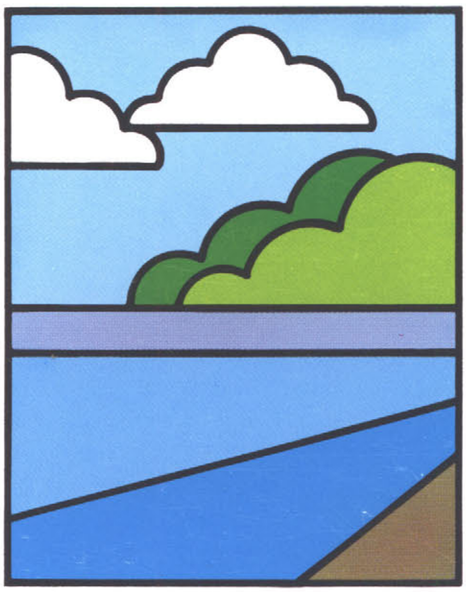
Bulletin 43

Reconnaisance Soil Survey of the
IOSEGUN LAKE AREA, ALBERTA



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Alberta
RESEARCH COUNCIL
Natural Resources Division

Soils Department

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Alberta Research Council
1983

Acknowledgments

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The cartographic work on the soils maps was a joint effort of Alberta Cartographic Consulting Co. Ltd. and the Drafting Department of the Alberta Research Council. Z. Widtman prepared most of the figures for the report.

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Preface

This report and accompanying soil maps describe the characteristics, distribution, and use limitations of the soils in the Iosegun Lake area of Alberta (National Topographic Series Map Sheet 83K). As part of the program to inventory Alberta's land resources at a reconnaissance scale, this soil survey provides baseline data for general land use planning.

The soil landscapes of the area are described as components of the total environment. A brief treatment of the geology, history, climate and vegetation of the area is presented as background information to a general understanding of the landscape. The complete report consists of the written text and four soil maps. Soil units are identified on the map, and are described briefly in the legend, and at a greater length in the text in terms of the landscape and environments where they occur. Discussion on use and management of the soils is included. Ratings of soil suitability for agriculture, forestry and selected engineering uses are included. The inherent susceptibility of the soils to water erosion is discussed briefly and the soils are rated for erosion hazard. Physical and chemical data to characterize specific soils are included in the Appendix.

Description of the area

Location and extent

The Iosegun Lake Sheet (83K) is located in northwestern Alberta (figure 1) and covers an area of approximately 14 410 km² (1.4 million hectares). The area is located between 116° and 118° W longitude and between 54° and 55° N latitude (figure 2), extending 130 km east to west and 110 km north to south. The vast majority of 83K is unsettled, forested land except for a small agricultural area near the Little Smoky River south of Valleyview. The town of Fox Creek and the hamlet of Little Smoky are the only population centers within the area. Valleyview lies just to the north and Whitecourt is a few miles east of the map sheet near its southern boundary.

Historical development

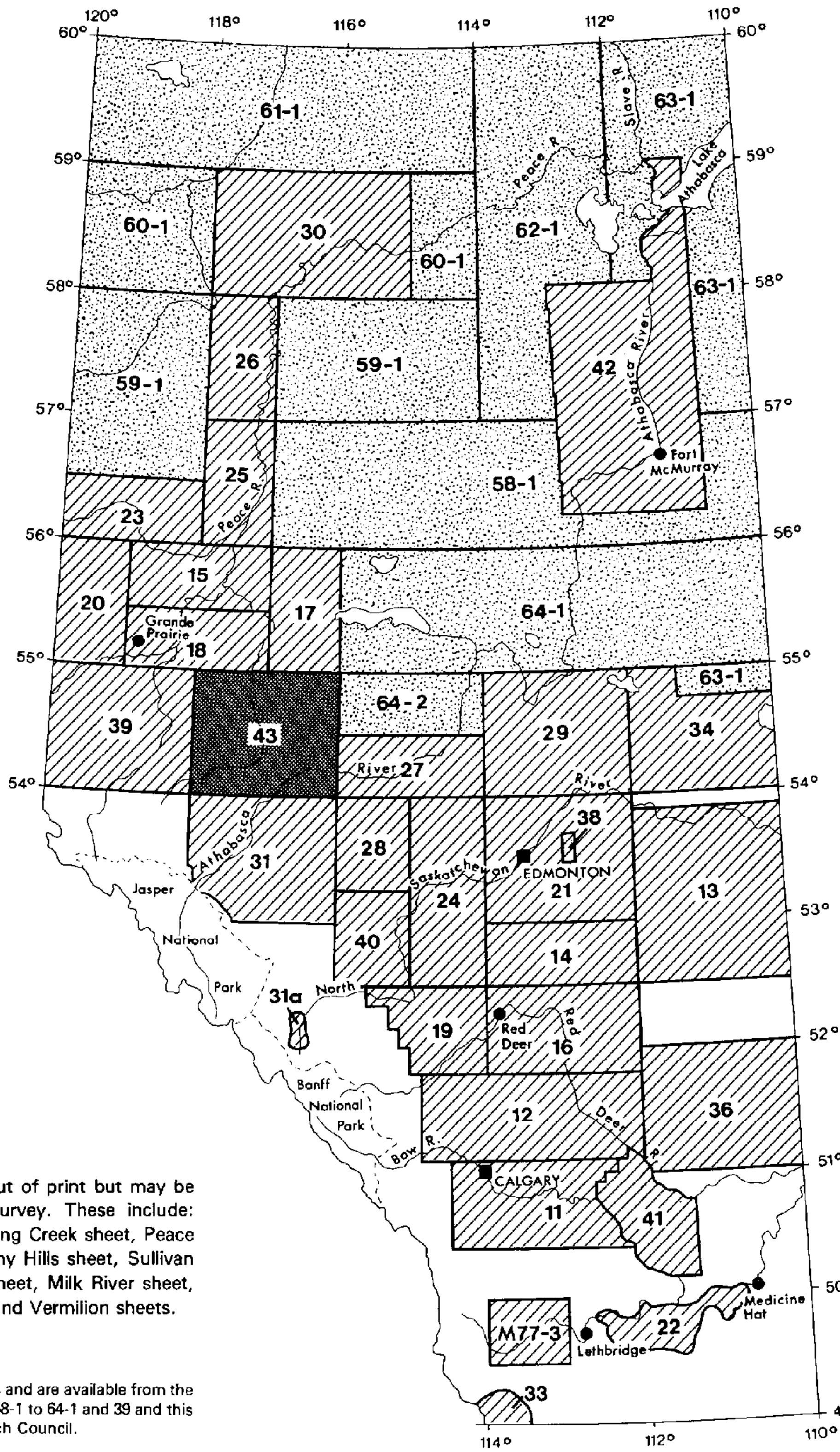
The native inhabitants in the area northwest of Whitecourt are described as Woodland Cree; there is evidence, however, that the Beaver Indians may have at one time occupied the area and were pushed north and west by the Crees as a result of intrusion by Europeans (Olecko, 1974). The word "Iosegun" orginates from the Indian name meaning "tail" (Holmgren and Holmgren, 1972).

The first Europeans looking for a route to the Pacific arrived during the latter part of the 18th century. Peter Pond established the first fur trading post on the Athabasca River in 1778 and likely travelled upstream into the Iosegun area (MacEwan, 1968). Duncan McGillivray is known to have travelled into the upper region of the Athabasca River in 1799, although he worked out of Rocky Mountain House and may not have ventured into the area covered by this study (Smith, 1971). In the same year, David Thompson travelled from Ft. Chipewyan at Lake Athabasca up the Athabasca River to a point where he could see the mountains. On his return he established his camp at the mouth of the McLeod River (present site of Whitecourt). This trip is well documented and is likely the first stop-over in the region by a white man (Allen, 1972). In 1810, Thompson discovered the Athabasca Pass at the headwaters of the Whirlpool River and in doing so established the Athabasca River as a major throughfare for east-west travel into the Columbia drainage basin (Allen, 1972).

Some 30 years later, missionaries arrived and were the first white settlers in the general region. In 1842, Father Thibault established a mission at Lac Ste. Anne and during the next decade the Oblate Fathers of St. Albert made contact with the Cree Indians who inhabited the area (Allen, 1972). Dr. James Hector, a member of Palliser's party, travelled by sled up the Athabasca River in 1859 (Spry, 1963). His comments about the physiography of the region were the first by a scientist. Missionaries and fur traders were probably the only whites within the region for the next 50 years. Big changes came with the Klondike gold rush in the late 1890s.

Legend

11 Blackfoot and Calgary sheets
12 Rosebud and Banff sheets
13 Wainwright and Vermilion sheets
14 Peace Hills sheet
15 Rycroft and Watino sheets
16 Red Deer sheet
17 High Prairie and McLennan sheets
18 Grand Prairie and Sturgeon Lake sheets
19 Rocky Mountain House sheet
20 Beaverlodge and Blueberry Mountain sheets
21 Edmonton sheet
22 St. Mary and Milk River project
23 Cherry Point and Hines Creek area
24 Buck Lake and Wabamun Lake area
25 Grimshaw and Notikewin area
26 Hotchkiss and Keg River area
27 Whitecourt and Barrhead area
28 Chip Lake area
29 Tawatinaw map sheet 83I
30 Mount Watt and Fort Vermilion area
31 Hinton-Edson area 83F
31a North Saskatchewan River Valley
33 Waterton Lakes National Park
34 Sand River sheet
35 Two Hills county
36 Oyen sheet
38 Elk Island National Park
39 Wapiti Map area
40 Brazeau Dam
41 Newell county
42 Athabasca Oil Sands area
43 Iosegun sheet
M77-3 NW Lethbridge
M89-3 NE Lethbridge
58-1 Preliminary
59-1 Preliminary
60-1 Preliminary
61-1 Preliminary
62-1 Preliminary
63-1 Preliminary
64-1 Preliminary
64-2 Preliminary



Note: Reports published prior to 1942 are out of print but may be obtained on loan from the Alberta Soil Survey. These include: MacLeod sheet, Medicine Hat Sheet, Sounding Creek sheet, Peace River, High Prairie, Sturgeon Lake area, Rainy Hills sheet, Sullivan Lake sheet, Lethbridge and Pincher Creek sheet, Milk River sheet, Rosebud and Banff sheets, and Wainwright and Vermilion sheets.

Reports are numbered as Alberta Soil Survey Reports and are available from the Faculty of Extension, University of Alberta. Reports 58-1 to 64-1 and 39 and this report are available directly from the Alberta Research Council.

FIGURE 1. Locations of surveyed areas for which reports have been published.

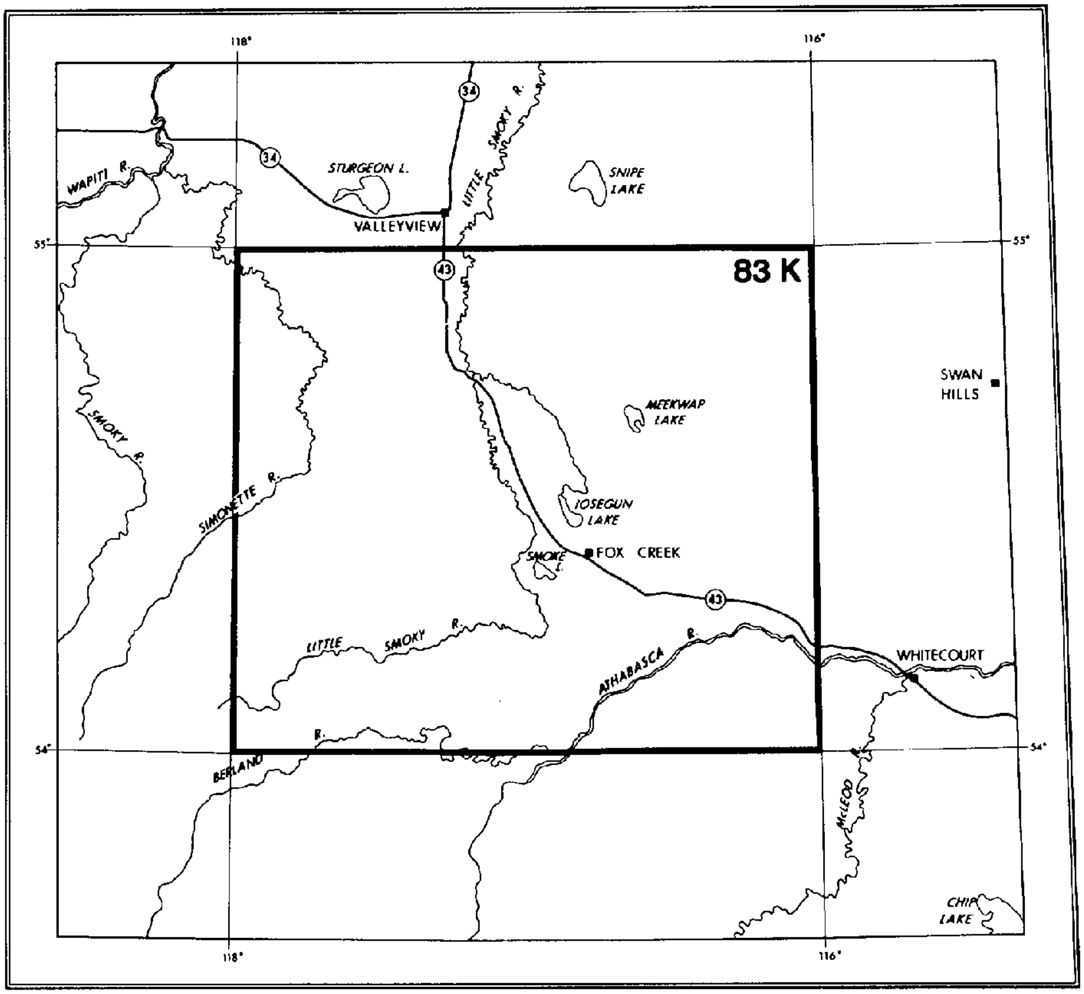


FIGURE 2. Location and general features of the Iosegun Lake area.

