

RESEARCH COUNCIL OF ALBERTA

Preliminary Soil Survey Report 58-1

EXPLORATORY SOIL SURVEY

of

Alberta Map Sheets 84-C (east half), 84-B, 84-A, and 74-D

by

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Alberta Soil Survey
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FOREWORD

Alberta has a large area of undeveloped land, primarily in the northern portion of the province. Although much of this northern portion is relatively inaccessible to ordinary ground inspection, nevertheless information is very desirable regarding its timber possibilities, for outlining the areas which may be suitable for future agricultural development, and for the planning of roads which could be utilized for mineral prospecting and other developments.

To assist in obtaining this information, the soil survey section of the Research Council of Alberta started an exploratory soil survey program in 1952, and that year covered about 1,150,000 acres by means of pack horses. In 1953 the area covered was around 1,350,000 acres and in 1954 about 400,000 acres. Obviously this method of doing exploratory soil surveys was much too time-consuming in relation to the enormous region to be surveyed. Consequently, with the help and financial support of the Alberta Department of Lands and Forests, a new method using a helicopter was tried in 1955 and proved to be an excellent way of making a rapid preliminary inspection of large areas in the region. About 10½ million acres were covered in 1955, around 10 million acres in 1956 and about 12 million acres in 1957.

To carry out a helicopter exploratory soil survey efficiently and successfully, it is necessary to transfer all pertinent aerial photograph information -- such as observations on soils, topography and vegetation -- to base maps for field use. Alberta is in the fortunate position of having available a complete set of aerial photographs of the region, at a scale of 3,300 feet to the inch.

The information obtained during exploratory soil surveys may aid in forest management studies and will serve as a guide for planning reconnaissance soil surveys in areas which appear to be suitable for future agricultural development. Thus the exploratory soil surveys may serve to outline the areas which should be reserved as permanent forest management districts, and could be of considerable value in indicating possible sites for other future developments.

Recently, a number of interested parties have made requests for information in connection with the helicopter exploratory soils surveys. Consequently, the Research Council has undertaken to issue a series of preliminary reports and maps giving the location and characteristics of the areas. The first report and accompanying maps (called Preliminary Soil Survey Report 58-1) deals with the 1957 helicopter survey. Reports on the previous exploratory soils surveys will be published in due course.

The helicopter exploratory soils surveys represent only a portion of the work planned each year by the Alberta Soil Survey Committee, which is responsible for outlining the joint program conducted by the soil survey staff of the Canada Experimental Farms Service and the Research Council of Alberta through the chairmanship of the Professor of Soil Science of the University of Alberta.

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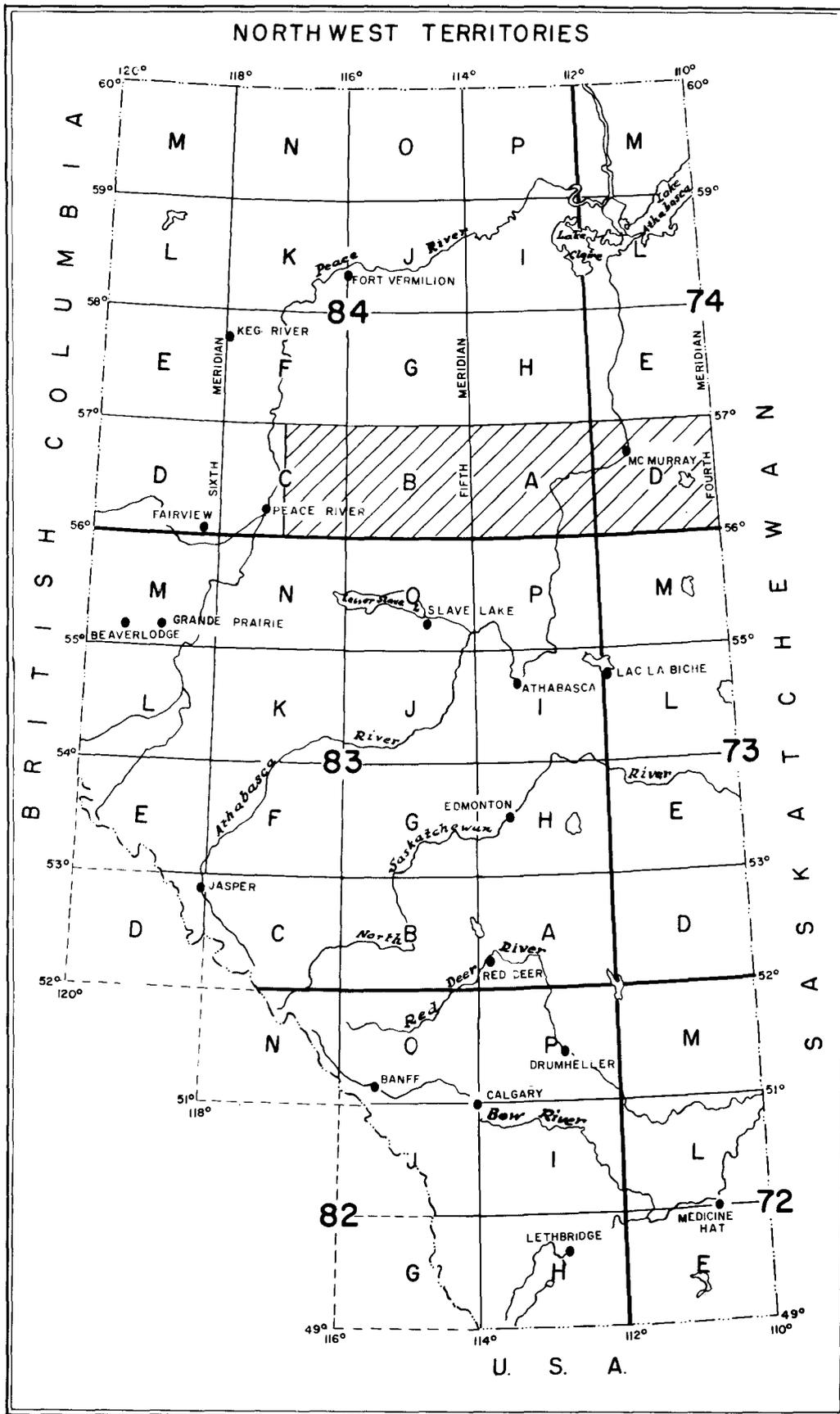


Figure 1 - Sketch map of Alberta showing the location of the 1957 exploratory soil survey area.

EXPLORATORY SOIL SURVEY OF ALBERTA MAP SHEETS

84-C (east half), 84-B, 84-A, and 74-D

Introduction

In 1957 the soil survey section of the Research Council of Alberta continued its program of exploratory soil surveys by helicopter. This project has been carried on continuously since 1955 for the purpose of determining the location and extent of potentially arable land in the undeveloped northern portion of Alberta. The information that is being obtained is required by the Department of Lands and Forests to facilitate the establishment of a permanent forest management program and also by other agencies interested in the natural resources of northern Alberta.

Location and Extent

During 1957 the exploratory soil survey covered Alberta map sheets 74-D, 84-A, 84-B, and the east half of 84-C. One complete map sheet extends approximately 77 miles east to west by 69 miles north to south, and covers about 5,300 square miles or 3,392,000 acres. As shown in Figure 1, the area lies between 110 and 117 degrees west longitude and between 56 and 57 degrees north latitude. A total of approximately 18,500 square miles (about 11.8 million acres) comprise the three and a half map sheets.

The east half of Alberta map sheet 84-C is located between 116 and 117 degrees west longitude and between 56 and 57 north latitude. The area includes all, or parts, of townships 81 to 92 between ranges 13 and 19 west of the fifth meridian.

Alberta map sheet 84-B is located between 114 and 116 degrees west longitude and between 56 and 57 degrees north latitude and includes all, or parts, of townships 81 to 92 between ranges 1 and 13 west of the fifth meridian.

Alberta map sheet 84-A is located between 112 and 114 degrees west longitude and 56 and 57 degrees north latitude and includes all, or parts, of townships 81 to 92 between ranges 13 and 26 west of the fourth meridian.

Alberta map sheet 74-D is located between 110 and 112 degrees west longitude and 56 and 57 degrees north latitude. The area includes all, or parts, of townships 81 to 92 between ranges 1 and 13 west of the fourth meridian.

Method of Survey

The exploratory soil survey of the area covered by these map sheets was carried out during the summer and fall of 1957. During the months of June and July a portion of the area was inspected by truck. However, the number of passable roads in the area are few, and this type of field work was confined to the area between Peace River town and the Red Earth oil field in township 87, range 8, west of the fifth meridian, and in a small area adjacent to McMurray in map sheet 74-D. For the most part, the area was traversed by helicopter. The helicopter operation was started in late August and completed in mid-September. About four flying days were required for each map sheet.

A preliminary base map on a scale of four miles to one inch had previously been prepared for use in the field. This base map was compiled from aerial photographs and showed the major land forms and, where possible, the type of surface geological material associated with these land features. The preparation of such base maps is a very time-consuming operation, and takes one person about ten months to prepare three map sheets.

The helicopter survey in map sheets 74-D and 84-A was carried on from a central base camp located near the center of the area. The map sheets were divided into 12 "pie-shaped" segments which were lined from the base-camp at 15 degree intervals. The radius of the segments ranged from 20 to 60 miles, thus making the total length of the traverses about 50 to 130 miles.

