Gray Solodized Solonetz
Landform:	
Genetic Material:	Glaciolacustrine; clayey
Surface Expression	Undulating; very gentle slopes
Site Features:	Lower slope position; east aspect; imperfectly drained; medium perviousness; slightly stony.
Vegetation:	Aspen-alder/bunchberry (2aA)

Profile Description:

LFH - 8 to 0 cm; mainly F material permeated with fungal hyphae; abundant, very fine to coarse, horizontal roots; clear, smooth boundary.

Ae - 0 to 12 cm; light gray (10YR 6/2 d; 10YR 5/3 m); silt loam; strong, medium platy; friable; plentiful, very fine to medium, oblique roots; less than 5% coarse fragments; abrupt, wavy boundary.

Bnt1 - 12 to 37 cm; grayish brown (10YR 5/2 d; 10YR 3/3 m); clay; moderate, medium, round topped columnar breaking to strong medium subangular blocky; very firm; few, very fine to medium oblique roots; less than 5% coarse fragments; gradual, smooth boundary.

Bnt 2 - 37 to 60 cm; grayish brown (10YR 5/2 d; 10YR 2.5/3 m); clay; moderate, medium prismatic breaking to strong medium subangular blocky; very firm; few, very fine to medium, oblique roots; less than 5% coarse fragments; gradual, smooth boundary.

BCsk - 60 to 100 cm; grayish brown (10YR 5/2 d; 10YR 2.5/3 m); pinkish gray blotches; clay; strong, fine subangular blocky; very sticky; very few, very fine to medium, vertical roots; less than 5% coarse fragments; pockets of gypsum crystals; gradual, smooth boundary.

Csk1 - 100 to 120 cm; dark grayish brown (10YR 4.5/2 d; 10YR 3/2 m); clay loam; massive; very sticky; very few roots; less than 5% coarse fragments; pockets of gypsum crystals; diffuse, smooth boundary.

Csk2 - 120 to 150 cm; dark grayish brown (10YR 4.5/2 d; 10YR 3/2 m); massive; very sticky; very few roots; less than 5% coarse fragments.

Table 13. Analysis: Site M77-9.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	4.4	4.8	36.26	1.87	19
Ae	17	tr	1	4	6	6	70	13	2	4.3	5.2	0.56	0.03	19
Bnt1	14	0	1	4	6	3	38	48	27	6.0	6.3	0.69	0.05	14
Bnt2	15	tr	1	4	6	4	35	50	23	6.8	7.0	0.48	0.04	12
BCsk	22	tr	2	7	10	3	33	45	22	7.2	7.2	-	-	-
Csk1	36	tr	2	11	17	6	33	31	19	6.6	6.2	-	-	-
Csk2	41	tr	4	11	18	8	31	28	15	7.4	7.4	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-	-	-	-	-	-	-
Ae	-	8.1	1.5	0.3	0.6	0.7	38	0.3	40	1.9	0.06	0.6	0.3
Bnt1	-	24.6	5.3	0.4	7.0	12.6	100	2.8	56	22.6	0.06	4.4	9.2
Bnt2	-	21.9	5.6	0.5	7.6	12.4	100	3.2	63	26.3	0.1	5.5	11.8
BCsk	-	19.0	5.5	0.5	30.6	11.2	100	5.8	68	60.9	0.3	25.1	32.3
Csk1	0.1	15.5	7.4	0.6	25.5	9.5	100	5.8	63	123.9	0.4	25.2	30.7
Csk2	0.2	13.4	6.8	0.6	19.5	8.6	100	6.0	61	85.9	0.6	23.8	28.2

Site:	M77-10
Land System:	Heart 1
Location:	NW 32-93-10-4
Classification:	Eluviated Eutric Brunisol
Landform:	
Genetic Material:	Eolian; sandy; overlying limestone rock
Surface Expression:	Ridged veneer; gentle slopes; moderate slopes on rock scarps
Site Features:	Upper slope position; south aspect; rapidly drained; high perviousness; non stony
Vegetation:	Jackpine-lichen/Labrador tea (2c)

Profile Description:

LFH - 3 to 0 cm; slightly to moderately decomposed needles and leaves; plentiful, fine and medium, horizontal roots; abrupt, wavy boundary.

Ae - 0 to 14 cm; light brownish gray (10YR 6.5/2 d; 10YR 4/2 m); loamy fine sand; weak medium platy; loose; few, fine and medium, and very few, coarse, oblique roots; clear, wavy boundary.

Bm1 - 14 to 40 cm; light yellowish brown (10YR 6/4 d;10YR 4/4 m); loamy fine sand; very weak, fine subangular blocky; very soft; very few, fine and medium, oblique roots; gradual, smooth boundary.

Bm2 - 40 to 75 cm; light yellowish brown (10YR 6.5/4 d; 10YR 4/4 m); fine sand; very weak, medium, subangular blocky; very soft; very few roots; clear, wavy boundary.

Bt - 75 to 85 cm; dark yellowish brown (10YR 4/6 d; 10YR 3.5/4 d); fine sandy loam; moderate, medium, subangular blocky; friable; very few roots; abrupt, wavy boundary (lithic contact).

R - 85+ cm; consolidated limestone rock.

Table 14. Analysis: Site M77-10.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	3.9	4.4	39.91	0.68	59
Ae	82	0	tr	5	39	37	15	3	1	5.0	5.5	0.41	0.02	21
Bm1	86	tr	tr	3	46	37	11	3	2	5.2	6.1	0.17	0.01	17
Bm2	88	tr	2	16	39	31	8	4	1	5.9	6.7	0.12	0.00	-
Bt	65	tr	2	10	31	22	16	19	14	6.7	7.0	0.55	0.04	14
R	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-						
Ae	-	2.0	0.0	0.06	1.6	0.2	93						
Bm1	-	1.7	0.01	0.1	1.7	0.2	100						
Bm2	-	1.6	0.02	0.04	2.1	0.3	100						
Bt	-	12.4	0.06	0.3	17.6	1.0	100						
R	-	-	-	-	-	-	-						

Site:	M77-11
Land System:	Mildred 2
Location:	SE 34-92-8-4
Classification:	Eluviated Dystric Brunisol
Landform:	
Genetic Material:	Glaciofluvial, sandy, overlying morainal
Surface Expression:	Undulating; very gentle slopes
Site Features:	Upper slope position; east aspect; well drained; high perviousness; non stony
Vegetation:	Jackpine/aspen (2aM)

Profile Description:

LFH - 4 to 0 cm; slightly to moderately decomposed leaves and needles; plentiful, very fine to medium horizontal roots; abrupt, wavy boundary.

Ae - 0 to 6 cm; light gray (10YR 6.5/1 d; 10YR 4/2 m); fine sandy loam; weak, medium platy; very friable; few, very fine to coarse, horizontal roots; clear, wavy boundary.

AB - 6 to 15 cm; light yellowish brown (10YR 6/4 d; 10YR 4/4 m); loamy fine sand; moderate, medium platy; very friable; few, very fine to coarse, horizontal roots; gradual, smooth boundary.

Bm - 15 to 27 cm; light yellowish brown (10YR 6/4 d; 10YR 4/4 m); fine sand; weak, medium, subangular blocky; friable; very few, very fine to medium, oblique roots; abrupt, smooth boundary.

IIBt - 27 to 60 cm; yellowish brown (10YR 5/4 d; 10YR 3.5/4 m); sandy clay loam; weak, medium subangular blocky; firm; very few, very fine to medium oblique roots; gradual, smooth boundary.

IICk1 - 60 to 100 cm; brown (10YR 5/3 d; 10YR 3/3 m); loam; massive; firm; very few, very fine to medium, oblique roots; gradual, smooth boundary.

IICk2 - 100 to 120 cm; brown (10YR 5/3 d; 10YR 3/3 m); loam; massive; firm; very few, very fine and fine, oblique roots.

Table 15. Analysis: Site M77-11.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	4.6	5.1	31.67	0.88	36
Ae,	66	1	5	21	30	9	34	-	-	4.0	4.8	0.62	0.02	31
AB	83	1	3	17	59	11	14	3	2	4.6	5.4	0.12	0.01	12
Bm	86	tr	3	16	57	10	12	2	2	4.5	5.2	0.14	0.01	14
IIBt	49	tr	4	16	21	7	27	24	14	5.3	5.6	0.41	0.02	21
IICk1	50	tr	4	15	22	8	32	18	9	7.0	7.2	-	-	-
IICk2	48	1	4	14	21	8	32	20	9	7.3	7.6	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-						
Ae	-	2.8	0.02	0.09	0.9	0.2	43						
AB	-	2.0	0.04	0.06	0.6	0.2	45						
Bm	-	1.9	0.0	0.05	0.6	0.2	45						
IIBt	-	9.2	0.05	0.3	7.4	2.4	100						
IICk1	9.7	6.9	0.06	0.2	35.0	2.3	100						
IICk2	10.5	-	-	-	-	-	-						

Site:	M77-12
Land System:	Mildred 2
Location:	NW 10-93-6-4
Classification:	Eluviated Dystric Brunisol
Landform:	
Genetic Material:	Glaciofluvial, sandy, overlying morainal
Surface Expression:	Hummocky; gentle slopes
Site Features:	Crest position; well drained; high perviousness; slightly stony.
Vegetation:	Jackpine/aspen-blueberry/lichen (2c)

Profile Description:

LFH - 6 to 0 cm; slightly to moderately decomposed needles, leaves and lichens; few, very fine and fine, horizontal roots; clear, wavy boundary.

Ae1 - 0 to 5 cm; gray (10YR 6/1 d; 10YR 3/2 m); loamy sand; moderate, medium platy; very friable; few, very fine to coarse, oblique roots; 10 to 20% coarse fragments; gradual, wavy boundary.

Ae2 - 5 to 16 cm; light gray (10YR 6/1 d; 10YR 5/2 m); loamy sand; moderate, medium platy; very friable; few, very fine to coarse, oblique roots; 10 to 20% coarse fragments; clear, wavy, boundary.

Bm - 16 to 36 cm; light yellowish brown (10YR 6/4 d; 10YR 4/4 m); fine sandy loam; moderate, fine and medium subangular blocky; friable; very few, very fine to coarse, oblique roots; 10 to 20% coarse fragments; gradual, smooth boundary.

BC - 36 to 68 cm; pale brown (10YR 6/3 d; 10YR 4/3 m); fine sandy loam; massive; friable; very few, very fine to medium, oblique roots; 10 to 20% coarse fragments; gradual, smooth boundary.

C - 68 to 93 cm; brown (10YR 5/3 d; 10YR 3/3 m); fine sandy loam; massive; friable; very few roots; 10 to 20% coarse fragments.