Many people settled in the Peace River district and in the area around Lac Ste. Anne and west (Olecko, 1974). In 1874, a survey and proposal for a railway to run from Edmonton to Peace River through the Whitecourt area created a minor rush of settlers to Whitecourt in anticipation of it being a railway divisional center.

Demands for a shorter route to Grande Prairie brought about creation of the Edson Trail, built in 1910 and opened in 1911. The route was east from Grande Prairie, across the Big Smoky River to the southern tip of Sturgeon Lake, then south over six river crossings to Edson (Campbell, 1975). In 1916, the Edmonton, Dunvegan and B.C. Railway reached Grande Prairie and put an end to the Edson Trail (Campbell, 1975).

Industrial development in the Iosegun region began shortly after the turn of the century with logging and milling operations initiated in 1909 near the Athabasca River, six miles west of Whitecourt (Olecko, 1974). The railroad was constructed as far as Whitecourt in 1921 but never went on to the Peace River country as had been initially proposed. Oil and gas exploration during the 1950s resulted in the building of the railroad into the Iosegun area (Olecko, 1974). Highway 43 opened in 1955 and was paved and completed to Valleyview in 1962 (Olecko, 1974).

Geophysical exploration for oil and gas and drilling during the 1940s and 1950s resulted in the first pumping well in 1955 at Windfall, about 50 km west of

Whitecourt (Olecko, 1974). Today there are numerous gas processing plants within the area. These are mainly serviced from the town of Fox Creek.

Several sawmill operations of varying size have operated in the area over the last 70 years. MacMillan-Bloedel held timber rights in Iosegun territory from 1961 to 1970 and proposed a $30 million pulp mill at Whitecourt, but details could not be resolved with the Provincial Government and the holdings were sold to Simpson Timber Co. of Seattle who are now developing the timber resource (Olecko, 1974). British Columbia Forest Products received the timber rights to much of the southern half of the Iosegun Lake area in 1979, and are planning sawmill and pulp and paper mill developments.

Agricultural development is confined to a fairly small area on both sides of the Little Smoky River from Little Smoky to Valleyview. Grain and mixed farming operations are most common. Canola (rapeseed), coarse grains, and forages are the common crops.

Physiography

The gross morphology of the landscape is attributable to preglacial fluvial processes. During mid to late Tertiary time, rivers flowed from the rising Rocky Mountains depositing coarse gravels and sands on a pediplaned surface and eroding broad valleys in the soft sediments of Early Tertiary and Cretaceous age. Further uplift in the mountain area caused the streams to erode deeper valleys in the shales and sandstones resulting in a plateau-benchland landscape. Remnants of the coarse gravels remain as a capping on isolated, flat-topped plateaus.

Glaciation during Pleistocene time modified the landscape slightly. Valleys were broadened and smoothed and thin layers of till were deposited on the uplands. Morainal materials and glacial lake sediments were deposited on the plains, resulting in subdued slopes.

The Iosegun Lake area lies in the Alberta Plateau division of the Interior Plains as defined in Bostock (1970).

TABLE 1.
Physiographic Divisions of the Iosegun Lake Area
(After Pettapiece, in prep.)
elevations in metres above sea level

Level I	Level II	Level III
Alberta Plateau (670-1370)	Wapiti Plain (670-900)	Iosegun Plain (670-900)
	Swan Hills Upland (850-1370)	Swan Hills (1070-1370) Driftpile Benchland (850-1040)
	Little Smoky-Mayberne Plateau (760-1300)	Simonette Benchland (800-980) Little Smoky Plateau (900-1280) Fox Creek Benchland (730-860) Mayberne Plateau (830-1370)
	Kakwa-Berland Plateau (800-1220)	Berland Plateau (1100-1220)
Eastern Alberta Plains (600-1070)	Big River Plains (670-1070)	Windfall Plain (670-1070)

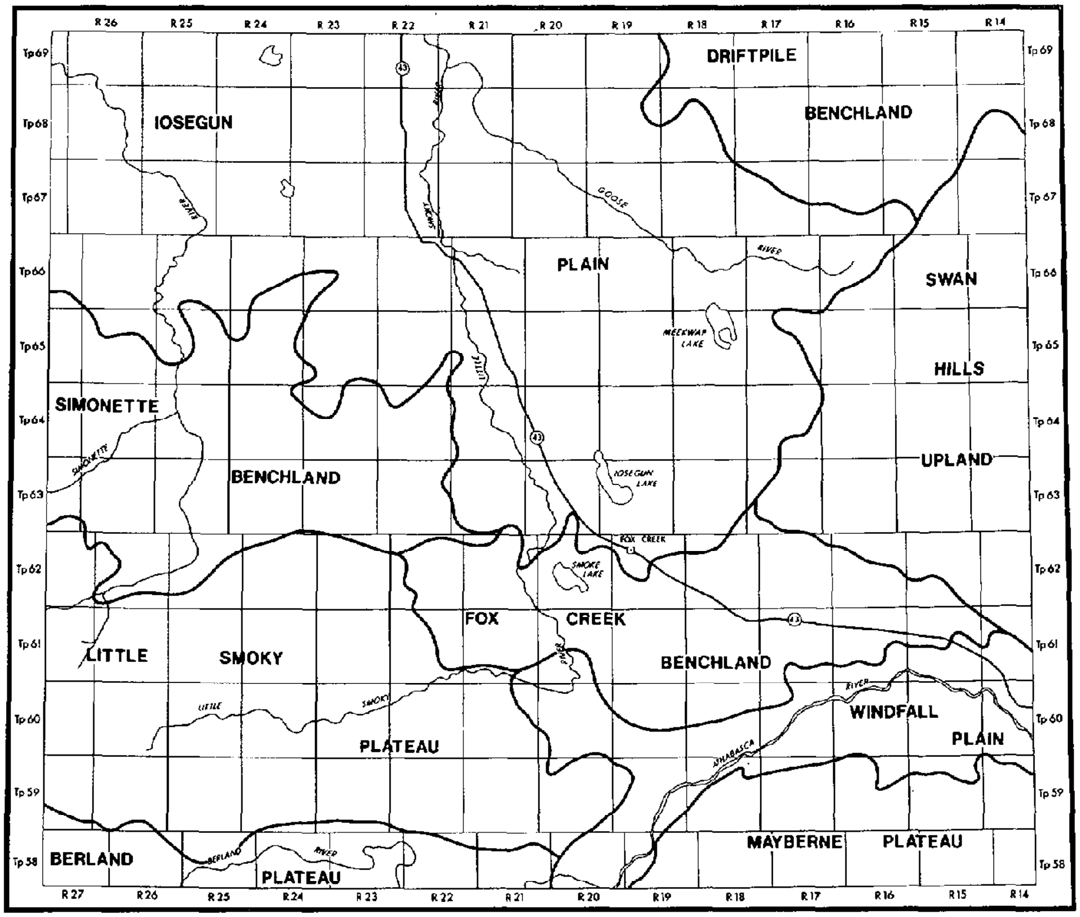


FIGURE 3. Physiographic divisions of the area.

Four major geomorphological elements can be recognized in the area: valleys, plains, benchlands, and dissected plateaus which form the basis for subdivision of the Alberta Plateau. The physiographic divisions of the map area are outlined in table 1 and illustrated in figure 3. The geomorphology and soil patterns of each Level III division are discussed later in this report, under the heading "Soils of the Iosegun Lake Area."

Drainage basins

The area is drained by the Peace and Athabasca River systems (figure 4). The Simonette, Little Smoky, Iosegun, and Goose Rivers (tributaries of the Peace River) drain the majority of map sheet 83K. The Athabasca River and tributaries, including the Berland River, drain the southern and southeastern parts of the area. The Wallace River and East Prairie River, which head in the Swan Hills, flow to Lesser Slave Lake, which is also part of the Athabasca River system.

Bedrock geology

The Iosegun Lake region is underlain by a thick succession of nonmarine sandstones, silty mudstones and coal beds which are covered by glacial drift of varying thickness. Structurally, the area is part of the broad Alberta Syncline. Beds dip slightly to the southwest.

The bedrock strata are described under two major groups after Kramers and Mellon (1972). The distribution of the Paskapoo Formation and the Wapiti Group is shown on figure 5.

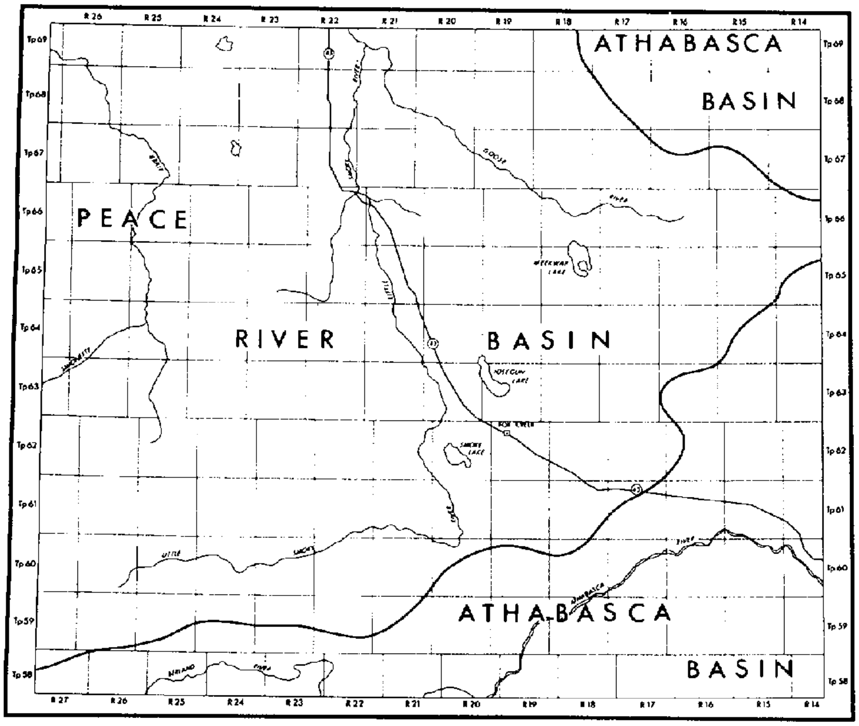
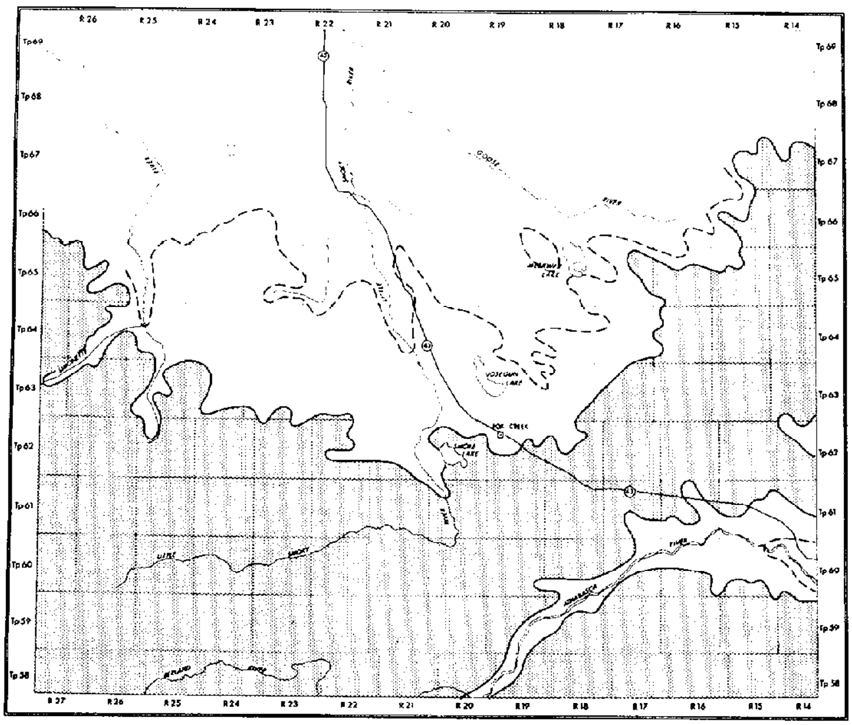


FIGURE 4. Regional drainage systems.



"Paskapoo" Formation

Wapiti Group

Base of Ardley-Equivalent Interval

FIGURE 5. Bedrock geology.

The Wapiti Group is a succession of Late Cretaceous-aged, nonmarine, fluviatile deposits consisting of thick, pale gray, crossbedded, bentonitic sandstones with scattered conglomerate beds, and medium to dark gray siltstones and mudstones with local coal seams. The lower and middle beds correlate with the Belly River Group, Bearpaw Formation and Edmonton Group of southcentral Alberta. The upper beds correlate to the Scollard Member, a Late Cretaceous unit with abundant coal seams, sometimes considered part of the Paskapoo Formation (Irish, 1970; Green, 1972). These beds contain several thick coal seams in the central part of Map Sheet 83K. The contact between the Wapiti Group and the overlying Paskapoo Formation occurs at approximately the 915 m contour.