In map sheets 84-B and 84-C considerable difficulty was encountered in establishing aviation fuel supplies and it was necessary to utilize two camp sites and use segments of varying shapes and lengths.

Approximately 70 to 80 landings were made in each complete map sheet for soil inspections. The distribution of the landings depended upon the nature of the terrain and tree cover, but wherever possible attempts were made to land about every ten miles along the lines of traverse.

Soil Classification and Mapping

The soils are mapped and classified very broadly, and no attempt has been made to correlate them with any of the soil series established in Alberta.

The type of soil occurring at specific points on each map sheet is shown on the accompanying maps. For the purpose of this exploratory soil survey the three-number system, formerly employed in Alberta, is used for describing the soil profiles. The first number refers to the great soil group, the second number denotes the type of parent material, and the third number refers to certain special or differentiating characteristics of the soil profile.

The following table explains the system of numbers used in describing soil profiles:

<u>Second number</u>	<u>Parent material</u>	<u>Third number</u>	<u>Profile development</u>
1	Modified residual	0	Little profile development
2	Glacial till	1	Hillside soils (shallow)
3	Reworked till	2	Modal soils (normal soils of a great soil group)
4	Gravelly outwash	3	Depressional, non-saline
5	Alluvial, water-sorted	4	Saline or alkaline
6	Alluvial or aeolian (stone free)	5	Saline
7	Lacustrine	6	Solonetz
		7	High lime to surface

As an example of the number system, a soil mapped as 7.2.2. refers to a Grey Wooded soil developed from glacial till with modal profile development.

Each of the accompanying maps has been delineated into three or more major areas on the basis of parent materials and numbered Area I, Area II, etc. Topographic areas having a predominance of a particular type or types of parent material were grouped together on each map sheet as one area and numbered accordingly. Owing to the broad nature of the survey it was not possible to keep these areas to a single type of material, but the material first named on each map area is the one most frequently occurring. In some cases it was possible to make an estimate of the percentage of bog in these areas, and where this was done it has been recorded on the map.

The topography of the area is shown on the maps by a system of hatching. The system used for classifying the slopes is similar to the one described in published reports of the Alberta Soil Survey and is shown in the following table:

<u>Percent slope</u>	<u>Mapped phases</u>
0.0 - 0.5 (
0.5 - 1.5 (- - - - - -	Level and undulating
2 - 5 (
6 - 9 (- - - - - -	Gently rolling
10 - 15 - - - - - -	Rolling
16 - 30 - - - - - -	Hilly
Irregular, often steeply-sloping banks adjacent to drainage courses	Rough and broken

The topographical classification includes a consideration of the steepness of slope, as well as the shape and frequency of the various slopes which determines the relative roughness of the surface.

The maps are colored on a soil rating basis. The soil rating is that used and described in published reports and is based on a consideration of such factors as the characteristics of the soil profile, the degree of stoniness, and the topography. For the purpose of this report the mapped areas have been delineated into three soil rating categories, namely, pasture and woodland, doubtful, and arable.

The first category -- pasture and woodland -- refers to those areas deemed unsuitable for agricultural developments for reasons of poor soil, excessive stoniness, rough topography, or some other associated feature.

The "doubtful" category embraces areas in which some feature of the soil or terrain make them of doubtful value as agricultural land at present. Perhaps at some time in the future the demand for agricultural land will require that some land suitable for development be found within the doubtful areas. For example, some of the bog areas might become suitable agricultural land if satisfactory drainage were provided. The broad general nature of this helicopter survey did not allow for detailed separations in the marginal areas and hence the need for a "doubtful" category.

The third category -- arable land -- consists of those areas in which the soil and topography are considered suitable for agricultural development. In assessing the agricultural potential of any area, however, it should be realized that factors other than the soil and topography must be considered. Such economic factors as the cost of land clearing, accessibility, and distance to

markets are features which would have to be assessed before any of the land included in this exploratory soil survey could be opened for settlement. Present economic conditions would seem to suggest that much of this remote area will remain undeveloped for the time being.

Since this was an exploratory survey, the soils and topography indicated on the maps should be considered as simply indicative of the broad general characteristics of each outlined area rather than as an accurate delineation of those features.

Climate

There is a very limited amount of meteorological data available for the area covered by the exploratory soil survey in 1957. However, records have been compiled for some stations near the survey area which give a fair indication of some of the climatic features of the entire region. Table I shows the mean monthly and mean annual temperature and precipitation data for six stations in or near the map area.

The range in annual precipitation in this general area of Alberta is from about 12.13 inches at Fort Vermilion, near north latitude 58 degrees 30 minutes, to 18.55 inches at Slave Lake, near north latitude 55 degrees 15 minutes. There appears to be a general lowering of annual precipitation in the area with increase in latitude. With regard to mean annual temperature, the range is from about 33.6 degrees Fahrenheit at Slave Lake to 27.2 degrees at Fort Vermilion.

The data shown in Table I must be regarded as being very general, since the records at each of the recording stations can be affected to some extent by local differences in topography and elevation. For example, the recording station at McMurray on the flood plain of the Clearwater river has provided a decidedly different record to that of the McMurray airport which is less than ten miles away but at some 400 to 500 feet higher elevation.

In assessing the exploratory soil survey area for agricultural development, climate is one of the most important features to be considered. No attempt is being made in this preliminary report to go into the climatic features of the area in detail, but it is interesting to note the duration of frost-free periods for some of the stations in or near the survey area. The frost-free period is taken as that period between the last time the temperature drops below 32 degrees Fahrenheit in the spring and the first time it reaches 32 degrees Fahrenheit in the fall of the year. The frost-free period for eight stations is shown in Table I I. Data for Beaverlodge, Edmonton, and Lethbridge are included in the table for comparison.

Table I I shows that there is a marked decrease in the length of the frost-free period in a south to north direction. At Peace River, near the 56th parallel, the average period without frost is about 91 days, while at Fort Vermilion, near the 58th parallel, it has decreased to 65 days. A factor such as this is important and must be given careful consideration when selecting the kind and variety of crop to be grown in northern areas.

TABLE I

Mean monthly and annual temperatures and precipitation data for selected stations in or near the 1957 exploratory soil survey area.

Station	Map sheet	Approx. Elev. feet		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean annual temp., °F	Mean annual precip., inches
Fort Vermilion	84-J	950	T....	-12.8	-4.7	8.0	32.1	47.6	55.8	60.6	57.4	45.8	32.4	10.4	-6.2	27.2	--
			P....	.62	.37	.60	.64	1.12	1.82	2.05	1.74	1.34	.74	.57	.52		12.13
Keg River	84-F	1402	T....	-0.2	-0.7	18.6	36.0	48.4	55.6	--	--	--	--	--	--	--	--
			P....	.77	.62	.79	.59	1.87	2.01	2.61	1.59	1.35	1.07	--	.99	--	--
Buffalo Head Prairie	84-K	1100	T....	-6.9	-0.6	15.0	34.4	50.3	56.4	61.0	58.0	47.5	34.0	13.2	-3.6	29.8	--
			P....	.55	.44	.88	.55	2.09	1.80	2.37	1.79	1.58	.82	.96	.66	--	14.49
McMurray	74-D	800	T....	-9.4	1.2	12.9	34.8	49.0	56.8	61.4	57.8	48.0	35.6	12.9	-3.8	29.8	--
			P....	1.08	.63	.88	.80	1.47	2.10	3.30	2.19	2.01	1.12	1.00	.99	--	17.57
Fairview	84-C	2143	T....	5.2	6.1	20.1	36.5	50.2	56.3	60.3	58.1	49.7	38.5	19.6	6.6	33.9	--
			P....	1.23	1.30	.98	1.01	1.40	1.99	2.52	1.96	1.48	1.14	1.40	1.42	--	17.57
Slave Lake	83-0	1921	T....	1.5	8.5	20.6	35.1	49.1	55.6	61.3	58.4	47.4	37.4	21.6	6.6	33.6	--
			P....	1.06	1.07	.89	.83	1.85	2.49	3.12	2.17	1.84	1.19	1.05	.99		18.55

T....Temperature (degrees Fahrenheit)

P....Precipitation (in inches)

TABLE 11

Frost-free periods -- shortest, longest, and average -- at selected stations since records were started.

Station	Map sheet	Average period, days	Shortest period, days	Longest period, days	Number of years records kept
Ft. Vermilion	84-J	65	5*	104	41
Keg River	84-F	57	29	79	15
Buffalo Head Prairie	84-K	73	35	97	17
Peace River	84-C	91	39	164	26
McMurray	74-D	67	29	101	27
Beaverlodge	83-M	94	27	140	38
Edmonton	83-H	100	44	144	60
Lethbridge	82-H	111	80	147	26

* One isolated occurrence.

Vegetation

The vegetative cover in the areas studied does provide information for differentiating the drainage and soil texture within the region of study, even though relatively few species could be recognized with ease from the air.

