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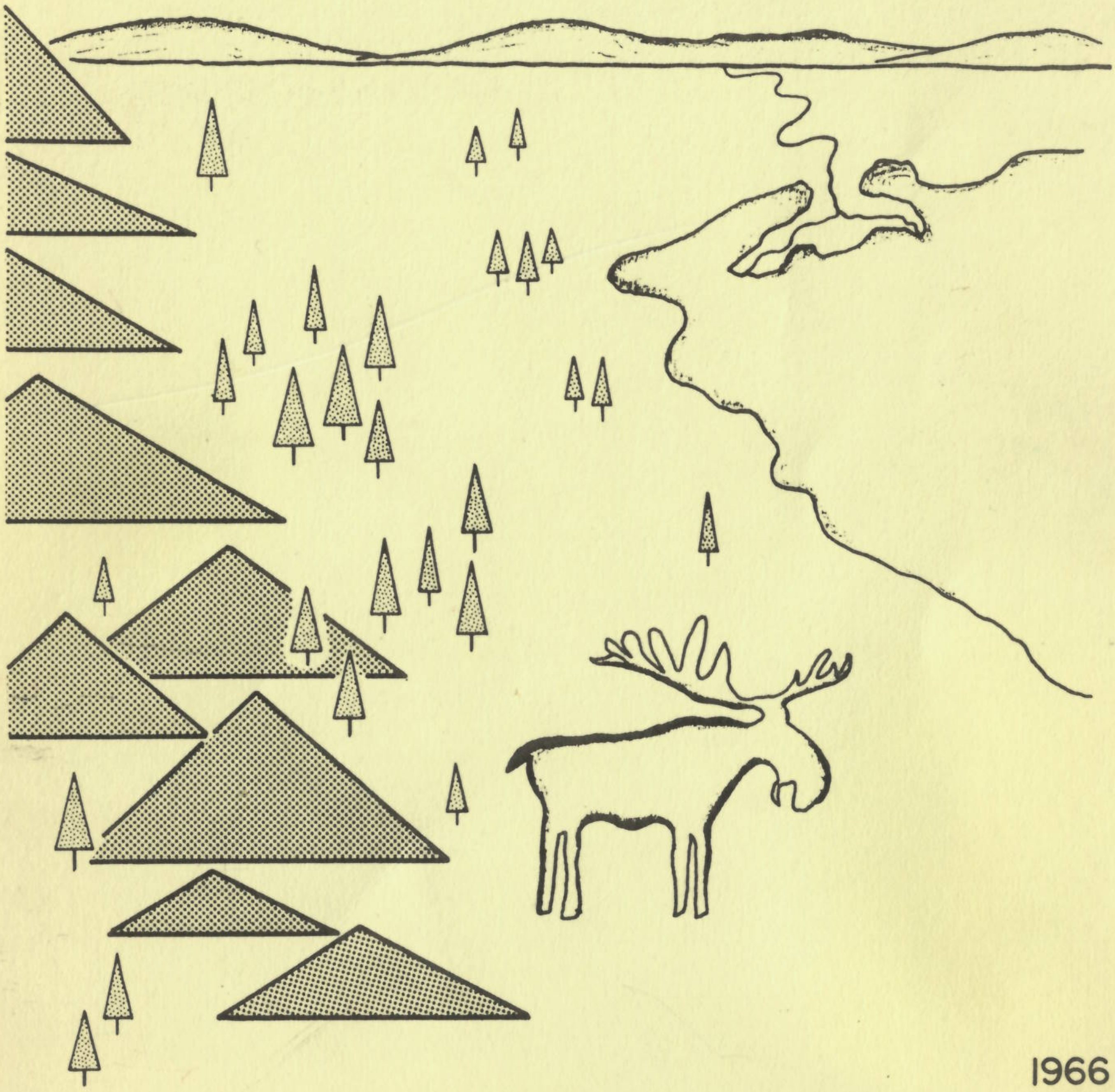
SOILS
of the
RED DEER LAKE AREA



1966

Report on the

SOILS

of the

RED DEER LAKE AREA IN MANITOBA

by

G.F. MILLS and R.E. SMITH

1966

With a Soil Map covering Township 45, Range 29W and portions of Township 44, Range 28W and 29W; Township 45, Range 28W; and Township 46 in Ranges 28W and 29W.

MANITOBA PEDOLOGY SECTION

Canada Department of Agriculture

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and

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Acknowledgement is made to Mr. H.J. Hortie, Canada Department of Agriculture, for his advice on this project and for his critical review of the report.

The soils were mapped by G.F. Mills and C.M. Kirkpatrick. Assistance in the field work was provided by D. Smith and L. Hopkins.

SUMMARY

The Report on the Soils of the Red Deer Lake Area covers 136 square miles (87,150 acres) in an embayment between Porcupine Mountain and the Pasquia Hills located on the west side of the province near Lat. N. 53°. This area lies within Townships 44 to 46 in Ranges 28 and 29 W.P.M. All of the map area except the lower slopes of Porcupine Mountain was once covered with the waters of glacial Lake Agassiz. The topography varies from level to gently undulating in the Agassiz Basin area to strongly undulating and steeply sloping in the Porcupine Mountain section. Surface and internal soil drainage is slow to moderate in the lowland area with more rapid drainage in the areas of rougher topography above the escarpment.

The climate is sub-humid with a definite summer maximum of precipitation. This area is characterized by fairly high precipitation in August and September along with cool temperatures. The average frost-free period is between 90 and 100 days. The climate becomes cooler and more humid with increased elevation on Porcupine Mountain. The native vegetation is dominantly aspen, balsam poplar, white birch, white and black spruce with the conifers becoming more prevalent with increasing elevation. Tamarack and black spruce prevail in many of the poorly drained areas. The vegetation in the wetter portions of the lowland area is dominantly sedges and reeds with willow and mixed forest on the levees.

The underlying bedrock formation in the north-eastern part of the map area is Paleozoic limestones and dolostones of the Devonian period. The central part of the area is underlain by Lower Cretaceous sandstones. The extreme southern part of the map area is underlain by Upper Cretaceous shales which outcrop on the steeply sloping face of Porcupine Mountain.

The Red Deer Lake Area may be divided into two main regions on the basis of physical features. The larger of the two areas is the Red Deer River plain which lies below the 1250 foot contour. This area is in the Lake Agassiz basin and contains water-laid deposits ranging from gravels to clays. A series of wave-cut terraces occur around the Porcupine Mountain between the 1075 and 1250 foot contours. They are composed of shaly clay deposits of various origin and cover about 7 per cent of the area. At this elevation, well developed gravel beaches also occur. A large part (39 per cent) of this landscape unit is covered by imperfectly and poorly drained recent flood plain deposits of variable texture (fine sand to heavy clay loam with clay loam texture predominating). The substrates under the shallower alluvial deposits vary from sands and gravels near the escarpment to silty clay and clay in the lake basin. Medium textured lacustrine and deltaic deposits comprise about 9 per cent of the area and are found in the north-western portion. Lacustrine silty clays and clays occupy about 1 per cent of the area and occur in the central portion around the periphery of Red Deer Lake. All of these deposits are underlain with strongly calcareous till at shallow depths. Glacial till occurs at the surface in the form of ground moraine only in the extreme eastern and western parts of the area (2 per cent). Shallow organic soils comprise 38 per cent of the area.

The remainder of the Red Deer Lake Map Area lies above the 1250 foot contour in the Porcupine Mountain section of the Western Uplands. This area consists of rougher morainic land with surface deposits being dominantly a medium textured moderately calcareous till of mixed limestone, shale and granitic origin. It comprises about 3 per cent of the map area.

The soils in the lowland are mainly Regosols and Gleysols on the recent flood plain deposits. Profile development on the lacustrine and till areas ranges from Gleyed Rego Black to Gleyed Dark Grey. Well drained soils on the beaches and deltaic deposits usually exhibit weakly developed Podzolic and Brunisolic profiles. Extensive areas of shallow organic soils occur. The soils on the uplands are mainly those of the Grey Wooded Great Group.

The map area is largely undeveloped. Present land-use is limited mainly to forestry and wildlife. Some trap lines are run by the local people and there is some fishing on Red Deer Lake and Red Deer River. Controlled use of the wildlife resources of this area is made during the hunting season. Agriculture use is limited to a few cultivated fields on the better drained alluvium and some native grazing on the lowland areas where the tree cover has been largely removed by fire. In drier years, hay is cut on the poorly drained levees and areas of treeless organic soils adjacent to Red Deer Lake.

The soils developed on the flood plain deposits have the highest agricultural potential of the land in this area. The present limitations are lack of control of runoff and inadequate drainage. The lacustrine and deltaic soils have the potential to produce a fairly wide range of crops, although extensive drainage would be necessary before utilizing the poorly drained areas. The stonier till areas, together with the steeply sloping parts of the wave-cut terraces and the morainic uplands, have severe limitations to agricultural use. The organic soils have little or no agricultural potential in their natural state.

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PART I

GENERAL DESCRIPTION OF AREA

A. LOCATION AND EXTENT

This report covers an area of 136 square miles (87,150 acres) located in an embayment between Porcupine Mountain and the Pasquia Hills in western Manitoba. The area includes Township 45, Range 29 and portions of Township 44, Ranges 28 and 29; Township 45, Range 28; and Township 46 in Ranges 28 and 29 all west of the Principal Meridian.

B. HISTORY OF DEVELOPMENT

Early settlement concentrated along the railway at the foot of Porcupine Mountain. Development has been dependent largely on the forest and wildlife resources of the area. Agricultural development of the Dauphin-Grandview areas in the late 1800's and in Swan River Valley in 1896 stimulated sawlog and lumber production. As a result, large saw mills were located at Bowsman, Birch River and Mafeking. A small saw mill still operates at National Mills. The present population is confined to the small hamlets of Westgate, National Mills, Barrows and the fire lookout tower on the shores of Red Deer Lake. The Porcupine Mountain was set up as a registered trap line area and has produced a sizeable quantity of fur. Development for recreation is just beginning as accessibility to the area increases.

PART II

PHYSIOGRAPHIC FACTORS AFFECTING SOIL FORMATION

A. GEOLOGY AND SOIL PARENT MATERIAL

A surface mantle of glacial drift covers the bedrock throughout most of the Red Deer Lake Area. As the glaciers retreated, glacial debris was resorted as stream outwash or deposited in local lakes. The drift deposits, recent flood plain deposits, lacustrine and deltaic deposits and organic deposits constitute the parent materials from which the soils have developed.

(i) Geology of the Underlying Rocks

The bedrock formations of the Red Deer Lake Area are shown in Figure 1. This area is underlain by Paleozoic limestones and Mesozoic shales and sandstones. The Mesozoic Formations contribute most of the materials that make up the surface deposits of this area. The central and northern part of the Red Deer Lake Area is underlain by Devonian limestones and dolostones of the Upper Manitoban Formation and Lower Cretaceous sands and sandstones of the Swan River Group. The Swan River sandstones are exposed along the Red Deer River five miles to the west of the map area. The hard, siliceous shales of the Riding Mountain Formation cap Porcupine Mountain to the south of the map area. The deposits on the wave-cut terraces on Porcupine Mountain may be residual shale beds.

(ii) Surface Deposits and Physiographic Areas

The kind of surface deposits occurring in the Red Deer Lake Area are defined in Table 1. The distribution of these deposits and their division into physiographic areas are shown in Figure 2.

The Red Deer River Plain, a subdivision of the Manitoba Lowlands, occupies the largest part of the map area. It extends north from a steeply sloping escarpment (elevation 1250 feet a.s.l.) on Porcupine Mountain. The escarpment

LEGEND

MESOZOIC

CRETACEOUS

UPPER CRETACEOUS

- 6 — *RIDING MOUNTAIN FORMATION: grey and greenish-grey shale with abundant clay ironstone concretions.*
- 5 — *VERMILION RIVER FORMATION: dark grey shale, calcareous speckled shale, bentonite.*
- 4 — *FAVEL FORMATION: calcareous speckled shale, limestone, bentonite.*

LOWER and UPPER CRETACEOUS

- 3 — *ASHVILLE FORMATION: dark grey shale, minor silt and sand.*

LOWER CRETACEOUS

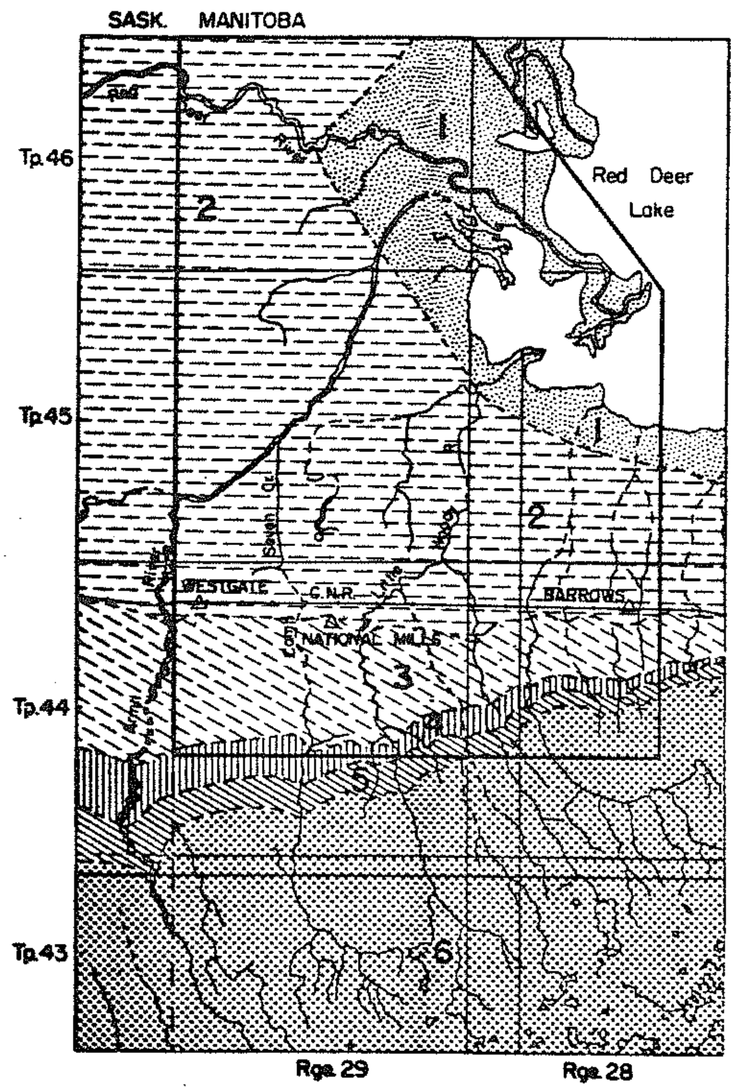
SWAN RIVER GROUP

- 2 — *Sand, sandstone, shale, clay*

PALAEOZOIC

DEVONIAN

- 1 — *Limestone, dolomite, red and buff shale.*



* Geology From Wickendon, R.T.D. Mesozoic Stratigraphy of the Eastern Plains, Manitoba and Saskatchewan. Canada Department of Mines and Resources, Geology Survey, Memoir 239, 1945.