Table 16. Analysis: Site M77-12.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	3.4	3.8	40.47	1.00	40
Ae1	72	tr	5	24	31	12	28	-	-	3.5	4.0	0.52	0.02	26
Ae2	78	tr	4	21	38	15	22	-	-	3.8	4.3	0.12	0.01	12
Bm	57	1	4	13	26	14	34	9	5	4.3	5.1	0.33	0.01	33
BC	62	1	7	20	25	9	27	11	6	4.6	5.0	-	-	-
C	58	1	5	19	24	9	26	16	8	5.6	5.7	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-						
Ae1	-	1.8	0.01	0.06	0.5	0.05	34						
Ae2	-	0.8	0.0	0.06	0.2	0.0	33						
Bm	-	4.0	0.02	0.1	1.1	0.2	36						
BC	-	4.2	0.01	0.1	2.5	0.8	81						
C	-	6.0	0.05	0.2	5.1	1.7	100						

Site:	M77-13
Land System:	Kinosis 1
Location:	SE 9-94-6-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Morainal, coarse loamy
Surface Expression:	Hummocky, moderate slopes
Site Features:	Upper slope position; northeast aspect; well drained; medium perviousness; moderately stony
Vegetation:	Jackpine-blueberry/lichen (2c)

Profile Description:

LFH - 6 to 0 cm; slightly to moderately decomposed needles, leaves and lichens; plentiful, very fine and fine, horizontal roots; clear, wavy boundary.

Ae - 0 to 10 cm; light gray (10YR 7/1 d; 10YR 4/2 m); fine sandy loam; weak, medium platy; very friable; few, very fine and fine, oblique roots; 10 to 20% coarse fragments; clear, wavy boundary.

Bt1 - 10 to 25 cm; light yellowish brown (10YR 6/4 d; 10YR 4/4 m); fine sandy loam; weak, fine subangular blocky; friable; very few, very fine and fine, oblique roots; 10 to 20% coarse fragments; clear, wavy boundary.

Bt2 - 25 to 53 cm; pale brown (10YR 6/3 d; 10YR 4/4 m); loam; weak, fine, subangular blocky; friable; very few, very fine and fine, oblique roots; 10 to 20% coarse fragments; gradual, smooth boundary.

BC1 - 53 to 90 cm; brown (10YR 5.5/3 d; 10YR 4/3 m); fine sandy loam; massive; friable; very few, very fine to coarse, oblique and vertical roots; 10 to 20% coarse fragments; diffuse, smooth boundary.

BC2 - 90 to 120 cm; brown (10YR 5/3.5 d; 10YR 3/3 m); fine sandy loam; massive; friable; very few roots; 10 to 10% coarse fragments; numerous, small sand lenses throughout matrix.

Table 17. Analysis: Site M77-13.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	3.5	4.0	37.77	1.09	35
Ae	52	tr	6	18	20	8	46	2	1	3.7	4.4	0.58	0.02	29
Bt1	51	1	7	15	19	9	35	14	3	4.3	5.1	0.68	0.02	34
Bt2	52	1	5	16	21	9	28	20	6	4.4	5.0	0.31	0.01	31
BC1	63	1	5	20	26	11	23	14	4	4.5	5.0	-	-	-
BC2	58	1	4	17	26	10	25	17	5	5.1	5.4	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-	<0.2	40	-	-	-	-
Ae	-	2.7	0.01	0.05	0.4	0.03	18	<0.2	40	-	-	-	-
Bt1	-	6.0	0.03	0.07	1.3	0.3	28	<0.2	40	-	-	-	-
Bt2	-	7.0	0.03	0.1	2.5	1.0	52	<0.2	40	-	-	-	-
BC1	-	6.2	0.03	0.1	3.7	1.5	86	<0.2	40	-	-	-	-
BC2	-	5.5	0.04	0.1	4.7	1.6	100	<0.2	40	-	-	-	-

Site:	M77-14
Land System:	Kinosis 1
Location:	SW 25-95-6-4
Classification:	Eluviated Dystric Brunisol
Landform:	
Genetic Material:	Morainal, coarse loamy
Surface Expression:	Hummocky, gentle slopes
Site Features:	Lower slope position; south aspect; imperfectly drained; medium perviousness; moderately stony
Vegetation:	Jackpine-lichen/blueberry (2c)

Profile Description:

LFH - 7 to 0 cm; slightly to moderately decomposed needles, leaves and lichens; plentiful, very fine to medium, horizontal roots; clear, wavy boundary.

Ae - 0 to 8 cm; light brownish gray (10YR 6/2 d; 10YR 4/2 m); silt loam; moderate, medium platy; very friable; few, very fine to medium, oblique roots; 10 to 20% coarse fragments; clear, irregular boundary tonguing into Bm.

AB - 8 to 20 cm; light yellowish brown (10YR 6.5/4 d; 10YR 4/4 m); fine sandy loam; weak, medium subangular blocky to weak, medium platy; friable; very few, very fine to medium, oblique roots; 10 to 20% coarse fragments; diffuse, smooth boundary.

Bm - 20 to 54 cm; light yellowish brown (10YR 6.5/d; 10YR 4/4 m); fine sandy loam; weak, medium subangular blocky; friable; few, fine to medium, oblique roots; 10 to 20% coarse fragments; gradual, smooth boundary.

BC - 54 5o 100 cm; pale brown (10YR 6/3 d; 10YR 4/3 m); fine sandy loam; very weak, medium subangular blocky; very few roots; 10 to 20% coarse fragments.

Table 18. Analysis: Site M77-14.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	3.2	3.7	47.28	1.40	34
Aegj	27	1	2	6	8	10	64	9	-	3.6	4.2	1.72	0.08	22
AB	68	tr	5	24	26	13	23	9	2	4.3	5.1	0.24	0.01	24
Bm	73	tr	5	24	28	16	17	10	-	4.4	5.2	0.13	0.01	13
BC	54	tr	5	17	22	9	27	19	5	4.6	4.9	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-						
Aegj	-	4.3	0.02	0.1	0.6	0.1	19						
AB	-	3.8	0.3	0.06	0.4	0.3	28						
Bm	-	2.5	0.05	0.04	0.4	0.3	32						
BC	-	6.7	0.04	0.1	2.8	2.2	77						

Site:	M77-15
Land System:	Kinosis 1
Location:	SW 10-95-8-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Mixed glaciolacustrine[a]; fine loamy
Surface Expression:	Level
Site Features:	Moderately well drained; medium perviousness; slightly stony.
Vegetation:	White spruce/aspen-rose/sarsaparilla-club moss/feathermoss (2aC)

Profile Description:

LFH - 8 to 0 cm; spongy matt mainly of moss composition, with some needles and leaves; permeated with fungal hyphae; abundant, fine to medium, horizontal roots; abrupt, wavy boundary.

Ae1 - 0 to 7 cm; light gray (10YR 6/2 d; 10YR 4/2 m); silt loam; strong, medium platy; very friable; few very fine and fine and very few, medium and coarse, oblique roots; less than 5% coarse fragments; gradual, wavy boundary.

Ae2 - 7 to 12 cm; light gray (10YR 6/2 d; 10YR 4.5/3 m) silt loam; moderate, medium platy; friable; few, fine to medium, oblique roots; less than 5% coarse fragments; gradual, wavy boundary.

AB - 12 to 17 cm; light gray (10YR 6/2 d; 10YR 4/3 m); clay loam; moderate, coarse platy to moderate, fine subangular blocky; friable; very few, very fine and fine, oblique roots; less than 5% coarse fragments; gradual, wavy boundary.

Bt1 - 17 to 59 cm; pale brown (10YR 6/3 d; 10YR 4/3 m); clay; strong, coarse subangular blocky; firm; very few, very fine, vertical roots; less than 2% coarse fragments; gradual, smooth boundary.

[a] McPherson and Kathol 1977

Bt2 - 59 to 63 cm; brown (10YR 5.5/3 d; 10YR 3/5/3 m); clay loam; moderate, medium subangular blocky; firm; very few roots; less than 2% coarse fragments; gradual, smooth boundary.

C - 63 to 73 cm; brown (10YR 5/3 d; 10YR 3.5/3 m); clay loam; massive; firm; very few roots; less than 5% coarse fragments; diffuse, smooth boundary.

Ck1 - 73 to 85 cm; brown (10YR 5/3 d; 10YR 3/3 m); loam; massive; firm; very few roots; less than 5% coarse fragments; diffuse, smooth boundary.

Ck2 - 85 to 105 cm; brown (10YR 5/3 d; 10YR 4/3 m); loam; massive; firm; very few roots; less than 5% coarse fragments; diffuse, smooth boundary.

Ck3 - 105 to 120 cm; brown (10YR 5.5/3 d; 10YR 3/3 m); loam; massive; firm; very few roots; less than 5% coarse fragments.

Table 19. Analysis: Site M77-15.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-F	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ae1	25	tr	2	5	7	10	65	10	-	4.4	5.1	0.45	0.03	15
Ae2	24	tr	1	5	8	9	56	20	-	4.4	5.0	0.31	0.02	16
AB	21	tr	1	4	7	8	43	36	11	4.5	4.7	-	-	-
Bt1	17	tr	1	4	7	4	29	54	23	4.5	4.7	-	-	-
Bt2	28	tr	2	9	12	4	42	30	11	4.7	4.9	-	-	-
C	35	tr	3	11	15	5	34	31	17	5.1	5.4	-	-	-
Ck1	43	tr	3	13	19	7	27	20	8	6.6	7.0	-	-	-
Ck2	42	1	4	13	18	6	35	23	7	7.3	7.5	-	-	-
Ck3	45	tr	4	14	20	7	36	19	7	7.6	7.8	-	-	-

Horizon	$CaCO_3$ eq. (%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-F	-	-	-	-	-	-	-	-	-	-	-	-	-
Ae1	-	4.1	0.02	0.1	1.4	0.6	52	<0.2	40	-	-	-	-
Ae2	-	4.2	0.3	0.08	1.5	0.8	64	<0.2	40	-	-	-	-
AB	-	10.9	1.0	0.4	4.2	3.3	82	<0.2	40	-	-	-	-
Bt1	-	18.8	0.3	0.5	7.4	6.4	78	<0.2	44	-	-	-	-
Bt2	-	16.7	0.2	0.4	7.9	6.4	89	<0.2	46	-	-	-	-
C	-	14.3	0.3	0.3	7.6	5.6	97	<0.2	40	0.6	0.01	1.0	0.6
Ck1	2.2	11.1	0.3	0.2	7.6	5.0	100	0.3	40	0.6	0.01	2.1	1.2
Ck2	-	-	-	-	-	-	-	0.4	50	1.2	0.02	2.0	1.0
Ck3	-	-	-	-	-	-	-	0.4	50	2.5	0.03	1.8	0.9

Site:	M77-16
Land System:	Ruth 1
Location:	NW 12-94-11-4
Classification:	Eluviated Dystric Brunisol
Landform:	
Genetic Material:	Weathered tar sand rock
Surface Expression:	Undulating; gentle slopes
Site Features:	Upper slope position; north aspect; drainage rapid in solum, but impeded by tar sands; high perviousness in solum; non stony
Vegetation:	White spruce/aspen-blueberry/bunch-berry-feathermoss/club moss (2aC)

Profile Description:

LFH - 7 to 0 cm; spongy, slightly to moderately decomposed matt of moss origin, permeated with fungal hyphae; clear, wavy boundary.

Ae - 0 to 16 cm; gray (10YR 6/1 d; 10YR 3/2 m); fine sand; single grain; loose; clear, wavy boundary.