The Paskapoo Formation caps the uplands extending across the southern half of the sheet and northeasterly to the Swan Hills. These Paleocene-aged "classical" Paskapoo strata are characterized in the lower part by thick, buff-weathering, pale gray, crossbedded sandstones which tend to form cliffs and ridges. The upper part of the succession is composed of soft, pale gray sandstone interbedded with green and gray siltstone and silty mudstone associated in places with thin coal and shale beds. The Paskapoo succession is overlain unconformably in some of the tableland areas by unconsolidated quartzite gravels presumed to be mid to late Tertiary age.

The sedimentary bedrocks in the area are usually soft and are highly susceptible to water erosion when exposed by activities such as road construction (Lengellé, 1976). Soils in parts of the benchland and upland areas are developed directly on weathered sedimentary bedrock or on thin drift overlying bedrock (plate 1).

Surficial materials

The entire Iosegun Lake Area was covered with glacial ice during the Pleistocene epoch. The glacial ice eroded and smoothed the landscape and deposited drift, modifying the pre-glacial landscape slightly. There is evidence of more than one glacial advance in the area (Henderson, 1959; St. Onge, 1974). The surficial geology of the east half of the area was mapped by St. Onge (1966) but the west half of the sheet has not been mapped. Henderson (1959) mapped the Sturgeon Lake area which is adjacent to this map sheet.

PLATE 1. Morainal veneer overlying soft mudstones in the Swan Hills south of Goose Mountain.

LEGEND

Quaternary

Recent

- Colluvial
- Eolian
- Fluvial
- Organic Material

Pleistocene

- Morainal
- Glaciolacustrine
- Glaciofluvial

Tertiary-Cretaceous

- Preglacial Fluvial
- Weathered Sedimentary Bedrock

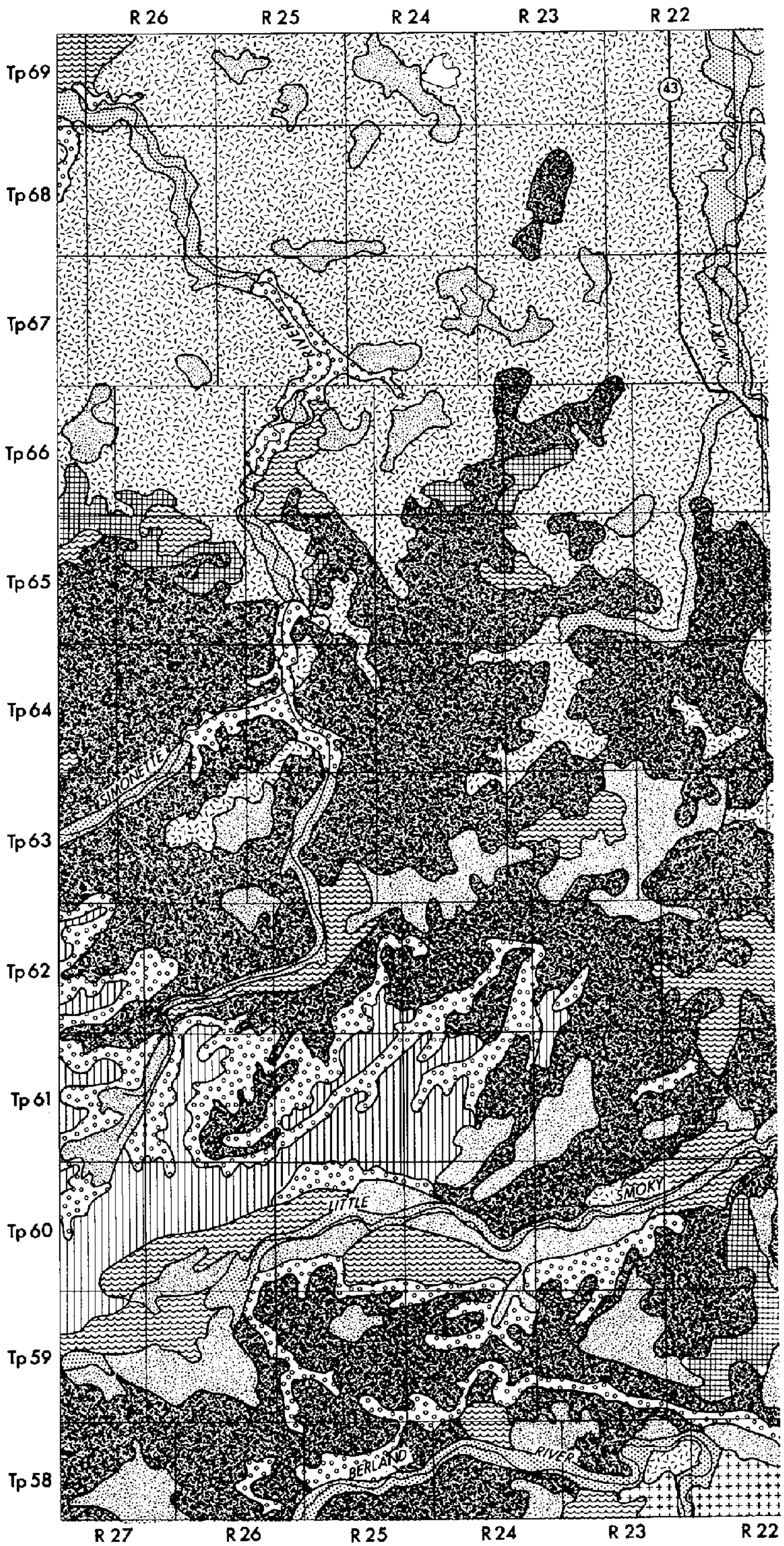
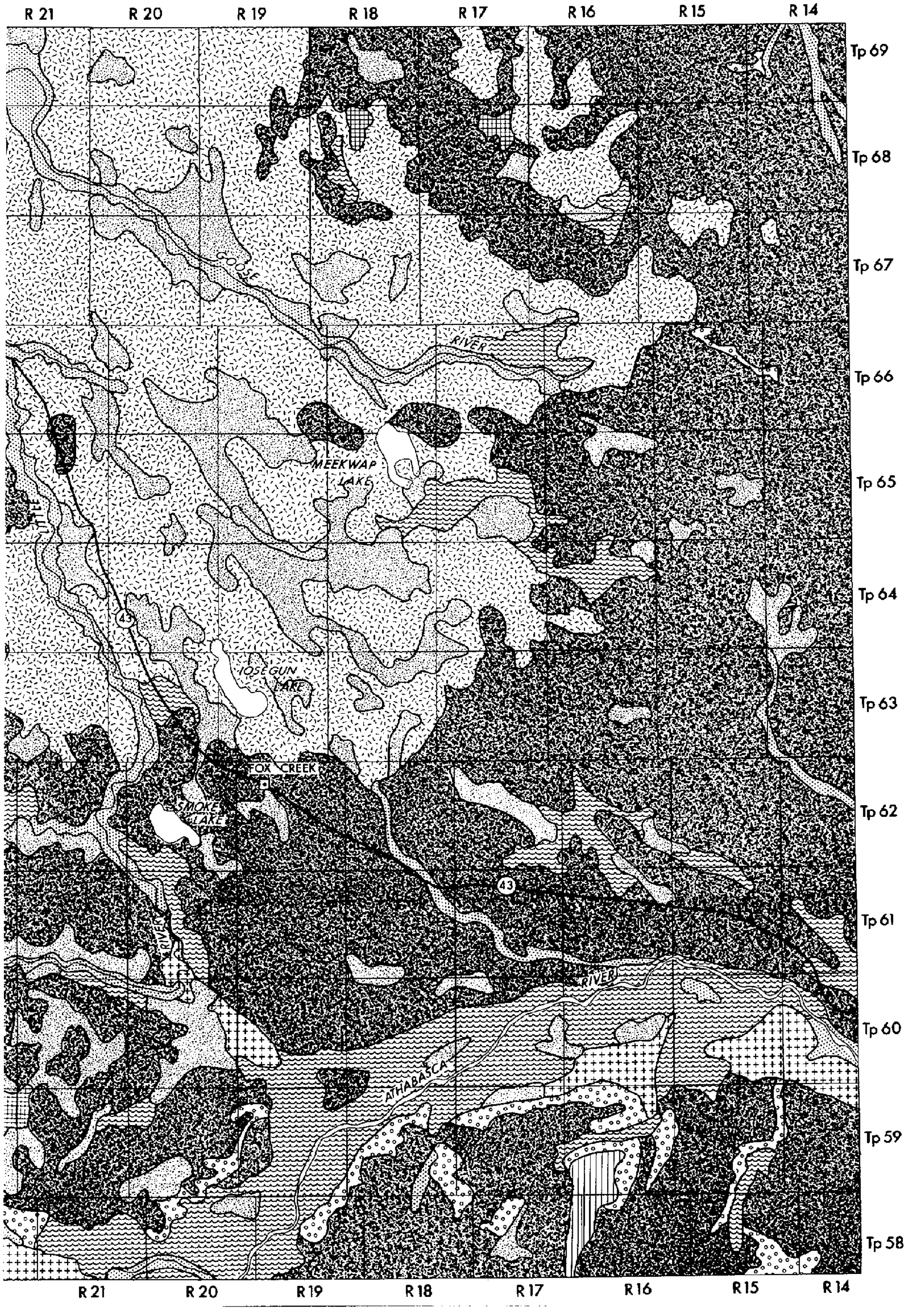


FIGURE 6. Surficial materials map.


R 21
R 20
R 19
R 18
R 17
R 16
R 15
R 14
Tp 69
Tp 68
Tp 67
Tp 66
Tp 65
Tp 64
Tp 63
Tp 62
Tp 61
Tp 60
Tp 59
Tp 58
GOOSE
RIVER
MEEKWAP LAKE
IOSEGUN LAKE
FOX CREEK
SMOKE LAKE
43
RIVER
ATHABASCA
RIVER

Soils of the present landscape are developed in materials of glacial origin over the majority of the area and the properties of the soils are largely inherited from the geological parent materials. The distribution of surficial materials, as interpreted from the soil maps of this report, is shown on figure 6.

Remnants of pre-glacial (Tertiary) deposits of rounded quartzite cobbles and gravels named the Saskatchewan Gravels (Dawson and McConnell, 1896; Rutherford, 1937) occur on the elevated plateaus of the Little Smoky-Mayberne Plateau and Swan Hills Plateau. These coarse gravels blanket the underlying Paskapoo Formation and are sometimes overlain by discontinuous morainal veneers.

Morainal materials are the most widespread surficial deposit in the uplands and plateau-benchlands. The moraines are comprised mostly of till deposited by Laurentide ice which originated in the Keewatin area of the Canadian Shield. Till is a heterogeneous material deposited directly from glacial ice onto the subglacial landscape. Thickness of the deposit varies from less than 1 m to several metres depending on landscape position and the form of the subglacial surface. In areas of low to moderate relief ground moraine, the till is usually in the order of 3 to 5 m thick. In upland areas, the till often occurs as a thin blanket or veneer overlying bedrock or preglacial gravels (plate 2).

Till that is derived mainly from fine textured bedrock of the Wapiti Group (Edson till) is usually clay loam textured, slowly permeable and dark gray colored. Pebbles and stones and occasional boulders from the Shield and quartzites from the Saskatchewan Gravels are common, but the till is seldom excessively stony.

Till associated with the Paskapoo Formation (Mayberne till) is dominantly sandy clay loam textured and a dark brown color. When associated with gravel-capped plateaus, the till contains numerous quartzite pebbles and cobbles. Mayberne till is often similar to Edson till at

PLATE 2. Morainal veneer overlying Saskatchewan Gravels on the Little Smoky Plateau.