Figure I. Bedrock Formations of the Red Deer Lake Area.*

TABLE 1

Description of Surface Deposits Occurring in the

Red Deer Lake Area

Deposit	Description
GLACIAL TILL DEPOSITS	
Modified Ground Moraine	Generally an unsorted mixture of rocks, boulders, sand, silt and clay deposited by glacial ice and resorted to some extent by wave-action of glacial lakes and meltwaters.
End Moraine	Often modified or resorted rough to hilly terminal ice deposits. Textures range from sand to clay loam. Frequently stonier than ground moraine.
GLACIO-FLUVIAL DEPOSITS	
Outwash	Glacial outwash sand and gravel deposits. Stone-free to excessively stony.
Beach	Stratified sandy and gravelly shoreline deposits which have been sorted by wave and water action.
LACUSTRINE AND FLOOD PLAIN DEPOSITS	
	Glacial lake and alluvial sands, silts and clays; also includes thin lacustrine deposits overlying till. Topography is usually level to gently sloping. Stone-free to slightly stony.
ORGANIC DEPOSITS	
	Accumulations of peat deposits in depressional areas under near permanently wet conditions.

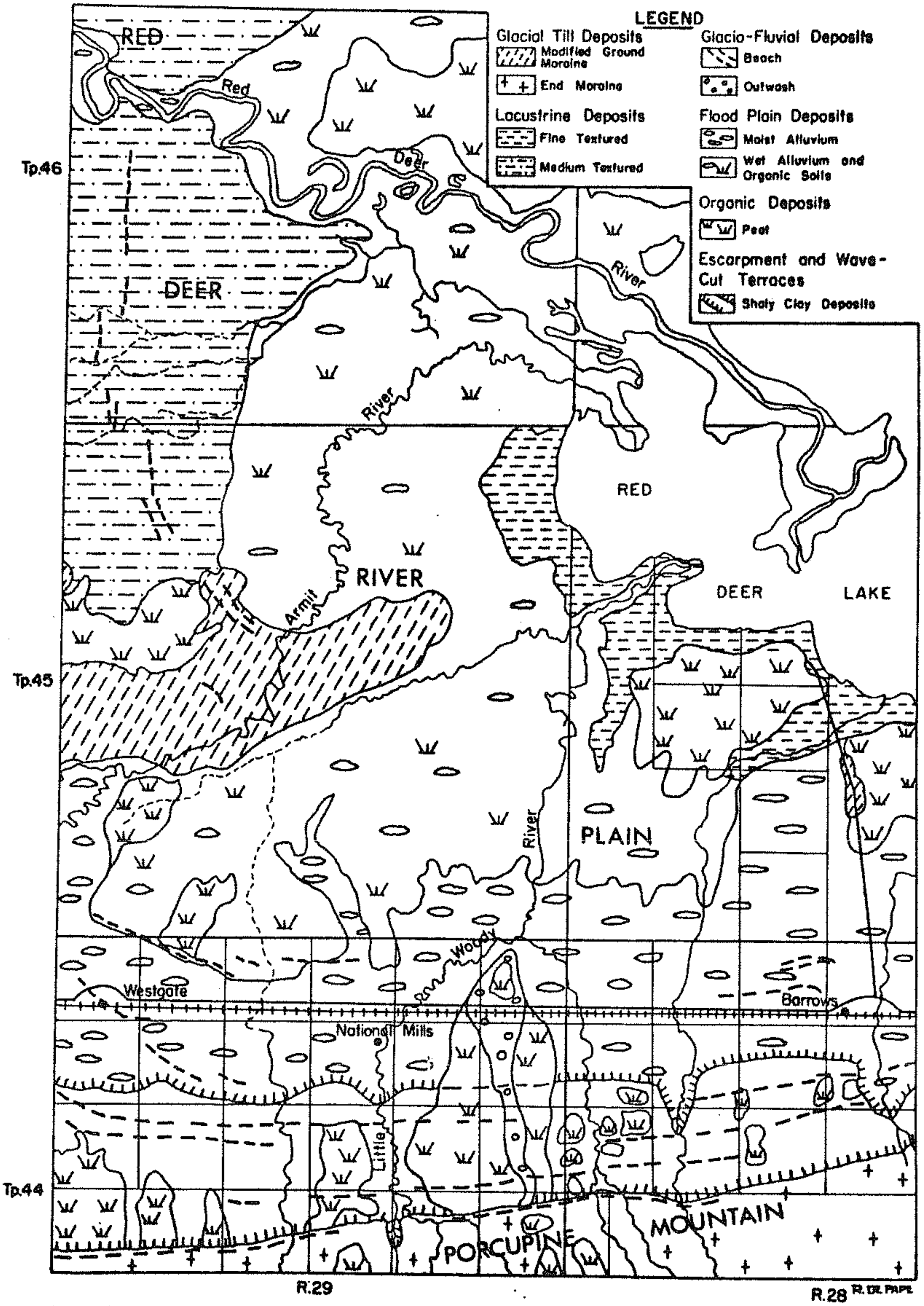


Figure 2. Physiographic Areas and Surface Deposits in the Red Deer Lake Area.

slope has a series of wave-cut terraces and well developed gravel beaches. The terraces are a complex of shaly clay till and outwash and alluvium derived from the shale beds. A large part of the Plain is covered by imperfectly and poorly drained flood plain deposits. The textures vary from fine sand to heavy clay loam with clay loam predominating. Substrates under the shallower alluvial deposits vary from sands and gravels near the escarpment to silty clay and clay in the lake basin. Medium textured lacustrine and deltaic deposits occur in the north-western part of the plain. Lacustrine silty clays and clays occur in the central portion around Red Deer Lake. All of these deposits are underlain by strongly to extremely calcareous till. A ground moraine occupies the extreme eastern and western parts of the plain. Other deposits occurring in the plain include beaches of sand and gravel and extensive areas of shallow organic soils. The topography varies from gently sloping in the glacial till areas to very gently sloping to level in the lacustrine and flood plain areas.

The remainder of the Red Deer Lake Area lies above the 1250 foot contour in the Porcupine Mountain section of the Western Uplands. This part of Porcupine Mountain consists of end moraine deposits with ground moraine and fluvial deposits occurring in some areas. The glacial till is moderately calcareous and contains some shale. The northern side of the moraine is quite steeply sloping. The face of the escarpment is deeply cut by ravines which originate along the top of the steep slope. The end moraine has a much rougher topography than the adjacent lowlands. Surface drainage is rapid over much of the terrain.

B. RELIEF AND DRAINAGE

The principal relief and drainage features of the Red Deer Lake Area are shown in Figure 3. The most prominent relief feature is the end moraine in the extreme south of the map area. The rise from the lowland area to this end

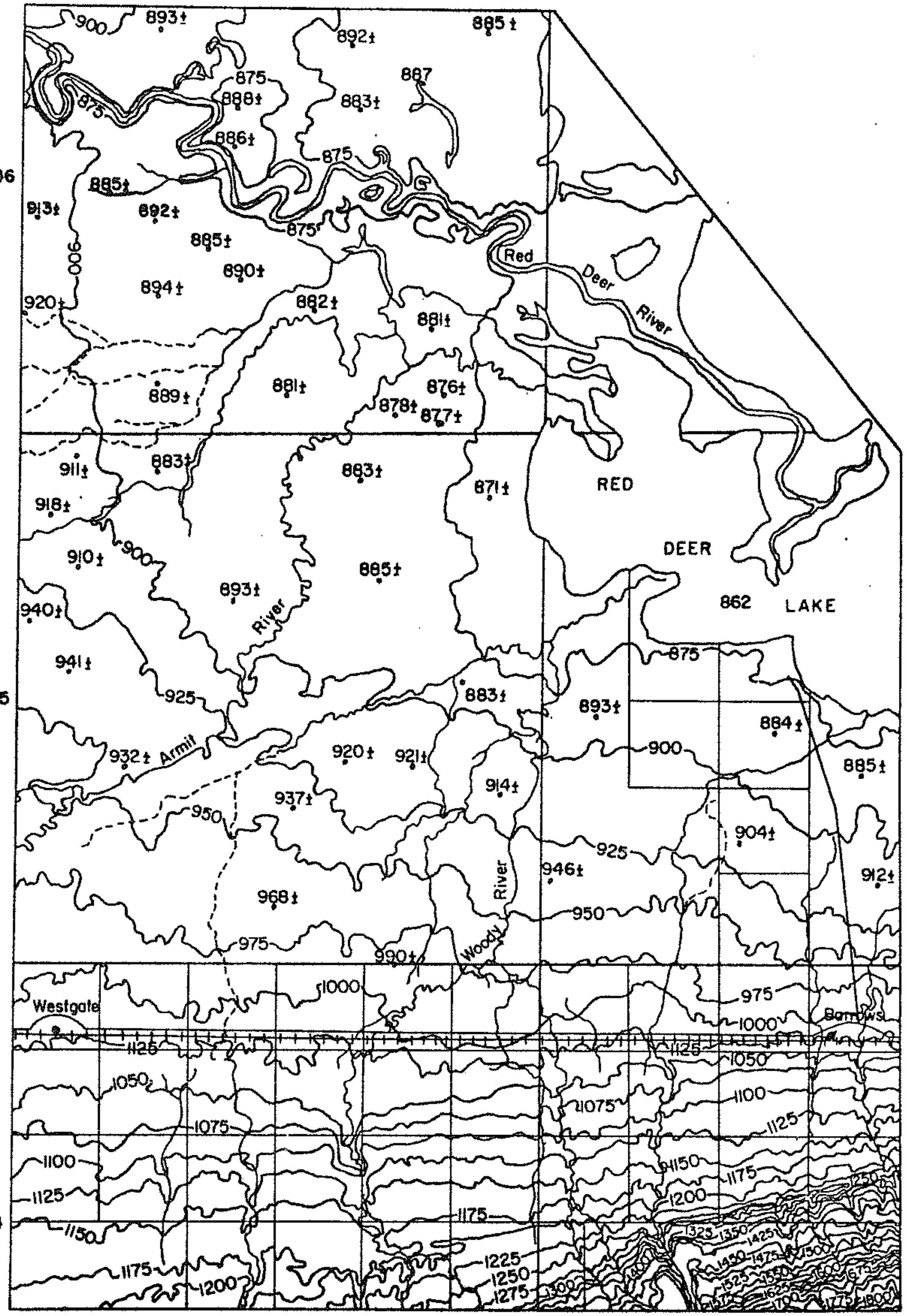


Figure 3. Principal Relief and Drainage Features of the Red Deer Lake Area.

moraine is fairly steep, being about 150 feet to the mile. The steepness of the slope increases with elevation where it may be 500 feet to the mile. From immediately below the escarpment area at about 1050 feet a.s.l., the land falls gently northwards to Red Deer Lake (el. 862 feet a.s.l.) at a rate of about 47 feet per mile on the eastern side of the map area. From Westgate, just below the escarpment on the Saskatchewan border, north-eastward to Red Deer Lake, the rate of fall is approximately 2.5 feet per mile. This rate of fall becomes less on the western side of the map area and in the lake basin.

Throughout most of the area, surface drainage is poorly developed. The imperfectly drained soils occur on the flood plain deposits immediately below the escarpment and on the levees of the streams. The poorly drained areas occur further from the levees and on areas of near level topography around Red Deer Lake. Flooding occurs frequently from the shallow bedded streams crossing the area.

Surface drainage of the area is provided by a network of streams contributing to Red Deer Lake which drains by way of the Red Deer River into Lake Winnipegosis. Local drainage is provided by the Armit and Little Woody rivers and numerous other unnamed creeks and intermittent streams flowing from the northern slopes of Porcupine Mountain.

C. CLIMATE

Precise information on the climate of the Red Deer Lake Area is not available. The general climate prevailing over this area of Manitoba is indicated by records from Hudson Bay Junction in Saskatchewan. For purposes of comparison, data are presented from Swan River and The Pas, Manitoba, Tables 2 and 3. Reference is also made to The Climates of Canada for Agriculture by Chapman and Brown*.

The area has a sub-humid climate with approximately 17 inches annual precipitation and a mean annual temperature of about 32°F. Approximately 13 inches of precipitation falls as rain during the period of April to October and about 4 inches falls as snow during the winter. The average annual water deficiency (4" storage assumed) is between 4 and 6 inches. The frost-free period is between 90 and 100 days. There are between 2000 and 2250 growing degree days above 42°F for this area.

The climate is modified with increasing elevation on Porcupine Mountain. A lower mean annual temperature at the higher elevations would cause a shortening of the frost-free and vegetative periods and a decrease in the number of growing degree days. The increase in precipitation on the uplands is likely to be slight as compared to the precipitation of the lowlands, but the cooler temperatures with increased elevation will result in a more humid climate.

In general, the frost-free period is marginal for wheat production, but is sufficiently long for production of coarse grains, forage and vegetable crops. The limit for the southern edge of the moderate frost-free hazard belt is 2200 degree days, so the climate of this area may be considered as a significant adverse departure from the medium climate of western Canada. Perhaps the most serious limitation to wheat and coarse grain production in the Red Deer Lake Area would occur in the fall when a combination of fairly high precipitation in August and September, together with cooler temperatures, result in poor harvesting conditions for grain crops.