Bm - 16 to 43 cm; very dark grayish brown (10YR 3/2 d; 10YR 2/1 m); fine sand; single grain; very friable; diffuse, smooth boundary.

C - 43+ cm; very dark grayish brown (10YR 3/2 d; 10YR 2/1 m); fine sand; semi-consolidated.

Table 20. Analysis: Site M77-16.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	4.0	4.4	25.83	0.81	32
Ae	89	tr	tr	tr	54	34	8	3	-	3.7	4.3	1.24	0.03	41
Bm	87	9	tr	1	59	26	9	4	-	3.8	4.3	6.58	0.06	110
C	90	0	tr	tr	55	33	6	4	-	4.1	4.8	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-						
Ae	-	2.5	0.02	0.06	0.5	0.2	31						
Bm	-	2.0	0.0	0.02	0.2	0.1	16						
C	-	2.0	0.05	0.02	0.2	0.2	24						

Site:	M77-17
Land System:	Dover 1
Location:	NE 11-87-10-4
Classification:	Solonetzic Gray Luvisol
Landform:	
Genetic Material:	Glaciolacustrine, clayey; overlying morainal
Surface Expression:	Undulating veneer; very gentle slopes
Site Features:	Mid slope position; north aspect; moderately well drained; low perviousness; non stony; water table at 1.5 m.
Vegetation:	White spruce/aspen-buffalo-berry/ twinflower-feathermoss/club moss (2aC)

Profile Description:

LFH - 9 to 0 cm; slightly to moderately decomposed, spongy matt mainly of moss origin; permeated with fungal hyphae; clear, wavy boundary.

Ahe - 0 to 7 cm; grayish brown (10YR 5/2 d; 10YR 3/2 m); silty clay loam; moderate, medium platy; friable; clear, wavy boundary.

Ae - 7 to 11 cm; pale brown (10YR 6/3 d; 10YR 4/3 m); silty clay loam; moderate, coarse platy; friable; gradual, smooth boundary.

AB - 11 to 27 cm; pale brown (10YR 6/3 d; 10YR 4/3 m); heavy clay; strong, medium subangular blocky; firm; diffuse, smooth boundary.

Bt - 27 to 60 cm; brown (10YR 5.5/3 d; 10YR 3/3 m); heavy clay; strong, medium subangular blocky; firm; diffuse, smooth boundary.

BC - 60 to 85 cm; brown (10YR 5/3 d; 10YR 3/3 m); clay loam; moderate, fine subangular blocky; firm; clear, wavy boundary.

IICk - 85 to 150 cm; pale brown (10YR 6/3 d; 10YR 3.5/3 m); loam; massive; firm.

Table 21. Analysis: Site M77-17.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	4.2	4.4	34.32	1.23	28
Ahe	11	tr	1	3	4	3	59	30	7	4.8	5.3	3.09	0.18	17
Ae	9	tr	1	2	4	2	53	38	11	4.5	5.1	0.67	0.07	10
AB	5	tr	tr	1	2	1	35	60	27	4.3	4.5	0.74	0.06	12
Bt	8	tr	1	2	4	1	31	61	27	4.6	4.9	0.61	0.04	15
BC	26	0	tr	3	16	7	38	36	20	5.7	5.9	-	-	-
IICk	33	tr	tr	2	14	16	21	26	14	7.0	7.0	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-	-	-	-	-	-	-
Ahe	-	18.8	0.2	0.7	7.6	4.1	67	<0.2	77	-	-	-	-
Ae	-	14.9	0.2	0.4	5.2	4.2	67	<0.2	58	-	-	-	-
AB	-	26.4	1.1	0.5	8.4	8.2	71	<0.2	70				
Bt	-	25.5	0.9	0.6	10.0	10.1	85	<0.2	78	-	-	-	-
BC	-	16.1	0.4	0.3	8.2	7.7	100	<0.2	60	-	-	-	-
IICk	-	9.9	1.1	0.2	6.9	5.5	100	0.4	60	2.35	0.02	1.64	1.00

Site:	M77-18
Land System:	Horse River 1
Location:	NW 8-90-12-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Morainal; fine loamy
Surface Expression:	Undulating; very gentle slopes
Site Features:	Upper slope position; southwest aspect; moderately well drained; medium perviousness; slightly stony
Vegetation:	Aspen/white spruce-alder-feather-moss (2aA)

Profile Description:

LFH - 5 to 0 cm; slightly to moderately decomposed leaves and mosses; abundant, fungal hyphae; abundant very fine to medium and few, coarse, horizontal roots; clear, wavy boundary.

Ae1 - 0 to 5 cm; pale brown (10YR 6.5/3 d; 10YR 4/3 m); silt loam; weak, medium platy; soft; plentiful, very fine to medium and few, coarse, horizontal roots; less than 5% coarse fragments; clear, wavy boundary.

Ae2 - 5 to 20 cm; light brownish gray (10YR 6.5/2 d; 10YR 4/3 m); silt loam; moderate, medium platy; soft; few, very fine to medium, oblique roots; less than 5% coarse fragments; clear, smooth boundary.

AB - 20 to 28 cm; pale brown (10YR 6/3 d; 10YR 4/4 m); clay loam; strong, medium subangular blocky; firm; few, very fine to medium, oblique roots; 5 to 10% coarse fragments; clear, smooth boundary.

Bt - 28 to 60 cm; brown (10YR 5/3.5 d; 10YR 3/4 m); clay loam; weak, medium prismatic breaking to strong, medium subangular blocky; firm; very few, very fine and fine, vertical roots; 5 to 10% coarse fragments; gradual, smooth boundary.

BC - 60 to 100 cm; brown (10YR 5/3.5 d; 10YR 3/3 m); loam; massive; firm; very few roots; 5 to 10% coarse fragments; gradual, smooth boundary.

Ck - 100+ cm; dark yellowish brown (10YR 4.5/4 d; 10YR 3/3 m); loam; massive; firm; very few roots; 5 to 10% coarse fragments.

Table 22. Analysis: Site M77-18.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	5.5	5.7	44.5	1.78	25
Ae1	22	tr	1	4	7	9	61	17	6	4.7	5.4	0.50	0.03	17
Ae2	18	tr	1	4	6	6	75	7	4	4.4	5.1	0.83	0.04	21
AB	29	tr	2	5	11	11	38	33	16	4.7	5.1	0.59	0.03	20
Bt	31	tr	2	6	11	12	34	35	20	4.6	5.0	0.67	0.03	22
BC	36	tr	2	6	14	13	38	26	16	5.4	6.1	-	-	-
Ck	38	tr	2	6	14	15	36	26	4	6.4	6.6	-	-	-

Horizon	$CaCO_3$ eq. (%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-	-	-	-	-	-	-
Ae1	-	6.6	0.04	0.1	2.5	1.3	60	<0.2	50	-	-	-	-
Ae2	-	5.4	0.02	0.1	1.6	0.8	47	<0.2	50	-	-	-	-
AB	-	13.5	0.7	0.3	6.0	4.1	82	<0.2	50	-	-	-	-
Bt	-	20.9	0.1	0.3	10.1	5.1	75	<0.2	44	-	-	-	-
BC	-	15.6	0.1	0.3	9.8	4.9	97	<0.2	45	-	-	-	-
Ck	1.2	14.4	0.1	0.2	11.9	5.3	100	0.4	44	0.78	0.04	3.11	1.66

Site:	M77-19
Location:	Namur 1
Location:	NE 13-99-11-4
Classification:	Gleyed Regosol
Landform:	
Genetic Material:	Fluvial; clayey
Surface Expression:	Level
Site Features:	Imperfectly drained; medium perviousness; non stony.
Vegetation:	Aspen/white spruce-willow-horsetail (1a)

Profile Description:

LFH - 6 to 0 cm; slightly to moderately well decomposed leaves.

Cgj1 - 0 to 18 cm; dark grayish brown (10YR 4/2.5 d; 10YR 3/2 m); heavy clay; moderate, fine subangular blocky; firm; diffuse, smooth boundary.

Cgj2 - 18 to 38 cm; dark grayish brown (10YR 4.5/2 d; 10YR 2/2 m); heavy clay; moderate, fine subangular blocky; firm; diffuse, smooth boundary.

Cgj3 - 38 to 65 cm; brown (10YR 5/3 d; 10YR 3/2 m); heavy clay; moderate, fine subangular blocky; firm; diffuse, smooth boundary.

Cgj4 - 65 to 92 cm; silty clay; moderate, fine subangular blocky; firm.

Table 23. Analysis: Site M77-19.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	5.7	6.0	38.31	2.03	19
Cgj1	3	-	-	-	-	-	29	68	30	4.6	4.9	2.39	0.21	11
Cgj2	2	-	-	-	-	-	38	60	26	4.9	5.2	1.80	0.17	11
Cgj3	1	-	-	-	-	-	27	72	25	4.7	5.0	1.79	0.17	11
Cgj4	1	-	-	-	-	-	40	59	28	4.7	4.9	1.83	0.20	9

Horizon	$CaCO_3$ eq. (%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-	-	-	-	-	-	-
Cgj1	-	31.5	0.1	1.2	14.5	7.7	76	<0.2	80	0.4	0.3	1.2	0.6
Cgj2	-	26.8	0.1	1.1	14.1	7.4	85	0.3	70	0.5	0.3	1.6	0.8
Cgj3	-	26.8	0.1	1.1	13.7	7.2	84	0.3	72	0.5	0.3	1.7	0.8
Cgj4	-	32.7	0.2	1.2	15.8	8.4	78	0.4	68	0.6	0.3	1.8	0.9

Site:	M77-20
Land System:	Buckton 1
Location:	SE 13-100-12-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Colluviated ground moraine; fine loamy
Surface Expression:	Inclined and hummocky; moderate slopes
Site Features:	Mid slope position; southeast aspect; well drained; medium perviousness; moderately stony.
Vegetation:	Aspen/balsam fir-rose-grasses (2aA)

Profile Description:

LFH - 5 to 0 cm; slightly to moderately decomposed leaves; clear, wavy boundary.

Ae - 0 to 15 cm; pale brown (10YR 6/3 d; 10YR 3/3 m) silt loam; strong, medium platy; friable; 10 to 20% coarse fragments; clear, wavy boundary.

Bt - 15 to 63 cm; brown (10YR 5/3 d; 10YR 4/3.5 m); clay loam; moderate, medium subangular blocky; friable; 10 to 20% coarse fragments; gradual, smooth boundary.

BC - 63 to 75 cm; yellowish brown (10YR 5/4 d; 10YR 3.5/4 m); clay; moderate, medium granular to massive; friable; abundant shale particles; less than 10% coarse fragments; diffuse, smooth boundary.

C - 75+ cm; brown (10YR 5/3 d; 10YR 3/3 m); clay loam; massive; friable; 10 to 20% coarse fragments.