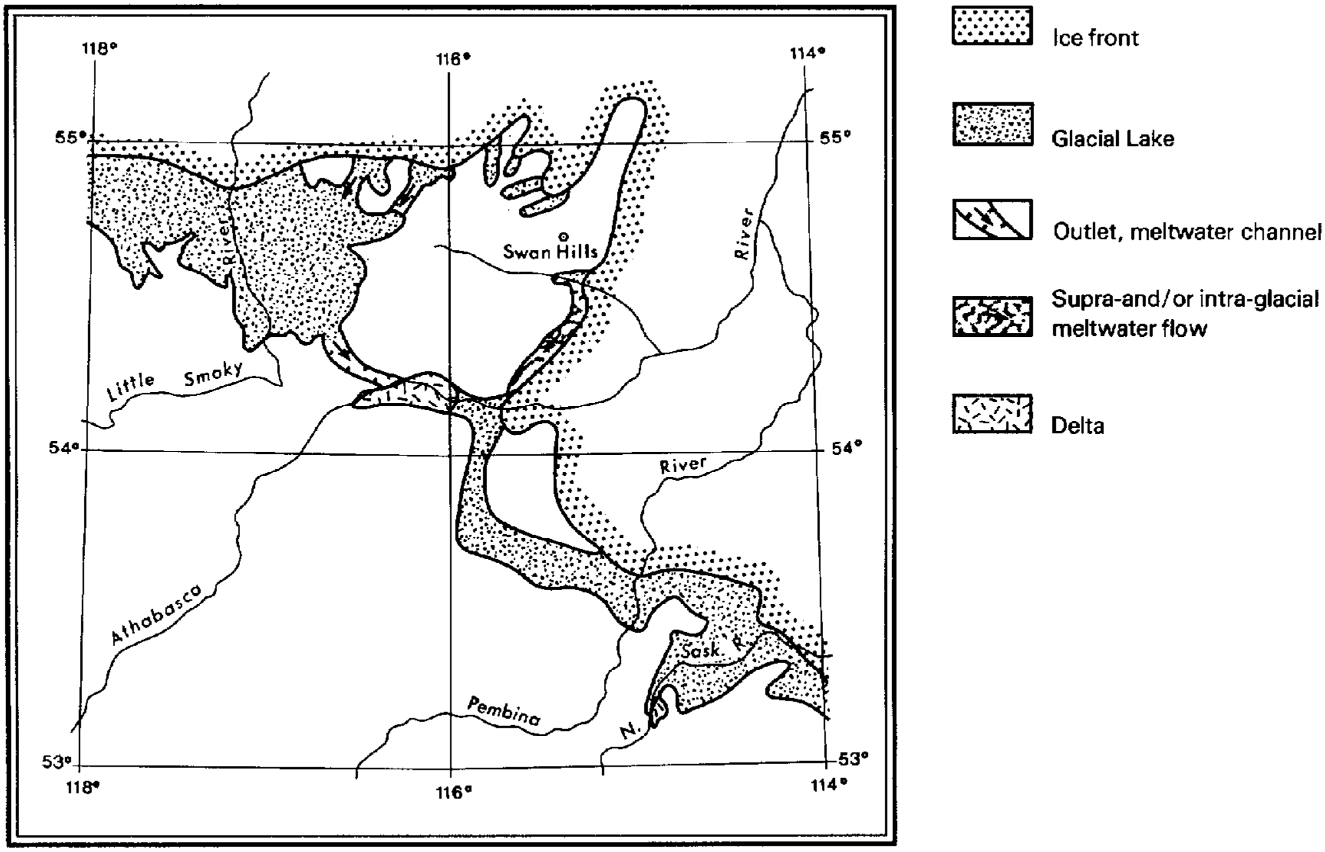


FIGURE 7. Location of the proglacial lakes at the time of Glacial Lake Iosegun I (after St. Onge, 1971).

lower elevations; the separation is based on physiographic criteria, not material characteristics.

The dominant surficial materials on the Iosegun Plain are glaciolacustrine clays which occur as blankets overlying a low-relief morainal landscape. These materials, of late glacial age, were deposited in a series of lakes formed when drainage to the north was blocked by retreating Laurentide ice. The glacial lakes have been named Glacial Lake Iosegun (stages I, II and III) and Glacial Lake Falher I by St. Onge (1971). Figure 7 illustrates the location and extent of glacial lakes at the time of Glacial Lake Iosegun I.

The glaciolacustrine sediments are dominantly clay and silt-sized and contain scattered pebbles, although occasionally they are pebble-free. Stratification and seasonal varving are commonly visible. Dark gray colors, inherited from black Cretaceous shales, are most common. These pebbly, glaciolacustrine sediments were deposited sufficiently close to the ice front to receive a significant contribution of stones carried by icebergs. Such materials are extensive throughout the Peace River region and were referred to as lacustro-till in earlier soil survey reports (Odynsky *et al.* 1950, 1952, 1956). The sediments vary in thickness from 1 m to several metres and generally occur below an elevation of 850 m above sea level. They form a blanket that is usually continuous throughout the Wapiti Plain and extends up the valleys of rivers and large creeks.

Glaciofluvial sediments were deposited by late-glacial streams usually as terrace deposits, or deltas. The textures of these sorted, stratified materials vary from gravel to sand to silt. Thickness and extent of deposits is also highly variable. These materials are scattered throughout the area, usually relating to deltas or outwash channels associated with glacial lake margins.

The sandy glaciofluvial materials that have been formed into dunes are classified as eolian deposits in figure 6 and in the legend of the soil map. The materials are medium to coarse sand or loamy medium sand textured and are usually formed into U-shaped or longitudinal dunes of 1 to 5 m relief. The dunes are no longer active, being stabilized by vegetation.

Organic deposits (muskegs) occur throughout the area wherever poor drainage encourages accumulation of peat. Moss peat and sedge peat comprise bog and fen peat lands which cover major portions of the plains and are also wide-spread in the plateau-benchlands.

Fluvial deposits of Holocene (modern) age occur along modern stream channels as terrace and floodplain deposits. These sediments are stratified and particle size varies widely with silts and sands and occasional gravels being present.

Colluvial materials, which have been moved by gravity, occur on the lower reaches of escarpments and very steep slopes. These materials have similar properties to the materials that occur in the local upper slope positions, and usually occur as veneers or blankets over soft sedimentary bedrock.

Hydrogeology

The following discussion is adapted from Hydrogeology of the Iosegun Lake area, Alberta, by Tokarsky (1977). For further information, the reader is referred to the original report.

The main aquifer types recognized in the area are:

1. recent alluvial gravels along the Athabasca River;
2. buried valley sands along the Little Smoky, Goose and Iosegun Rivers;
3. high-level gravels on the Swan Hills and in the southern part of the area;
4. Paskapoo Formation sandstones;
5. bentonitic sandstones;
6. more rarely, coal seams of the Wapiti Formation and Scollard Member.

Yields exceeding 38 L/sec (500 igpm) have not been assigned to any area, although such yields may be possible under favorable conditions at certain localities from aquifer types 1, 2 and 4, listed above.

Yields of 8 to 38 L/sec (100 to 500 igpm) are considered possible from aquifer types 2 and parts of 4, listed above.

Yields of 2 to 8 L/sec (25 to 100 igpm) are considered possible over most of aquifer type 4. Aquifer types 1 and 2 should also be capable of at least this rate of production.

Yields of 0.4 to 2 L/sec (5 to 25 igpm) are considered to be possible throughout most of the remainder of the area, from bedrock aquifers, thin alluvium and intertill, or near-surface sands and gravels.

Sodium bicarbonate waters with total dissolved solids content ranging from 500 to 1500 ppm are the rule in commonly utilized aquifers. Wells completed in the Paskapoo Formation tend to have lower total dissolved solids content and slightly higher percentages of calcium and magnesium. High iron content is a problem in many domestic wells in the vicinity of Little Smoky River.

The existing information on groundwater is generally very limited and therefore serves only as a preliminary guide for potential groundwater resource development.

Climate

Climate exerts a strong influence over the development of soils, the distribution of vegetation and the options for land use. Availability of climatic data for this region is limited to May to September temperature and precipitation records for ten forestry lookouts, and year round temperature and precipitation records for three stations (tables 2 and 3). Studies by Longley (1967, 1968), MacIver, Holland and Powell (1972), Powell and MacIver (1976), and Bowser (1967) provide general characterization of climatic conditions.

The Iosegun map area has a continental climate with long cold winters and cool summers. Over most of the area, mean annual precipitation is 500 to 600 mm or more; snowfall averages 150 to 200 cm; and hours of bright sunshine from May 1 to September 30 are less than 1100 (Longley, 1968).

Climatic evaluation of the Iosegun Plain and Simonette and Fox Creek Benchlands is based on data from stations at Eagle Lookout (LO), Kaybob, Pass Creek LO, Simonette, Snuff LO, Sweathouse LO, and Whitecourt. As a broad grouping, these stations represent the low (850 to 1150 m) elevation and somewhat warmer and drier climate of the region. Frost-free period is generally less than 75 days (Bowser, 1967) and May to

TABLE 2.
Mean Monthly Temperature (°C)*
Source: Temperature and Precipitation Means 1941-1970
(Atmospheric Environment Service, 1970)

Station	Elev. (m)	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Berland LO	1219					6	9	12	11	6			
Eagle LO	1040					8	12	15	13	9	4		
Goose Mtn. LO	1494					6	9	13	11	7	3		
Huckleberry LO	1430					7	11	13	12	8	3		
Kaybob	853	-11	-13	-7	1	8	12	17	11	11	3	-4	-9
Mayberne LO	1449					7	10	13	12	8	3		
Pass Cr. LO	1135					8	12	14	13	8			
Simonette	855	-10	-13	-7	3	8	12	17	11	11	3	-5	-9
Simonette LO	1379					7	11	13	12	8			
Snuff LO	969					9	12	15	14	9			
Sweathouse LO	853					9	12	15	14	9			
Whitecourt	741	-16	-11	-6	2	9	12	15	14	9	3	-6	-13
Whitecourt LO	1158					6	10	12	11	7			

*Some stations are less than 10 years

TABLE 3.
May to September and Annual Precipitation Data
from Recording Stations near or in the Area

Precipitation (mm)

Station	Elev. (m)	May	June	July	Aug	Sept	May-Sept	Annual
Berland LO	1219	61	97	107	94	58	417	-
Eagle LO	1040	61	109	104	106	51	431	-
Goose Mtn. LO	1494	61	132	114	104	56	467	-
Huckleberry LO	1430	46	93	92	111	54	396	-
Kaybob	853	50	132	93	60	24	359	580
Mayberne LO	1449	61	100	105	94	58	418	-
Pass Cr. LO	1135	64	94	96	86	54	394	-
Simonette	855	42	83	98	60	29	312	608
Simonette LO	1379	-	90	110	99	74	-	-
Snuff LO	969	84	80	76	84	54	378	-
Sweathouse LO	853	61	84	100	88	51	384	-
Whitecourt	741	48	75	101	83	33	340	521
Whitecourt LO	1158	55	78	102	89	43	367	-

LO = Lookout
(firetower)

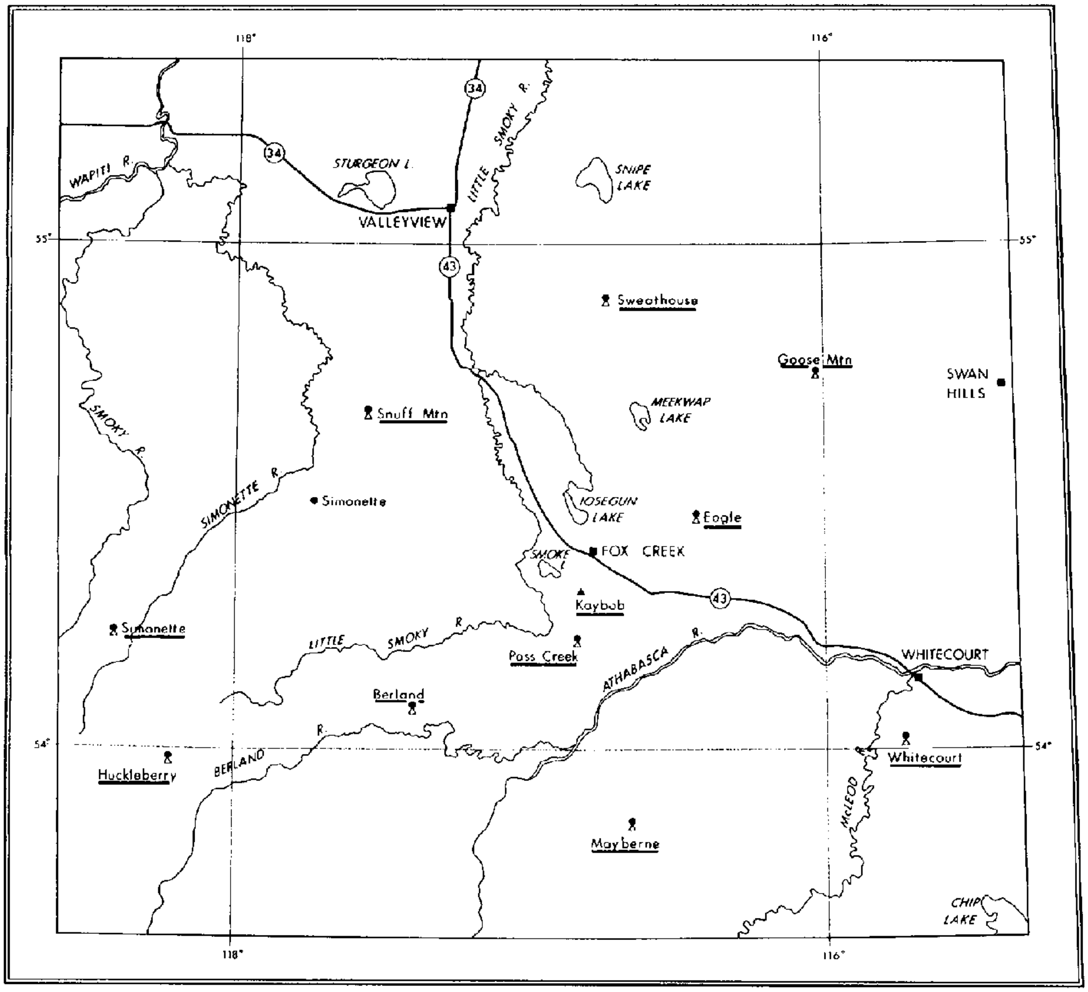


FIGURE 8. Location of meteorological stations.