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* Chapman, L.J. and Brown, D.M. The Climates of Canada for Agriculture. Report No. 3, 1966, The Canada Land Inventory, Dept. of Forestry and Rural Development, Canada.

TABLE 2

The Mean Monthly Temperatures in Degrees Fahrenheit

Recorded at Hudson Bay Junction, Sask.,

Swan River, Man. and The Pas, Man.

Month	Hudson Bay Junction, Sask.*		Swan River, Man.**		The Pas, Man.***	
	Years Obs.	Mean Monthly Temp. °F.	Years Obs.	Mean Monthly Temp. °F.	Years Obs.	Mean Monthly Temp. °F.
January	22	- 4.1	11	- 4.3	48	- 6.8
February	22	2.0	11	.8	48	- 1.1
March	22	20.9	12	17.3	48	12.1
April	23	34.6	27	36.2	47	35.6
May	23	48.0	29	49.5	47	48.1
June	23	57.2	30	58.6	48	58.3
July	23	63.4	32	64.1	47	64.6
August	23	60.5	32	60.9	47	61.3
September	23	49.2	30	50.5	48	50.4
October	23	39.9	27	39.5	49	37.8
November	23	19.3	12	20.3	49	17.8
December	23	3.2	12	4.3	49	1.2
Yearly Mean		32.2		33.1		31.6

* Data were obtained from the published records of the Climatology Division, Meteorological Branch, Department of Transport, Toronto, Ont.

** Data were obtained from Report of Detailed Reconnaissance Soil Survey of Swan River Map Sheet Area, Ehrlich, W.A., et al, Report No. 13, pp. 21 and 22.

*** Data were obtained from Report of Detailed Soil Survey of Pasquia Map Area in Northern Manitoba, Ehrlich, W.A., et al, Report No. 11, p. 21.

TABLE 3

The Mean Monthly Precipitation in Inches Recorded at

Hudson Bay Junction, Sask., Swan River, Man.

and The Pas, Man.

Month	Hudson Bay Junction, Sask.*		Swan River, Man.**		The Pas, Man.***	
	Years Obs.	Mean Monthly Precip. ins.	Years Obs.	Mean Monthly Precip. ins.	Years Obs.	Mean Monthly Precip. ins.
January	22	.61	8	.63	47	.75
February	22	.68	7	.79	48	.62
March	22	.91	7	.97	47	.79
April	23	1.00	31	.80	46	.96
May	23	1.54	33	1.55	47	1.51
June	23	2.70	34	3.11	48	2.29
July	22	2.90	35	2.99	48	2.50
August	22	2.29	36	2.57	47	2.33
September	22	1.77	35	1.82	48	1.95
October	23	.87	29	.95	48	1.14
November	23	1.19	8	1.05	48	1.11
December	23	.78	9	.91	48	.84
Yearly Mean		17.24		18.14		16.79

* Data were obtained from the published records of the Climatology Division, Meteorological Branch, Department of Transport, Toronto, Ont.

** Data were obtained from Report of Detailed Reconnaissance Soil Survey of Swan River Map Sheet Area, Ehrlich, W.A., et al, Report No. 13, pp. 21 and 22.

*** Data were obtained from Report of Detailed Soil Survey of Pasquia Map Area in Northern Manitoba, Ehrlich, W.A., et al, Report No. 11, p. 21.

D. VEGETATION

The Red Deer Lake Map Area lies entirely within the Boreal Forest Region (Rowe*). The two sections of the Boreal Forest Region occurring in the Red Deer Lake Area are the Manitoba Lowlands and the Mixedwood Sections.

The Manitoba Lowlands Section occupies the area designated as the Red Deer River Plain. While aspen (Populus tremuloides) is still the dominant species in this area, good stands of white spruce (Picea glauca) and balsam poplar (Populus balsamifera), sometimes in mixture with balsam fir (Abies balsamea) and white birch (Betula papyrifera), occur on the well drained sites. Jack pine (Pinus banksiana) also occur, but more particularly on sandy or gravelly sites. Areas of black spruce (Picea mariana) and tamarack (Larix laricina), together with treeless swamp and meadow areas, are found in the poorly drained sites. Green ash (Acer negundo) and white elm (Ulmus americana) occur on the recent flood plain deposits at the foot of the escarpment.

The Mixedwood Section is separated from the Manitoba Lowlands Section by elevation and climate. The characteristic forest cover is a mixture of white spruce, aspen and balsam poplar, white birch and balsam fir. In mature stands, the conifers are more prevalent and some jack pine are found on the drier soils. Depressions and small basins develop black spruce and tamarack bogs with shallow accumulations of peat.

The vegetation on the organic soils varies with a number of environmental factors, the most important of which are moisture regime and the nutrient status of the waters influencing the living plants. Very wet oligotrophic (low nutrient) sites support a vegetative cover of stunted black spruce and

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* Rowe, J.S. Forest Regions of Canada. Bulletin 123, Canada Dept. Northern Affairs and Natural Resources, Forestry Branch, Ottawa, 1959.

tamarack with an understory of sphagnum moss, sedges and ericaceous shrubs as the main peat formers. These areas are isolated from mineral influenced groundwaters. This may be due to location in the central portion of a large bog, or else to the convex surface of the peat deposits where the growth of the peat formers has raised the living plants above the level of the groundwaters.

Very wet, eutrophic (high nutrient) sites support sedges, reed grasses, hypnum mosses, bull rushes, cattails, willow and swamp birch in open fen areas. Sedges are the dominant peat former.

Slightly better drained eutrophic sites support dense stands of black spruce and stands of mixed black spruce and tamarack. Under this canopy, the dominant peat former is sphagnum and feathermosses in varying proportion with minor amounts of ericaceous shrubs.

PART III

SOILS

A. SOIL MORPHOLOGY

Soils form under the influence of the soil forming factors, (relief and drainage, climate, vegetation and other organic life operating on a parent material over a period of time) and exhibit definite morphological characteristics. Through observation of these characteristics, it is possible to classify soils and infer their genesis or the processes involved in their formation.

The soil profile is a vertical section of the soil through all its horizons (or layers) extending downward into the unweathered parent material. The soil horizons differ from one another in one or more of the following features: color, texture, structure, consistence, reaction, concretions, intrusions and chemical and biological composition. The main diagnostic horizons and subhorizons now in use in the Canadian Taxonomic Soil Classification are outlined in Appendix II.

B. SOIL GENESIS

Soil genesis is the mode of origin of various soils with special reference to the processes responsible for the development of the solum from the unconsolidated parent material. The formation of a soil is a complex process involving the interaction of a number of different factors discussed in Part II. A brief discussion of how the various soil forming factors have reacted to produce the major kinds of soil profiles in the Red Deer Lake Area follows.

Chernozemic Black and Dark Grey soils. These soils have characteristic dark colored A horizons developed by the cyclic accumulation and decomposition of grasses and forbs representative of grassland communities or grassland-forest communities. They generally have good structured brownish colored B horizons over lighter-colored calcareous C horizons.

Gleyed Rego Black soils characterized by an A-C profile have developed in this area. The lack of a B horizon is attributed to immaturity and/or the high lime content of the parent material. Soils: Lundar series, Plainview series, Swanford series.

Gleyed Dark Grey soils have developed under impeded drainage in a grassland-forest transitional area. These soils have started to degrade and develop weak Ahej and B horizons. Soils: Peguis series, Duck River series.

Podzolic Orthic Grey Wooded soils. These soils have developed in a cool moist climate under deciduous, coniferous or mixed-forest vegetation on calcareous parent material. The processes involved in the formation of these soils are depletion of bases in the solum, activation and translocation of clay and sesquioxides, causing the formation of an eluvial A horizon and an illuvial B horizon. Organic matter is added to these soils as a surface L-H horizon. The leaching by the decomposition products of this organic matter results in a light-colored eluviated Ae horizon. This Ae horizon is underlain by a darker colored, finer textured Bt horizon in which organic matter, sesquioxides and clays are the main accumulation products. The C horizon consists of lighter-colored, mildly alkaline and usually calcareous relatively unaltered material. Soils: Waitville association, Eroded Slopes complex, Woodridge complex.

Brunisolic Orthic Brown Wooded and Degraded Brown Wooded soils. These soils have developed under similar conditions of climate and vegetation as the Grey Wooded soils. They are characterized by a brownish colored sola without marked eluvial horizons. Soils: Armit series, Woodridge complex.

Regosolic soils. These soils occur under a climate and vegetative cover similar to associated Chernozemic and Podzolic soils, but they lack development due to youthfulness.

Those associated with Chernozemic soils include soils with a non-chernozemic Ah horizon that may or may not be present. Soils: Birch River series, Barrows series.

Those associated with Podzolic soils include soils which have light-colored eluvial horizons and weak illuvial horizons containing insufficient clay and sesquioxides to meet the B horizon requirements of Podzolic soils.
Soils: Sandilands series, Eroded Slopes complex.

Gleysolic (wet) soils. The dominant characteristics of these soils are determined by topographic position and drainage features that result in wet to saturated profiles and periodic conditions of poor aeration. These soils have developed under hydrophytic vegetation. They may have an organic surface horizon up to 18 inches, or a mineral surface (Ah) horizon or both. They are gleyed due to periods of intense reducing conditions when the soils are wet. The development of a bluish matrix with rusty yellowish mottles in these soils is due to partial oxidation and reduction of iron caused by intermittent wet and dry periods. Soils: Foley series, Fyala series, Kerry series, Meleb series, Novra series, Sundown series.

Organic soils. These soils occupy depressional areas which are permanently wet. They consist of various kinds of organic deposits accumulated on the surface of mineral materials. The organic deposits consist of mosses, sedges, aquatic and semi-aquatic plants, reeds and woody materials that vary in decomposition from relatively undecomposed and partially decomposed to highly decomposed. The type of peat being formed is dependent on the climate and nutrient status of the waters in the depressional area. Soils: Okno complex, Molson complex, Cayer complex.

C. SOIL CLASSIFICATION

The principal mapping unit used in this area is the soil series. Individual soil series may occupy large continuous land areas, but more commonly are associated with other soils in a complex landscape pattern. Non-conforming substrates, salinity and peat overlays are described as phases of the soil series.

The soil complex is a group of soil series that cannot be separated with the scale of mapping provided for in this survey. As mapping units, they are named according to the soil series they contain. They are described giving the proportions of the soil members and the topographic relationship to one another in the landscape pattern.

The soil association (catena) consists of a number of soil series developed on similar parent material within the same zonal region. The soil series result from differences in relief or drainage. In the Red Deer Lake Area, the mapping units include 15 series, 32 complexes and one association.

D. SOIL MAPPING

The amount of detail obtained in mapping the soils of the Red Deer Lake Area was limited by lack of accessibility. Traverses were made along the two main roads and along several of the old logging trails. Inspection of a large portion of the area was limited to foot traverses and helicopter spot checks. The information obtained from the soil inspections and associated landscapes was plotted on aerial photo-mosaics. The boundaries of the soil areas and relevant physical features were projected from the areas of ground inspection by interpretation of aerial photographs. A soil map of one inch equal one-half mile was prepared from the field sheets.

E. DESCRIPTION OF SOIL SERIES AND MAPPING UNITS

A key to the soils of the Red Deer Lake Area is presented in Table 4. The soil series are grouped according to parent material and drainage. The subgroup to which each series belongs is indicated in the table. The acreage figures recorded in the table are estimates of each series. The percentage of the area covered by each series is given.

TABLE 4

Key to Soils and Their Estimated Acreages in

the Red Deer Lake Area

	Acreage	% of Total
A. Soils Developed on Glacial Till		
1. Very Strongly Calcareous Till		
(a) Imperfectly drained		
(i) Lundar series (Gleyed Carbonated Rego Black)	1,339	1.50
(b) Poorly drained		
(i) Meleb series (Carbonated Rego Humic Gleysol)	746	0.90
2. Soils Developed on Moderately and Strongly Calcareous Till		
(a) Well to Poorly Drained		
(i) Waitville association (Orthic Grey Wooded, Gleyed Grey Wooded and Carbonated Rego Humic Gleysol)	2,536	2.90
3. Weakly to Moderately Calcareous Shaly Deposits		
(a) Imperfectly drained		
(i) Barrows series (Gleyed Mor Regosol)	5,769	6.60
B. Soils Developed on Lacustrine Deposits		
1. Moderately Calcareous Fine Textured Sediments		
(a) Imperfectly drained		
(i) Peguis series, till substrate phase (Gleyed Dark Grey)	297	0.30
(ii) Plainview series, till substrate phase (Gleyed Rego Black)	130	0.10

TABLE 4 - CONTINUED

	Acreage	% of Total
(b) Poorly drained		
(i) Fyala series (Rego Humic Gleysol)	831	0.81
2. Strongly Calcareous Moderately Coarse to Medium Textured Sediments		
(a) Well drained		
(i) Armit series (Degraded Brown Wooded)	559	0.60
(b) Imperfectly drained		
(i) Duck River series (Gleyed Dark Grey)	398	0.50
(ii) Swanford series (Gleyed Rego Black)	4,723	5.40
(c) Poorly drained		
(i) Foley series (Carbonated Rego Humic Gleysol)	1,858	2.00
C. Soils Developed on Variable Textured Recent Alluvium		
(a) Imperfectly drained		
(i) Birch River series (Gleyed Mor Regosol)	22,145	25.40
(b) Poorly drained		
(i) Novra series (Carbonated Rego Gleysol)	12,459	14.02
D. Soils Developed on Coarse Textured Outwash and Beach Deposits		
(a) Well drained		
(i) Woodridge complex (Orthic Grey Wooded, Orthic Brown Wooded, Degraded Brown Wooded)	2,088	2.40
(ii) Sandilands series (Arenic Podzo Regosol)	99	0.01
(b) Poorly drained		
(i) Sundown series (Carbonated Rego Humic Gleysol)	174	0.20
(ii) Kerry series (Rego Gleysol)	333	0.30

TABLE 4 - CONTINUED

	Acreage	% of Total
E. Soils Developed on Organic Deposits		
1. 18 to 60 inches of fibrous feathermoss-sphagnum peat		
(i) Okno complex (Organic Soil)	4,924	5.70
2. 18 to 60 inches of fibrous sphagnum peat		
(i) Molson complex (Organic Soil)	10,601	12.60
3. 18 to 60 inches of fibrous herbaceous peat		
(i) Cayer complex (Organic Soil)	7,344	8.85
F. Miscellaneous Soils and Materials		
(a) Eroded Slopes complex (Regosolic and Podzolic)	737	0.90
(b) Lakes in Map Area	7,004	8.00
(c) Sand Beaches	56	0.01
Total Area	87,150	100.00

The soil series are discussed in alphabetical order in the following section. Information is presented on the profile features that characterize each soil and on the properties of the soils. Detailed descriptions are given for some of the profiles. Analytical data for some of the profiles is presented in Appendix I. A discussion of the agricultural features of the soils is presented in Part IV.