Table 24. Analysis: Site M77-20.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-H	-	-	-	-	-	-	-	-	-	4.0	5.5	39.57	1.87	21
Ae	37	tr	2	10	16	9	50	13	3	4.5	5.1	0.83	0.07	12
Bt	29	tr	2	11	13	3	33	38	19	4.0	4.7	0.73	0.06	12
BC	13	tr	1	2	8	2	32	55	24	3.9	4.2	-	-	-
C	41	1	4	17	15	4	24	35	13	3.9	4.2	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-H	-	-	-	-	-	-	-						
Ae	-	8.4	0.1	0.3	3.5	1.8	68						
Bt	-	22.6	0.1	0.5	5.1	4.2	44						
BC	-	32.2	0.4	1.0	7.3	6.7	48						
C	-	18.3	0.4	0.6	4.6	4.2	54						

Site:	M77-23
Land System:	Firebag 2
Location:	NW 12-97-7-4
Classification:	Eluviated Eutric Brunisol
Landform:	
Genetic Material:	Glaciofluvial (kame moraine); coarse loamy
Surface Expression:	Hummocky, kettled and gullied; gentle to strong slopes
Site Features:	Mid position of gentle slope; west aspect; well drained; high perviousness; exceedingly stony.
Vegetation:	Aspen/jackpine-alder (2aA)

Profile Description:

LFH - 7 to 0 cm; slightly to moderately well decomposed leaves; abundant, very fine to medium, very few coarse, horizontal roots; clear, wavy boundary.

Ae - 0 to 11 cm; light brownish gray (10YR 6/2 d; 10YR 4/2 m); coarse sand; single grain; loose; plentiful very fine and fine, few medium and coarse, horizontal roots; about 50% coarse fragments; gradual, wavy boundary.

Bm - 11 to 20 cm; light yellowish brown (10YR 6/4 d; 10YR 4/4 m); coarse sand; single grain; very friable; plentiful very fine to medium, oblique and vertical roots; about 50% coarse fragments; smooth boundary.

Btj - 20 to 33 cm; yellowish brown (10YR 5/4 d; 10YR 3/4 m); coarse sandy loam; single grain; very friable; few, very fine and fine, vertical roots; about 50% coarse fragments; gradual, smooth boundary.

BC - 33+ cm; light gray (10YR 6/2 d; 10YR 4/3 m); sandy loam; single grain to massive; hard; very few, very fine and fine, vertical roots; about 50% coarse fragments.

Table 25. Analysis: Site M77-23.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	5.8	6.3	38.07	2.04	19
Ae	88	2	41	33	9	3	12	-	-	4.5	5.3	0.32	0.02	16
Bm	90	2	39	35	11	3	8	2	-	4.7	5.7	0.02	0.01	2
Btj	80	3	28	29	16	4	8	12	3	5.8	6.2	0.72	0.05	14
BC	55	1	6	18	23	7	30	15	2	5.3	6.0	-	-	-

Horizon	$CaCO_3$ eq. (%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-	-						
Ae	-	1.4	0.3	0.03	0.8	0.3	100						
Bm	-	1.1	0.0	0.02	0.8	0.4	100						
Btj	-	6.4	0.05	0.06	4.2	1.9	97						
BC	-	3.6	0.01	0.05	2.0	1.1	88						

Site:	M77-24
Land System:	Firebag 1
Location:	SE 10-98-4-4
Classification:	Eluviated Dystric Brunisol
Landform:	
Genetic Material:	Glaciofluvial; sandy
Surface Expression:	Hummocky; gentle to moderate slopes
Site Features:	Mid position of gentle slope; northeast aspect; rapidly drained; high perviousness; very stony
Vegetation:	Jackpine-lichen (2c)

Profile Description:

LFH - 1 to 0 cm; slightly to moderately well decomposed needles and lichens; few, fine to medium, horizontal roots; clear, smooth boundary.

Ae - 0 to 12 cm; light gray (10YR 7/1.5 d; 10YR 5/2 m); sand; single grain; loose; few, fine to coarse, horizontal roots; 20 to 30% coarse fragments; clear, irregular boundary - tonguing to about 50 cm in places.

Bfj - 12 to 28 cm; light yellowish brown (10YR 6/5 d; 10YR 4/5 m; 7.5YR 5/6 m in field); sand; single grain; loose; very few, fine and medium, oblique roots; 20 to 30% coarse fragments; gradual, smooth boundary.

Bm - 28 to 68 cm; brownish yellow (10YR 6/6 d; 10YR 4/6 m); sand; single grain; loose; very few, fine and medium, oblique roots; 20 to 30% coarse fragments; diffuse, smooth boundary.

C - 68 to 115 cm; very pale brown (10YR 6/3 d; 10YR 5/4 m); sand; single grain; loose; very few roots; 20 to 30% coarse fragments.

Table 26. Analysis: Site M77-24.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	3.9	4.5	7.48	0.20	37
Ae	92	1	12	48	29	2	7	1	-	4.3	5.3	0.19	0.01	19
Bfj	94	tr	10	50	33	1	3	3	-	4.9	5.7	0.10	0.01	10
Bm	96	tr	10	51	34	1	-	4	-	4.7	5.9	0.06	0.00	-
C	96	tr	5	41	46	3	-	4	-	4.8	5.9	-	-	-

Horizon	$CaCO_3$ eq. (%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-	-						
Ae	-	0.7	0.04	0.01	0.4	0.1	79						
Bfj	-	1.1	0.02	0.03	0.2	0.1	32						
Bm	-	0.8	0.0	0.03	0.4	0.2	79						
C	-	0.4	0.0	0.01	0.2	0.05	65						

Site:	M77-25
Land System:	Kinosis 1
Location:	SE 30-98-5-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Morainal; coarse loamy
Surface Expression:	Undulating; gentle slopes
Site Features:	Upper slope position; northeast aspect; well drained; medium perviousness; moderately stony.
Vegetation:	Jackpine/aspen-alder/blueberry/ cowberry-lichen (2c)

Profile Description:

LFH - 8 to 0 cm; slightly to moderately well decomposed leaves and needles; plentiful, very fine to medium and very few, coarse, horizontal roots; clear, smooth boundary

Ae1 - 0 to 18 cm; light gray (10YR 6/2 d; 10YR 5/2 m); loamy sand; weak, medium platy; very friable; few, very fine to medium and very few, coarse, horizontal roots; 20 to 30% coarse fragments; diffuse, smooth boundary.

Ae2 - 18 to 26 cm; light gray (10YR 7/2 d; 10YR 5/3 m); fine sandy loam; weak, medium platy; very friable; few, very fine and fine, and very few medium and coarse, oblique roots; 20 to 30% coarse fragments; clear, smooth boundary.

Bt - 26 to 60 cm; pale brown (10YR 6/3 d; 10YR 4/4 m); loam; moderate, medium subangular blocky; firm; very few, very fine to medium roots; 20 to 30% coarse fragments; gradual, smooth boundary.

C - 60+ cm; brown; loam to clay loam; massive; hard; very few roots; 20 to 30% coarse fragments.

Table 27. Analysis: Site M77-25.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	5.1	4.8	48.09	1.3	37
Ae1	71	1	5	21	30	14	27	2	-	4.2	4.8	0.32	0.03	11
Ae2	65	1	6	20	25	13	31	4	-	4.3	4.9	0.15	0.01	15
Bt	47	1	7	14	18	7	28	25	11	4.6	4.9	0.56	0.02	28
C	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-	-						
Ae1	-	1.0	0.01	0.01	0.6	0.2	82						
Ae2	-	1.0	0.01	0.02	0.5	0.2	73						
Bt	-	9.6	0.03	0.1	5.3	2.6	84						
C	-	-	-	-	-	-	-						

Site:	M77-26
Land System:	MIL1-HRT1
Location:	NE 12-100-8-4
Classification:	Eluviated Eutric Brunisol
Landform:	
Genetic Material:	Glaciofluvial; sandy
Surface Expression:	Undulating; very gentle slopes
Site Features:	Lower slope position; south aspect; rapidly drained; high perviousness; non stony
Vegetation:	Jackpine-bearberry-lichen (2c)

Profile Description:

LFH - 1 to 0 cm; slightly to moderately decomposed needles and lichens; gradual, smooth boundary.

Ahe - 0 to 5 cm; dark brown (10YR 4/3 d; 10YR 3/2.5 m); sand; single grain; loose; few, very fine and fine, vertical roots; gradual, smooth boundary.

Bm1 - 5 to 25 cm; light yellowish brown (10YR 6/5 d; 10YR 4/6 m); sand; single grain; loose; few, very fine and fine, vertical roots; less than 5% coarse fragments; diffuse, smooth boundary.

Bm2 - 25 to 55 cm; brownish yellow (10YR 6/6 d; 10YR 4/6 m); sand; single grain; loose; very few, very fine and fine, vertical roots; less than 5% coarse fragments; gradual, smooth boundary.

C1 - 55 to 90 cm; yellowish brown (10YR 5.5/4 d; 10YR 3.5/4 m); fine sand; single grain; loose; very few roots; less than 5% coarse fragments; diffuse, smooth boundary.

C2 - 90 to 120 cm; brown; (10YR 5/3 d; 10YR 3/2 m); fine sand; single grain; loose; very few roots; less than 5% coarse fragments.

Table 28. Analysis: Site M77-26.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	4.4	4.9	3.01	0.11	27
Ahe	92	tr	7	34	45	5	6	2	1	5.2	6.2	0.36	0.02	18
Bm1	88	tr	7	31	43	6	10	2	1	5.1	6.2	0.12	0.01	12
Bm2	95	1	13	36	39	6	2	3	2	5.0	6.2	0.17	0.00	-
C1	95	tr	2	26	62	5	3	2	1	5.2	6.3	-	-	1
C2	95	tr	tr	6	80	8	3	2	1	5.1	6.2	-	-	-

Horizon	$CaCO_3$ eq. (%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-	-						
Ahe	-	1.6	0.0	0.04	0.9	0.2	71						
Bm1	-	1.0	0.01	0.04	0.5	0.1	65						
Bm2	-	0.7	0.0	0.05	0.5	0.2	100						
C1	-	-	-	-	-	-	-						
C2	-	-	-	-	-	-	-						

Site:	M77-27
Land System:	Firebag 1
Location:	SW 11-97-10-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Glaciofluvial (kame moraine); fine loamy
Surface Expression:	Undulating; very gentle slopes
Site Features:	Mid slope position; west aspect; moderately well drained; medium perviousness; moderately stony
Vegetation:	Aspen (2aA)

Profile Description:

LFH - 10 to 0 cm; slightly to moderately decomposed leaves; permeated with fungal hyphae; plentiful, very fine to coarse, horizontal roots; clear, wavy boundary.

Ae1 - 0 to 10 cm; light brownish gray (10YR 6/2 d; 10YR 4/2 m); fine sandy loam; weak, medium platy; loose; few, very fine to coarse, oblique roots; 10 to 15% coarse fragments; gradual smooth boundary.

Ae2 - 10 to 21 cm; pale brown (10YR 6/3 d; 10YR 4/3 m); fine sandy loam; weak, medium platy; very friable; few, very fine to coarse, oblique roots; 10 to 15% coarse fragments; smooth, wavy boundary.