The major distinction which can be made by observing the vegetation, is the separation of organic from inorganic soils. Some organic soils are often referred to as muskegs or, more appropriately sphagnum moss bogs. Open bogs with the occasional stunted black spruce (*Picea mariana*) are characteristic of deep accumulations of sphagnum; this material is often water saturated and, in some cases, is frozen at shallow depths. It is characteristic of the bog regions that better black spruce growth shows up as the organic accumulation becomes thinner and drainage improves; this is characteristic of both sedge and sphagnum bogs. The appearance of tamarack (*Larix laricina*) is infrequent, but it does appear occasionally mixed with the black spruce.

The major portion of inorganic soils has a mixed cover of trembling aspen (*Populus tremuloides*) and white spruce (*Picea glauca*). These soils are generally Grey Wooded or Podzol-Grey Wooded, and have moderately good to poor drainage. The soils vary from a medium to a fine texture and are not confined to any particular type of parent material or topography. The more poorly drained areas with the finer textured soils and more level topography have white spruce as the major cover, with occasional aspen. Improvement in drainage, decrease in fineness of texture, and more irregular topography results in an increase in trembling aspen and a decrease in white spruce, ultimately giving rise to relatively pure aspen stands (with occasional paper birch [*Betula papyrifera*]) on the hill crests with soils of sandy clay loam to sandy loam textures. Pure stands of poor-growth trembling aspen are also found on poorly sorted glacial materials, most typically, gravelly and stony ridges.

Areas of inorganic soils covered by trembling aspen and jack pine (*Pinus banksiana*), and by pure jack pine forests, are of lesser importance. The occurrence of the mixed trembling aspen - jack pine forest type are not uncommon in regions of well sorted sands with high water tables, stratified alluvial sands and crevasse fillings. Their presence is also noted at the base of slopes where sandy overlays occur on medium textured till as a result of slope wash. In cases where the slope wash is well drained and of considerable depth, narrow bands of pure jack pine stands appear. The sandy tills in the McMurray area are covered with poor-growth trembling aspen as a major species, with only occasional patches of jack pine as the minor species, despite the very irregular topography and large content of sand. The major portion of the outwash materials containing well sorted sands are covered by pure jack pine forests. Numerous sand bars and U-shaped dunes, which appear among the larger bog areas, are typical locations favorable to relatively pure stands of jack pine.

The region surrounding Lubicon lake has a meadow-type vegetation with occasional bluffs of trembling aspen and balsam poplar (*Populus balsamifera*). Sedge bogs occur rather infrequently throughout the area. The area is relatively free of tree cover and appears to lie in a huge fine textured lacustrine basin of fairly level topography.

A major portion of the western region mapped by helicopter was burned over, hence the use of vegetation as a guide to mapping was difficult. In this region the finer textured soils were almost entirely covered by young-growth aspen while the regeneration in the sandy areas was largely jack pine and a jack pine-lodgepole pine (*Pinus contorta*) hybrid.

Alberta Map Sheet 84-C (east half)

The western boundary of the soil surveyed portion of map sheet 84-C is located some 12 miles east of Peace River and is adjacent to the Harmon Valley and Three Creeks settlements.

Area 1

Area 1 is the largest area delineated on the map sheet and comprises about 77 percent of the soil surveyed portion of the map. For the most part, the topography is level to undulating, with occasional gently rolling ridges.

Moss bogs or muskegs are a common occurrence in this section of the map sheet and it is estimated that about 50 percent of Area 1 consists of muskeg. Draining the area are the Cadotte and Little Cadotte rivers and Jackpine creek in the northern and central portions, and the North Heart river and Benjamin creek in the southern section. These rivers and streams all drain into the Peace river.

The soils of Area 1 are derived principally from lacustrine clay, glacial till, and lacustro-till. The latter type of deposition is one which has been mapped in the settled portion of the Peace River district and is characterized by some of the distinguishing features of both glacial till and lacustrine clay deposits. In Area 1 soils developed from alluvial materials appear to be of minor occurrence and are confined to local areas adjacent to drainage ways.

For the most part, the soils in this section of the map sheet are Grey Wooded in character. Podzol and Podzol-Grey Wooded types of development are confined to the coarse textured alluvial materials, although some podzolic-like development was noted in the upper portion of the A₂ horizon of some of the Grey Wooded soils formed from till.

Those soils of Area 1 developed from lacustrine clay are similar to the Nampa soil series described in the soil survey report of the Rycroft-Watino area (Research Council of Alberta, report No. 56). The following is a description of a lacustrine clay profile examined in Area 1 of map sheet 84-C:

Horizon	Thickness, in inches	Description
A ₁	1	Dark brown, clay loam, friable.
A ₂	1 - 2	Pale brown, clay loam, coarse platy, friable.
B ₁	3 - 5	Brown, clay, subangular blocky, slightly hard.
B ₂	15 - 17	Dark brown, clay, blocky, hard, waxy.
B _{ca}	at 24 inches below surface	Dark brown, clay, blocky, hard, moderate lime content.
C		Dark greyish brown, stratified, clay, stone-free.

A second type of soil found in Area 1 is a Grey Wooded profile developed on lacustrine till. Similar soil, the Donnelly series, has been described in the soil survey report of the Grande Prairie-Sturgeon Lake area (Research Council of Alberta, Report No. 74). The following is a generalized description of this soil series:

Horizon	Thickness, in inches	Description
A _o	1	Dark brown, semi-decomposed leaf litter.
A ₁	1	Dark brown, clay loam, friable.
A ₂	2	Pale brown, silt loam, platy, pH 5.7.
B ₁	6	Brown, silty clay loam, subangular blocky, may be tops of old columns, pH 4.8.
B ₂	10	Dark brown, clay, blocky, waxy, pH 4.8.
B ₃	11	Dark brown with occasional dark streak, clay, pH 5.7.
B _{ca}	at 30 inches below surface	Dark grey, clay, moderate lime content, pH 7.6.
C		Dark grey, clay, stratified, some stones, pH 7.6.



Figure 2 - White Spruce growing on medium to fine textured soils in map sheet 84-C.

In Area 1 the soils developed from glacial till are similar to the Braeburn series which is described in the soil survey report of the Grande Prairie-Sturgeon Lake area (Research Council of Alberta, Report No. 74). The Braeburn series is Grey Wooded in character. A generalized description of this soil type follows:

Horizon	Thickness, in inches	Description
A ₀	1	Dark brown, semi-decomposed leaf litter.
A ₁	1	Dark brown to black, loam, pH 7.1.
A _{2p}	1	Light grey in upper inch, pale brown in lower, sandy loam, platy, friable, pH 5.6.
A _{2gw}	1	
B ₁	4	Yellowish brown, silty clay loam, medium subangular blocky, slightly hard, pH 5.2.
B ₂	12	Brown, clay, weakly blocky to subangular blocky, slightly hard, pH 5.3.
B ₃	21	Dark brown, clay loam, medium subangular blocky, slightly hard, pH 5.7.
B _{ca}	at 40 inches below surface	Greyish brown, clay loam, lime flecks, pH 7.7.
C		Greyish brown, till, pH 7.9.

In the map area there is some variability within the till soils inasmuch as a Podzol-like A_{2p} horizon has developed in the upper portion of some of the Grey Wooded A₂ horizons. These soils are termed Podzol-Grey Wooded.

Area 1 is typified by poor or impeded drainage throughout a large portion of the area, and this feature is reflected in many of the soil profiles where mottling in the A₂ and B horizons char-

acterizes the soils. In some of the Meadow soils examined, the A₀ and A₁ horizons reach a thickness of 14 inches at some locations. The underlying mineral horizons are invariably mottled and gleied. The following description is that of a Meadow soil found in Area 1:

Horizon	Thickness, in inches	Description
A ₀₀ & A ₀	1 - 2	Dark brown organic debris, often peaty.
A ₁	6	Very dark grey, silt loam, fine granular, loose.
B _g	10	Dark grey, clay, medium subangular blocky, mottling, slightly hard.
G	10	Dark grey and yellowish grey, clay, massive, iron staining.
C _g	at 28 inches below surface	Grey to dark grey, lacustrine clay.

Podzol soils are confined to the coarse textured alluvial materials of the map area. Distinct ashy grey A_{2p} horizons and bright reddish brown B horizons commonly occur in areas where the parent materials are of a sandy nature. The depth of the alluvium is variable and ranges from less than a foot to three feet or more. A description of a typical Podzol soil developed on sandy alluvial materials is as follows:

Horizons	Thickness, in inches	Description
A ₀₀	1	Coniferous needle mat.
A ₀	$\frac{1}{2}$ - 1	Black, semi-decomposed litter.
A ₂	4	Light grey, sand, platy, loose, pH 5.8.
B ₂	10	Reddish brown, sand, single grain, loose, pH 6.2.
B ₃	10	Yellowish brown, sand, single grain, loose, pH 6.2.
C	at 26 inches below surface	Yellowish brown, stone-free, sand.

In many cases the sandy material is relatively shallow and a D horizon is reached at depths of less than 30 inches. The underlying material, depending upon location, is usually lacustrine clay, lacustro-till or glacial till.

Area 1 comprises about 1,278,000 acres of which about 600,000 acres are considered suitable for agricultural development. The remainder -- about 678,000 acres -- consists of muskeg, rough broken land, and water. Since it has little agricultural potential it has been placed in the pasture and woodland rating category.