ARMIT SERIES

The Armit series consists of well and moderately well drained Degraded Brown Wooded soils developed on strongly calcareous, moderately coarse to medium textured lacustrine and deltaic deposits. Dominant surface texture is very fine sandy loam.

The Armit soils occur in the north-western portion of the Red Deer River Plain. The deposits adjacent to the Red Deer River are fairly deep. The river has exposed deposits about 30 feet thick. South of the Red Deer River, the deposits thin out rapidly becoming a shallow overlay on till. North of the Red Deer River, a clay textured till lies under these deposits. The Armit soils occupy irregular, gently sloping topography. Drainage is good except where the till substrate is near the surface and internal drainage is impeded. A few stones occur in areas where the till is near the surface.

The solum of the Armit soils is thin (18 inches). In most cases, the carbonates have been removed from the upper 18 to 24 inches and weak eluvial (Aej) and illuvial (Btj or Bm) horizons are present. A description of the Armit series is given below:

L-H 1 to 0 inches, dark brown to brown (10YR4/3, dry) leaf and sod mat; slightly acid to neutral; abrupt, smooth, lower boundary.

Aej 0 to 5 inches, greyish brown (10YR5/2, dry) very fine sandy loam; single grain structure; loose when moist and dry; slightly acid; grades through a gradual, smooth boundary into:

Bm_1 5 to 8 inches, light yellowish brown (10YR6/4, dry), very fine sandy loam; single grain structure; loose when moist and dry; medium acid; gradual, smooth, lower boundary.

Bm_2 8 to 13 inches, brownish yellow (10YR6/6, dry), very fine sandy loam; single grain structure; loose when moist and dry; medium acid; abrupt, smooth, lower boundary.

Ck_1 13 to 24 inches, very pale brown (10YR7/4, dry), very fine sand; single grain structure; loose when moist and dry; mildly alkaline, moderately calcareous.

Ck_2 24 to 36 inches, very pale brown (10YR7/4, dry), very fine sand; single grain structure; loose when moist and dry; mildly alkaline and moderately calcareous.

Mapping Units

Armit Series (444 acres)

Areas consisting dominantly of Armit soils. Inclusions are primarily Duck River, Swanford and Foley soils.

Armit till substrate phase (115 acres)

Areas of Armit soils in which a substrate of calcareous clay till occurs within 30 inches of the surface. These soils usually have areas of scattered small stones on the surface. A thin gravel or cobble lens may occur at the contact of the two materials. The till substrate is usually compacted and may impede internal drainage. Inclusions are Duck River till substrate and Swanford till substrate soils.

BARROWS SERIES (5,769 acres)

The Barrow series consists of Gleyed Mor Regosols developed on moderately fine to fine textured weakly to moderately calcareous shaly deposits. They occur on the northern slopes of the Porcupine Mountain on a series of wave-cut terraces between the 1075 and the 1250 contours. These shaly deposits are a complex of shaly clay till, outwash and alluvium derived from the shale beds. The topography is gently to strongly sloping, falling about 100 feet per mile through a series of step-like terraces. The terraces fall initially at a 10 to 15 per cent slope and then level off through long, gentle slopes to the point where the next terrace begins. Associated with the summit of each terrace are beach deposits which vary from a thin discontinuous deposit of sand and gravel to large, well developed, stratified sand and gravel beaches.

Surface runoff is moderate on the sloping terrain and very slow in the depressional areas. Internal drainage is impeded by the nature of the fine textured deposits. The dominant soils are Gleyed Mor Regosols. They have 6 to 8 inches of undecomposed and partially to well decomposed L-H horizon underlain by very dark grey to black heavy clay C horizon.

BIRCH RIVER SERIES

The Birch River series consists of Gleyed Mor Regosol soils developed on moderately to strongly calcareous, coarse to moderately fine textured alluvial deposits. Dominant texture in the profile is loam to clay loam.

The Birch River soils occur on the stream terraces and the small fans which are forming from materials carried down from the bordering upland. The topography is smooth level to irregular, very gently sloping. The irregularity is caused by areas of shallow water courses and low levees. Surface drainage is good, particularly on the levees adjacent to the streams. Internal drainage is impeded by bands of fine textured sediments in the profile and by a high water-table in wet periods.

These soils have an organic surface horizon and sometimes a weak Ah horizon. Buried soils are common. Stratification with sorted materials ranging from sands to clays is common. The substrates under the shallower, alluvial deposits vary from sands and gravels near the escarpment to silty clay and clay further in the lake basin. A description of a Birch River profile is presented below:

L-H 6 to 0 inches, very dark brown (10YR2/2, dry) leaf mat; medium acid; abrupt, smooth, lower boundary.

Ckg 0 to 8 inches, greyish brown (10YR5/2, dry), silt loam; weak fine granular; friable when moist, soft when dry; mildly alkaline; very strongly calcareous; iron stained; abrupt, smooth, lower boundary.

IIL 8 to 9 inches, compacted leaf litter, abrupt, smooth, lower boundary.

IIICkg 9 to 13 inches, light brownish grey (10YR6/2, dry), loam; weak fine granular; friable when moist, soft when dry; mildly alkaline, strongly calcareous; abrupt, smooth, lower boundary.

IVCkg 13 to 17 inches, pale brown (10YR6/3, dry), loamy very fine sand; single grain structure, loose when moist and dry; mildly alkaline; strongly calcareous, very strongly iron stained; abrupt, smooth, lower boundary.

VCkg 17 to 25 inches, pale brown (10YR6/3, dry), silt loam; weak fine granular; friable when moist, soft when dry; mildly alkaline; strongly calcareous; abrupt, smooth, lower boundary.

VICkg 25 to 36 inches, very pale brown (10YR7/3, dry), loamy fine sand; single grain structure; loose when moist and dry; mildly alkaline; strongly calcareous; iron stained.

In a few small cultivated areas of Birch River soils, it was noted that the mixing of the L-H horizon with the mineral material forms a darker colored surface layer. A description of a cultivated Gleyed Mor Regosol soil follows.

Apk 0 to 8 inches, dark grey and greyish brown (10YR4/1 and 5/2), silt loam, weak medium granular; friable when moist, soft when dry; neutral, moderately calcareous; clear, smooth, lower boundary.

Ckg 8 to 30 inches, greyish brown to pale brown (10YR5/2 to 6/3, dry), silt loam; weak fine granular; friable when moist, soft when dry; mildly alkaline; strongly calcareous; clear, smooth, lower boundary.

IICkg 30 to 36 inches, pale brown (10YR6/3, dry), medium sand, single grain structure; loose when moist and dry; mildly alkaline; strongly calcareous.

Mapping Units

Birch River Series (15,166 acres)

Birch River till substrate and sand substrate soils may be included with the Birch River series. Small areas of Novra soils may also occur.

Birch River till substrate phase (205 acres)

Very strongly to extremely calcareous till occurs within 6 to 30 inches of the surface. There is usually a gravel or cobble lens at the contact of the two materials. Areas of these soils occur at the periphery of the alluvial fans.

Birch River sand substrate phase (265 acres)

Coarse sand and gravel is found within 6 to 30 inches of the surface. These soils occur near the escarpment where areas of sand and gravel outwash have been buried by recent flood plain deposits.

Birch River-Novra complex (2,833 acres)

Birch River-Novra peaty phase complex (8,205 acres)

Areas containing Birch River and Novra soils in which the individual soil areas are too small and intimately mixed to be shown separately on the soil map. The Birch River soils occupy the higher land on the stream levees and the Novra soils occur in the lower depressional areas behind the levees and in abandoned stream channels.

Birch River-Birch River till substrate phase complex (307 acres)

Areas containing Birch River series and the till substrate phase. These areas occur where the underlying till is near the surface.

CAYER COMPLEX

The Cayer complex consists of a group of soil series developed on 18 to 60 inches of fibrous, herbaceous peat deposits. These soils occur in the lowland area surrounding Red Deer Lake. The topography is nearly level having a slope of 4 to 8 feet per mile.

The soils of the Cayer complex occur in nutrient rich (eutrophic) fen and patterned fen areas. The organic deposits are derived from sedges, reed grasses, mosses and semi-aquatic plants. The flat treeless fens occur more frequently than the patterned fens. The nutrient saturated groundwater determines the kind of vegetation and thus the peat formers. The mineral materials underlying these soils are usually clay loam to clay textured lacustrine and alluvial deposits.

These soils are usually slightly acid to neutral, medium to fine fibered at the surface grading into more compact and matted fine fibered material as the depth increases. The organic material is generally dark brown to brown (10YR3/2 to 2/2) in color.

Mapping Units

Cayer Complex (4,883 acres)

Areas of Cayer complex with minor inclusions of poorly drained mineral soils.

Fyala peaty phase-Cayer complex (257 acres)

-See Fyala series.

Molson-Cayer complex (3,161 acres)

-See Molson complex.

Okno-Cayer complex (750 acres)

Okno-Molson-Cayer complex (709 acres)

-See Okno complex.

Novra peaty phase-Cayer complex (1,439 acres)

-See Novra series.

DUCK RIVER SERIES

The Duck River series consists of Gleyed Dark Grey soils developed on strongly calcareous, moderately coarse to medium textured lacustrine and deltaic deposits. Surface textures range from very fine sandy loam to silt loam.

The Duck River soils occur in scattered patches in the west-central portion of the Red Deer River Plain. The topography is irregular, gently sloping. Runoff is moderate. They are moderately permeable. These soils are stone-free, but boulders and cobbles occur where the till is close to the surface.

The Duck River soils are weakly degraded with a thin dark grey A horizon that may be blotched with grey patches in the lower portion. The B horizon has a slight clay accumulation and is mottled. The solum is generally about 15 inches thick; the sola of the till substrate phases are usually thinner.

Mapping Units

Duck River Series (398 acres)

Areas consisting dominantly of Duck River soils. Inclusions are principally Swanford and Armit soils.

ERODED SLOPES COMPLEX (737 acres)

This complex consists of Regosolic and Podzolic soils occurring on the sharp slopes of the various streams and eroded channels. Orthic Regosols are found where erosion, solifluction and slippage occur on the sharp slopes. Degrading soils occur on less sharply inclined slopes. Surface textures are variable, although medium textures tend to predominate. Nearly all slopes are forested with aspen, birch and spruce, with black poplar, ash, birch and spruce occurring at lower elevations.

FOLEY SERIES

The Foley series consists of Carbonated Rego Humic Gleysol soils developed on strongly to very strongly calcareous, moderately coarse to medium textured lacustrine and deltaic deposits. Surface textures range from fine sandy loam to silt loam.

These soils occur on the western end of the Red Deer River Plain in depressional areas under a cover of sedges, reeds, scattered spruce and tamarack. Fires have destroyed the tree cover and the area is now covered with sedges, reeds, willows and swamp birch. In some areas, the surface layer of peat has been destroyed by fire. Permeability is moderately rapid, although the underlying till is impermeable. Scattered surface stones occur only where the underlying till is near the surface.

Foley soils have a dark colored Ahkg horizon 4 to 10 inches thick underlain by a transitional dark greyish brown ACkg horizon which gradually fades into a strongly gleyed calcareous C horizon. Foley peaty phase soils have an organic surface of 6 to 18 inches of mixed fen and moss peat. The till substrate phase may have a gravel or cobble layer at the contact.

Mapping Units

Foley Series (190 acres)

Areas of Foley soils. Inclusions are mainly Foley peaty phase soils.

Foley peaty phase (210 acres)

Areas of Foley peaty phase soils which may contain minor inclusions of Foley soils, Cayer complex and Molson complex soils.

Foley till substrate peaty phase (187 acres)

Areas of Foley peaty phase soils in which a very strongly to extremely calcareous till occurs within 6 to 30 inches. These soils may be higher in calcium carbonate content than Foley soils and have scattered stones on the surface.

Foley peaty phase-Okno complex (253 acres)

Foley peaty phase-Molson complex (1,448 acres)

<u>Foley till substrate peaty phase-Molson complex</u> (358 acres)

These complexes occur in depressional areas. Foley peat phase soils are found around the periphery of the depression and Okno or Molson complex soils occur in the depression where the organic deposits are deeper.

<u>Swanford-Foley complex</u> (774 acres)

<u>Swanford-Foley peaty phase complex</u> (161 acres)

<u>Swanford till substrate-Foley till substrate peaty phase complex</u> (79 acres)

-See Swanford series.

<u>FYALA SERIES</u>

The Fyala series consists of Rego Humic Gleysol soils developed on moderately calcareous, fine textured lacustrine deposits. The clay is underlain by very strongly to extremely calcareous, moderately fine textured till. A few small areas of these soils occur in depressional areas adjacent to the south-west corner of Red Deer Lake. These soils have a level to depressional topography. Permeability is slow and ponding of water in the spring and after heavy rainfalls is quite common. Native vegetation appears to have been good stands of spruce with some aspen and black poplar but, due to fire, much of this soil is now covered by meadow grasses, sedges and willows. Some cobbles and stones are present where the till is near the surface.

Fyala peaty phase soils have 6 to 18 inches of fibrous mixed moss and fen peat which is underlain by a thin dark grey A horizon high in organic matter and neutral to mildly alkaline. The Ah horizon is 2 to 4 inches thick, may be carbonated and tongues into the C horizon. A thin grey transitional layer containing some organic matter may separate the Ah horizon from a light grey strongly gleyed C horizon.

Mapping Units

Fyala peaty phase (107 acres)

In areas that are dominantly Fyala peaty phase soils, minor inclusions are principally Molson complex and Fyala soils.