Bt - 21 to 65 cm; pale brown (10YR 6/3 d; 10YR 4/3 m); clay loam; strong, medium subangular blocky; very firm; very few, very fine to coarse, oblique roots; 10 to 15% coarse fragments; gradual, smooth boundary.

BC - 65 to 85 cm; brown (10YR 5/3 d; 10YR 3.5/3 m); clay loam; massive; firm; very few roots; 10 to 15% coarse fragments; gradual, smooth boundary.

Ck - 85 to 110 cm; brown (10YR 5/3 d; 10 YR 3.5/3 m); clay loam; massive; firm; very few roots; 10 to 15% coarse fragments.

Table 29. Analysis: Site M77-27.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	6.0	6.3	47.34	1.80	26
Ae1	67	tr	tr	5	32	29	30	3	1	5.7	6.5	0.40	0.03	13
Ae2	73	0	1	5	33	34	23	4	2	5.6	6.6	0.23	0.02	12
Bt	35	tr	1	3	11	20	32	33	13	5.2	6.5	0.53	0.03	18
BC	35	tr	1	4	12	18	34	31	17	6.2	6.6	-	-	-
Ck	36	tr	1	4	13	17	35	29	14	6.9	7.6	-	-	-

Horizon	$CaCO_3$ eq. (%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-	-						
Ae1	-	2.5	0.0	0.1	2.3	0.4	100						
Ae2	-	2.3	0.01	0.2	2.0	0.4	100						
Bt	-	10.0	0.02	0.3	8.0	2.2	100						
BC	-	11.7	0.1	0.3	7.6	2.8	100						
Ck	2.8	-	-	-	-	-	-						

Site:	M77-28
Land System:	Firebag 1
Location:	NE 31-96-9-4
Classification:	Eluviated Dystric Brunisol
Landform:	
Genetic Material:	Glaciofluvial (kame moraine); sandy
Surface Expression:	Rolling; moderate slopes
Site Features:	Lower slope position; north aspect; rapidly drained; high perviousness; non stony
Vegetation:	Jackpine-blueberry/bearberry-lichen (2c)

Profile Description:

LFH - 2 to 0 cm; slightly to moderately well decomposed needles and lichens; clear, wavy boundary.

Ahe - 0 to 7 cm; grayish brown (10YR 5/2.5 d; 10YR 3/2 m); sand; single grain; loose; plentiful, very fine to medium and very few, coarse, horizontal roots; clear, wavy boundary.

Ae - 7 to 16 cm; light yellowish brown (10YR 6/4 d; 10YR 4/4 m); single grain; loose; few, very fine to medium and very few, coarse, oblique roots; clear, wavy boundary.

Bm - 16 to 37 cm; yellowish brown (10YR 5/5 d; 10YR 4/5 m); sand; single grain; loose; few, very fine and fine, and very few, medium and coarse, vertical roots; diffuse, smooth boundary.

BC - 37 to 55 cm; brown (10YR 4.5/3 d; 10YR 3/3 m); sand; single grain; loose; very few roots; gradual, smooth boundary.

C - 55+ cm; brown (10YR 5/3 d; 10YR 3/3 m); sand; single grain; loose; very few roots.

Table 30. Analysis: Site M77-28.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	4.2	4.5	32.92	0.79	42
Ahe	95	0	4	61	28	2	5	-	-	4.5	5.3	1.07	0.02	54
Ae	94	0	3	57	32	2	6	-	-	4.5	5.2	0.21	0.01	21
Bm	95	tr	3	59	31	2	5	-	-	5.0	5.9	0.14	0.01	14
BC	96	0	2	53	38	3	4	-	-	5.1	6.1	-	-	-
C	97	0	2	58	35	2	3	-	-	4.9	6.1	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-							
Ahe	-	3.2	0.02	0.03	0.4	0.2	20						
Ae	-	1.2	0.02	0.02	0.0	0.05	8						
Bm	-	0.9	0.01	0.02	0.0	0.2	26						
BC	-	0.5	0.1	0.01	0.0	0.0	22						
C	-	0.4	0.02	0.02	0.0	0.05	23						

Site:	M77-29
Land System:	Legend 1-Kenzie 2
Location:	NW 9-100-12-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Morainal; sandy
Surface Expression:	Hummocky; moderate slopes
Site Features:	Upper slope position; northeast aspect; well drained; high perviousness; moderately stony
Vegetation:	Jackpine-bearberry/Labrador tea-lichen (2c)

Profile Description:

LFH - 2 to 0 cm; slightly to moderately well decomposed needles and lichens; clear, wavy boundary.

Ae - 0 to 7 cm; light brownish gray (10YR 6.5/2 d; 10YR 4/2 m); sandy loam; weak, medium platy; friable; plentiful, very fine to medium and few, coarse, horizontal roots; 10 to 20% coarse fragments; clear, wavy boundary.

Bt - 7 to 17 cm; light yellowish brown (10YR 6/5 d; 10YR 4/5 m); fine sandy loam; weak, fine subangular blocky; friable; plentiful, very fine to medium, oblique roots; 10 to 20% coarse fragments; gradual, smooth boundary.

Bm - 17 to 35 cm; light yellowish brown (10YR 6/5 d; 10YR 4/5 m); fine sand; single grain; very friable; plentiful, very fine to medium, oblique roots; 10 to 20% coarse fragments; gradual, smooth boundary.

BC - 35 to 50 cm; light yellowish brown (10YR 6/4 d; 10YR 4/4 m); sand; single grain; very friable; very few, very fine to coarse, vertical roots; 10 to 20% coarse fragments; diffuse, smooth boundary.

C - 50 to 80 cm; dark grayish brown; sand; single grain; loose; very few roots; 10 to 20% coarse fragments.

Table 31. Analysis: Site M77-29.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	3.6	4.0	22.46	0.61	37
Ae	64	1	9	27	20	7	36	-	-	3.7	4.4	0.69	0.03	23
Bt	67	1	3	15	40	8	22	11	3	4.5	5.3	0.67	0.03	22
Bm	92	tr	1	37	52	1	4	4	-	4.7	5.5	0.69	0.00	-
BC	88	tr	11	65	10	1	9	3	-	4.8	5.5	-	-	-
C	91	1	12	40	34	4	8	1	1	5.1	5.7	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-	-						
Ae	-	3.5	0.01	0.07	0.4	0.2	19						
Bt	-	7.4	0.02	0.09	0.7	0.2	14						
Bm	-	1.4	0.01	0.03	0.3	0.2	39						
BC	-	1.3	0.01	0.03	0.3	0.1	34						
C	-	1.5	0.02	0.05	0.9	0.3	85						

Site:	M77-30
Land System:	Legend 1-Kenzie 2
Location:	NW 9-100-12-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Morainal; fine loamy
Surface Expression:	Hummocky, moderate slopes
Site Features:	Upper slope position; southeast aspect; moderately well drained; medium perviousness; moderately stony.
Vegetation:	Jackpine/black spruce-Labrador tea-lichen (2c)

Profile Description:

LFH - 4 to 0 cm; slightly to moderately well decomposed needles and lichens; clear, wavy boundary.

Ae - 0 to 6 cm; light brownish gray (10YR 6/2 d; 10YR 4/2 m); silt loam; weak, medium platy; very friable; less than 10% coarse fragments; clear, wavy boundary.

Bt1 - 6 to 21 cm; light yellowish brown (10YR 6/4 d; 10YR 4/4 m); loam; weak, fine, subangular blocky; soft; less than 10% coarse fragments; gradual, smooth boundary.

Bt2 - 21 to 45 cm; pale brown (10YR 6/3 d; 10YR 4/4 m); loam; moderate, medium subangular blocky; firm; less than 10% coarse fragments; diffuse, smooth boundary.

C - 45 to 65 cm; brown (10YR 5/3.5 d; 10YR 3/3 m); loam; massive; firm; less than 10% coarse fragments.

Table 32. Analysis: Site M77-30.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	4.4	4.6	31.06	1.05	30
Ae	38	1	6	15	11	5	56	6	2	4.2	4.8	1.41	0.06	24
Bt1	41	tr	5	18	14	4	39	20	9	4.6	5.0	0.46	0.04	12
Bt2	48	2	7	16	17	6	20	22	13	6.0	6.5	0.27	0.04	7
C	52	3	8	17	17	7	27	21	13	5.6	5.6	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-	-	-	-	-	-	-	-
Ae	-	7.7	0.09	0.2	2.0	0.5	36	<0.2	51	0.3	0.2	1.1	0.4
Bt1	-	10.4	0.03	0.2	3.7	1.9	56	<0.2	40	0.3	0.07	0.6	0.2
Bt2	-	11.7	0.04	0.3	11.2	3.1	100	0.5	46	0.4	0.1	4.2	1.8
C	0.2	13.3	0.05	0.3	9.8	7.2	100	0.2	40	0.4	0.05	1.4	0.8

Site:	M77-31
Land System:	Surmount 1
Location:	NE 18-85-8-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Morainal; fine loamy
Surface Expression:	Rolling; gentle slopes
Site Features:	Upper slope position; north aspect; moderately well drained; medium perviousness; very stony
Vegetation:	Aspen/white birch-bunchberry-club moss (2aA)

Profile Description:

LFH - 7 to 0 cm; slightly to moderately well decomposed; spongy matt mainly of leaf composition; permeated with fungal hyphae; clear, wavy boundary.

Ae - 0 to 12 cm; light brownish gray (10YR 6.5/2 d; 10YR 5.5/2 m); fine sandy loam; weak, medium platy; very friable; 20 to 30% coarse fragments; clear, wavy boundary.

Bt1 - 12 to 25 cm; yellowish brown (10YR 5/4 d; 10YR 3/4 m); loam; weak, medium, subangular blocky; firm; 10 to 20% coarse fragments; gradual, smooth boundary.

Bt2 - 25 to 38 cm; yellowish brown (10YR 5.5/4 d; 10YR 4/4 m); sandy clay loam; weak, medium subangular blocky; firm; 10 to 20% coarse fragments; diffuse, smooth boundary.

BC - 38 to 67 cm; brown (10YR 5/3 d; 10YR 3/3 m) sandy clay loam; massive; firm; 10 to 20% coarse fragments; diffuse, smooth boundary.

C - 67 to 120 cm; brown (10YR 5/3 d; 10YR 3/3 m); sandy clay loam; massive; firm; 10 to 20% coarse fragments.