It should be noted that on the accompanying soil rating map, muskeg areas have not been delineated. Hence all of Area 1 is shown as being arable. However, it is estimated that 50 per cent of the area consists of muskeg and a deduction has been made from the arable acreage to compensate for this feature. The area of muskeg is included in the pasture and woodland category.

Area II

In the soil surveyed portion of map sheet 84-C, Area IIA and IIB constitute about 23 percent of the total area. The topography in these sections of the map sheet is gently rolling with occasional rolling ridges.

Generally, the drainage in Area II is fairly good. This is due, in part at least, to the gently sloping nature of the terrain in the area. Some muskegs occur, but not as frequently as in Area I. The main rivers and streams draining Area IIA are the Otter river and Ochre creek; while in Area IIB the major portion of the drainage is provided by the Heart and Cadotte rivers. These rivers are a part of the Peace river drainage system.

Area II is the western portion of a glacial till moraine which extends for some distance to the east into Alberta map sheet 84-B. The soils, therefore, are predominantly of till origin, although soils developed from sandy and, in places, somewhat gravelly outwash materials occur frequently. These coarse textured materials probably were deposited as kames and eskers during glaciation. It is also a possibility that some of the sand is of recent origin, having been deposited by presently flowing streams and rivers. The occurrence of sand appears to be somewhat more frequent or widespread in Area IIB than it is in Area IIA.

For the most part, the soils developed from glacial till in Area II are Grey Wooded and Podzol-Grey Wooded in character and are, therefore, similar to the till soils described in Area I. Similarly, the soils developed from sandy parent materials in Area II are Podzols and are morphologically the same as those of Area I. Soil profile descriptions of the above mentioned soil types are included in the sections of this report dealing with Area I.

Area II is about 384,500 acres in size, of which Area IIA consists of 288,500 acres and Area IIB 96,000 acres. The greater portion of Area IIA is considered to be of doubtful value for agricultural development owing to the occurrence of sand and muskeg within the till area. This doubtful area consists of 275,800 acres, while 5,100 acres of pasture and woodland and 7,600 acres of water make up the remainder of Area IIA. Area IIB consists of 84,500 acres of pasture and woodland and 11,500 acres of arable land. The pasture and woodland portion of this area is unsuitable for development because of the frequent occurrence of sandy soils and muskeg. The arable portion of the area appears suitable for development since the soils are generally fairly heavy textured soils developed from glacial till.

Summary

For convenient reference, the land rating acreages for map sheet 84-C (east half) are summarized in Table III. This area is shown in Figure 1.

TABLE III

Land rating classification for map sheet 84-C (east half).

Area	Arable, acres	Doubtful, acres	Pasture and woodland, acres	Water, acres
Area I	600,000		666,000	12,000
Area IIA		275,800	5,100	7,600
Area IIB	11,500		84,500	
Total	611,500	275,800	755,600	19,600

Alberta Map Sheet 84-B

Lubicon lake is located in the western portion of map sheet 84-B and Peerless and Graham lakes in the east-central portion of the area. There is very little settlement at the present time in this section of northern Alberta.

Area I

Area I comprises about nine percent of the total map sheet. This section of the area represents an eastern extension of Area I of map sheet 84-C and, for the most part, the soils, topography and associated features are very similar in the two adjacent areas.

There are numerous rivers and streams draining the area, the more important of which are the Lubicon and Loon rivers. These rivers flow north and join the Peace river east of Fort Vermillion. Moss bogs and meadows are of frequent occurrence, and it is estimated that about 50 percent of the area consists of moss bog.



Figure 3 - Meadow soil area in map sheet 84-B. Some of these areas might become suitable agricultural land if satisfactory drainage is provided.

The soils of Area I are derived principally from lacustrine clay, lacustro-till, and glacial till. Sand deposits in this section of the map sheet are of infrequent occurrence. The soil profile descriptions are similar to those included in the section describing Area I of map sheet 84-C.

Area I is about 294,400 acres in size, of which about one-half is deemed suitable for agricultural development. The remainder consists of about 16,000 acres of water and 139,200 acres of moss bog which has little agricultural potential and has, therefore, been placed in the pasture and woodland rating category.

Area II

Area II is the largest area delineated on the map sheet and constitutes about 45 percent of the total map area. The topography for the most part is gently rolling except in the northeast section of the area where rolling topography predominates.

For the purpose of description, Area II has been separated into Area IIA, IIB, and IIC. These individual areas have similar characteristics with regard to soils, topography and degree of drainage, but occur in different sections of the map area.

Area IIA is situated in the northwestern portion of the map sheet. Drainage in this area is provided by numerous streams and rivers, the more important of which are the Otter, Cadotte and Loon rivers.

Area IIB is located in the central and northeastern section of the map area. The topography of Area IIB is quite variable, ranging from gently rolling in the central portion near Peerless lake to rolling in the northeastern section of the area. On the whole, the area is fairly well drained by a number of streams and rivers. The Wabiskaw river drains a major portion of the northern section of Area IIB, while in the central and southern parts the Trout and Shoal rivers and Hospital creek are the principal drainage ways. Lakes are numerous in Area IIB and range in size from a few acres to the largest, Peerless and Graham lakes, which occupy about 21,800 and 10,200 acres respectively.

Area IIC is located in the south-central and southwestern portion of the map sheet. The topography in this section ranges from gently rolling to rolling. Drainage in Area IIC is provided by numerous streams, the most important being the Utikuma river. All the drainage from Area II eventually flows into the Peace river.

The soils of Area II are derived principally from glacial till and are characterized, for the most part, by the Grey Wooded type of development. However, there is evidence in some of the till profiles of the development of a bleached Podzol A₂ horizon in the upper portion of the older Grey Wooded A₂ horizon. The following is a profile description of such a soil which is considered to be Podzol-Grey Wooded in character:

Horizon	Thickness, in inches	Description
A ₀	1	Dark brown leaf litter.
A ₁	1	Dark brown to black, sandy loam to loam.
A _{2p}	2	Light grey, sandy loam, platy, friable.
A _{2gw}	2	Pale brown, sandy loam to loam, coarse platy, friable.
B ₁	4	Brown, clay loam, subangular blocky, slightly hard.
B ₂	12	Dark brown, clay, blocky, slightly hard.
B ₃	6	Brown, sandy clay, blocky, slightly hard.
C	at 28 inches below surface.	Greyish brown to yellowish brown, sandy clay, till.

In addition to the glacial till soils, there is a frequent occurrence in Area II of soils developed from sandy and, in some cases, gravelly outwash materials. These soils occur in all sections of Area II, but appear to be particularly prominent in Area IIB. The sand and gravelly outwash materials are of variable depth, ranging from shallow overlays of less than a foot to fairly deep deposits of three feet or more. The following is a description of a Podzol sand profile which overlies glacial till:

Horizon	Thickness, in inches	Description
A ₀	1	Dark brown leaf and needle litter.
A ₁	$\frac{1}{2}$ - 1	Dark brown to black, sand, loose.
A ₂	5	Light grey, sand, fine platy, loose.
B	5	Reddish brown, sand, single grain.
C	8	Pale brown, sand.
D	at 20 inches below surface	Yellowish brown to greyish brown, sandy clay, till.

The soils of Area II are perhaps the best drained in map sheet 84-B. This is due to the gently rolling to rolling nature of the topography, which facilitates a fair degree of surface run-off. Some examples, however, of Meadow soils and other poorly drained soil profiles were examined in Area II, but they appear to be of minor occurrence.

Area II is about 1,456,700 acres in size. A considerable portion of the area consists of an intimate mixture of glacial till and sand. However, it was not possible, with the scale of mapping employed, to make detailed separations. The area has been classed as doubtful arable, and about 1,098,000 acres are included in this rating category. The remainder of the area has been delineated into 21,800 acres of arable and 278,600 acres of pasture and woodland. The major lakes in the area amount to about 58,300 acres.

Area III

Area III comprises about 23 percent of map sheet 84-B. The topography of Area III ranges from undulating to gently rolling. On the accompanying map, Area III is shown as occurring in four separate locations which have been designated as IIIA, IIIB, IIIC, and IIID.

A large portion of Area IIIA is poorly drained and moss bogs are a common occurrence. The major rivers draining the area are the Muskwa, Patecho, Nipisi, Utikuma, and Trout rivers, Area IIIB is drained mainly by the Wabiskaw river, while Area IIIC is drained by Trout river and Hospital creek. Westerly flowing tributaries of the Loon river provide most of the drainage for Area IIID. These rivers and streams are all part of the Peace river drainage system.

The soils of Area III are chiefly derived from sandy and gravelly outwash materials. These permeable soils are severely leached and, for the most part, are Podzol and Podzol-Grey Wooded in character. The sand areas are associated with moraines, and the sand probably was deposited by glacial streams in the form of kames, eskers or along spillways. Some sandy shoreline material was noted in the northeastern part of Area IIIA, while part of the sand associated with Area IIIB may have been deposited in comparatively recent times by the Wabiskaw river.

As in the case of previously described areas, the sand deposits are of variable depth ranging from less than a foot to several feet or more. The following profile description is that of a fairly deep Podzol soil typical of much of the sand in Area III:

Horizon	Thickness, in inches	Description
A ₀	1	Coniferous needle mat and leaf litter.
A ₁	$\frac{1}{2}$	Black, loamy sand to sand.
A ₂	5 - 7	Light grey, sand, fine platy, loose.
B ₂	14	Reddish brown, sand, single grain.
B ₃	12	Yellowish brown, sand, single grain.
C	at 33 inches below surface	Yellowish brown, coarse sand.