Fyala till substrate peaty phase (239 acres)

Fyala peaty phase soils in which a substrate of very strongly to extremely calcareous till occurs within 30 inches.

Fyala peaty phase-Cayer complex (257 acres)

Fyala peaty phase-Molson complex (350 acres)

Areas in which Fyala peaty phase soils and Molson complex soils occur in such a complex pattern that no individual soil areas could be separated at the mapping scale used.

Peguis till substrate-Fyala till substrate peaty phase complex (372 acres)

-See Peguis series.

Plainview till substrate-Fyala till substrate peaty phase complex (186 acres)

-See Plainview series.

KERRY SERIES

The Kerry series consists of Rego Gleysol soils developed on coarse textured outwash and lacustrine deposits. These soils occur in depressional areas in association with the Sandilands soils on an elongated narrow bar about a mile below the escarpment. The topography is level to depressional and soil drainage is poor. The ground water-table is at or near the surface for a considerable part of the growing season. These soils are stone-free.

Kerry soils have a strongly mottled, slightly acid to neutral Ahg horizon usually less than 3 inches thick. The upper portion of the Cg horizon may be leached or bleached and frequently has mottling. In very wet sites, where the water-table does not fluctuate, the Cg horizon is strongly gleyed and lacks mottling. Kerry peaty phase soils have 6 to 18 inches of slightly acid, non-woody fibrous to humic peat overlying the mineral material. A representative soil profile of the Kerry series is described below:

L-H 5 to 0 inches, very dark brown (10YR2/2, dry), non-decomposed to partially decomposed mucinic peat, medium to fine fibrous; loose; slightly acid; clear, smooth, lower boundary.

Ahg 0 to 3 inches, dark grey (10YR4/1, dry) medium and fine sand; single grain structure; loose when wet and moist; neutral; diffuse, smooth, lower boundary.

ACg 3 to 10 inches, light brownish grey (10YR6/2, dry), medium and fine sand, single grain structure; loose when wet and moist; neutral; diffuse lower boundary.

Cg 10 to 36 inches, light grey (10YR7/2, dry), medium and fine sand; single grain structure; loose when wet and moist; neutral.

Mapping Units

Kerry peaty phase (80 acres)

Areas consisting of Kerry peaty phase soils with inclusions of Kerry soils and Okno complex soils.

Kerry peaty phase-Okno complex (362 acres)

Areas of Kerry peaty phase and Okno complex soils where the individual soil areas are too small and intimately mixed to be separated at the scale of mapping.

LUNDAR SERIES

The Lundar series consist of Gleyed Carbonated Rego Black soils developed on very strongly to extremely calcareous water-worked till. This high lime till underlies the Red Deer River Plain and where the surface deposits are thinner, till substrate phases occur. Lundar soils occur on the eastern side near Red Deer Lake and in a complex area near the Manitoba-Saskatchewan border. The topography is smooth, level to gently sloping. These soils are moderately to very stony.

The modal Lundar soils have a thin solum with a dark grey A horizon grading into the gleyed, very strongly calcareous parent material. The A horizon is usually moderately alkaline and contains calcium carbonate. There may be a transitional AC horizon which fades into the C horizon. A representative Lundar soil profile is described below:

L-H 10 to 0 inches, very dark brown (10YR2/2, dry), leaf litter; neutral; clear, smooth, lower boundary.

Ahk 0 to 4 inches, black to very dark brown (10YR2.5/1, moist) and grey (5Y5/1, dry), clay loam; weak fine granular; sticky when wet, hard when dry; strongly calcareous; diffuse, smooth, lower boundary.

ACkg 4 to 18 inches, very dark greyish brown (10YR3.5/1, moist) and light brownish grey (2.5Y6/2, dry), clay loam; amorphous; sticky when wet, very hard when dry; very strongly calcareous; clear, smooth, lower boundary.

Ccag 18 to 20 inches, grey (10YR5.5/1, moist) and light grey (2.5Y7/2, dry) clay loam; amorphous; sticky when wet, very hard when dry; very strongly calcareous; diffuse, smooth, lower boundary.

Ckg 20 to 36 inches, light grey (10YR7/2, dry), clay loam; amorphous; sticky when wet, very hard when dry; strongly calcareous.

Mapping Units

Lundar Series (96 acres)

Areas consisting dominantly of Lundar soils with inclusions of Meleb soils.

Lundar-Meleb complex (1,190 acres)

Lundar-Meleb peaty phase complex (30 acres)

Areas containing both Lundar and Meleb soils in which the individual soil areas are too small to be shown separately on the soil map.

Swanford till substrate phase-Lundar complex (1,266 acres)

-See Swanford series.

MELEB SERIES

The Meleb series consists of Carbonated Rego Humic Gleysol soils developed on very strongly to extremely calcareous water-worked till and may include soils developed on a very thin mantle (less than 6 inches) of lacustrine sediments over the till. Surface textures vary from sandy loam to clay. These soils are associated with Lundar soils south of the Red Deer River on the western side of the map area. The Meleb soils occupy the depressional portions of this smooth level to irregular, very gently sloping till area. These soils are moderately to very stony depending on the depth of the lacustrine mantle over the very stony till.

Meleb soils have a very thin dark grey A horizon that is calcareous and may tongue into the extremely calcareous C horizon. Where a thin lacustrine mantle lies over the till, the A horizon usually ends at the contact. A gravel or cobble lens usually occurs at the contact. Meleb peaty phase soils have 6 to 18 inches of fibrous fen and moss peat overlying the mineral material.

Mapping Units

Meleb peaty phase (136 acres)

Areas consisting dominantly of Meleb peaty phase soils with inclusions of Meleb and Cayer complex soils.

Lundar-Meleb complex (1,190 acres)

Lundar-Meleb peaty phase complex (30 acres)

-See Lundar series.

MOLSON COMPLEX

The Molson complex consists of a group of soil series developed on 18 to 60 inches of fibrous sphagnum peat deposits. These soils are associated with soils of the Cayer complex and the Okno complex. The topography of these areas is nearly level with slopes of 4 to 8 feet or more per mile.

The soils of the Molson complex occur in low nutrient areas covered by stunted black spruce and tamarack with an understory of mosses, sedges and ericaceous shrubs as the dominant peat formers. The mineral materials underlying these soils vary from lacustrine and alluvial deposits in the lowland areas to undifferentiated materials in the Porcupine Mountain area.

These soils are usually strongly acid in the surface sphagnum layers and become slightly acid to neutral where the lower layers are derived from mixed sedges and mosses. The peat is coarse to medium fibered at the surface, becoming medium to fine fibered and more compact as the depth increases. The organic material is generally brown (10YR5/3, dry) at the surface and dark brown to very dark brown (10YR3/3 to 2/2, dry) at lower depths.

Mapping Units

Molson complex (3,174 acres)

Areas of Molson complex soils with inclusions of poorly drained mineral soils.

Molson-Cayer complex (3,161 acres)

Areas of organic soils in which treeless fen areas occur intimately mixed with areas of moss peat supporting stunted black spruce and tamarack.

Okno-Molson complex (3,138 acres)

Okno-Molson-Cayer complex (709 acres)

-See Okno complex.

Foley peaty phase-Molson complex (1,448 acres)

Foley till substrate peaty phase-Molson complex (358 acres)

-See Foley series.

Fyala peaty phase-Molson complex (350 acres)

-See Fyala series.

Novra peaty phase-Molson complex (2,831 acres)

Novra peaty phase-Molson-Cayer complex (914 acres)

-See Novra series.

NOVRA SERIES

The Novra series consists of Carbonated Rego Gleysol soils developing on moderately to strongly calcareous, coarse to moderately fine textured alluvial deposits. Dominant texture in the profile is loam to clay loam.

The Novra soils occur on recent alluvial deposits in nearly level, low lying portions of the Red Deer River Plain. Previous flooding from the Armit and Little Woody rivers and other smaller intermittent streams is indicated by buried organic horizons in the profile. The topography is very gently to gently sloping with some abandoned stream channels and low levees. The better drained soils occur on the levees; wetter soils occur in the old stream channels. Permeability is moderately rapid in the medium textured materials to slow in finer sediments. These soils are stone-free.

The Novra soils have less than 6 inches of organic material on the surface. underlain by mineral substrata with a weak Ah horizon (less than 3 inches). There is usually a layer of calcium carbonate concentration in the upper 6 to 12 inches of soil. Buried surface soil horizons are common in the profiles. Novra peaty phase soils consist of a thin layer of mixed moss and fen peat (6 to 18 inches) overlying the mineral soil. Surface peat common to undisturbed sites has disappeared from many areas through fires. A description of a Novra peaty phase soil is given below:

L-H 10 to 0 inches, dark brown (7.5YR3/2, dry) peat; abrupt, smooth, lower boundary.

Ahkg 0 to 3 inches, very dark greyish brown (2.5Y3/2, dry), silt loam, weak fine granular; plastic when wet, hard when dry; strongly calcareous; clear, smooth, lower boundary.

Ccag1 3 to 8 inches, light brownish grey (2.5Y6/2, dry) silty clay loam, amorphous; plastic when wet, hard when dry; very strongly calcareous; clear, smooth, lower boundary.

Ckg2 8 to 24 inches, pale brown (10YR6/3, dry) silt loam, amorphous; plastic when wet, hard when dry; strongly calcareous.

Mapping Units

Novra Series (1,914 acres)

Areas of Novra soils; small areas of Novra peaty phase soils may occur where the peaty surface has been incompletely burned.

Novra till substrate phase (50 acres)

Areas of Novra soils in which a very strongly to extremely calcareous till substrate occurs within 30 inches.

Novra saline phase (94 acres)

An elongated area of Novra soils near Red Deer River which has been affected by a salt spring.

Novra peaty phase (1,731 acres)

Areas consisting of Novra peaty phase soils; inclusions are Novra soils and the soils of Cayer and Molson complexes.

Novra sand substrate peaty phase (24 acres)

Coarse sand and gravel occurs within 6 to 30 inches of the surface in areas near the escarpment where sand and gravel outwash have been buried by recent flood plain deposits.

Novra-Novra peaty phase complex (405 acres)

Areas of Novra soils in which the peaty phase is so intimately mixed with the Novra soils that the two could not be separated on the scale of mapping used.

Novra peaty phase-Okno complex (714 acres)

Novra peaty phase-Molson complex (2,831 acres)

Novra peaty phase-Cayer complex (1,439 acres)

Novra peaty phase-Molson-Cayer complex (914 acres)

Areas of organic soils in which Novra peaty phase is so intimately mixed with the organic soils that the two could not be separated at the scale of mapping used.

Birch River-Novra complex (2,833 acres)

Birch River-Novra peaty phase complex (8,205 acres)

-See Birch River series.

OKNO COMPLEX

The Okno complex consists of a group of soils developed on 18 to 60 inches of fibrous feathermoss-sphagnum peat deposits. They occur in scattered areas around Red Deer Lake and in depressional areas on the lower slopes of Porcupine Mountain. At higher elevations on Porcupine Mountain (above the 1100 foot contour), the soils of Okno complex are associated with the Molson complex. The topography of these areas is nearly level, the slope usually not exceeding 4 to 8 feet per mile.

These organic soils are usually brown to dark brown, coarse to medium fibered, loose to compacted and strongly acid in the surface layers. This grades into a medium to fine fibered,compact and/or matted, strongly to slightly acid, dark brown to black sedge and moss peat. These soils are more compacted than the soils of the Molson complex and contain considerably less sphagnum. The water-table usually recedes to about two feet by mid-summer. A description of one of the soils of the Okno complex is given below:

Fi_1 0 to 1 inch, living cover of green and reddish brown sphagnum mosses and hypnales (feathermoss), extremely acid.

Novra peaty phase-Molson complex (2,831 acres)

Novra peaty phase-Cayer complex (1,439 acres)

Novra peaty phase-Molson-Cayer complex (914 acres)

Areas of organic soils in which Novra peaty phase is so intimately mixed with the organic soils that the two could not be separated at the scale of mapping used.

Birch River-Novra complex (2,833 acres)

Birch River-Novra peaty phase complex (8,205 acres)

-See Birch River series.

OKNO COMPLEX

The Okno complex consists of a group of soils developed on 18 to 60 inches of fibrous feathermoss-sphagnum peat deposits. They occur in scattered areas around Red Deer Lake and in depressional areas on the lower slopes of Porcupine Mountain. At higher elevations on Porcupine Mountain (above the 1100 foot contour), the soils of Okno complex are associated with the Molson complex. The topography of these areas is nearly level, the slope usually not exceeding 4 to 8 feet per mile.

These organic soils are usually brown to dark brown, coarse to medium fibered, loose to compacted and strongly acid in the surface layers. This grades into a medium to fine fibered,compact and/or matted, strongly to slightly acid, dark brown to black sedge and moss peat. These soils are more compacted than the soils of the Molson complex and contain considerably less sphagnum. The water-table usually recedes to about two feet by mid-summer. A description of one of the soils of the Okno complex is given below:

Fi_1 0 to 1 inch, living cover of green and reddish brown sphagnum mosses and hypnales (feathermoss), extremely acid.

Fi_2 1 to 1.5 inches, 100 per cent fiber, non-living sphagnum and feather-mosses interspersed with fungal mycelia, extremely acid.

Fi_3 1.5 to 18 inches, medium to fine fibered, dark reddish brown (5YR3/2, wet); dark brown (7.5YR3/2, dry); porous, loose, extremely acid; contains some woody material; abrupt, smooth, lower boundary.

Fi_4 18 to 30 inches, very fine fibrous, dark reddish brown (5YR2/2, wet; 5YR3/2, dry); dense, matted, medium acid.

Me_1 30 to 40 inches, about 50 per cent very fine fiber, dark reddish brown (5YR2/2, wet) dark brown (7.5YR3/2, dry); dense, matted, medium acid.

Me_2 40 to 55 inches, approximately 50 per cent fiber, dark brown (7.5YR3/2, dry); dense, very compacted, medium acid; abrupt, smooth, lower boundary.

IIC_1 55 to 60 inches, grey to light brownish grey (2.5Y5/0 to 6/2, dry) silty clay to clay, amorphous; very plastic when wet, very hard when dry; strongly calcareous.

Mapping Units

Okno complex (2,794 acres)

Areas of Okno complex soils with inclusions of poorly drained mineral soils.