Table 33. Analysis: Site M77-31.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	3.6	3.9	22.04	1.10	20
Ae	66	1	7	21	27	10	31	3	-	3.9	4.7	0.43	0.03	14
Bt1	52	tr	4	15	23	10	30	18	10	4.2	4.7	0.86	0.07	12
Bt2	48	1	4	13	20	10	29	23	14	4.3	4.8	0.46	0.04	12
BC	49	1	5	14	20	9	28	23	15	4.3	4.7	-	-	-
Ck	50	1	6	16	19	8	27	23	14	4.7	4.8	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-	-	-	-	-	-	-	-
Ae	-	3.0	0.01	0.06	1.1	0.3	49	<0.2	40	0.3	0.06	1.0	0.4
Bt1	-	11.3	0.09	0.1	2.2	0.7	27	<0.2	42	0.3	0.05	0.8	0.3
Bt2	-	12.7	0.02	0.2	2.7	1.2	32	<0.2	44	0.3	0.06	0.6	0.2
BC	0.1	13.3	0.03	0.2	4.4	2.0	50	<0.2	40	0.2	0.05	0.7	0.2
Ck	0.2	12.7	0.08	0.2	6.3	3.4	79	<0.2	42	0.4	0.05	1.0	0.4

Site:	M77-32
Land System:	Rough Broken
Location:	SW 1-101-12-4
Classification:	-
Landform:	
Genetic Material:	Undifferentiated; clayey
Surface Expression:	Inclined, strong to very strong slopes
Site Features:	Upper and mid slope positions; southwest aspect; rapidly drained; low perviousness; slightly rocky
Vegetation:	None

Profile Description:

C(1) - At 3 to 4 m from top of scarp; gray (10YR 5/1 d; 10YR 3/2 m); clay; very sticky; weakly weathered shale with spherical concretions of stone and boulder size containing gypsum.

C(2) - At 5 m from top of scarp; very dark gray (10YR 3.5/1 d; 10YR 2/1 m); silt; flaky structure; soft; weakly weathered shale.

C(3) - At 10 m from top of scarp; gray (10YR 5/1 d; 10YR 3/1 m); silty clay; very sticky; weakly weathered shale with concretions.

Table 34. Analysis: Site M77-32.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
C(1)	3	-	-	-	-	-	52	45	19	3.2	3.3	2.23	0.15	15
C(2)	11	-	-	-	-	-	81	8	7	7.1	7.3	8.00	0.30	27
C(3)	1	-	-	-	-	-	48	51	15	4.0	4.1	1.87	0.17	11

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
C(1)	-	21.3	1.2	0.5	27.2	3.3	100	3.4	72	2.9	0.6	28.9	22.0
C(2)	-	17.7	10.8	0.8	131.2	14.1	100	-	-	-	-	-	-
C(3)	-	15.7	0.06	0.2	14.2	3.5	100	-	-	-	-	-	-

Site:	M77-38 (Description for one of three sites, M77-38, 39 and 40, sampled near Richardson lookout)
Land System:	Firebag 1
Location:	SE 31-102-6-4
Classification:	Eluviated Eutric Brunisol
Landform:	
Genetic Material:	Glaciofluvial (ice contact); sandy
Surface Expression:	Hummocky; moderate to strong slopes
Site Features:	Upper slope position; northeast aspect; very rapidly drained; high perviousness; slightly stony and rocky
Vegetation:	Aspen/white birch (2aA)

Profile Description:

L-F - 3 to 1 cm; slightly decomposed leaves; permeated with fungal hyphae.

H - 1 to 0 cm; moderately well to well decomposed; abundant, fine and medium, horizontal roots; diffuse, smooth boundary.

Ahe - 0 to 4 cm; very dark grayish brown (10YR 3/2 m); light gray (10YR 7/1 m) patches; sand; single grain; loose; abundant, fine and medium, horizontal roots; gradual, wavy boundary.

Ae - 4 to 12 cm; white (10YR 8/2 d); sand; single grain; loose; abundant, fine and medium, horizontal and oblique roots; less than 10% coarse fragments; gradual, wavy boundary.

Bm - 12 to 27 cm; light brownish yellow (10YR 6/4 m); sand; single grain; loose; plentiful, fine and medium, oblique roots; less than 10% coarse fragments; gradual, wavy boundary.

BC - 27 to 100 cm; yellow (10YR 8/6 m); dark yellowish brown (10YR 4/4) splotches; sand; single grain; loose; few, fine and medium, vertical roots; less than 10% coarse fragments; gradual, wavy boundary.

C - 100+ cm; pink (7.5YR 8/4); sand; single grain; loose; very few roots; less than 10% coarse fragments.

Table 35. Analysis: Site M77-38.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
L-F	-	-	-	-	-	-	-	-	-	-	6.1	40.52	1.20	34
H	-	-	-	-	-	-	-	-	-	-	6.4	14.91	0.66	23
Ahe	85	tr	7	37	29	12	14	1	1	-	6.3	3.29	0.11	30
Ae	79	1	4	24	34	16	21	-	-	-	6.0	0.30	0.012	25
Bm	67	1	4	26	25	11	28	5	4	-	6.0	0.38	0.018	21
BC	96	tr	4	56	32	4	4	-	-	-	6.7	0.06	0.002	30
C	99	0	4	65	29	1	1	-	-	-	6.9	0.03	-	-

Horizon	$CaCO_3$ eq. (%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
L-F								-	-	-	-	-	-
H								-	-	-	-	-	-
Ahe								0.2	18	0.1	0.1	1.5	1.2
Ae								0.2	16	0.2	0.05	1.3	1.6
Bm								-	-	-	-	-	-
BC								-	-	-	-	-	-
C								-	-	-	-	-	-

Site:	M77-39 (Descriptions are given for M77-39 and M77-40, which are two of several sites, M77-33, 34, 35, 39, 40 and 41, sampled at and near the AOSERP Mildred Lake field camp)
Land System:	Ruth 1
Location:	SE 19-94-10-4
Classification:	Eluviated Dystric Brunisol
Landform:	
Genetic Material:	Glaciofluvial; sandy
Surface Expression:	Undulating; gentle slopes
Site Features:	Lower slope position; west aspect; well drained; high perviousness; non stony
Vegetation:	Jackpine-bearberry-lichen (2c)

Profile Description:

LFH - 1 to 0 cm; very dark grayish brown (10YR 3/2 m) slightly decomposed needles and lichens; clear, wavy boundary.

Ahe - 0 to 5 cm; dark brown (10YR 4/3 m); sand; single grain; loose; abundant, very fine to medium, horizontal roots; gradual, smooth boundary.

AB - 5 to 11 cm; dark yellowish brown (10YR 4/4 m); sand; single grain; loose; plentiful, very fine to medium, oblique roots; diffuse, smooth boundary.

Bm - 11 to 56 cm; yellowish brown (10YR 5/6 m); sand; single grain; loose; very few roots; diffuse, smooth boundary.

BC - 56 to 86 cm; brownish yellow (10YR 6/6 m); sand; single grain; loose; no roots; diffuse, smooth boundary.

C - 86+ cm; yellow (10YR 7/6 m); fine sand; single grain; loose; no roots; less than 10% coarse fragments.

Table 36. Analysis: Site M77-39.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	3.9	4.5	42.12	0.83	51
Ahe	96	tr	2	51	41	2	4	-	-	-	5.5	1.08	0.03	36
AB	94	tr	2	45	44	3	6	-	-	-	5.8	0.55	0.015	37
Bm	91	tr	1	45	42	3	8	1	-	-	5.8	0.03	0.003	10
BC	92	1	1	44	44	2	8	-	-	-	5.8	0.04	0.004	10
C	97	tr	1	28	66	2	3	-	-	-	6.0	0.04	0.003	13

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-	-	-	-	-	-	-	-
Ahe	-	3.5	0.01	0.05	1.1	0.2	39	0.1	28	0.3	0.1	0.6	0.4
AB	-	2.4	0.01	0.05	1.2	0.2	61	0.1	31	0.2	0.2	0.6	0.3
Bm	-	1.3	0.04	0.03	0.5	0.2	59	<0.1	20	0.3	0.2	0.1	0.08
BC	-	1.0	0.01	0.02	0.3	0.1	43	<0.1	22	0.5	0.2	0.2	0.2
C	-	0.7	0.01	0.02	0.5	0.1	90	-	-	-	-	-	-

Site:	M77-40
Land System:	Ruth 2
Location:	SE 19-94-10-4
Classification:	Eluviated Dystric Brunisol
Landform:	
Genetic Material:	Glaciofluvial; sandy
Surface Expression:	Undulating; very gentle slopes
Site Features:	Mid slope position; northeast aspect; well drained; high perviousness; non stony.
Vegetation:	Aspen/birch/jackpine-blueberry (2aA-2c)

Profile Description:

LFH - 9 to 0 cm; very dark grayish brown (10YR 3/2 m); slightly to moderately well decomposed organic matter; abundant, fine to medium, horizontal roots; clear, smooth boundary.

Ahe - 0 to 2 cm; light brownish gray (10YR 6/2 m) mixed with very dark yellowish brown (10YR 3/2 m); fine sand; single grain; loose; abundant, very fine to medium, horizontal roots; clear, wavy boundary.

Ae - 2 to 10 cm; light brownish gray (10YR 6/2 m); fine sand; single grain; loose; abundant, very fine to medium, horizontal roots; clear, smooth boundary.

Bm - 10 to 35 cm; yellowish brown (10YR 5/6 m); fine sand; single grain; few, very fine and fine, oblique roots; diffuse, wavy boundary.

BC - 35 to 57 cm; transitional

C - 57 to 100 cm; grayish brown (2.5Y 5/2); fine sand; single grain; loose; some patches of tar sand.

IIC - 100 to 110 cm; hard; black, tar sand layer.

Table 37. Analysis: Site M77-40.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
LFH	-	-	-	-	-	-	-	-	-	4.5	4.5	24.41	1.02	24
Ahe	92	1	3	15	64	9	7	1	-	-	4.5	3.11	0.136	23
Ae	90	tr	2	14	64	10	10	-	-	-	4.9	0.51	0.023	22
Bm	89	1	3	15	62	8	10	1	-	-	5.7	0.31	0.013	24
BC	92	tr	1	11	68	12	4	4	-	-	5.8	0.32	0.006	53
C	88	0	tr	3	64	21	7	5	-	-	5.3	2.11	0.025	84
IIC	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Horizon	$CaCO_3$ eq. (%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
LFH	-	-	-	-	-	-	-	-	-	-	-	-	-
Ahe	-	11.5	0.02	0.08	4.4	0.6	44	0.3	55	0.3	0.5	3.4	1.9
Ae	-	2.1	0.02	0.03	1.0	0.2	60	0.1	27	0.2	0.1	1.2	0.7
Bm	-	2.0	0.03	0.03	0.8	0.3	58	0.1	24	0.6	0.05	0.8	0.7
BC	-	1.6	0.03	0.03	0.7	0.3	66	0.1	25	0.2	0.08	0.9	0.5
C	-	2.8	0.04	0.04	1.0	0.4	53	0.2	28	1.0	0.1	0.7	0.6
IIC	-	-	-	-	-	-	-	-	-	-	-	-	-

Site:	M77-42
Land System:	Horse River 1
Location:	SE 25-91-10-4
Classification:	Orthic Gray Luvisol
Landform:	
Genetic Material:	Morainal, fine loamy
Surface Expression:	Undulating; very gentle slopes
Site Features:	Mid slope position; east aspect; moderately well drained; medium perviousness; slightly stony
Vegetation:	Aspen-hazelnut (2aA)

Profile Description:

LFH - 5 to 0 cm; very dark brown (10YR 2/2); slightly to moderately well decomposed organic matter; abundant, fine and medium, horizontal roots; abrupt, smooth boundary.