Soils derived from glacial till are of secondary importance in this area, but where their occurrence was noted they were found to be Grey Wooded and Podzol-Grey Wooded in character.

Area III is about 761,600 acres in size, of which 743,000 acres are rated as suitable only for pasture and woodland. The remainder, 18,600 acres, represents the area occupied by the major lakes in the area.

Area IV

Area IV represents about 23 percent of the total area of map sheet 84-B. Generally, the topography is level to depressional with only occasional gently rolling ridges.

Poor drainage is perhaps the most outstanding characteristic of Area IV. It is estimated that about 70 percent of the area is occupied by moss and sedge bogs. The main drainage ways are the Loon and Shoal rivers and Red Earth creek which flow into the Peace river.

The soils of Area IV are developed from glacial till and lacustrine clay. However, in many of the profiles examined, peat varying in depth from a few inches to two feet or more overlies the till and lacustrine materials. Mottled and gleied B horizons are commonly found in the soils of this area. In better drained locations the soils developed on glacial till are normally Grey Wooded and Podzol-Grey Wooded in character while the lacustrine clay soils are most frequently Grey Wooded.

Area IV is about 760,300 acres in size. The major lakes occupy about 5,100 acres and the remainder, 755,200 acres, has been rated as suitable only for pasture and woodland since most of the area consists of moss bog of variable depth.

Summary

A summary of the acreage in each of the land rating categories for map sheet 84-B is given in Table IV. The location of this area is shown in Figure 1.

TABLE IV

Land rating classification for map sheet 84-B.

Area	Arable, acres	Doubtful, acres	Pasture and Woodland, acres	Water, acres
Area I	139,200		139,200	16,000
Area IIA		248,000	10,500	4,500
Area IIB		633,000	268,100	51,300
Area IIC	21,800	217,000		2,500
Area IIIA			634,200	18,600
Area IIIB			56,300	
Area IIIC			42,900	
Area IIID			9,600	
Area IV			755,200	5,100
Total	161,000	1,098,000	1,916,000	98,000

Alberta Map Sheet 84-A

The southern boundary of this map sheet is about 85 miles north of the town of Athabasca. The more important lakes in the area are the North Wabiskaw and Chipewyan lakes which are located in the southwestern and north-central portions of the map sheet respectively.

Area I

Area I is the largest area delineated in map sheet 84-A and represents about 62 percent of the total area. The topography is, for the most part, level to depressional with only occasional gently rolling ridges.

Poor drainage is perhaps the most distinguishing characteristic of Area I. It is estimated that approximately 70 percent of the area is occupied by moss bog. The depth of peat is quite variable throughout the area, ranging from less than a foot to several feet. An interesting feature of some of the deeper bogs is the occurrence of ice at depths of 16 to 20 inches. Considering the fact that this area was examined in late summer, the presence of ice relatively near the surface at this time of year would seem to indicate that at some locations the peat may remain frozen the year round. However, there was no evidence of frozen conditions in any of the mineral soils in the area, and it would appear that the insulating effect of peat is a requirement for the icing conditions.

There are numerous rivers and streams draining Area I. In the western section the Wabiskaw river, a tributary of the Peace river, provides a major portion of the drainage, while to the east the Athabasca river and its tributaries carry most of the drainage.

The soils of Area I are characteristically coarse textured and developed from sandy and gravelly outwash materials. Some heavier textured clay loam and silty clay loam soils occur in the area, but they appear to be of minor significance.



Figure 4 - An area in map sheet 84-A of moss bog in the foreground and meadow in the background.

The soils are quite variable in regard to depth of profile and stage of development. The outwash deposits range from about a foot to four feet or more in depth and from Grey Wooded to Podzol in development. Some of the finer textured soils, which may be of lacustrine or alluvial-lacustrine origin, have the morphological characteristics of Brown Wooded soils; however, the majority of the soils exhibit Grey Wooded soil characteristics.

A large portion of the land in Area I is poorly drained, consequently a large number of the soil profiles show somewhat peaty A horizons as well as mottled and gleied B horizons. Dark Grey Gleisolic and Depression Podzol soils are of frequent occurrence in this portion of the map sheet.

The majority of the better drained soils in this area occur in relatively small aspen and pine "islands" which are surrounded by muskeg. The following is a description of a Podzol sand profile found in Area I:

Horizon	Thickness, in inches	Description
A ₀	$\frac{1}{2}$ - 1	Deciduous leaf and coniferous needle mat.
A ₂	8	Greyish white, sand, loose.
B	10	Reddish brown, sand, single grain.
C	at 19 inches below surface	Pale brown to yellowish brown sandy outwash with some stones.

Some of the outwash materials in this area show characteristics of Podzol soils in the upper portion of the solum and Grey Wooded characteristics in the lower portion. The following is a description of such a Podzol-Grey Wooded soil:

Horizon	Thickness, in inches	Description
A _o	1	Coniferous needle and deciduous leaf mat.
A _{2p}	1	Grey, sand to loamy sand, loose.
B _p	$\frac{1}{2}$	Brown, loamy sand, loose.
A _{2gw} (C _p)	5	Greyish brown, loamy sand, friable.
B _{gw}	4	Reddish brown, loamy sand to sandy loam, friable.
C	at 11 inches below surface	Yellowish brown, coarse outwash sand to coarse loamy sand.

Area I is about 2,079,000 acres in size of which 65,900 acres is occupied by the major lakes and the remainder, about 2,013,100 acres, is suitable only for pasture and woodland. The frequent occurrence of moss bogs, together with the sandy and gravelly nature of the soil, make this area of little value insofar as agricultural development is concerned.

Area II

Area II is located in the northwestern portion of the map sheet and represents about two per cent of the total map area. The topography is, for the most part, rolling. Area II is actually the eastern extremity of a moraine that is situated mainly in Alberta map sheet 84-B. In an earlier section of this report, when describing map sheet 84-B, the morainic area was delineated as Area IIB

The drainage and soils of Area II (map sheet 84-A) are very similar to those described in Area IIB of map sheet 84-B. The soils are derived primarily from glacial till with some sandy and gravelly soils associated with kames and eskers within the morainic area. The soil profile descriptions in this area are, therefore, similar to those of area IIB in map sheet 84-B.

Area II of map sheet 84-A is about 54,400 acres in size. Owing to the rather steeply sloping nature of the terrain, Area II has been rated as suitable only for pasture and woodland.

Area III

Area III is situated adjacent to the Athabasca river in the east-central portion of the map sheet and represents about nine percent of the map area. Moss bogs occupy the greater portion of Area III. It is estimated that about 80 percent of the area is occupied by moss bog while the remainder consists of sand which occurs in the form of dunes in some sections. In the poorly drained areas the topography ranges from level to depressional, while in the dune sand areas gently rolling topography predominates.

The sandy soils in this area are Podzol and Podzol-Grey Wooded in character. Similar soils have been described in earlier sections of this report.

Area III is about 297,600 acres in size of which 288,000 acres have been rated as suitable only for pasture and woodland. The remainder, 9,600 acres, represents the area covered by the Athabasca river and lakes in this section of the map sheet.

Area IV

Area IV is the second largest area delineated on the map sheet and comprises about 27 percent of the total map area. The topography of Area IV is level to depressional, with occasional gently rolling ridges scattered throughout the area.

Insofar as drainage is concerned, Area IV is similar to Area I; it is estimated that about 60 percent of the area is moss bog. The western section of Area IV is drained by the Wabiskaw, Liege, and Chipewyan rivers which flow to the Peace river, while the eastern portion is drained by the Dunkirk and Mackay rivers which are tributary to the Athabasca river.

There is a wide range of soils in this area; the most frequently occurring soil profiles are those developed from water-sorted sand and gravel, with soils developed from glacial till of secondary prominence. Small areas of soils developed on lacustrine materials were also noted in this section of the map sheet.

The water-deposited sands and gravels are of variable depth. Depending upon location, glacial till or lacustrine clay occur at depths of from one to over three feet below the surface. The sandy soils are characteristically Podzol-Grey Wooded and Podzol in nature. Profile descriptions of these soil types are included in previous sections of this report. Similarly, the soils developed from glacial till and lacustrine materials are described in earlier sections of this report and are mostly Grey Wooded, with occasional Podzol-Grey Wooded development in some of the soils developed from till.

Poorly drained soils having a peaty surface and mottled and gleyed subsoil horizons are of frequent occurrence in Area IV. The following is a description of a Dark Grey Gleisolic soil developed on glacial till in Area IV:

Horizons	Thickness, in inches	Description
A ₀₀ & A ₀	2	Deciduous leaf mat.
A ₁	6	Black, silt loam, shotty nuciform, friable.
A ₂	3	Grey, sandy loam to loam, coarse platy.
B _g	12	Dark grey, clay, mottled, sticky.
C	at 23 inches below surface	Dark yellowish brown, till.

Area IV is about 934,400 acres in size. Of this amount, 918,400 acres is considered suitable only for pasture and woodland since much of the area is poorly drained and the soils coarse textured. The remainder, about 16,000 acres, is water.