September precipitation is about 350 to 400 mm (table 3). The Swan Hills and Little Smoky, Berland, and Mayberne Plateaus experience comparatively cooler temperatures and higher precipitation. These lands are represented by stations at Berland LO, Goose Mountain LO, Huckleberry LO, Mayberne LO, Simonette LO, and Whitecourt LO. Elevations of these stations range from about 1150 to 1500 m. Frost-free period is generally less than 60 days (Bowser, 1967) and May to September precipitation is about 400 to 450 mm (table 3). June, July and August are the wettest months at all locations, with May and September precipitation usually considerably less. The location of recording stations is shown on figure 8.

Temperatures recorded at the forestry lookout towers (table 2) appear relatively high. This is largely due to the location of lookout towers and associated climatological stations on heights of land. Cold air drainage from these high areas results in higher temperature recordings at stations than are representative for the overall area. Longley (1967) found that temperature differences exceeding 5°C over short distances in the Spring Creek area correlated with changes in elevation.

Vegetation

The Iosegun Lake area is covered with coniferous and mixed (deciduous-coniferous) forests (plate 3) except for areas that have been cleared for cultivation.

PLATE 3. Wetland (fen and beaver dams) and mixedwood forest on the Little Smoky Plateau.

In accordance with classification of the forests of Canada by Rowe (1972) most of the area is in the Lower Foothills section of the Boreal Region, whereas the Iosegun Plain is in the Mixedwood section. The Lower Foothills section is transitional from the Transcontinental Boreal Forest to the Rocky Mountain Subalpine Forest. The main feature distinguishing the two sections is the presence of lodgepole pine (*Pinus contorta* var. *latifolia*) in the Lower Foothills section and the abundance of aspen in the Mixedwood section.

Observations made during the course of the soil survey generally agree with the work of Rowe (1972), except in the Iosegun Plain portion of the map area. In this area, aspen poplar (*Populus tremuloides*) dominates the forest vegetation farther south than indicated by Rowe, and should be considered as part of the Mixedwood section, not as part of the Lower Foothills section. This alteration of Rowe's boundaries is adopted here.

The flora of the area is mostly boreal with cordilleran elements occurring at higher elevations on the plateaus and in the Swan Hills (Moss and Pegg, 1963; Vitt, 1973; Achuff, 1974; Alberta Wilderness Association, 1976). Species of cordilleran affinity include lodgepole pine, Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), trailing raspberry (*Rubus pedatus*), mountain laurel (*Kalmia polifolia* var. *microphylla*), white rhododendron (*Rhododendron albiflorum*), tall bilberry (*Vaccinium membranaceum*) and elderberry (*Sambucus pubens*). Devil's club (*Oplopanat horidum*), and false mitrewort (*Tiarella trifoliata*) are two Pacific coast species found in the Goose Mountain area and on the high tablelands in the southeast corner of the area.

The spruce, fir and pine in the area are often hybrids of boreal and cordilleran species (Achuff, 1974). Pure populations of white spruce in the lower Mixedwood forests grade to white-Engelmann hybrids with increasing elevation. Fairly pure Engelmann spruce occur at the highest elevation on Goose Mountain and possibly other tablelands also. Boreal balsam fir (*Abies balsamea*) hybridizes with subalpine fir and lodgepole pine hybridizes with jackpine (*Pinus banksiana*) in the area.

The distribution of vegetation is related to elevation, soil moisture-nutrient regime, and fire history. Spruce-fir forests occupy upland areas that have not been burned recently. Lodgepole pine forests and mixed coniferous forests (plate 3) occur in upland areas with more recent fire history. White spruce-aspen mixedwood forests prevail at lower elevations. Black spruce forests, and bogs and fens occupy extensive areas of poorly drained soils on the plains and on the tablelands.

Spruce-fir forests form the climax forest type on freely drained upland sites. The forests are dominated by white spruce, Engelmann spruce and their hybrids, and by balsam fir, subalpine fir and their hybrids. Lodgepole pine is usually a seral species on these sites. Fir tends to become more dominant at higher elevations in the Lower Foothills section, while white spruce is dominant in the Mixedwood section.

Shrubs that commonly occur in the understory of this vegetation type include low-bush cranberry (*Viburnum edule*), rose (*Rosa acicularis*), Labrador tea (*Ledum groenlandicum*), tall bilberry (*Vaccinium membranaceum*) cranberry (*Vaccinium vitis-idaea*) and twinflower (*Linnaea borealis*). Herbs include bunchberry (*Cornus canadensis*), one-sided wintergreen (*Pyrola secunda*) and blunt-leaved orchid (*Habenaria obtusata*). The forest floor is generally covered with three main species of feather moss (*Ptilium crista-castrensis, Hylocomium splendens* and *Pleurozium schreberi*). Epiphytic lichens of the genera *Usnea, Alectoria* and *Parmelia* are common on the branches and trunks of trees.

Lodgepole pine forests are typically even-aged stands established after fire. Young stands are often very dense. Older stands are typically being replaced by spruce and fir (plate 4). On some droughty soils pine

PLATE 4. Lodgepole pine-black spruce forest on the Little Smoky Plateau.

communities may be self-perpetuating. Typical understory shrubs include Labrador tea, lowbush cranberry, buffalo-berry (*Shepherdia canadensis*), bearberry (*Arctostaphylos uva-ursi*), cranberry, and blueberry (*Vaccinium myrtilloides*). Common herbs include bunchberry, trailing raspberry, one-sided wintergreen, and stiff clubmoss (*Lycopodium annotinum*). The three common feather mosses (*Hylocomium splendens, Pleurozeum schreberi* and *Ptilium crista-castrensis*) carpet the ground. Lichens of the genera *Cladina* and *Cladonia* are common on the forest floor and species of *Alectoria* and *Usnea* are found on the trees.

Mixedwood forests are dominated by white spruce and aspen. Balsam poplar replaces aspen in wet areas receiving groundwater seepage. Balsam fir occurs in older stands that have been subjected to fire for some time. Paper birch is of scattered occurrence.

Typical shrubs include lowbush cranberry, snowberry (*Symphoricarpos albus*), rose, and red raspberry (*Rubus strigosis*). Typical herbs include dewberry (*Rubus pubescens*), twinflower, bunchberry, bluebells (*Mertensia paniculata*), bluejoint grass (*Calamagrostis canadensis*), wild lily-of-the-valley (*Maianthemum canadense* var. *interius*) and pink wintergreen (*Pyrola asarfolia*). The most common feather moss carpeting the ground is *Hylocomium splendens*. Species of *Alectoria* and *Usnea* are the dominant epiphytic lichens and the moss *Orthotriclihum speciosum* var. *elegans* is a common epiphyte on aspen and balsam poplar trunks.

Poplar forests occur at lower elevations in areas where repeated burning has essentially eliminated white spruce and balsam fir. The stands are often even-aged; older stands are being invaded by white spruce, thus developing into mixedwood forests.

Typical shrubs in the understory are red-osier dogwood (*Cornus stolonifera*), low-bush cranberry, saskatoon (*Amelanchier alnifolia*), rose, and red raspberry. There are a large number of herbaceous species in these stands. The most common herbs include dewberry, pink wintergreen, wild strawberry (*Fragaria virginiana*), wild sarsaparilla (*Aralia nudicaulis*), bluejoint grass, pea vine (*Lathyrus ochroleucus*), and wild lily-of-the-valley. Moss cover is restricted to the bases of trees due to the smothering effect of the annual leaf fall.

Muskegs, or peatland vegetation types, can be subdivided into bogs and fens based on floristic composition and nutrient status.

The groundwater in bogs is acidic and low in nutrients (ombrotrophic). The vegetation community is typically characterized by black spruce, Labrador tea, and sphagnum moss. The amount of tree cover varies from dense cover to none (plate 5). The peat is formed primarily of decaying sphagnum mosses.

Fens have higher pH and nutrient levels than bogs. They are characterized by sedges (for example, *Carex limosa* and *C. aquatilis*), and mosses such as *Tomenthypnum nitens* and *Aulacomnium palustre*. Sphagnum mosses are rare and the fen peat is formed of sedges and non-sphagnum mosses. Fens may be treed or open and patterned fens are common (Vitt, Achuff and Andrus, 1975).

Soils

Soils in the landscape

Soils are part of land, that assemblage of resources that extends from the atmosphere to some depth below the surface of the earth. The natural attributes of land include climate, landform, soil, vegetation, fauna, and water. In the mapping of soils, the interrelationships between components of the landscape are recognized, and the soil delineations and groupings are based on an awareness of the natural environment. The soil units delineated in this soil survey correspond to the soil components of Land Systems in the Ecological (Biophysical) Land Classification System (Lacate, 1969; Thie and Ironside, 1977).

Soils display variation both vertically and horizontally, and by examining these variations, soil individuals and patterns of individuals may be recognized. Vertical variation is in the form of horizons which differ from one another in such properties as color, texture, structure, consistence, and chemical and biological activity. These are parameters used to identify and classify soils within a taxonomic framework such as the Canadian System of Soil Classification (Canada Soil Survey Committee, 1978). A hypothetical soil profile with brief descriptions of horizons is illustrated in figure 9.

Soils also vary in the horizontal dimension, as does the rest of the landscape. As geological materials, topography, moisture regime, and vegetation change, so do the soils. Mapping units describe collections (or populations) of soils which occupy characteristic portions of the landscape. Each population of soils can be defined, recognized, mapped, and treated as a unit for interpretive purposes. The mapping units are usually named after the dominant soils within the population. Soil names do not usually cross major physiographic-ecological boundaries.

Soil survey methods

The purpose of a soil survey is to identify and map the soil patterns of the landscape and to present the information to the user.

Accessory characteristics used in mapping include:
1) color of the solum;
2) mottles and gleying;
3) porosity;
4) vegetation type;
5) atmospheric climate;
6) surficial materials and their genesis.

Soil survey involves identification, description, and delineation on a map of contrasting segments of the landscape as estimated from direct field observations or indirect inferences from such sources as aerial photographs and topographic maps. The differentiating criteria (Valentine *et al.*, 1979) used to delineate segments of the landscape include:
1) texture, depth and mineralogy of the solum and the underlying parent material;
2) soil water regime/drainage class;
3) organic matter in solum;
4) horizon sequence;

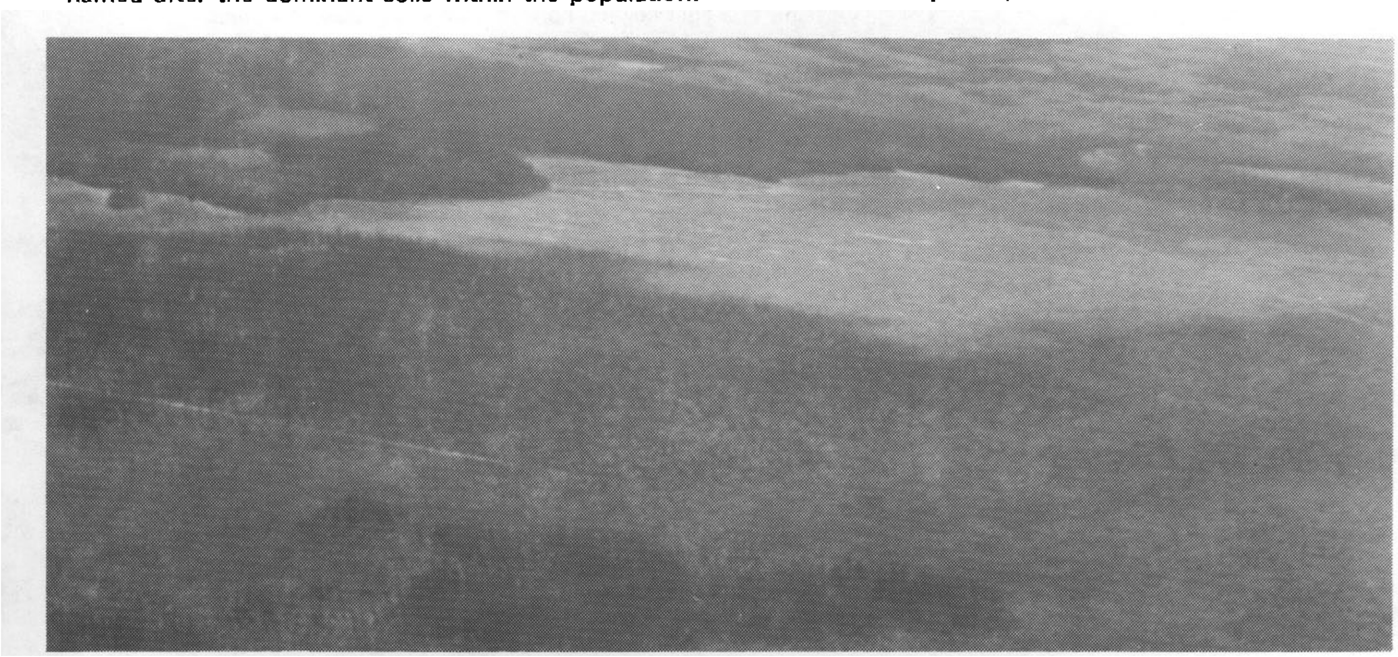


PLATE 5. Treed and open bog and fen (KNZ-EGL soil area) on the Little Smoky Plateau.

5) surface expression, slope and erosion;
6) type and proportions of soil taxa.