Ae - 0 to 8 cm; light brownish gray (10YR 6/2); fine sandy loam; weak medium platy; friable; abundant, fine and medium, horizontal roots; 10% coarse fragments; abrupt, wavy boundary.

AB - 8 to 20 cm; brown (10YR 5/3); loam; weak, medium subangular blocky; firm; plentiful, fine and medium, oblique roots; 10% coarse fragments; gradual, wavy boundary.

Bt - 20 to 50 cm; dark brown (10YR 4/3); clay loam; moderate, medium subangular blocky; firm; very few, fine and medium, oblique roots; 10% coarse fragments; gradual, wavy boundary.

BC - 50 to 80 cm; dark yellowish brown (10YR 3/4); fine sandy loam; very few roots; 10% coarse fragments; gradual, wavy boundary.

Ck - 80+ cm; dark yellowish brown (10YR 4/4), mixed with gray (10YR 7/2); fine sandy loam; massive; friable; 10 to 20% coarse fragments.

Table 38. Analysis: Site M77-42.

Horizon	Particle Size Distribution (%)									pH $CaCl_2$	pH H_2O	Org.C. %	Total N %	C/N
	Sand	VCS	CS	MS	FS	VFS	Silt	Clay	Fine C					
Ae	57	2	7	16	22	10	39	4	2	-	5.7	0.98	0.036	27
AB	54	1	5	15	24	9	31	15	6	-	5.9	0.41	0.035	12
Bt	47	1	4	13	21	8	28	25	16	-	5.9	0.67	0.020	34
BC	65	1	6	13	30	15	17	18	12	-	6.1	0.40	0.020	20
Ck	56	1	3	14	28	10	25	19	9	0	8.2	-	-	-

Horizon	$CaCO_3$ eq.(%)	TEC me/100g	Exch. Cations me/100 g				Base Sat. %	E.C. mmho/cm	Sat.H_2O %	Cations in saturation extract me/l			
			Na	K	Ca	Mg				Na	K	Ca	Mg
Ae	-	3.9	0.04	0.07	2.7	0.5	85	0.4	21	0.2	0.1	4.3	2.5
AB	-	-	-	-	-	-	-	0.3	21	0.2	0.1	3.7	2.0
Bt	-	12.5	0.04	0.2	8.3	2.7	90	0.3	32	0.2	0.05	2.6	1.9
BC	-	11.8	0.08	0.3	8.3	1.5	86	-	-	-	-	-	-
CK	8.08	6.2	0.06	0.2	27.4	1.3	100	0.6	30	0.5	0.2	5.1	3.7

8.2 Alberta Oil Sands Environmental Research Program Project LS 2.1 - Soils Inventory Legend.

DISTRICT	PHYSIOGRAPHY	SYSTEM	UNIT	SYSTEM COMPONENTS				
				MATERIAL	LANDFORM AND SLOPE CLASS	DOMINANT SOILS	SIGNIFICANT SOILS	MINOR INCLUSIONS
				MIXEDWOOD SUBREGION				
MORAINAL DISTRICTS								
Thickwood Hills Upland	Undulating ground moraine and hummocky moraine with some glaciofluvial inclusions; elevations 450 to 500 m.	Horse River	HRR 1	Medium to moderately fine textured, dark yellowish brown to olive brown calcareous glacial till.	Mu, 3 - 4 Mh, 4 - 5	Orthic Gray Luvisol	Gleyed Gray Luvisol peaty Gleysols	Organics
		Kenzie	KNZ 1	Undecomposed to moderately well decomposed moss peat (Bog).	Bh, Bhp, 1 - 2	Typic Mesisol Fibric Mesisol	Terric Mesisol Typic Fibrisol Mesic Fibrisol Fibric Organic Cryosol	sedge peat peaty Gleysols
			KNZ 2	as above	Bb, Bo, Bs, 2	Terric Mesisol	Typic Mesisol Fibric Mesisol	sedge peat peaty Gleysols
			KNZ 3	as above	Bp, Bhp, 2	Fibric Organic Cryosol	Typic Fibrisol	Fibric Mesisol Terric Mesisol/sedge peat
		Eaglesham Mildred*	EGL 1	Undecomposed to moderately well decomposed sedge peat (Fen).	Nh, Nr, 1	Typic Mesisol	Fibric Mesisol Terric Mesisol	moss peat peaty Gleysols
Muskeg Mountain Upland	Undulating ground moraine with some inclusions of glaciofluvial and ice-contact deposits; elevation 350 to 650 m.	Kinosis	KIN 1	Moderately coarse to medium textured light brown to brown glacial till.	Mu, 3 - 4	Orthic Gray Luvisol	Gleyed Gray Luvisol peaty Gleysols	Organics
		Steepbank Kenzie Eaglesham Mildred Kearl Firebag	STP 1	Moderately coarse to moderately fine textured glacial till and mixed glaciolacustrine materials.	Mu, 2 - 3	peaty Gleysols	Gleyed Gray Luvisol Orthic Gray Luvisol	Organics
Birch Mountain Upland	Undulating to rolling moraine with slumped and colluviated bedrock and glacial materials in highly dissected, steeply sloping areas; elevation 350 to 800 m.	Legend	LGD 1	Medium textured, brown to dark brown glacial till.	Mu, 3 - 4 Mh, 4 - 5	Orthic Gray Luvisol	Gleyed Gray Luvisol peaty Gleysols	Organics
		Buckton Kenzie Eaglesham Firebag	BKN 1	Moderately coarse to moderately fine textured, brown to dark gray, mixed glacial till and bedrock (shale), colluvial deposits.	Ch, Cl, 3 - 6	Orthic Regosol Orthic Gray Luvisol	peaty Gleysols	Organics
Stony Mountain Upland	Hummocky moraine with glaciofluvial (ice-contact) inclusions; elevation 450 to 750 m.	Surmount Kenzie Eaglesham Firebag	SMT	Medium textured, brown to dark brown glacial till; usually thin, overlying shaly basal till.	Mh, 4 - 5	Orthic Gray Luvisol	Gleyed Gray Luvisol peaty Gleysols	Organics

Hangingstone Plain	Undulating ground moraine elevation 450 to 600 m.	Horse River Kenzie Eaglesham Steepbank						
Dunkirk Plain	Undulating ground moraine, low relief area dominated by peatlands; elevation 500 to 600 m.	Kenzie Eaglesham Horse River Bitumount						
GLACIOLACUSTRINE DISTRICTS								
Dover Plain	Level to undulating, thick and thin glaciolacustrine deposits overlying till; some abandoned beach ridges along glacial lake margins; elevation 300 to 500 m.	Dover	DOV 1	Fine to very fine textured, gray to dark gray, bedded glaciolacustrine materials; occasionally with pebbles; usually grayish-pink colored west of Athabasca River.	L^G_u, L^G_v, 2 - 3	Orthic Gray Luvisol	Gleyed Gray Luvisol peaty Gleysols	Organics
		Algar	ALG 1	as above	as above	peaty Gleysols	Gleyed Gray Luvisol Orthic Gray Luvisol	Organics
		Livock	LVK 1	Medium to moderately fine textured, brown, glacio-lacustrine materials.	L^G_u, L^G_v, 2 - 3	Orthic Gray Luvisol	Gleyed Gray Luvisol Brunisolic Gray Luvisol peaty Gleysols	Organics
		Kearl Kenzie Eaglesham Mildred Ruth McMurray Horse River Heart	KEL 1	Coarse textured (sandy and gravelly), brown to grayish brown beach deposits.	F^G_r, 3 - 4	Eluviated Eutric Brunisol	Gleyed Eluviated Eutric Brunisol peaty Gleysols	Organics
AEOLIAN DISTRICTS								
Algar Sand Plain	Undulating and duned aeolian sand plains; elevation 400 to 500 m.	Heart	HRT 1	Coarse textured, light yellowish brown to grayish brown, well sorted and loose or poorly compacted aeolian deposits	Eu, Er, Ev, 2 - 5	Eluviated Dystric Brunisol	Eluviated Eutric Brunisol	Gleyed Eluviated Dystric Brunisol peaty Gleysols
		Kenzie Eaglesham	HRT 2	as above	as above	Eluviated Dystric Brunisol	Gleyed Eluviated Dystric Brunisol peaty Gleysols	Organics
GLACIOFLUVIAL AND FLUVIAL (RECENT) DISTRICTS								
Clearwater Plain	Undulating glaciofluvial plains; mainly outwash deposits; includes eroded till and meltwater channels along Athabasca and Clearwater Rivers; elevation 250 to 350 m.	Mildred	MIL 1	Coarse textured, brown to grayish brown outwash deposits; generally thick; locally thin over till or bedrock.	F^G_u, F^G_v, 2 - 3	Eluviated Dystric Brunisol	Eluviated Eutric Brunisol	Gleyed Eluviated Eutric Brunisol peaty Gleysols
			MIL 2	as above	as above	Eluviated Dystric Brunisol	Gleyed Eluviated Dystric Brunisol peaty Gleysols	Organics

		Bitumount	BMT 1	as above	as above	peaty Gleysols	Gleyed Eluviated Dystric Brunisols Eluviated Dystric Brunisol	Organics
		Ruth Heart Kenzie Eaglesham Kinosis Steepbank Dover Algar	RUT 1	Coarse textured, brown to grayish brown, gravelly and bouldery meltwater channel deposits; includes thin outwash and eroded till along channels.	$F^{G}_{u'}$ 3 - 4	Eluviated Eutric Brunisol Orthic Gray Luvisol	Gleyed Eluviated Eutric Brunisol Gleyed Gray Luvisol peaty Gleysols	Organics
McMurray Lowland	Undulating, terraced fluvial deposits along Athabasca River and tributaries; includes rough, broken stream banks; elevation 200 to 400 m.	McMurray	MMY 1	Variably textured Recent alluvial deposits	Fu, Fut, 2 - 3	Orthic Regosol Cumulic Regosol	Gleyed Regosol peaty Gleysols	Orthic Gray Luvisol Organics
			MMY 2	as above	as above	Gleyed Regosol peaty Gleysols	Orthic Regosol Cumulic Regosol	Organics
				UPPER MACKENZIE SUBREGION				
Embarass Plain	Undulating outwash and aeolian plain, including active sand dunes and meltwater channel deposits along lower Athabasca River; elevation 200 to 300 m.	Mildred Heart Ruth Kenzie Eaglesham McMurray		Variable, coarse textured deposits				
Calumet Plain	Level, slightly inclined and undulating alluvial fans at the base of the Birch Mountain Uplands, elevation 250 to 350 m.	Namur	NAM 1	Medium to fine textured, gray to dark gray alluvial materials, partly derived from shale bedrock.	Fl, Fl, Fu, 2 - 3	Orthic Regosol Cumulic Regosol	Gleyed Regosol peaty Gleysols	Organics
		Kenzie Eaglesham McMurray	NAM 2	as above	as above	Gleyed Regosol peaty Gleysols	Orthic Regosol Cumulic Regosol	Organics
Athabasca Delta Plain	Level to depressional, variably textured, Recent alluvial (deltaic) deposits; elevation about 200 m throughout.	Chipewyan	CPN 1	Moderately coarse to medium textured, brown, usually calcareous, fluvial material.	Fl, Fu, Fr, 1 - 3	Gleyed Cumulic Regosol Gleyed Regosol	Rego Gleysol	peaty Gleysol Organics
		Mamawi	MMI 1	as above	Fl, 1 - 2	Rego Gleysol	Gleyed Cumulic Regosol Gleyed Regosol	peaty Gleysols Organics
			MMI 2	as above	as above	Rego Gleysol		peaty Gleysols
				ATHABASCA SOUTH SUBREGION				
Fort Hills Upland	Hummocky and rolling, highly dissected kame and kame moraine deposits with some glacial till inclusions; elevation 300 to 350 m.	Firebag	FIR 1	Mainly coarse textured, often gravelly and bouldery; brownish to grayish brown ice-contact materials.	$F^{G}_{h'}$ 3 - 4 $F^{G}_{m'}$ 4 - 6	Eluviated Eutric Brunisol		Gleyed Eluviated Eutric Brunisol peaty Gleysols
		Kenzie Eaglesham	FIR 2	as above	as above	Eluviated Eutric Brunisol	Gleyed Eluviated Eutric Brunisol peaty Gleysols	Organics

Richardson Hills Upland	Hummocky and rolling, highly dissected kame and kame moraine deposits; small water bodies common; elevation 300 to 450 m.	Firebag Kenzie Eaglesham

* Systems which occur in a district, but are not dominant; these are described under districts in which they are major components.