Summary

The acreage of the various land rating categories for map sheet 84-A is given in Table V. This area is shown on the location map, Figure 1, in an earlier section of this report.

TABLE V

Land rating classification for map sheet 84-A.

Area	Arable, acres	Doubtful, acres	Pasture and woodland, acres	Water, acres
Area I			2,013,100	65,900
Area II			54,400	
Area III			288,000	9,600
Area IV			918,400	16,000
Total			3,273,900	91,500

Alberta Map Sheet 74-D

The townsites of McMurray and Waterways are located in the northwestern portion of the map area. Waterways is connected to Lac La Biche by means of the Northern Alberta Railway which traverses the centre of the map sheet.

Area I

Area I comprises about 53 percent of the total map area. This area occurs in three separate locations: Area I is adjacent to the Athabasca river in the northwestern and north-central portions of the map sheet, Area IB covers the major portion of the southern half of the map area, and Area IC is a small area in the southeast corner.

The topography of Area I is quite variable. In Area IA level to undulating topography predominates, with only occasional gently rolling ridges. Area IB is extremely variable, with level to somewhat depressional land in some portions and gently rolling and rolling topography in other sections. Area IC is a small area of undulating topography.

The better drained portion of Area I is found on the gently rolling and rolling topography, while the undulating to depressional areas are, for the most part, poorly drained. Moss bogs are of common occurrence in these latter areas. It is estimated that about 60 percent of Area I is covered with moss bogs. The depth of peat is quite variable, ranging from about a foot to several feet or more. In some of the peat profiles examined, ice was encountered at depths of from 16 to 20 inches.

Area IA is drained chiefly by the Athabasca and Beaver rivers. Numerous rivers and streams drain Area IB, the more important of which are the Horse and Hangingstone rivers in the western portion of the area and the Christina, Winefred and Clearwater rivers in the central and eastern portions. These rivers eventually flow into the Athabasca river.

The soils of Area I are sandy and gravelly in nature. This material appears to be mostly of outwash origin. However, since there is such a widespread occurrence of this coarse textured material between McMurray and Lac La Biche, a distance of some 130 miles, it is possible that some of the material may actually be a glacial till deposition. If this is so a more detailed survey than that conducted by this exploratory soil survey is required in the area to delineate between coarse textured outwash materials and sandy till. It should be noted, however, that a sandy clay loam till

was examined in this area but, in most cases, was mantled with varying depths of sand. Thus it would seem that even if some of the till is of a sandy nature, there is also a till of finer texture in the area.



Figure 5 - The Clearwater river in the foreground at the junction with the Athabasca river in map sheet 74-D.

The soils of Area I are, for the most part, Podzol-Grey Wooded and Podzol in character. The following description is of a Podzol sand found in Area I:

Horizon	Thickness, in inches	Description
A ₀	1	Pine needle litter.
A ₁	$\frac{1}{2}$ - 1	Black, loamy sand, friable.
A ₂	2 - 3	Pinkish white, sand, fine platy, pH 5.2.
B ₂	4 - 5	Reddish brown, sand, single grain, pH 5.0.
B ₃	8	Yellowish brown, sand, some stones, pH 5.0.
C	at 18 inches below surface	Yellowish brown, coarse sand, occasional stone, lime, pH 8.0.

In some cases the sand was found to be relatively shallow and underlain with finer textured glacial till or alluvial-lacustrine clay. The following profile is that of a Podzol sand overlying glacial till:

Horizon	Thickness, in inches	Description
A ₀	1	Deciduous leaf and coniferous needle mat.
A ₁	1	Black, loamy sand to sand, loose.
A ₂	3	Light grey, coarse sand, coarse platy.
B	5	Reddish brown, sand, single grain.
C	3	Yellowish brown, sand.
D	at 12 inches below surface	Greyish brown, sandy clay till.

Area I is about 1,797,000 acres in size. About 39,000 acres consists of water while the remainder, 1,758,000 acres, have been classed as pasture and woodland. A combination of coarse-textured soils and poor drainage make this area of little value for agricultural development.

Area II

Area II is the second largest area delineated and consists of about 43 percent of map sheet 74-D. It occurs in three separate locations. Area IIA is situated in the central and northeastern portions of the map area, Area IIB is in the northwestern section, and Area IIC is in the extreme southeast corner.

The topography of the three separated areas is quite variable. In Area IIA the terrain is level to depressional except in the northeastern and south-central sections where gently rolling and rolling topography predominate. Area IIB is quite uniform in that only an occasional gently rolling ridge interrupts the generally level to depressional nature of the land. Area IIC has considerable rolling topography.

The level and depressional portions of Area II are, for the most part, poorly drained. Moss bogs occupy about 70 percent of the area. The main rivers draining Area IIA are the Hangingstone river in the western portion, Christina and Clearwater rivers in the central section, and the Steep-bank river in the northern part of the area. In Area IIB the MacKay river and Conn creek provide a major portion of the drainage, while in Area IIC the Winefred river and its tributaries are chiefly responsible for the drainage.

The soils of Area II consist of an intimate mixture of a sandy clay glacial till and sandy out-wash. The soils developed from till are Grey Wooded and Podzol-Grey Wooded in character while the sandy soils are generally Podzols. The following profile description is of a Grey Wooded soil developed from glacial till:

Horizon	Thickness, in inches	Description
A ₀	1	Deciduous leaf litter.
A ₁	1	Dark brown, loam, friable.
A ₂	3	Pale brown, loam, fine platy.
B ₁	4	Brown, sandy clay, medium subangular blocky, friable, sandy clay.
B ₂	10	Dark brown, clay, large subangular blocky, slightly hard.
C	at 20 inches below surface	Greyish brown, sandy clay, till.

In some of the till profiles examined a light grey Podzol-like A_{2p} horizon has developed in the upper portion of some of the Grey Wooded A₂ horizons. These soils are classed as Podzol-Grey Wooded.

The sandy soils are similar to those of Area I, and the soil profile descriptions are similar to those included in that section of this report.

In addition to the well drained soils developed from till and sandy outwash materials, there is in Area II a fairly widespread occurrence of poorly-drained soils. These soils are characteristically Depression Podzol and Dark Grey Gleisolic in nature. The following description is that of a Depression Podzol profile found in Area II:

Horizon	Thickness, in inches	Description
A ₀	2	Mixed coniferous needle and sedge grass litter.
A ₁	1	Black, sandy loam, friable.
A ₂	4	Light grey, sandy loam, coarse platy, mottling.
B _g	10	Grey to greyish brown, clay, massive, gleied.
C	at 17 inches below surface	Dark greyish brown, saturated, sandy clay.

Area II is about 1,427,200 acres in size. The sandy nature of much of the soil, coupled with poor drainage, make this area unsuitable for agricultural development. Hence, about 1,386,200 acres of Area II have been classed as suitable only for pasture and woodland while the remainder of the area, about 41,000 acres, is occupied by the major lakes in the area .

Area III

Area III is the smallest separated area on map sheet 74-D and comprises about five percent of the total area. The topography in this section is generally level to depressional, with occasional small gently rolling areas of sand dunes.

Poor drainage is, perhaps, the most important characteristic of Area III since about 80 percent of the area is occupied by moss bog. The Athabasca river flows through the centre of the area and provides a major portion of the drainage.

Sand is the principal material from which the soils of Area III are developed. Sand dunes are common, particularly in the area adjacent to the Athabasca river. These coarse textured soils are Podzol and Podzol-Grey Wooded in nature. Similar soils have been described in previous sections of this report.

Area III is about 140,800 acres in size of which 4,480 acres are occupied by the major lakes while the remainder, 136,320 acres, has been classed as pasture and woodland.

Summary

For reference, the acreage of the various land rating categories in map sheet 74-D is given in Table VI. The location of this area is shown in Figure 1.

TABLE VI

Land rating classification for map sheet 74-D.

Area	Arable, acres	Doubtful, acres	Pasture and woodland, acres	Water, acres
Area IA			156,800	
Area IB			1,599,280	39,000
Area IC			1,920	
Area IIA			1,128,920	39,080
Area IIB			225,280	1,920
Area IIC			32,000	
Area III			136,320	4,480
Total			3,280,520	84,480

Chemical Composition of Some Representative Soil Profiles

A number of soil profiles were sampled in the survey area and taken to the laboratory for analyses. The analyses serve a twofold purpose: firstly, they assist in the classification of the soils; secondly, they give some indication of the productive capacity of the soils.

Chemical data on three representative soil profiles are given in Tables VII and VIII. The soils reported therein are: Profile #1, a Grey Wooded soil developed from lacustro-till; Profile #2, a Grey Wooded soil developed from glacial till; Profile #3, a Podzol-like soil developed from out-wash sand.

Profile #1 was examined and sampled in Area I of map sheet 84-C, Profile #2 was sampled in Area II of map sheet 84-B, and Profile #3 was taken in Area I of map sheet 74-D.

The analyses of Profile #1 show low amounts of organic matter and available nitrogen. The exchangeable base status is fairly high and shows no evidence of calcium, magnesium, or potassium deficiencies in the soil. The high percentage of clay provides high retentive powers for moisture. The chemical data confirm the field observations which indicated that the soil is Grey Wooded in character. Furthermore, the data compare favorably with the analyses shown for the Donnelly soil series as reported in the soil report of the Grande Prairie-Sturgeon Lake area (Research Council of Alberta, Report No. 74).