Okno-Cayer-complex (750 acres)

Okno-Molson-Cayer complex (709 acres)

Areas of poorly drained organic soils in which treeless fen areas occur intermixed with soils developed on sphagnum peat and mixed sphagnum and feather-moss peats.

Okno-Molson complex (3,138 acres)

Areas of poorly drained organic soils in which sphagnum peats occur in such close association with mixed sphagnum-feathermoss peats that the two could not be separated on the scale of mapping used.

Foley peaty phase-Okno complex (253 acres)

-See Foley series.

Kerry peaty phase-Okno complex (362 acres)

-See Kerry series.

Novra peaty phase-Okno complex (521 acres)

-See Novra series.

PEGUIS TILL SUBSTRATE PHASE

The Peguis till substrate phase consists of Gleyed Dark Grey soils developed on moderately calcareous fine textured lacustrine deposits overlying very strongly to extremely calcareous, moderately fine textured till. The till is at a depth of 6 to 30 inches.

These soils occur in a few small areas near the south-western corner of Red Deer Lake. The topography is irregular, very gently sloping. Runoff is moderate to slow. A small number of stones occur on the surface.

The slight degradation of this soil is indicated in the Ahej and Btj horizons. The soils are slightly acid in the A horizon and neutral to mildly alkaline in the B horizon. The sola of the till substrate phase soils range from 8 to about 16 inches and are thinner than the sola of the Peguis soils. A description of a representative Peguis till substrate phase soil is given below:

L-H 6 to 0 inches, very dark brown (10YR2/2, dry) leaf and sod mat; medium acid; clear, smooth, lower boundary.

Ahej 0 to 3 inches, dark grey to grey (10YR4/1-5/1, dry) clay; moderate fine granular; plastic when wet, firm when moist; slightly acid; diffuse, smooth, lower boundary.

Btjg 3 to 8 inches, very dark grey (10YR3/1, moist) and grey (10YR5/1, dry) clay; moderate fine granular; plastic when wet, very firm when moist; slightly acid; diffuse, smooth, lower boundary.

Ckg 8 to 12 inches, light grey (10YR6/1, dry) silty clay; amorphous; plastic when wet, hard when moist; moderately calcareous; clear, smooth, lower boundary.

IICkg 12 to 24 inches, light grey (10YR7/1, dry) silty clay loam, amorphous; non-plastic when wet, very firm when moist; very strongly calcareous.

Mapping Units

Peguis till substrate phase (111 acres)

The very strongly to extremely calcareous till occurs within 6 to 30 inches. Associated with these soils are minor inclusions of Lundar, Plainview till substrate phase and Fyala till substrate peaty phase.

Peguis till substrate phase-Fyala till substrate peaty phase complex (372 acres)

Areas of Peguis till substrate phase and Fyala till substrate peaty phase in which the individual soil areas are too small and intimately mixed to be shown separately on the soil map. The Fyala till substrate peaty phase soils occupy the depressions in the irregular, gently sloping landscape.

PLAINVIEW TILL SUBSTRATE PHASE

The Plainview till substrate phase consists of Gleyed Rego Black soils developed on moderately calcareous, fine textured lacustrine deposits overlying very strongly to extremely calcareous, moderately fine textured till. The till is at a depth of 6 to 30 inches.

These soils occur in a few small areas near the south-western corner of Red Deer Lake in association with Fyala till substrate peaty phase soils. The Plainview till substrate phase soils occupy level to very gently sloping areas with slow to medium runoff. Permeability is generally slow. Some stones are present where the till is close to the surface.

The soil has a dark colored Ah horizon underlain by a transitional AC horizon. The Ah horizon may tongue into the C horizon. The C horizon is underlain by till. Development of the sola does not extend into the calcareous till.

Mapping Units

Plainview till substrate-Fyala till substrate peaty phase complex (186 acres)

Areas in which Plainview till substrate and Fyala till substrate peaty phase soils occur in such close association that they could not be separated on the scale of mapping used.

SANDILANDS SERIES

The Sandilands series consists of well and rapidly drained Arenic Podzo Regosol soils developed on coarse textured sandy outwash and beach deposits. These soils occur on a narrow bar of sandy outwash about one mile below the toe of the escarpment and in a complex of sand and gravel deposits on the eastern portion of the escarpment area. Native vegetation is mainly jack pine.

Sandilands soils have very weakly developed horizons distinguishable only by faint change in color and reaction. They have a thin Ahe horizon underlain by an Ae horizon and an indefinite Bfj horizon. The B horizon grades very gradually into structureless, very pale brown sand which may contain a slight accumulation of lime carbonate at 3 or more feet. A Sandilands soil is described below:

L-H 2 to 0 inches, very dark brown (10YR2/2, dry) partially to moderately decomposed needles, twigs, mosses, herbs and grasses; neutral; abrupt, smooth, lower boundary.

Ahej 0 to 6 inches, brownish grey (10YR5/2, dry) medium and fine sand; single grain structure; loose when moist and dry; medium acid; gradual, smooth, lower boundary.

Bfj 6 to 24 inches, yellowish brown (10YR5/4, dry) medium and fine sand; single grain structure; loose when moist and dry; medium acid; diffuse, smooth, lower boundary.

BC 24 to 32 inches, pale brown (10YR6/3, dry) medium and fine sand; single grain structure; loose when moist and dry; medium acid; diffuse, smooth, lower boundary.

Ccag 32 to 46 inches, pale brown to very pale brown (10YR6/3-7/3, dry) medium and fine sand; single grain structure; loose when moist and dry; neutral; moderately calcareous; clear, smooth, lower boundary.

Ckg_2 46 to 58 inches, brown (10YR5/3, dry), medium and fine sand; single grain structure; loose when moist and dry; weakly calcareous; clear, smooth, lower boundary.

Ckg_3 58 inches plus, light grey (10YR7/2, dry) medium and fine sand; single grain structure; loose when moist and dry; moderately calcareous.

Mapping Units

Sandilands Series (86 acres)

Areas that are dominantly Sandilands series. Inclusions are Armit series and Gleyed Arenic Podzo Regosol soils.

Woodridge-Sandilands complex (42 acres)

-See Woodridge series.

SUNDOWN SERIES

The Sundown series consists of Carbonated Rego Humic Gleysol soils developed on calcareous coarse textured sand and gravel outwash and beach deposits. These soils may have a thin overlay of finer textured materials.

The Sundown soils occur in small areas on the north-facing slope of Porcupine Mountain associated with the beach ridges which parallel the escarpment. Some of these ridges have been partially eroded or washed out. The outwash is deposited behind a ridge downslope and Sundown soils are formed on these deposits. These soils have rapid permeability, but have a high water-table over much of the year. The soils are stone-free to slightly stony.

Sundown soils have a thin dark colored Ahkg horizon. A strongly calcareous, strongly gleyed, sometimes mottled and stratified sandy and gravelly Ckg horizon underlies the Ah horizon. Sundown peaty phase soils have an organic surface of 6 to 18 inches of mixed fen and moss peat.

Mapping Units

Sundown peaty phase (174 acres)

Areas of Sundown peaty phase soils with minor inclusions of Sundown soils, Molson complex and Okno complex soils.

SWANFORD SERIES

The Swanford series are Gleyed Rego Black soils developed on strongly calcareous, moderately coarse to medium textured lacustrine and deltaic deposits. Surface textures range from very fine sandy loam to silt loam. The Swanford soils are scattered over the western portion of the Red Deer River Plain. The topography is irregular, very gently to gently sloping. Runoff and permeability are both moderate. At the present time, much of the tree cover has been destroyed by fire. Some stones occur where the underlying till is close to the surface.

The Swanford series consists of soils with calcareous surface horizons underlain by a strongly calcareous substrata. They have a thin L-H horizon (2 to 6 inches) overlying a very dark grey Ah horizon (4 to 15 inches) which is usually carbonated. A thin transitional light brownish grey AC horizon (2 to 4 inches) may be present. This gradually fades into a very pale brown to white C horizon. The textures usually become slightly coarser with depth. In the till substrate phase soils, there is usually a gravelly or cobbly lens at the contact of the two materials.

Mapping Units

Swanford Series (3,323 acres)

Areas that are dominantly Swanford soils. Duck River soils may occur as inclusions.

Swanford till substrate phase (259 acres)

These soils are underlain by very strongly to extremely calcareous till within 6 to 30 inches. Drainage may be slightly better than the Swanford soils as the till substrate causes more relief.

Swanford-Foley complex (774 acres)

Swanford-Foley peaty phase complex (161 acres)

Areas of Swanford and Foley soils in which the individual soil areas are too small and intimately mixed to be shown separately on the soil map. Within these areas, the Swanford soils occupy the knoll and upper slope position, while the poorly drained Foley soils occur in the intervening depression. The poorly drained soils of the latter complex have a 6 to 18 inch surface organic cover.

Swanford-till substrate-Foley till substrate peaty phase complex (79 acres)

Areas of Swanford-Foley peaty phase complex which are underlain by very strongly to extremely calcareous till at depths of 6 to 30 inches.

Swanford till substrate-Lundar complex (1,266 acres)

Areas of Swanford till substrate and Lundar soils occurring in complex patterns with no individual soil area large enough to warrant separation on the scale of mapping used.

WAITVILLE ASSOCIATION (2,536 acres)

The Waitville association are medium textured soils developed on moderately calcareous till of mixed limestone, granitic and shale origin. The imperfectly and well drained soils are Grey Wooded.

The Waitville soils of the map area occur on the northern slopes of Porcupine Mountain above the 1250 foot contour. The topography is irregular, gently to very steeply sloping. Most of the soils are well drained having rapid runoff and moderate permeability. Stoniness ranges from moderate to severe.

The dominant series is the well drained Orthic Grey Wooded. Other soils in the association are Gleyed Grey Wooded and Carbonated Rego Humic Gleysol soils.

WOODRIDGE COMPLEX

The Woodridge complex consists of well to excessively drained Orthic Brown Wooded, Degraded Brown Wooded and Orthic Grey Wooded soils developed on coarse textured stratified sand and gravel outwash and beach deposits. There may be a thin sandy surface mantle over the coarser materials. Surface textures range from loamy fine sand to sand. These soils have rapid runoff and permeability. These soils are slightly stony.

Most of the beach and outwash deposits in the Red Deer Lake area are included in the Woodridge soil complex. The largest area of these soils occurs on the north-facing slope of Porcupine Mountain.

All soils of the Woodridge complex show some effects of leaching, but the degree of degradation varies with position on the ridges. The summit of the ridge is usually characterized by Orthic Brown Wooded soils. They have a thin L-H horizon underlain by a very thin dark brown Ah horizon. A brownish colored Bm horizon overlies the moderately calcareous, stratified coarse sand and gravel.

The intermediate and lower slopes of the ridges exhibit Grey Wooded profiles with thin greyish brown Ae horizons and strongly developed Bt horizons. Between the Orthic Brown Wooded soils and the Grey Wooded soils, there are areas of Degraded Brown Wooded soils. These soils have a thin L-H horizon underlain by weak Aej and Btj horizons.

Mapping Units

Woodridge complex (2,059 acres)

Areas consisting of normal Woodridge soils. These areas of Woodridge soils are quite distinct and rarely include other soils.

Woodridge-Sandilands complex (42 acres)

Areas of coarse textured outwash and beach deposits in which ridges of Sandilands soils occur in such a complex pattern with the Woodridge soils that they could not be separated on the scale of mapping used.

PART IV

SOIL CAPABILITY CLASSIFICATION FOR AGRICULTURE

A. THE SOIL CAPABILITY CLASSIFICATION

The soil capability classification for agriculture is an interpretive grouping that shows in a general way what the capability of the soils are for growing a range of regionally adapted crops. In this classification, the mineral soils are grouped into seven classes according to their limitations for agricultural use. Class 1 soils have few limitations, the widest range of use and the least risk of damage when they are used for agriculture. The soils in the other classes have progressively greater natural limitation.

The first three classes contain soils which are considered capable of sustained production of common field crops, soils in the fourth are marginal for sustained arable culture, the fifth is capable of use only for permanent pasture and hay, the sixth is capable of use only for wild pasture, while soils in Class 7 are unsuitable for arable culture or permanent pasture. Soil areas in all classes may be suited for forestry, wildlife, recreational and engineering purposes.

This capability classification consists of two main categories: (1) the capability class and (2) the capability subclass. The class is a grouping of subclasses that have the same relative degree of limitation or hazard. The subclass is a grouping of soils with similar kinds of limitation and hazards and indicates major kinds of limitations within classes. These are adverse climate (c); undesirable soil structure and/or low permeability (d); erosion (e); low fertility (f); overflow (i); moisture limitation mainly because of coarse texture (m); salinity (n); stoniness (p); consolidated bedrock (r); accumulative adverse soil characteristics in place of subclasses d, f, m and n, either individually or collectively (s); topography, slope and pattern (t);

wetness (w); and cumulative minor adverse characteristics where there is a moderate limitation caused by the cumulative effect of two or more adverse characteristics which singly are not serious enough to affect the class rating (x).

B. CAPABILITY GROUPINGS OF SOILS OF THE RED DEER LAKE AREA

There are no soils of the Red Deer Lake Area in Class 1 because this region is affected by a significant adverse departure from what is considered as the median climate of western Canada. Thus, the best soil with no limitations other than climate is downgraded according to the severity of the climatic limitation. Soils with other significant limitations or hazards to use will be placed in lower classes as the subregional climate affects all of them. Soils downgraded to Class 4 or lower, because of other limitations, remain in their original class. The severity of the limitations is the dominant factor in the capability of these soils and overrides the effects of the adverse climate. (See Part II, Climate).

Brief descriptions of the various classes and subclasses, together with soils contained in each class, are presented in the following sections.

CLASS 1. Soils in this class have no significant limitations in use for crops. They are level or have very gentle slopes and are deep, well to imperfectly drained with a good water-holding capacity. They are easily maintained in good tilth and productivity, and damage from erosion is slight. They are moderately high to high in productivity for a wide range of field crops.

No soils of the Red Deer Lake Are are listed in this capability class.