The mapping procedure in this soil survey included (1) an initial air-photo interpretation using 1966 photos at a scale of 1:31 680 and 1950 photos at a scale of 1:40 000; (2) transfer of the lines from the photos to 1:50 000 topographic maps; and (3) field checking and sampling of representative soils. The project was initiated in 1974 and the field program was completed in 1977; one pedologist was involved in the project. The ground access in the Iosegun Lake Sheet, although variable, was generally limited because of the scarcity of roads. A four-wheel-drive truck and a Cramer A.W.D. all-terrain vehicle were used to traverse available roads and trails and some seismic lines. A helicopter was used to access parts of the area, but suitable landing sites were often unavailable.

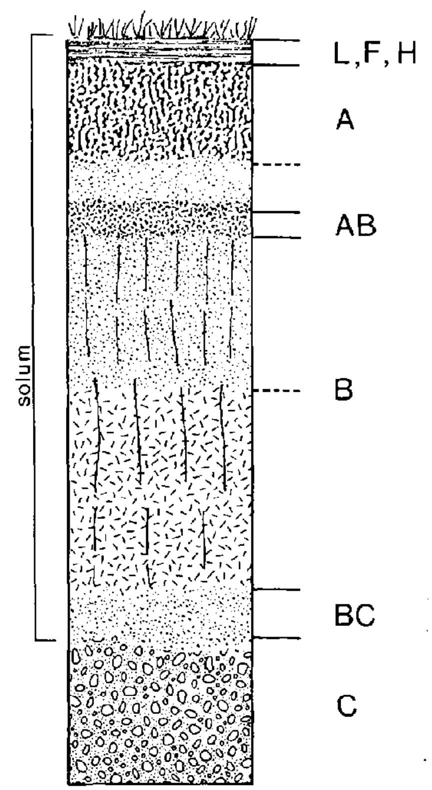
Map reliability

Reliability of the soil map is clearly related to access. The routes that were traversed and the sites inspected by helicopter are shown on the access and reliability map of the area (figure 10). In areas of poor access, mapping relied heavily on air photo interpretation.

Map legend

The legend used in this soil survey is similar to the legend used in the Wapiti Sheet (83L) and represents an attempt to correlate contrasting types of legends used in surrounding areas in the past. Soil units are used to describe collections (or populations) of soils which occupy all delineated areas of the landscape identified by the same soil notation. These soil units are usually named after the dominant series present. Exceptions to this system occur where the soil units are named after soil associations established in the Hinton-Edson area by Dumanski *et al.* (1972). The soil units are quite similar in concept to the soil associations. Table 4 summarizes the correlation of soil names used in this survey.

Each area delineated and labelled on the soil maps is called a Map Delineation. The label identifies the soil unit in the numerator, and the topographic class in the



L,F,H - Organic horizon, which may be subdivided into: L (raw organic matter), F (partially decomposed organic matter), and H (decomposed organic matter).

A - A mineral horizon at or near the surface. It may be a dark colored horizon in which there is an accumulation of humus (Ah), or a light colored horizon from which clay, iron, and humus have been leached (Ae).

AB - Transition horizon.

B - Mineral horizons that (1) may have an enrichment of clay (Bt), iron (Bf), or organic matter (Bh); or (2) may be characterized by a columnar structure and a significant amount of exchangeable sodium (Bn); or (3) may be altered to give a change in color or structure (Bm). Usually lime and salts have been leached out of this horizon. The symbol "j" is used with the above suffixes to denote a failure to meet the specific limits of the suffix.

BC - Transition horizon.

C - Mineral horizon comparatively unaffected by the soil forming process operative in the A and B horizons except for the process of gleying (Cg) and the accumulation of calcium or magnesium carbonates (Ck) and soluble salts (Cs).

FIGURE 9. Diagram of a soil profile.

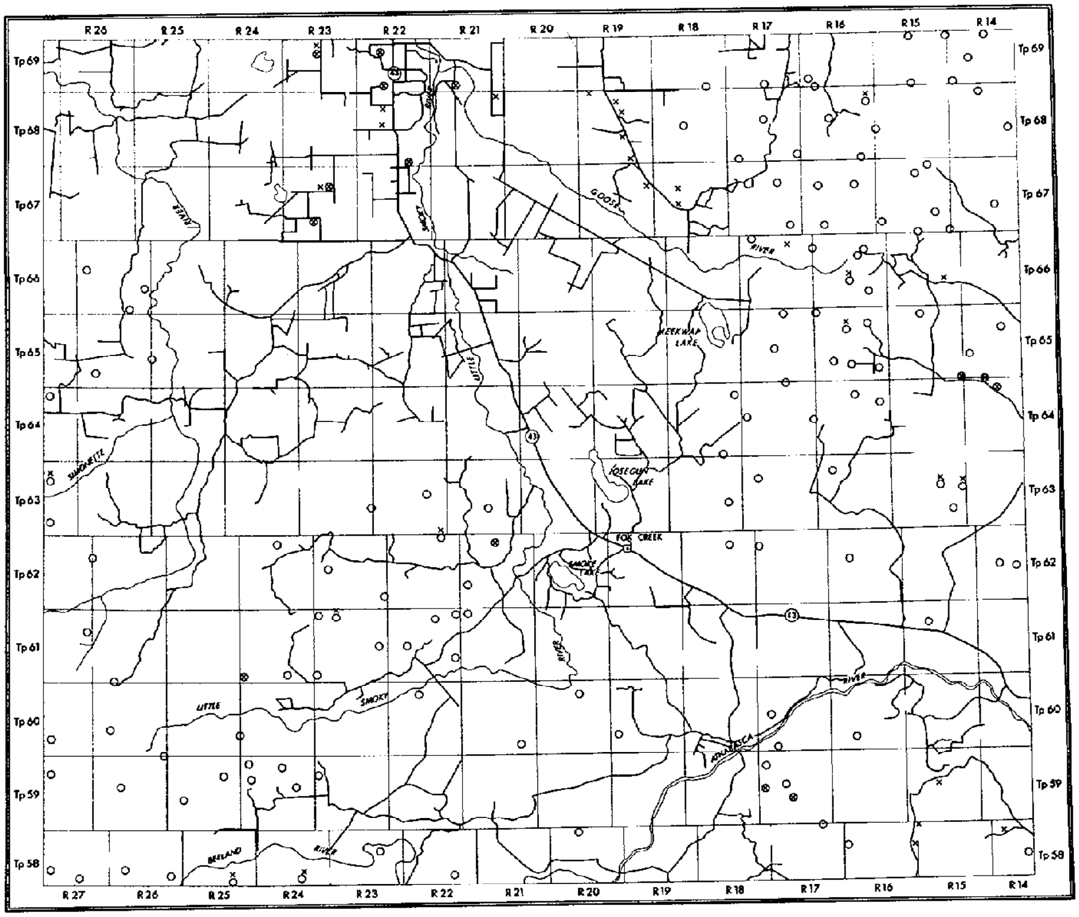


FIGURE 10. Access map.

—— Route traversed for soil inspections

o Helicopter landing site

× Parent material sampled for engineering analyses

⊗ Soil profile sampled for routine analyses and parent material sampled for engineering analyses

denominator. For example, a notation such as $\frac{\text{DON 1}}{\text{c}}$ occuring on a soil map identifies a Donnelly 1 Soil Unit on class c topography. The soils are dominantly Gleyed Solonetzic Gray Luvisols developed on glaciolacustrine clays (Donnelly Soil Series). There are also significant inclusions, 15 to 40 percent of the area, of Orthic Gray Luvisols on the same materials (unnamed soil series). The denominator indicates the topography is class c, an undulating surface with 2 to 5 percent slopes.

When more than one soil unit is identified in the numerator it indicates contrasting materials are present in the delineated area. For example: $\frac{\text{DON 1 - EDS 4}}{\text{d}}$ indicates the presence of Gleyed Solonetzic Gray Luvisols developed on glaciolacustrine clays and Orthic and Brunisolic Gray Luvisols on clay loam till (Edson 4 Soil Unit). The topography is class d, a gently rolling surface with 5 to 9 percent slopes.

The legend is designed to be brief and clear and to avoid repetition where possible. For example, Soil Unit EDS 5 is comprised dominantly of EDS 4 (defined in legend immediately above), but in addition has a significant occurrence of Gleysolics. If written out in full, the description of EDS 5 would read: Dominant Orthic Gray Luvisol with Significant Brunisolic Gray Luvisol and Significant Gleysolics.

TABLE 4.
Correlation of Soil Units, Established Soil Series
and Hinton-Edson Associations

Iosegun Soil Unit	Dominant Soil Series	Hinton-Edson Association
Blackmud	Bickerdike, Culp	Blackmud
Copton	Copton, Modeste	Maskuta
Davis	Davis	-
Deep Valley	Deep Valley	Summit-Maskuta
Donnelly	Donnelly	-
Eaglesham	none established	Fickle
Edson	Hubalta, Ansell, Braeburn	Edson
Enilda	Enilda	-
Esher	Esher	-
Goose	Goose	Erith
Gunderson	Gunderson	Erith
Heart	none established	Heart
High Prairie	High Prairie	-
Iosegun	Iosegun	Alluvium
Jarvis	Jarvis, Nose, Hightower	Jarvis
Judy	Judy	Summit
Kenzie	none established	Fickle
Lodge	Codesa, Peppers	Lodge
Mayberne	Tom Hill, Nosehill	Mayberne
Simonette	Simonette	Erith
Smoky	Smoky	Erith
Snipe	Snipe	Erith
Toad	Toad	-
Torrens	Torrens	Maskuta
Tri-Creek	Wampus	Tri-Creek
Wanham	Wanham	Erith

Soils of the Iosegun Lake area

The soils of the Iosegun Lake Area are discussed in the following section at two levels of generalization: (1) general soil patterns in each physiographic division, and (2) descriptions of the soil units recognized in this reconnaissance soil survey. A tabulation of the areal distribution of soil units and combinations of soil units for the entire map sheet is presented in table 5. Small scale distribution maps accompany many of the soil unit descriptions.

General soil patterns of the area were previously inventoried at an exploratory scale (1:750 000) using pack horses and helicopter from 1952 to 1955 (Lindsay, Wynnyk and Odynsky, 1963). Reconnaissance soil surveys were conducted in various portions of the map area, particularly in the northwest corner (see Reconnaissance Soil Survey of the Grande Prairie and Sturgeon Lake sheets by Odynsky, Wynnyk and Newton, 1956; and Soils of the Simonette Ecological Reserve by Lindsay, Kjearsgaard and Scheelar, 1971). The present soil survey incorporates and replaces the earlier inventories.

TABLE 5.
Areal Distribution of Soil Units

Soil Unit	Acres	Hectares
Blackmud:		
BKM 6	2,000	810
BKM 6-GUN 1	520	211
BKM 6-LDG 6	600	243
BKM 7	2,080	842
BKM 7-HRT 2-KNZ	2,920	1,182
BKM 7-JRV 4	600	243
BKM 7-KNZ	9,640	3,902
BKM 7-LDG 7	3,880	1,571
BKM 8	1,120	453
BKM 8-EGL	600	243
BKM 8-KNZ	280	113
BKM 8-KNZ-EDS 4	520	210
BKM 8-LDG 9	1,040	421
BKM 8-MBN 7	520	210
BKM 9-TOD 2	11,920	4,826
TOTAL	38,240	15,480
Copton:		
COP 1-TOR 1	3,880	1,571
COP 1-EDS 4/t	12,000	4,858
TOTAL	15,880	6,429
Davis:		
DVS 2	3,400	1,376
DVS 2-BKM 6	1,080	437
DVS 2-KNZ	8,280	3,352
DVS 2-LDG 7	1,240	502
TOTAL	14,000	5,667
Deep Valley:		
DPV	133,360	54,010
TOTAL	133,360	54,010
Donnelly:		
DON 1	4,960	2,008
DON 1-EDS 4	11,040	4,470
DON 1-EDS 5	1,040	421
DON 1-LDG 6	480	194
DON 2	216,400	87,611
DON 2-EDS 4	48,960	19,822
DON 2-EDS 5	14,640	5,927
DON 2-KNZ	6,520	2,640
DON 2-LDG 6	7,520	3,045
DON 2-LDG 7	23,840	9,652
DON 2-EDS 4-LDG 7	2,480	1,004
DON 3	54,800	22,186
DON 3-EDS 4	22,520	9,117
DON 3-EDS 5	8,640	3,498
DON 3-LDG 6-EDS 4	5,320	2,154
DON 3-LDG 7	3,360	1,360
DON 4	26,760	10,834
TOTAL	459,280	185,943
Eaglesham:		
EGL	31,480	12,745
EGL-BKM 8	6,080	2,462
EGL-JRV 5	3,480	1,409
EGL-KNZ	15,280	6,186
EGL/t	880	356
TOTAL	57,200	23,158
Edson:		
EDS 4	73,440	29,733
EDS 4-COP 1	1,440	583
EDS 4-DON 2	9,280	3,757
EDS 4-DON 3	2,440	988
EDS 4-EDS 4/t	2,680	1,085
EDS 4-GOS 2	9,440	3,822
EDS 4-HRT 2	1,560	631
EDS 4-JRV 4	1,680	680
EDS 4-KNZ	600	243
EDS 4-LDG 6	23,240	9,409
EDS 4-LDG 6-KNZ	24,720	10,008
EDS 4/t	21,200	8,583

TABLE 5 (continued)