The chemical data for Profile #2 show a relatively high carbon-nitrogen ratio which indicates a low available nitrogen status, while the percentages of carbon and nitrogen show that the total organic matter of the soil is low. The exchangeable cation status shows a fairly high level of calcium, magnesium, and potassium. However, it has been demonstrated that the productivity of soils similar to both Profiles #1 and #2 can be increased through the use of commercial fertilizers. The analyses of Profile #2 compare favorably with the data published for the Braeburn soil series in the soil survey report of the Grande Prairie-Sturgeon Lake area.

Soil Profile #3 is typical of many Podzol-like soils of northern Alberta. The high carbon-nitrogen ratio and the low percentages of nitrogen and carbon indicate that the soil is extremely

TABLE VII

Soil reaction (pH), organic carbon, nitrogen, carbon-nitrogen ratio, and particle size distribution, of some representative soil profiles.

Horizon	Thickness, in inches	pH	Organic carbon, %	Nitrogen, %	C/N ratio	Sand 2.0-0.05 mm., %	Silt 0.05-0.002 mm., %	Coarse clay 0.002-0.0002 mm., %	Fine clay 0.0002 mm., %
Profile #1 - (7.3.2.)		Grey Wooded clay							
A ₂	2	5.7	1.22	0.087	14	27.0	61.9	18.0	3.1
B ₁	6	4.8	0.76	0.076	10	17.4	33.7	36.3	12.6
B ₂	10	4.8	0.60	0.049	12	13.4	38.8	40.6	7.6
B ₃	11	5.7	0.71	0.052	14	10.4	37.9	33.2	18.5
Bca & C	at 30 inches below surface	7.6	--	--	--	3.3	33.0	59.0	5.7
Profile #2 - (7.2.2.)		Grey Wooded clay loam							
A ₁	1	7.1	12.80	0.786	16	--	--	--	--
A ₂	2	5.6	0.49	0.040	12	48.1	42.7	7.2	2.0
B ₁	4	5.2	0.71	0.056	13	37.4	30.3	19.7	12.6
B ₂	12	5.3	0.57	0.043	13	35.9	28.1	22.7	13.3
B ₃	21	5.7	0.57	0.039	15	38.9	27.8	20.4	12.9
Bca	at 40 inches below surface	7.7	--	--	--	40.5	34.2	20.3	5.0
C		7.9	--	--	--	22.3	44.8	27.9	5.0
Profile #3 (9.6.2.)		Podzol sand							
A ₂	5	6.6	0.05	0.001	50	100.0	0.0	0.0	0.0
B ₂₁	5	6.1	0.49	0.009	54	94.2	2.6	2.4	0.8
B ₂₂	8	6.2	0.05	0.003	17	98.0	1.2	0.2	0.6
B ₃₁	8	6.3	0.03	0.002	15	98.7	0.5	0.8	0.0
B ₃₂	10	6.2	0.03	0.002	15	97.3	1.7	1.0	0.0

TABLE VIII

Total exchange capacity by determination and by summation, exchangeable cations, and percent base saturation, of some representative soil profiles.

Horizon	Thickness, in inches	Total exchange capacity		Ca m.e./100gms.	Mg m.e./100gms.	Exchangeable cations		H m.e./100gms.	Base sat., %
		Deter. m.e./100gms.	Sum. m.e./100gms.			K m.e./100gms.	Na m.e./100gms.		
Profile #1 - (7.3.2.) Grey Wooded clay									
A ₂	2	12.3	13.1	6.6	2.8	0.3	0.2	3.2	76
B ₁	6	26.1	23.6	11.3	5.6	0.4	0.2	6.1	74
B ₂	10	28.1	23.4	12.4	5.1	0.5	0.2	5.2	78
B ₃	11	26.8	25.9	16.2	7.0	0.5	0.2	2.0	92
Bca & C	at 30 inches below surface	--	--	--	--	--	--	--	--
Profile #2 - (7.2.2.) Grey Wooded clay loam									
A ₁	1	56.8	38.6	31.0	2.9	0.6	0.3	3.8	90
A ₂	2	4.4	6.5	2.9	0.9	0.1	0.2	2.4	63
B ₁	4	16.3	16.9	9.6	3.3	0.2	0.2	3.6	79
B ₂	12	17.6	18.2	10.6	4.1	0.3	0.2	3.0	84
B ₃	21	16.7	17.2	10.5	4.2	0.3	0.2	2.0	88
Bca	at 40 inches below surface	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--
Profile #3 - (9.6.2.) Podzol sand									
A ₂	5	0.2	0.9	0.6	0.3	tr.	0	tr.	
B ₂₁	5	1.9	2.3	0.4	0.2	tr.	0	1.6	30
B ₂₂	8	0.9	1.1	0.4	0.2	tr.	0	0.5	55
B ₃₁	8	0.5	0.8	0.2	0.3	tr.	0	0.3	62
B ₃₂	10	0.6	1.2	0.8	0.3	tr.	0	0.1	92

tr. - trace

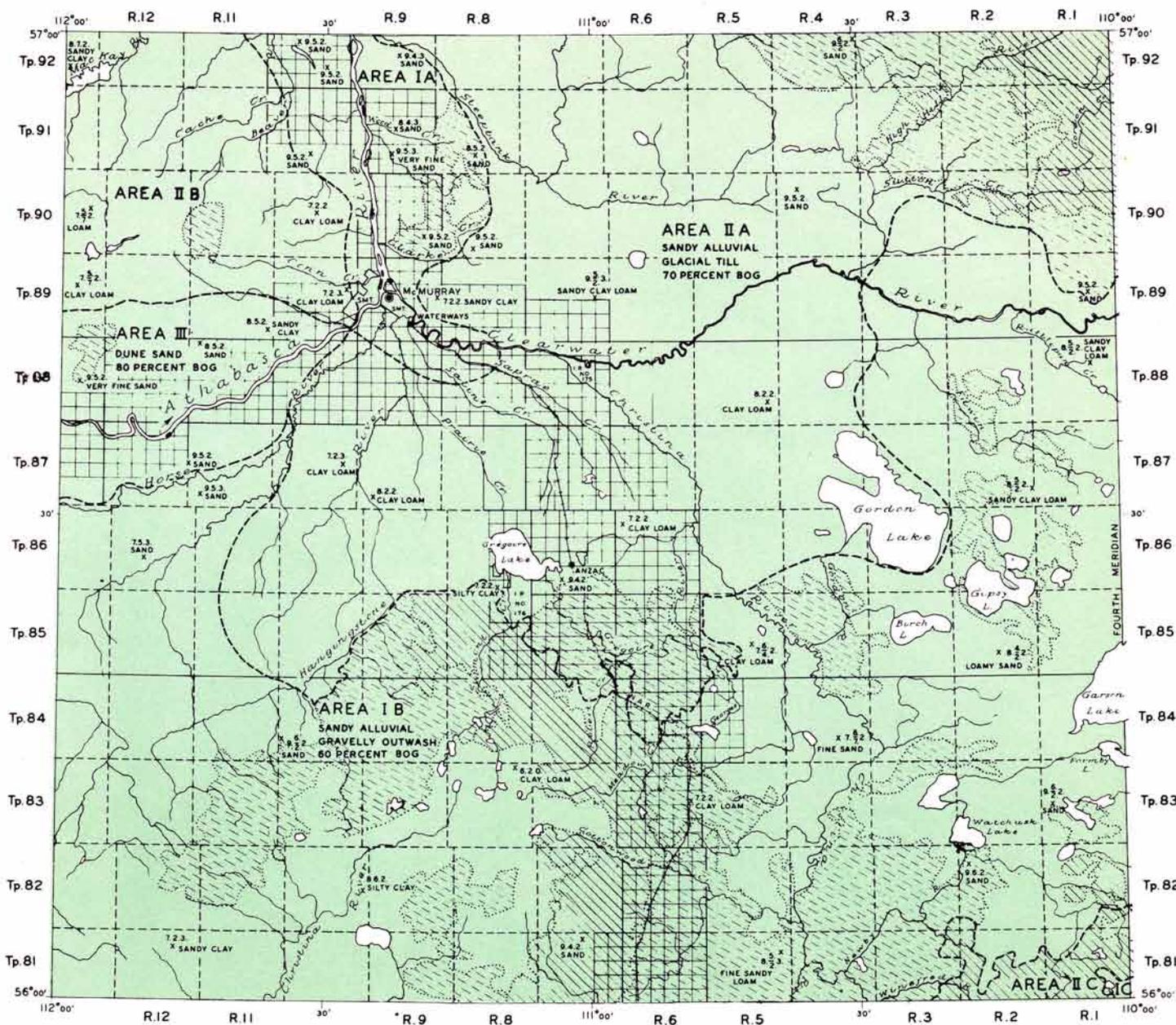
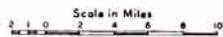
m.e. - milliequivalents

low in both available nitrogen and total organic matter. The data show an extremely low base status and low degree of base saturation. It would appear from the analyses that the fertility level of these soils is very low.