CLASS 2. Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices. These soils have good water-holding capacity and are either naturally well supplied with plant nutrients or are highly responsive to inputs of fertilizer. They are moderately high to high in productivity for a fairly wide range of field crops adapted to the region. The limitations are not severe and good soil cropping practices can be applied without serious difficulty.

Limitations may include any one of the following: climate; accumulation of undesirable soil characteristics; low fertility; poor soil structure or slow permeability; topography; overflow and wetness. There are no soils described in the Red Deer Lake Area listed in this capability class.

CLASS 3. Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices. They are medium to moderately high in productivity for a range of crops. These soils have more severe limitations than those in Class 2. These limitations affect one or more of the following farm practices: timing and ease of tillage, planting and harvesting, the choice of crops, the application and maintenance of conservation practices. The limitations also include one of the following: moderate climatic limitation including frost pockets, erosion, structure or permeability, low fertility, topography, overflow, wetness, low water-holding capacity or slowness in release of water to plants, stoniness, depth of soil to consolidated bedrock. The capability units in this class are described below:

3dw - These soils are imperfectly drained and water moves slowly through them due to the fine texture and poor structure which result in low permeability. As the soils in this unit are level to very gently sloping, adequate surface drainage is required for crop production. If drainage is improved, these soils would be placed in Subclass 2dw.

Peguis till substrate phase

Plainview till substrate phase

3i - These soils are subject to periodic damaging overflow. They are smooth level to irregular, very gently sloping. If runoff is controlled adequately and sufficient drainage supplied, these soils could grow a wide range of field crops within the limitations imposed by the climate. These soils would be classified in Subclass 2c if improvement measures were carried out.

Birch River Series

3x - These soils have a moderate limitation due to the cumulative effect of two or more adverse characteristics, which singly are not serious enough to lower the class rating from 2c.

Duck River Series

Swanford Series

CLASS 4. Soils in this class have severe limitations that restrict the range of crops or require special conservation practices or both. These soils have such limitations that they are only suitable for a few crops, or the yield for a range of crops is low, or the risk of crop failure is high. The limitation may seriously affect such farm practices as the timing and ease of tillage, planting, harvesting and the application and maintenance of conservation practices. These soils are low to medium in productivity for a narrow range of crops, but may have higher productivity for a specially adapted crop. The limitations include the adverse effects of one or more of the following: moderately severe climate, very low water-holding capacity, low fertility difficult or unfeasible to correct, strong slopes, severe past erosion, poor structure or extremely slow permeability, frequent overflow, severe salinity, extreme stoniness, very restricted rooting zone and poor drainage resulting in crop failures in some years. The capability units in this class are described below.

4m - These soils are low in natural fertility and have low water-holding capacity. In years of low precipitation, these soils need protection from wind erosion.

Armit Series

4p - These soils are moderately to very stony. Extensive stone-picking programs are required to improve these soils so that common tillage practices are not severely hindered.

Lundar Series

4t - These soils occur on gently to strongly sloping topography. They are limited as to ease of tillage and by danger of erosion.

Barrows Series

CLASS 5. Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, but improvement practices are feasible. These soils have such serious soil, climatic, or other limitation that they are not capable of use for sustained production of annual field crops. However, they may be improved by the use of farm machinery for the production of native or tame species of perennial forage plants. Feasible improvement practices include clearing of bush, cultivation, seeding, fertilizing and water control. The limitations include the adverse effects of one or more of the following: severe climate; low water-holding capacity; severe past erosion; steep slopes; very poor drainage; very frequent overflow; severe salinity permitting only salt tolerant forage plants to grow; stoniness or shallowness to bedrock that make annual cultivation impractical. The capability units in this class are:

5t - These soils are irregular, gently to very steeply sloping. They are further limited by adverse climate due to increased elevation.

Waitville Association

CLASS 6. Soils in this class are capable only of producing perennial forage crops and improvement practices are not feasible. Class 6 soils have some natural sustained grazing capacity for farm animals, but have such serious soil, climate, or other limtation as to make impractical the application of improvement practices that can be carried out on Class 5 soils. Soils may be placed in this class because their physical nature prevents improvement through the use of farm machinery, or the soils are not responsive to improvement practices or because of a short grazing season or because stock-watering facilities are inadequate. Such improvement as may be affected by seeding and fertilizing by hand or by aerial methods shall not change the classification of these soil areas.

The limitations include the adverse effects of one or more of the following: very severe climate; very low water-holding capacity; very steep slopes; very severely eroded land; severely saline land producing only edible, salt tolerant native plants; very frequent overflow; water on the soil surface for most of the year and stoniness or shallowness to bedrock that makes annual cultivation impractical. The capability units in this class are:

6mf - These coarse textured soils are very low in water-holding capacity and natural fertility. They are well drained and so the rooting zone is usually not affected by a water-table.

Sandilands Series

Woodridge Complex

6w - These soils occur in depressional to level areas and are normally flooded for considerable periods of time. Drainage of widespread areas of these soils cannot be effected by the individual at the farm level, but must be carried out through larger scale governmental and community action. It should be noted that, when such drainage improvements are made, these soils would become capable of sustained arable culture or marginal for sustained arable culture dependent on what the remaining limiting factors are.

6w 1 - Medium textured, permeable soils which, if the drainage is improved, will be subject to a moderately severe limitation of wetness - Class 3w.

Foley Series

6w 2 - These fine textured soils have slow permeability. If adequate surface drainage is provided, they will be subject to a moderately severe to severe limitation of wetness - Class 3w.and 4w..

Fyala Series

6w 3 - These coarse textured soils will be subject to severe limitations due to wetness if adequate drainage is supplied - Class 4w.

Kerry Series

Sundown Series

6wi - These soils are limited by wetness and flooding. If the flooding hazard is controlled and adequate drainage is supplied, these soils will have a moderately severe limitation due to wetness - Class 3w.

Novra Series

6wp - These are medium textured, moderately to very stony soils. If adequate drainage is supplied, they will be subject to severe limitations of stoniness - Class 4p.

Meleb Series

CLASS 7. Soils in this class have no capability for arable culture or permanent pasture. The Class 7 soils have limitations so severe that they are not capable of use for arable culture or permanent pasture. These lands may or may not have a high capability for trees, native fruits, wildlife and recreation. The capability units in this class are:

7t - These steeply to extremely sloping soils have limited forestry and wildlife use.

Eroded Slopes Complex

O The interpretive soil capability classification is not applied to organic soils since, in general, there is insufficient information on these organic soil areas to make such an interpretative judgement.

The Organic Soils are very poorly drained and permanently wet. They are of no agricultural value in their natural state and little is known of their capabilities when they are drained. With adequate drainage, some areas of Cayer complex soils have been utilized for limited hay production and grazing. The soils in this class are:

Okno Complex

Molson Complex

Cayer Complex

APPENDIX I

TABLE 5

Chemical and Physical Analysis of Some Soils of

The Red Deer Lake Area

Horizons and Depths (inches)	% Sand	% Silt	% Clay	pH	Cond mmhos/cm²	% $CaCO_3$ Equiv.	% Calcite	% Dolomite	% Org. C	% Total N	C/N	Exch. Cap. m.e.	Exchangeable Cations m.e./100 gms Ca	Mg	Na	K	H	% Free Iron (Oxalate)
ARMIT SERIES																		
L-H 1-0	—	—	—	6.6	0.4	—	—	—	13.1	0.9	14	—	—	—	—	—	—	—
Aej 0-5	70	24	6	6.4	0.3	—	—	—	—	—	—							.136
Bm_1 5-8	68	26	6	5.7	0.1	—	—	—	—	—	—	7.6	5.9	1.9	0.1	0.3	1.2	.146
Bm_2 8-13	73	21	6	5.9	0.1	—	—	—	—	—	—	5.5	4.5	2.2	0.1	0.3	0.7	.132
Ck_1 13-24	88	9	3	7.5	0.3	18.2	2.7	14.4	—	—	—	—	—	—	—	—	—	.077
Ck_2 24-36	87	11	2	7.6	0.2	17.2	4.2	12.0	—	—	—	—	—	—	—	—	—	.086
BIRCH RIVER SERIES																		
L-H 6-0	—	—	—	6.1	0.3	—	—	—	41.6	2.2	19	—	—	—	—	—	—	—
Ckg 0-8	7	78	15	7.4	0.3	27.0	9.0	16.5	1.9	0.2	10	—	—	—	—	—	—	—
IIL 8-9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
IIICkg 9-13	45	45	10	7.4	0.2	22.0	6.3	14.5	1.0	0.1	10	—	—	—	—	—	—	—
IVCkg 13-17	77	18	5	7.5	0.4	20.3	9.0	10.3	0.4	0.1	4	—	—	—	—	—	—	—
VCkg 17-25	36	53	11	7.5	0.2	21.7	7.9	12.7	0.8	0.1	8	—	—	—	—	—	—	—
VICkg 25-36	86	11	3	7.5	0.2	17.3	9.5	7.2	0.2	0.1	2	—	—	—	—	—	—	—
BIRCH RIVER SERIES (CULTIVATED)																		
Apk 0-8	24	54	22	7.2	0.3	13.9	1.9	11.1	6.3	0.8	8	—	—	—	—	—	—	—
Ckg 8-30	7	71	22	7.4	0.2	24.0	5.5	17.1	2.6	0.2	13	—	—	—	—	—	—	—
IICkg 30-36	95	0	5	7.4	0.2	20.3	7.6	11.7	0.3	0.1	3	—	—	—	—	—	—	—

TABLE 5 - CONTINUED

Horizons and Depths (inches)	% Sand	% Silt	% Clay	pH	Cond mmhos/ cm^2	% $CaCO_3$ Equiv.	% Calcite	% Dolomite	% Org. C	% Total N	C/N	Exch. Cap. m.e.	Exchangeable Cations m.e./100 gms Ca	Mg	Na	K	H	% Free Iron Oxalate
KERRY SERIES																		
L-H 5-0	—	—	—	6.4	0.4	—	—	—	40.6	1.1	37	—	—	—	—	—	—	—
Ahg 0-3	90	3	7	7.0	0.2	—	—	—	0.4	0.1	4	—	—	—	—	-	-	0.027
ACg 3-10	97	2	1	7.2	0.2	0.4	0.2	0.2	0.1	0.1	1	2.9	1.3	0.3	0.1	0.1	1.4	0.036
Cg 10-36	98	1	1	7.3	0.2	0.0	0.0	0.0	0.1	0.1	1	2.0	0.7	0.0	0.1	0.1	0.1	0.027
LUNDAR SERIES																		
L-H 10-0	—	—	—	6.6	0.7	—	—	—	32.9	1.8	18	—	—	—	—	—	—	—
Ahk 0-4	31	42	27	7.5	0.4	20.8	9.8	10.2	0.7	0.2	3	—	—	—	—	—	—	—
ACkg 4-18	24	44	32	7.7	0.4	29.5	16.2	12.2	0.6	0.1	6	—	—	—	—	—	—	—
Ccag 18-20	19	46	35	7.8	0.5	37.4	19.6	16.5	0.4	0.1	4	—	—	—	—	—	—	—
Ckg 20+	11	57	32	7.6	0.5	24.2	2.7	19.8	0.2	0.1	2	—	—	—	—	—	—	—
NOVRA SERIES																		
L-H 10-0	—	—	—	6.6	0.3	—	—	—	51.8	2.4	22	—	—	—	—	—	—	—
Ahkg 0-3	6	73	21	7.2	0.3	16.0	3.6	11.5	6.8	0.5	14	—	—	—	—	—	—	—
$Ccag_1$ 3-8	2	65	33	7.5	0.2	25.7	10.1	14.4	1.1	0.2	6	—	—	—	—	—	—	—
Ckg_2 8-24	17	56	27	7.5	0.2	19.4	3.4	13.3	0.6	0.1	6	—	—	—	—	—	—	—
OKNO COMPLEX																		
Fi 1 0-1	—	—	—	4.4	0.7	—	—	—	47.1	1.6	29	83.2	37.4	5.4	2.3	5.2	43.3	—
Fi 2 1-1.5	—	—	—	4.2	0.6	—	—	—	50.8	1.8	29	104.2	Insufficient sample				54.2	—
Fi 3 1.5-18	—	—	—	4.3	0.5	—	—	—	36.6	1.7	22	152.3	55.1	14.0	6.4	1.5	74.5	—
Fi 4 18-30	—	—	—	6.0	0.3	—	—	—	32.8	2.7	12	227.9	161.7	9.4	3.8	1.0	33.9	—
Me 1 30-40	—	—	—	5.9	0.4	—	—	—	53.7	3.2	17	213.8	142.5	19.4	3.0	0.7	32.9	—
Me 2 40-55	—	—	—	5.8	1.0	—	—	—	45.6	3.0	15	187.4	108.5	27.5	2.4	0.9	22.9	—
IIC 1 55-60	12	57	31	7.7	1.4	18.2	5.0	12.2	1.9	0.2	10	—	—	—	—	—	—	—

TABLE 5 - CONTINUED

Horizons and Depths (inches)		% Sand	% Silt	% Clay	pH	Cond mmhos/ cm^2	% $CaCO_3$ Equiv.	% Calcite	% Dolomite	% Org. C	% Total N	C/N	Exch. Cap. m.e.	Exchangeable Cations m.e./100 gms Ca	Mg	Na	K	H	% Free Iron (Oxalate)
PEGUIS TILL SUBSTRATE																			
L-H	6-0	—	—	—	6.0	0.4	—	—	—	52.6	2.0	26	—	—	—	—	-	-	—
Ahej	0-3	22	28	50	6.4	0.2	—	—	—	2.3	0.2	12	29.9	14.3	13.0	0.2	1.3	1.3	—
Btjg	3-8	23	24	53	6.4	0.3	—	—	—	1.6	0.2	8	22.9	22.1	2.3	0.1	0.4	1.0	—
Ckg	8-12	7	44	49	7.4	0.2	13.4	0.3	12.1	0.6	0.1	6	—	—	—	—	-	-	—
IICkg	12-24	17	44	39	7.9	0.2	39.8	18.3	19.8	0.5	0.1	5	—	—	—	—	-	-	—
SANDILANDS SERIES																			
L-H	2-0	—	—	—	6.8	0.3	—	—	—	10.2	0.4	26	—	—	—	—	-	-	—
Ahej	0-6	96.3	2.0	1.7	5.9	0.2	—	—	—	—	—	—	3.9	3.2	0.3	0.1	0.1	0.9	0.094
Bfj	6-24	97.7	1.9	0.4	5.7	0.1	—	—	—	—	—	—	1.5	1.0	0.2	0.1	0.1	0.6	0.130
BC	24-32	99.6	0.2	0.2	5.9	0.1	—	—	—	—	—	—	1.5	1.2	0.3	0.1	0.1	0.4	0.132
Ccag	32-46	98.3	1.1	0.6	7.2	0.2	5.6	0.5	4.7	—	—	—	—	—	—	—	-	-	0.063
Ckg2	46-58	95.9	2.8	1.3	7.3	0.2	3.1	3.1	0.0	—	—	—	—	—	—	—	-	-	0.114
Ckg3	58+	97.9	1.3	0.8	7.5	0.2	10.5	7.4	2.9	—	—	—	—	—	—	—	-	-	0.079

APPENDIX II

DEFINITION OF SOIL HORIZON SYMBOLS*

Conventions Concerning the Use of Designations

1. The capital letters A and B may not be used singly in profile descriptions, but must be accompanied by the lower case suffix (Ah, Bf, Bt, etc.) indicating the estimated modification from the parent material. The capital letter C may be used alone except when the material is affected by reducing conditions or has the properties of a fragipan.