Soil Unit	Acres	Hectares
Edson (continued)		
EDS 4/t-COP 1	7,280	2,947
EDS 4/t-COP 2	2,320	939
EDS 4/t-LDG 6	6,200	2,510
EDS 4/t-TOR 1	2,200	891
EDS 4/s	840	340
EDS 5	182,480	73,878
EDS 5-DON 2	15,880	6,429
EDS 5-DON 3	2,320	939
EDS 5-EDS 5/t	6,240	2,526
EDS 5-HRT 2	2,080	842
EDS 5-KNZ	84,960	34,397
EDS 5-KNZ-LDG 7	11,520	4,664
EDS 5-LDG 6	17,120	6,931
EDS 5-LDG-7	102,840	41,635
EDS 5-LDG 7-KNZ	2,000	810
EDS 5-LDG 8-KNZ	40	16
EDS 5/t	25,440	10,300
EDS 5/t-COP 1	1,440	583
EDS 5/t-TOR 1	12,880	5,214
EDS 5/t-TOR 2	8,200	3,320
EDS 6	22,840	9,247
EDS 6-KNZ	1,480	599
EDS 6/t	10,120	4,097
TOTAL	700,440	283,576
Enilda:		
EID 2	1,160	470
EID 2-GOS 1	1,040	421
EID 2-GUN 2	2,360	955
TOTAL	4,560	1,846
Esher:		
ESH 1	36,200	14,656
ESH 1-KNZ	760	308
TOTAL	36,960	14,964

Soil Unit	Acres	Hectares
Goose:		
GOS 1	18,240	7,385
GOS 1-GUN 2	480	194
GOS 1-KNZ	8,000	3,239
GOS 1/p	2,800	1,134
GOS 1/p-KNZ	11,240	4,551
GOS 1/p-LDG 7-KNZ	6,200	2,510
GOS 2	57,680	23,352
GOS 2-KNZ	6,040	2,445
GOS 2-LDG 7	4,440	1798
GOS 2-SIP 2	3,760	1,522
GOS 3	27,400	11,093
GOS 3-KNZ	5,840	2,364
GOS 3-SKY 2-KNZ	9,640	3,903
GOS 4-EDS 5-KNZ	3,200	1,295
GOS 4-KNZ	8,120	3,287
GOS 4-TOR 2	600	243
TOTAL	173,680	70,315
Gunderson:		
GUN 1	600	243
GUN 1-WHM 1-KNZ	7,440	3012
GUN 2	1,320	534
TOTAL	9,360	3,789
Heart:		
HRT 1	2,000	810
HRT 1-KNZ	21,680	8,777
HRT 1-KNZ-LDG 6	4,800	1,943
HRT 1-MBN 7	360	146
HRT 2	3,200	1,295
HRT 2-KNZ	1,160	470
HRT 3-KNZ	7,960	3,223
TOTAL	41,160	16,664
High Prairie:		
HPR 1	760	308
HPR 2	1,480	599
TOTAL	2,240	907

Soil Unit	Acres	Hectares
Iosegun:		
IOS 1	8,000	3,239
IOS 1-JRV 4	2,280	923
IOS 2	112,760	45,652
IOS 2-JRV 4	18,440	7,466
IOS 2-JRV 5	14,720	5,959
IOS 2-KNZ	10,480	4,243
TOTAL	166,680	67,482
Jarvis:		
JRV 4	5,120	2,073
JRV 4-EGL	1,400	567
JRV 4-IOS 1	16,000	6,478
JRV 4-IOS 2	4,480	1,814
JRV 4-KNZ	5,040	2,040
JRV 4-MBN 5	1,440	583
JRV 5	1,120	453
JRV 5-EGL	2,000	810
JRV 5-IOS 2	2,000	810
JRV 5-KNZ	13,600	5,506
TOTAL	52,200	21,134
Judy:		
JUY 1	880	356
JUY 1-MBN 4/s	1,280	518
JUY 1-MBN 7	680	275
JUY 2	1,920	777
JUY 2-KNZ	120	49
JUY 2-MBN 7	4,520	1830
TOTAL	9,400	3,805
Kenzie:		
KNZ	198,400	80,324
KNZ-BKM 7	7,080	2,866
KNZ-DVS 2	1,600	648
KNZ-EGL	41,720	16,891
KNZ-GOS 1	11,040	4,470
KNZ-GOS 1/p	12,440	5,036
KNZ-GOS 3	4,400	1,781
KNZ-GOS 4	1,560	632

Soil Unit	Acres	Hectares
Kenzie (continued)		
KNZ-GUN 1	400	162
KNZ-HRT 1	6,120	2,478
KNZ-HRT 2	1,440	583
KNZ-IOS 2	11,160	4,518
KNZ-JRV 5	4,920	1,992
KNZ-LDG 7	200	81
KNZ-MBN 5	640	259
KNZ-MBN 7	240	97
KNZ-SIP 1	3,240	1,312
KNZ-SIP 1/p	6,600	2,672
KNZ-SIP 2	8,480	3,433
KNZ-SIP 3	3,960	1,603
KNZ-SKY 1	9,000	3,644
KNZ-SKY 1/p	12,800	5,182
KNZ-SKY 2	5,360	2,170
KNZ-SKY 3	15,680	6,348
KNZ-WHM 1	5,080	2,057
KNZ-WHM 1/p	5,360	2,170
KNZ-WHM 1-SKY 2	9,320	3,773
KNZ-WHM 2	3,040	1,231
KNZ/t	5,880	2,380
KNZ/t-GOS 1	9,360	3,789
KNZ/t-GOS 1/p	1,240	502
KNZ/t-SIP 2	4,160	1,684
KNZ/t-WHM 1	320	129
TOTAL	412,240	166,897
Lodge:		
LDG 6	640	259
LDG 6-DON 1	1,120	453
LDG 6-DON 2	15,760	6,380
LDG 6-EDS 4	6,480	2,623
LDG 6-MBN 4	520	210
LDG 7	1,880	761
LDG 7-BKM 7	4,680	1,895
LDG 7-BKM 7-KNZ	5,360	2,170
LDG 7-DON 1	120	48
LDG 7-DON 2	3,920	1,587
LDG 7-DVS 2-KNZ	4,160	1,684
LDG 7-EDS 4	1,880	761
LDG 7-EDS 5	23,240	9,409
LDG 7-GOS 1	1,040	421
LDG 7-GOS 2	3,480	1,409

TABLE 5 (continued)

Soil Unit	Acres	Hectares
Lodge (continued)		
LDG 7-KNZ	5,320	2,154
LDG 7-MBN 5	9,880	4,000
LDG 7-MBN 5-KNZ	560	227
LDG 7-MBN 7	3,680	1,490
LDG 7-MBN 7-KNZ	8,240	3,336
LDG 7-SIP 1	1,280	518
LDG 7-SIP 1/p-KNZ	1,680	680
LDG 7-SIP 2	4,760	1,927
LDG 7-SKY 2	800	324
LDG 7-SKY 2/p	5,000	2,024
LDG 7-WHM 2-KNZ	5,360	2,170
LDG 9	440	178
LDG 9-KNZ	640	259
LDG 9-MBN 5	2,080	842
LDG 9-MBN 7	2,280	923
LDG 9-MBN 7/s	2,080	842
LDG 9-MBN 7-JUY 1	2,240	907
LDG 9-MBN 7-JUY 2	13,000	5,263
LDG 9-SKY 3	1,160	470
TOTAL	144,760	58,605
Mayberne:		
MBN 4	35,960	14,559
MBN 4-LDG 7	1,760	712
MBN 4-MBN 4/s	8,960	3,627
MBN 4-MBN 4/t	640	259
MBN 4/s	3,680	1,490
MBN 4/st	3,360	1,360
MBN 4/t	6,440	2,607
MBN 4/t-COP 1	25,240	10,219
MBN 5	64,880	26,267
MBN 5-EGL	2,760	1,117
MBN 5-JRV 5	960	389
MBN 5-KNZ	36,480	14,769
MBN 5-LDG 7	40,040	16,210
MBN 5-TOR 2	3,840	1,555
MBN 5/s	1,600	648
MBN 5/t	24,720	10,008
MBN 5/t-COP1	26,560	10,753
MBN 6	11,480	4,648
MBN 6-COP 1	200	81
MBN 6-LDG 6	11,360	4,599
MBN 6-LDG 9	240	97
MBN 6/s	840	340
MBN 6/s-KNZ	3,160	1,279
MBN 6/t-COP 1	3,240	1,312
MBN 6/t-JUY 1-LDG 9	440	178
MBN 6/st	1,240	502
MBN 7	30,680	12,421
MBN 7-BKM 9	1,000	405
MBN 7-EGL	21,160	8,567
MBN 7-JUY 2	4,240	1,717
MBN 7-JUY 2-KNZ	1,880	761
MBN 7-KNZ	21,360	8,648
MBN 7-KNZ-TOR 2	1,320	534
MBN 7-LDG 7	280	113
MBN 7-LDG 9	10,560	4,275
MBN 7-MBN 7/s	7,840	3,174
MBN 7/s	1,480	599
MBN 7/s-EGL	8,600	3,482
MBN 7/s-JUY 1	2,000	810
MBN 7/s-JUY 2	4,000	1,620
MBN 7/s-JUY 2-EGL	4,600	1,862
MBN 7/s-JUY 2-KNZ	4,320	1,749
MBN 7/s-KNZ	1,640	664
MBN 7/s-KNZ-JUY 2	31,440	12,729
MBN 7/s-LDG 9	9,040	3,660
MBN 7/st JUY 1	9,320	3,773
MBN 7/t	760	308
MBN 7/t-KNZ	520	210
MBN 7/t-TOR 2	6,360	2,575
TOTAL	504,480	204,241
Simonette:		
STT 1	400	162
STT 2-KNZ	8,200	3,320
STT 2-MBN 7/s-EGL	41,240	16,696
STT 2-MBN 7/s-KNZ	2,040	826
TOTAL	51,880	21,004
Smoky:		
SKY 1	6,120	2,478
SKY 1-EGL	360	146
SKY 1-KNZ	14,280	5,781
SKY 1-TOR 2	2,560	1,036
SKY 1/p	1,720	696

Soil Unit	Acres	Hectares
Smoky (continued)		
SKY 1/p-KNZ	1,120	453
SKY 2	22,800	9,231
SKY 2-KNZ	27,840	11,271
SKY 2-LDG 7	1,960	793
SKY 2-LDG 7-KNZ	12,200	4,939
SKY 2/p-KNZ	2,480	1,004
SKY 3	12,160	4,923
SKY 3-GUN 1	1,440	583
SKY 3-KNZ	23,480	9,506
SKY 3-LDG 7	5,840	2,364
SKY 3-LDG 7-EGL	680	275
SKY 3-LDG 7-KNZ	6,040	2,445
SKY 3-LDG 9	1,160	470
SKY 3/t-TOR 2	6,120	2,478
SKY 4-KNZ	7,080	2,866
SKY 4-STT 2-KNZ	7,920	3,206
TOTAL	165,360	66,944
Snipe:		
SIP 1	4,440	1,797
SIP 1-KNZ	11,000	4,453
SIP 1/p	1,120	453
SIP 1/p-KNZ	8,600	3,482
SIP 1/p-LDG 7-KNZ	2,840	1,150
SIP 2	31,040	12,567
SIP 2-EGL-LDG 7	2,040	826
SIP 2-KNZ	16,120	6,526
SIP 2-KNZ-LDG 7	34,040	13,781
SIP 2 LDG 7	2,440	988
SIP 3-KNZ	6,160	2,494
SIP 3-SKY 2-KNZ	4,520	1,830
SIP 3-WHM 2-KNZ	3,360	1,360
TOTAL	127,720	51,707
Toad:		
TOD 2	1,320	534
TOD 2-BKM 7	2,240	907
TOD 2-BKM 8	3,200	1,295
TOD 2-BKM 8-KNZ	7,560	3,061
TOD 2-COP 1	1,280	518
TOD 2-HRT 2-KNZ	6,480	2,623
TOD 2-JRV 5	1,160	470

Soil Unit	Acres	Hectares
TOD 2-KNZ	1,160	470
TOD 2-LDG 9-MBN 5	1,200	486
TOD 2-MBN 5	4,880	1,976
TOTAL	30,480	12,340
Torrens:		
TOR 1-EDS 4	240	97
TOR 1-EDS 4/t	920	372
TOR 2	1,080	437
TOR 2-EDS 5/t	640	259
TOR 2-GOS 1	1,480	599
TOR 2-MBN 7	2,120	858
TOR 2-MBN 7/t-KNZ	7,880	3,190
TOTAL	14,360	5,812
Tri-Creek:		
TRC 3	1,160	470
TRC 3-LDG 6	840	340
TRC 4	2,000	810
TRC 4-EDS 4	360	146
TRC 4-LDG 7	5,120	2,073
TOTAL	9,480	3,839
Wanham:		
WHM 1	720	291
WHM 1/p	1,240	502
WHM 1/p-KNZ	8,720	3,530
WHM 2	5,040	2,040
WHM 2-GUN 2-KNZ	3,800	1,538
WHM 2-KNZ	29,166	11,808
WHM 2-KNZ-GOS 2	4,800	1,943
WHM 2-KNZ/t	1,920	777
WHM 2-LDG 7	7,040	
WHM 2-LDG 7-KNZ	15,960	6,461
WHM 2-SIP 2-KNZ	9,880	4,000
TOTAL	88,286	35,740

TABLE 5 (continued)

Soil Unit	Acres	Hectares	Soil Unit	Acres	Hectares
Rough Broken:			Water:	22,840	9,247
RB	74,640	30,219			
TOTAL	74,640	30,219	GRAND TOTAL	3,561,166	1,441,745

Soils of the Iosegun Plain

The most common soils of the undulating to gently rolling Iosegun Plain (figure 11) are Luvisols, Solods, and Gleysols on glaciolacustrine clays and Organics on bog and fen peat. The Luvisols and Solods on clays are identified by the Donnelly, and Esher Soil Units. Gleyed Solonetzic, Orthic and Dark Gray Subgroups of the Luvisolic Order are represented. Gleysolic soils of the Snipe and Goose Soil Units occupy extensive poorly drained areas and occur as small inclusions in landscapes dominated by Luvisolic soils. Eaglesham Soil Units on fens and Kenzie Soil Units on bogs make up the extensive peatlands.