Throughout this report, soils similar to Profile #3 have been referred to as Podzols. The chemical data indicate that these soils have some of the characteristics, notably a low base status, which is typical of the Podzol soils described elsewhere. However, it should be noted that a more comprehensive study is required before any definite conclusions are drawn regarding the classification of these soils.

PRELIMINARY SOIL SURVEY AND RATING MAP

OF THE
ALBERTA SHEET 74-D



LEGEND

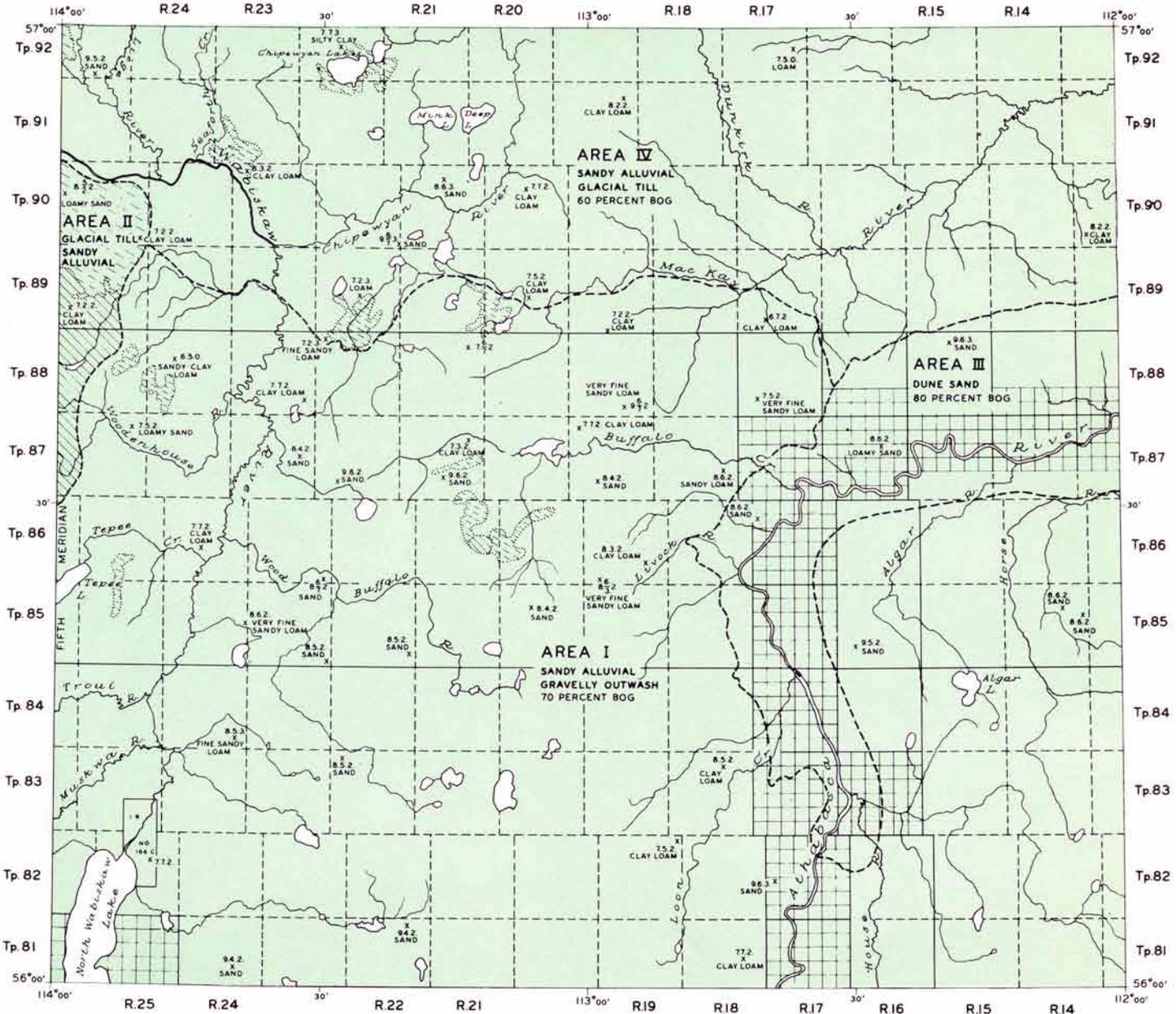
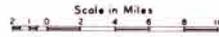
- Pasture and Woodland...
- Level and Undulating Topography...
- Gently Rolling Topography...
- Rolling Topography...

Soil information by Alberta Soil Survey,
Research Council of Alberta,
Helicopter Project - 1957.

Prepared by Research Council of Alberta, Edmonton - 1957.
Base map supplied by Technical Division,
Department of Lands and Forests,
Province of Alberta.

PRELIMINARY SOIL SURVEY AND RATING MAP

OF THE
ALBERTA SHEET 84-A



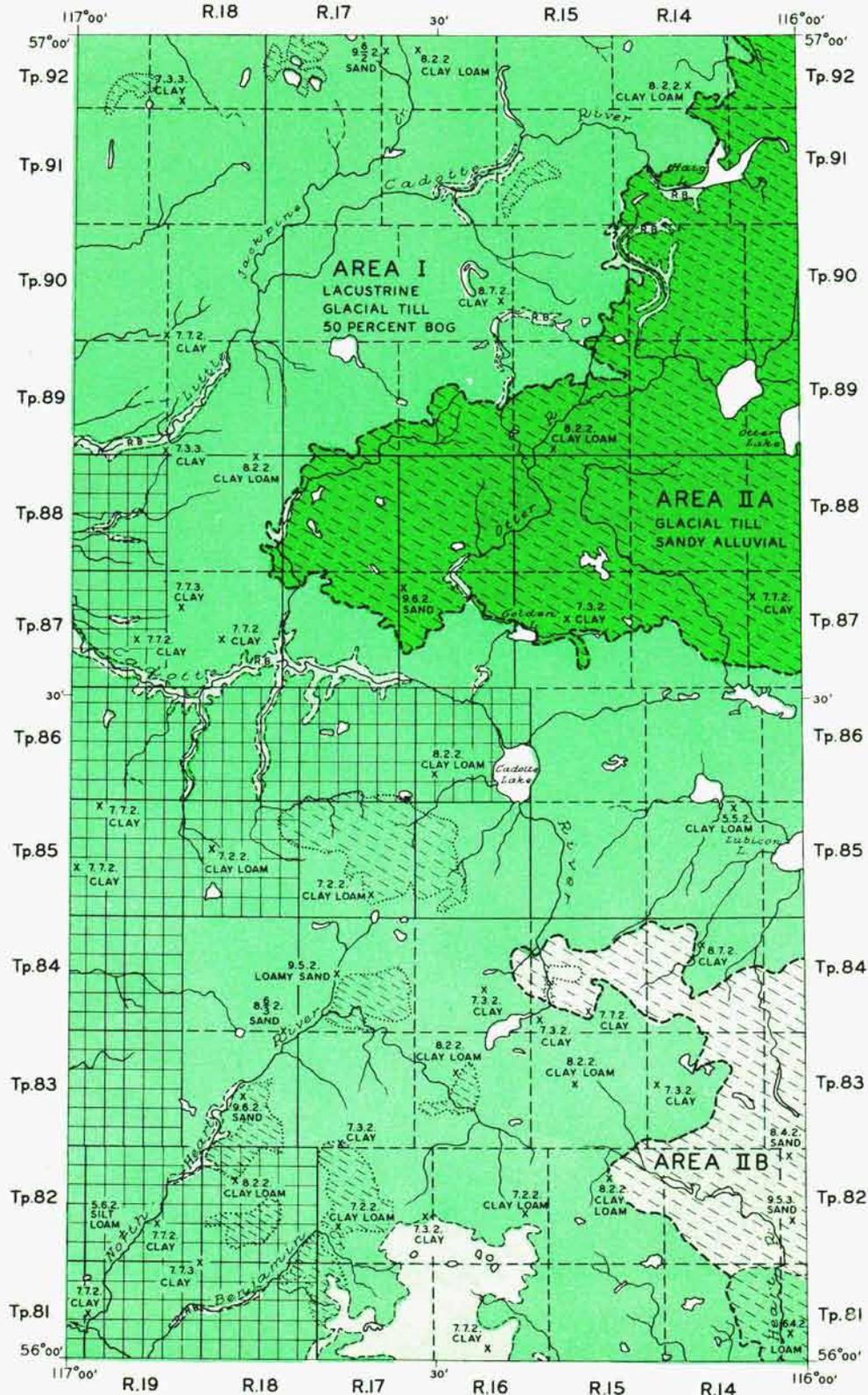
LEGEND

- Level and Undulating Topography
- Gently Rolling Topography
- Rolling Topography
- Pasture and Woodland

PRELIMINARY SOIL SURVEY AND RATING MAP

OF THE
ALBERTA SHEET 84-C (EAST HALF)

Scale in Miles
2 1 0 2 4 6 8 10



LEGEND

- | | |
|-----------------------|---------------------------------|
| Pasture and Woodland | Level and Undulating Topography |
| Doubtful Arable Land | Gently Rolling Topography |
| Potential Arable Land | Rough Broken Land |

Prepared by
Research Council of Alberta,
Edmonton - 1957.
Base map supplied by Technical Division,
Department of Lands and Forests,
Province of Alberta.