2. Unless otherwise specified, additional lower case suffixes indicate a secondary or subordinate feature or features in addition to those characteristic of the defined major horizon. The symbol Btg, for example, indicates that, in addition to the dominance of illuvial clay in the B horizon, there is also evidence of strong gleying. Some combinations are redundant or impractical in light of present knowledge and definitions, thus their use should be avoided, e.g. Bmj. In some cases, such as Bgf, Bfh and Bhf, the combination of suffixes has a specific meaning differing from that of the sum of the two suffixes used singly.

3. All horizons except AB, A and B, AC and B and A may be vertically subdivided by consecutive arabic numbers after the letter designations. The assigned arabic numeral has no meaning except that of vertical subdivision. For example, a profile may be described as having the following: Ae1, Ae2, Bt1, Bt2, Bt3, Bt4, C1 and C2.

4. Roman numerals are prefixed to horizon designations to indicate unconsolidated lithologic discontinuities in the profile. Roman numeral I

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* Report on the Sixth Meeting of the National Soil Survey Committee of Canada, 1965.

is understood for the uppermost material and, therefore, is not written. Subsequent contrasting materials are numbered consecutively in the order in which they are encountered downward, that is, II, III, etc.

Organic Horizons

Organic horizons may be found at the surface of mineral soils, at any depth beneath the surface in buried soils or overlying geologic deposits. They contain more than 30 per cent organic matter. Three horizons are recognized.

L- An organic layer characterized by the accumulation of organic matter in which the original structures are easily discernible.

F - An organic layer characterized by the accumulation of partly decomposed organic matter. The original structures are discernible with difficulty. Fungi mycelia are often present.

H - An organic layer characterized by an accumulation of decomposed organic matter in which the original structures are undiscernible.

Note 1 - If it is not possible or advisable to subdivide the organic layer, it may be referred to as L-H or other combinations.

Note 2 - It may be desirable to use lower case suffixes to differentiate kinds of organic material. However, none is suggested in this report.

Master Mineral Horizons and Layers

Mineral horizons are those that contain less organic matter than that specified for organic horizons.

A - A mineral horizon or horizons formed at or near the surface in the zone of removal of materials in solution and suspension and/or maximum in situ accumulation of organic matter. Included are:

(1) horizons in which organic matter has accumulated as a result of biological activity (Ah);

(2) horizons that have been eluviated of clay, iron, aluminum, and/or organic matter (Ae);

(3) horizons having characteristics of 1 and 2 above but transitional to underlying B or C (AB or A and B);

(4) horizons markedly disturbed by cultivation or pasture (Ap).

B - A mineral horizon or horizons characterized by one or more of the following:

(1) an enrichment in silicate clay, iron, aluminum, or humus, alone or in combination (Bt, Bf, Bfh, Bhf, and Bh);

(2) a prismatic or columnar structure which exhibits pronounced coatings or stainings and with significant amounts of exchangeable sodium (Bn);

(3) an alteration by hydrolysis reduction or oxidation to give a change in color or structure from horizons above and/or below and does not meet the requirements of (1) and (2) above (Bm, Bg).

C - A mineral horizon or horizons comparatively unaffected by the pedogenic processes operative in A and B, excepting (1) the process of gleying, and (2) the accumulation of calcium and magnesium carbonates and more soluble salts (Cca, Csa, Cg and C).

R - Underlying consolidated bedrock, such as granite, sandstone, limestone, etc.

Lower Case Suffixes

b - Buried soil horizon.

c - A cemented (irreversible) pedogenic horizon. The ortstein of a Podzol, a layer cemented by calcium and a duripan are examples.

ca,- A horizon with secondary carbonate enrichment where the concentration of lime exceeds that present in the unenriched parent material. It is more than 10 cm. (4 inches) thick, and if it has a calcium carbonate equivalent of less than 15 per cent it should have at least 5 per cent more calcium carbonate equivalent than the parent material (IC). If it has more than 15 per cent calcium carbonate equivalent, it should have 1/3 more calcium carbonate equivalent than IC. If no IC is present, this horizon is more than 10 cm. thick and contains more than 5 per cent by volume of secondary carbonates in concretions or soft, powdery forms.

cc - Cemented (irreversible) pedogenic concretions.

e - A horizon characterized by removal of clay, iron, aluminum or organic matter alone or in combination. Higher in color value by 1 or more units when dry than an underlying B horizon. It is used with A (Ae).

f - A horizon enriched with hydrated iron. It usually as a chroma of 3 or more. It is used with B alone (Bf), with B and h (Bfh and Bhf) and with B and g (Bfg), etc.

The criteria for an f horizon (excepting Bgf) are that: the oxalate extractable Fe + Al exceeds that of the IC horizon by 0.8 per cent or more (ΔFe + Al $>$ 0.8%) and the organic matter to oxalate extractable Fe ratio is less than 20.

These horizons are differentiated on the basis of organic matter content into:

Bf	less than 5% organic matter
Bfh	from 5 to 10% organic matter
Bhf	greater than 10% organic matter

g - A horizon characterized by gray colors and/or prominent mottling indicative of permanent or periodic intense reduction. Chromas of the matrix are generally 1 or less.

It is used with A and e (Aeg); with B alone (Bg); with B and f (Bfg); with B, h and f (Bfhg and Bhfg); with B and t (Btg); with C alone (Cg); with C and k (Ckg); etc.

In some reddish parent materials, matrix colors of reddish hues and high chromas may persist, in spite of long periods of reduction. In such soils, horizons are designated as g if there is gray mottling or if there is marked bleaching on ped faces or along cracks.

Aeg - This horizon must meet the definitions of A and e as well as those of g.

Bg - This horizon cannot be defined precisely at present. It includes those horizons occurring between A and C horizons in which the main features are:

(1) Colors of low chroma and a change in structure from that of the C or,

(2) Matrix colors of low chroma accompanied by mottles more prominent and/or abundant than those in the C, but not satisfying the requirements of Bgf horizons.

Bg horizons occur in some Orthic Humic Gleysols and in some Orthic Gleysols. These horizons are comparable, to some extent, with the Bm horizons of soils that are not strongly gleyed.

Bfg, Bfhg, Bhfg, Btg, etc. - When used in any of these combinations the horizons must be within the limits set for f, fh, hf, t, etc.

Bgf - The dithionite extractable Fe of this horizon exceeds that of the IC by 1% or more and the dithionite extractable Al does not exceed that of the IC by more than 0.5%.

This horizon occurs in Fera-Gleysols and Fera Humic Gleysols, and possibly below the Bfg horizons of gleyed Podzols. It is distinguished from the Bfg horizon of Podzols on the basis of the extractability of the Fe and Al. The iron in the Bgf horizon is thought to have accumulated as a result of oxidation of ferrous iron. The ferric oxide formed is not associated intimately with organic matter or with aluminum, and it is sometimes crystalline. Usually Bgf horizons are prominently mottled and more than half of the soil material occurs as mottles of high chroma.

Cg, Ckg, Ccag, Csg, Csag - When g is used with C alone or C and one of the lower case suffixes k, ca, s, sa, it must meet the definitions for C and these suffixes.

h - A horizon enriched with organic matter. It is used with A alone (Ah); or with A and e (Ahe); or with B alone (Bh); or with B and f (Bfh, Bhf).

Ah - When used with A alone, it refers to the accumulation of organic matter and must contain less than 30 per cent organic matter. It must show one Munsell unit of value darker than the layer immediately below or have 1 per cent more organic matter than IC.

Ahe - When used with A and e, it refers to an Ah horizon which has been degraded as evidenced, under natural conditions, by streaks and splotches and often by platy structure. It may be overlain by a darker colored Ah and underlain by a lighter colored Ae.

Bh - This horizon contains more than 2 per cent organic matter and the organic matter to oxalate extractable Fe ratio is 20 or more.

In general, this horizon has a color with value and chroma of less than 3 when moist. Usually the Δ(Fe + Al) is less than 0.8 per cent but in some cases Δ Al is great enough to exceed this value.

j - Used as a modifier of suffixes e, f, g, n and t to denote an expression of but failure to meet the specified limits of the suffix it modifies. It must be placed to the right and adjacent to the suffix it modifies.

Aej - When used with A and e, it denotes an eluvial horizon which is thin or discontinuous or slightly discernible.

Btj - When used with B and t, it is a horizon with some illuviation of clay but not enough to meet the limits of Bt.

Bfj - When used with B and f, it is a horizon with some illuviation of iron and aluminum but not enough to meet the limits of Bf. It must underlie an Ae horizon.

Btgj, Bfgj, Bmgj - When used with g, it refers to horizons which are mottled but do not show the neutral colors of intense reduction.

Bnjt - j may be used with n when secondary enrichment of sodium is present, but does not meet the limits for n.

k - Presence of carbonate as indicated by visible effervescence with dilute HCl. May be used with any master horizon or combination of master horizon and lower case suffix. Most often is used with B and m (Bmk) or C (Ck).

m - A horizon slightly altered by hydrolysis, oxidation and/or solution to give a change in color and/or structure. The suffix is used only with B to denote a B horizon that is greater in chroma by 1 or more units than the parent material, or that has granular, blocky or prismatic structure without evidence of strong gleying, and that has $\Delta(Fe + Al) < 0.8$ per cent. It may not be used under an Ae horizon but may be used under an Aej horizon. This rule distinguishes it from a Bfj horizon. It can be used as Bm, Bmgj, Bmk, Bms.

n - A horizon in which the ratio of exchangeable calcium to exchangeable sodium is 10 or less. When used with B it must also have the following distinctive morphological characteristics: prismatic or columnar structure, dark coatings on ped surfaces, and hard to very hard consistence when dry.

p - A layer disturbed by man's activities, i.e. by cultivation and/or pasturing. It is to be used only with A.

s - A horizon with salts including gypsum which may be detected as crystals or veins, or as surface crusts of salt crystals, or by distressed crop growth, or by the presence of salt tolerant plants. Most commonly used with C and k (Csk) but can be used with any master horizon or combination of master horizon and lower case suffix.

sa - A horizon with secondary enrichment of salts more soluble than calcium and magnesium carbonates where the concentration of salts exceeds that present in the unenriched parent material. The horizon is 10 cm. (4 inches) or more thick. The conductivity of the saturation extract must be at least 4 mmhos/cm. and must exceed that of the C horizon by at least one-third.

t - A horizon enriched with silicate clay. It is used with B alone (Bt) and with B and g (Btg), etc.

Bt - A Bt horizon is one that contains illuvial layer-lattice clays. It forms below an eluvial horizon but may occur at the surface of a soil that has been partially truncated. It usually has a higher ratio of fine clay to total clay than IC. It has the following properties:

1. If any part of an eluvial horizon remains and there is no lithologic discontinuity between it and the Bt horizon, the Bt horizon contains more total and more fine clay than the eluvial horizon as follows:

(a) If any part of the eluvial horizon has less than 15 per cent total clay in the fine earth fraction, the Bt horizon must contain at least 3 per cent more clay.

(b) If the eluvial horizon has more than 15 per cent and less than 40 per cent total clay in the fine earth fraction, the ratio of the clay in the Bt horizon to that in the eluvial horizon must be 1.2 or more.

(c) If the eluvial horizon has more than 40 per cent total clay in the fine earth fraction, the Bt horizon must contain at least 8 per cent more clay.

2. A Bt horizon must be at least 2 inches thick. In some sandy soils where clay accumulation occurs in lamellae, the total thickness of the lamellae should be 4 inches in the upper 60 inches of the profile.

3. In massive soils, the Bt horizon should have oriented clays in some pores and bridging the sand grains.

4. If peds are present, a Bt horizon shows clay skins on some of both the vertical and horizontal ped sufaces and in the fine pores or shows oriented clays in 1 per cent or more of cross section.

5. If a soil shows a lithologic discontinuity between the eluvial horizon and the Bt horizon or if only a plow layer overlies the Bt horizon, the Bt horizon need show only clay skins in some part, either in some fine pores or on some vertical and horizontal ped surfaces. Thin sections should show that some part of the horizon has about 1 per cent or more of oriented clay bodies.

Btj and Btg are defined under j and g respectively.

x - A horizon of fragipan character. A fragipan is a loamy subsurface horizon of high bulk density. It is very low in organic matter, it is seemingly cemented when dry having a hard consistence. When moist, it has a moderate to weak brittleness. It has few or many bleached fracture planes. It is overlain by a friable B horizon.

z - A permanently frozen layer.

Notes:

1. Transition horizons need capitals only, and

   (a) if transition gradual, use e.g. AB, BC, etc.

   (b) if transition interfingered, use e.g. A and B, B and C, etc.

   (c) if desired, dominance can be shown by order e.g. AB and BA.

2. The designations for diagnostic horizons must be given in the same sequence as shown for the definition, e.g. Ahe not Aeh.

3. Although definitions have been given to all diagnostic horizons, all possible combinations of horizon designations have not been covered. It is still necessary to write profile descriptions.