MAPPING CONVENTIONS

SOIL CLASSIFICATION - according to the Canadian System of Soil Classification, Canada Soil Survey Committee.

LANDFORMS AND SLOPE CLASS - according to system of the Landform Committee of the Canada Soil Survey Committee.

COMPLEXES - complexes of two land systems can occur in which the first system is dominant and the second system is significant.

DOMINANT SOIL - constitutes over 40% of an area

SIGNIFICANT SOIL - constitutes 15 to 40% of an area

MINOR INCLUSION - constitutes less than 15% of an area

MAP SYMBOLS

RB	- rough, broken land; mainly steep, unstable stream banks.
DL	- disturbed land resulting from construction and open pit mining activities
W	- open water bodies
R	- bedrock
~~	- system boundary
———	- district boundary
⌒⌒⌒	- active sand dunes
-----	- prominant sand ridges

EXAMPLE OF A SIMPLE SYSTEM

$$\frac{\text{DOV 1}}{L_u^G,\ 2-3}$$

DOV 1 ← system; L_u^G → landform; 2 - 3 ← slope class

EXAMPLE OF A COMPLEX SYSTEM

$$\frac{\text{DOV 1 - KNZ 2}}{L_u^G\text{ - Bb},\ 2-3}$$

dominant system → DOV 1; significant system ← KNZ 2; landform of complex system → L_u^G - Bb; slope class ← 2 - 3

9. AOSERP RESEARCH REPORTS

1.		AOSERP First Annual Report, 1975
2.	AF 4.1.1	Walleye and Goldeye Fisheries Investigations in the Peace-Athabasca Delta--1975
3.	HE 1.1.1	Structure of a Traditional Baseline Data System
4.	VE 2.2	A Preliminary Vegetation Survey of the Alberta Oil Sands Environmental Research Program Study Area
5.	HY 3.1	The Evaluation of Wastewaters from an Oil Sand Extraction Plant
6.		Housing for the North--The Stackwall System
7.	AF 3.1.1	A Synopsis of the Physical and Biological Limnology and Fisheries Programs whithin the Alberta Oil Sands Area
8.	AF 1.2.1	The Impact of Saline Waters upon Freshwater Biota (A Literature Review and Bibliography)
9.	ME 3.3	Preliminary Investigations into the Magnitude of Fog Occurrence and Associated Problems in the Oil Sands Area
10.	HE 2.1	Development of a Research Design Related to Archaeological Studies in the Athabasca Oil Sands Area
11.	AF 2.2.1	Life Cycles of Some Common Aquatic Insects of the Athabasca River, Alberta
12.	ME 1.7	Very High Resolution Meteorological Satellite Study of Oil Sands Weather: "A Feasibility Study"
13.	ME 2.3.1	Plume Dispersion Measurements from an Oil Sands Extraction Plant, March 1976
14.		
15.	ME 3.4	A Climatology of Low Level Air Trajectories in the Alberta Oil Sands Area
16.	ME 1.6	The Feasibility of a Weather Radar near Fort McMurray, Alberta
17.	AF 2.1.1	A Survey of Baseline Levels of Contaminants in Aquatic Biota of the AOSERP Study Area
18.	HY 1.1	Interim Compilation of Stream Gauging Data to December 1976 for the Alberta Oil Sands Environmental Research Program
19.	ME 4.1	Calculations of Annual Averaged Sulphur Dioxide Concentrations at Ground Level in the AOSERP Study Area
20.	HY 3.1.1	Characterization of Organic Constituents in Waters and Wastewaters of the Athabasca Oil Sands Mining Area
21.		AOSERP Second Annual Report, 1976-77
22.	HE 2.3	Maximization of Technical Training and Involvement of Area Manpower
23.	AF 1.1.2	Acute Lethality of Mine Depressurization Water on Trout Perch and Rainbow Trout
24.	ME 4.2.1	Air System Winter Field Study in the AOSERP Study Area, February 1977.
25.	ME 3.5.1	Review of Pollutant Transformation Processes Relevant to the Alberta Oil Sands Area

26.	AF 4.5.1	Interim Report on an Intensive Study of the Fish Fauna of the Muskeg River Watershed of Northeastern Alberta
27.	ME 1.5.1	Meteorology and Air Quality Winter Field Study in the AOSERP Study Area, March 1976
28.	VE 2.1	Interim Report on a Soils Inventory in the Athabasca Oil Sands Area
29.	ME 2.2	An Inventory System for Atmospheric Emissions in the AOSERP Study Area
30.	ME 2.1	Ambient Air Quality in the AOSERP Study Area, 1977
31.	VE 2.3	Ecological Habitat Mapping of the AOSERP Study Area: Phase I
32.		AOSERP Third Annual Report, 1977-78
33.	TF 1.2	Relationships Between Habitats, Forages, and Carrying Capacity of Moose Range in northern Alberta. Part I: Moose Preferences for Habitat Strata and Forages.
34.	HY 2.4	Heavy Metals in Bottom Sediments of the Mainstem Athabasca River System in the AOSERP Study Area
35.	AF 4.9.1	The Effects of Sedimentation on the Aquatic Biota
36.	AF 4.8.1	Fall Fisheries Investigations in the Athabasca and Clearwater Rivers Upstream of Fort McMurray: Volume I
37.	HE 2.2.2	Community Studies: Fort McMurray, Anzac, Fort MacKay
38.	VE 7.1.1	Techniques for the Control of Small Mammals: A Review
39.	ME 1.0	The Climatology of the Alberta Oil Sands Environmental Research Program Study Area
40.	WS 3.3	Mixing Characteristics of the Athabasca River below Fort McMurray - Winter Conditions
41.	AF 3.5.1	Acute and Chronic Toxicity of Vanadium to Fish
42.	TF 1.1.4	Analysis of Fur Production Records for Registered Traplines in the AOSERP Study Area, 1970-75
43.	TF 6.1	A Socioeconomic Evaluation of the Recreational Fish and Wildlife Resources in Alberta, with Particular Reference to the AOSERP Study Area. Volume I: Summary and Conclusions
44.	VE 3.1	Interim Report on Symptomology and Threshold Levels of Air Pollutant Injury to Vegetation, 1975 to 1978
45.	VE 3.3	Interim Report on Physiology and Mechanisms of Air-Borne Pollutant Injury to Vegetation, 1975 to 1978
46.	VE 3.4	Interim Report on Ecological Benchmarking and Biomonitoring for Detection of Air-Borne Pollutant Effects on Vegetation and Soils, 1975 to 1978.
47.	TF 1.1.1	A Visibility Bias Model for Aerial Surveys for Moose on the AOSERP Study Area
48.	HG 1.1	Interim Report on a Hydrogeological Investigation of the Muskeg River Basin, Alberta
49.	WS 1.3.3	The Ecology of Macrobenthic Invertebrate Communities in Hartley Creek, Northeastern Alberta
50.	ME 3.6	Literature Review on Pollution Deposition Processes
51.	HY 1.3	Interim Compilation of 1976 Suspended Sediment Date in the AOSERP Study Area
52.	ME 2.3.2	Plume Dispersion Measurements from an Oil Sands Extraction Plan, June 1977

53.	HY 3.1.2	Baseline States of Organic Constituents in the Athabasca River System Upstream of Fort McMurray
54.	WS 2.3	A Preliminary Study of Chemical and Microbial Characteristics of the Athabasca River in the Athabasca Oil Sands Area of Northeastern Alberta
55.	HY 2.6	Microbial Populations in the Athabasca River
56.	AF 3.2.1	The Acute Toxicity of Saline Groundwater and of Vanadium to Fish and Aquatic Invertebrates
57.	LS 2.3.1	Ecological Habitat Mapping of the AOSERP Study Area (Supplement): Phase I
58.	AF 2.0.2	Interim Report on Ecological Studies on the Lower Trophic Levels of Muskeg Rivers Within the Alberta Oil Sands Environmental Research Program Study Area
59.	TF 3.1	Semi-Aquatic Mammals: Annotated Bibliography
60.	WS 1.1.1	Synthesis of Surface Water Hydrology
61.	AF 4.5.2	An Intensive Study of the Fish Fauna of the Steepbank River Watershed of Northeastern Alberta
62.	TF 5.1	Amphibians and Reptiles in the AOSERP Study Area
63.		An Overview Assessment of <u>In Situ</u> Development in the Athabasca Deposit
64.	LS 21.6.1	A Review of the Baseline Data Relevant to the Impacts of Oil Sands Development on Large Mammals in the AOSERP Study Area
65.	LS 21.6.2	A Review of the Baseline Data Relevant to the Impacts of Oil Sands Development on Black Bears in the AOSERP Study Area
66.	AS 4.3.2	An Assessment of the Models LIRAQ and ADPIC for Application to the Athabasca Oil Sands Area
67.	WS 1.3.2	Aquatic Biological Investigations of the Muskeg River Watershed
68.	AS 1.5.3 AS 3.5.2	Air System Summer Field Study in the AOSERP Study Area, June 1977
69.	HS 40.1	Native Employment Patterns in Alberta's Athabasca Oil Sands Region
70.	LS 28.1.2	An Interim Report on the Insectivorous Animals in the AOSERP Study Area
71.	HY 2.2	Lake Acidification Potential in the Alberta Oil Sands Environmental Research Program Study Area
72.	LS 7.1.2	The Ecology of Five Major Species of Small Mammals in the AOSERP Study Area: A Review
73.	LS 23.2	Distribution, Abundance and Habitat Associations of Beavers, Muskrats, Mink and River Otters in the AOSERP Study Area, Northeastern Alberta
-	--	Interim Report to 1978
74.	AS 4.5	Air Quality Modelling and User Needs

These reports are not available upon request. For further information about availability and location of depositories, please contact:

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