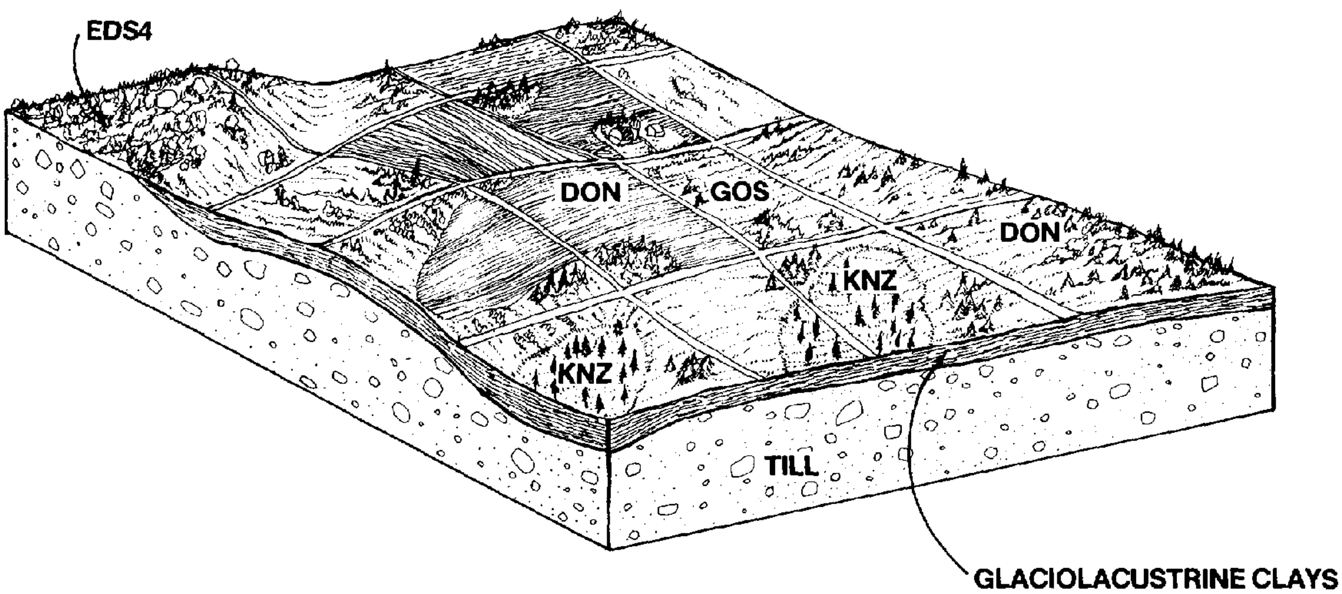


FIGURE 11. Block diagram of Iosegun Plain.

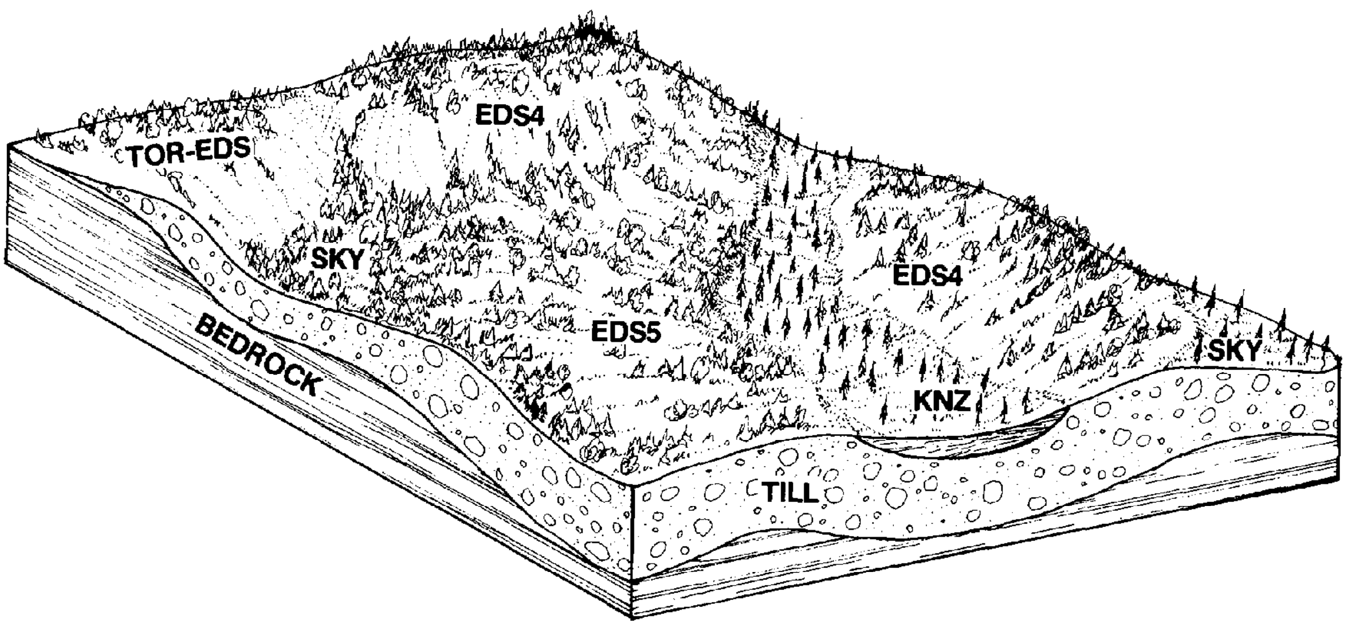


FIGURE 12. Block diagram of Simonette Benchland.

Brunisolic and Luvisolic soils on glaciofluvial sands (Blackmud Soil Units) and Luvisolic soils on thin sand veneers overlying till or glaciolacustrine clays (Lodge Soil Units) occur in areas where deltas were formed near the margins of glacial lakes.

Regosolic, Chernozemic and Gleysolic soils occupy post-glacial floodplains, on materials of varying texture. Iosegun Soil Units include mostly Regosolic and Gleysolic soils on active floodplains. High Prairie Soil Units (Chernozemic soils) and Enilda Soil Units (Gleysolic soils) occur in a small area marginal to the Little Smoky and Goose Rivers.

Gray Luvisols on till (Edson Soil Units) are of very limited extent on the Iosegun Plain. These soils are found on occasional ridges or knobs that are not blanketed with glaciolacustrine clays.

Soils of the Simonette Benchland and Fox Creek Benchland

Extensive areas of Orthic Gray Luvisols on rolling morainal landscapes (Edson Soil Units) characterize the Simonette and Fox Creek Benchlands (figure 12). Smoky Soil Units occupy poorly drained portions of the moraines and Kenzie Soil Units occur as bowl and blanket bogs.

On prominent ridges the till cover is thin and often discontinuous. Soils developed on the soft, weathered bedrock are described by the Torrens and Copton Soil Units.

Glaciofluvial deposits are not common in these benchlands, but small areas of Brunisolic soils on sands (Blackmud Soil Units) and Luvisolic soils on thin sand veneers overlying till (Lodge Soil Units) do occur.

Soils of the Driftpile Benchland

The most common soil landscapes in the Driftpile Benchland are made up of Orthic Gray Luvisols on till (Edson Soil Units) with variable amounts of Gleysolic soils (Smoky Soil Units) and Organic soils on bogs (Kenzie Soil Unit). The till tends to form thin blankets and discontinuous veneers over soft, fine-textured bedrock in the rolling to hilly upland. Gray Luvisols and Eutric Brunisols on soft, clayey bedrock (Torrens Soil Units) and Gray Luvisols on thin (<1 m) till over bedrock form a distinctive soil landscape in this area.

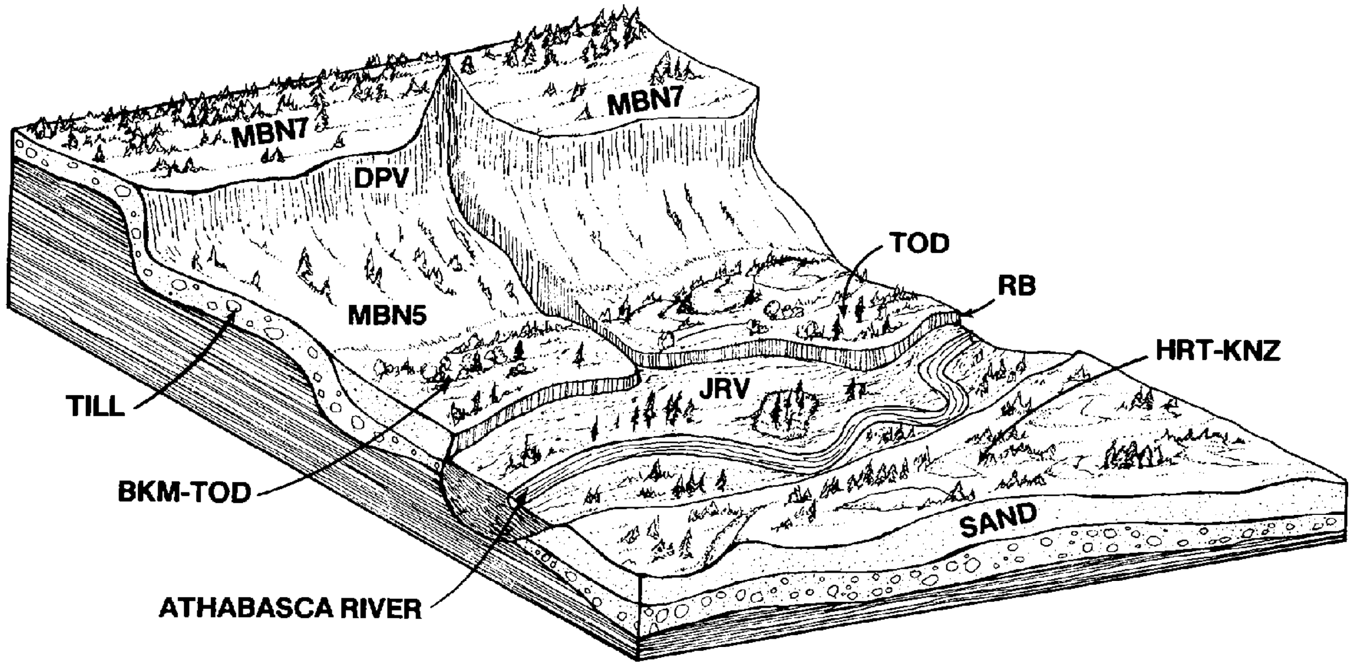


FIGURE 13. Block diagram of Windfall Plain.

Glacial lakes were formed in small basins in this upland area during the late glacial period. The soils developed on the clayey glaciolacustrine veneers and blankets are described by the Tri-Creek (Orthic Gray Luvisols) and Snipe (Luvic Gleysols) Soil Units.

Soils of the Swan Hills

The Swan Hills upland is a rugged, highly dissected plateau, the western portion of which extends into this map sheet. The most common soils are Orthic and Brunisolic Gray Luvisols developed on till of varying thickness. These soil landscapes, described by Mayberne Soil Units, often have inclusions of Brunisols and Luvisols developed on soft, sandy textured bedrock (Copton Soil Units). Soils on fine-textured bedrock also occur but are of minor areal extent. Gleysolic soils (Smoky Soil Units) and Organic soils on fens (Eaglesham Soil Unit) or on bogs (Kenzie Soil Unit) occupy depressional portions of the landscape. Soils developed on tableland gravels (Judy Soil Units) occur on the summit of Goose Mountain (the western end of the Swan Hills Plateau) and the tills in the area are often very stony.

Soils of the Windfall Plain

The soils of the Windfall Plain (figure 13) are developed on glaciofluvial deltas and terraces. Brunisolic and Orthic Gray Luvisols on sands (Blackmud Soil Units), Brunisolic Gray Luvisols on silts and fine sands (Toad Soil Units) and Podzolic Gray Luvisols and Brunisols on gravels (Jarvis Soil Units) are the most common soils in the broad valley. In areas where the sands have been formed into dunes, the Heart Soil Units are used to describe the landscape of dominantly Brunisolic soils. Organic soils on bogs (Kenzie Soil Unit) commonly occupy the interdune areas and Organic soils on fens (Eaglesham Soil Unit) are common on the terraces. Gleysolic soils on sands (Gunderson Soil Units) and on silts and fine sands (Wanham Soil Units) are of common occurrence in areas of groundwater discharge and ponded runoff. Regosolic and Gleysolic soils on the active floodplains are described by the Iosegun Soil Units.

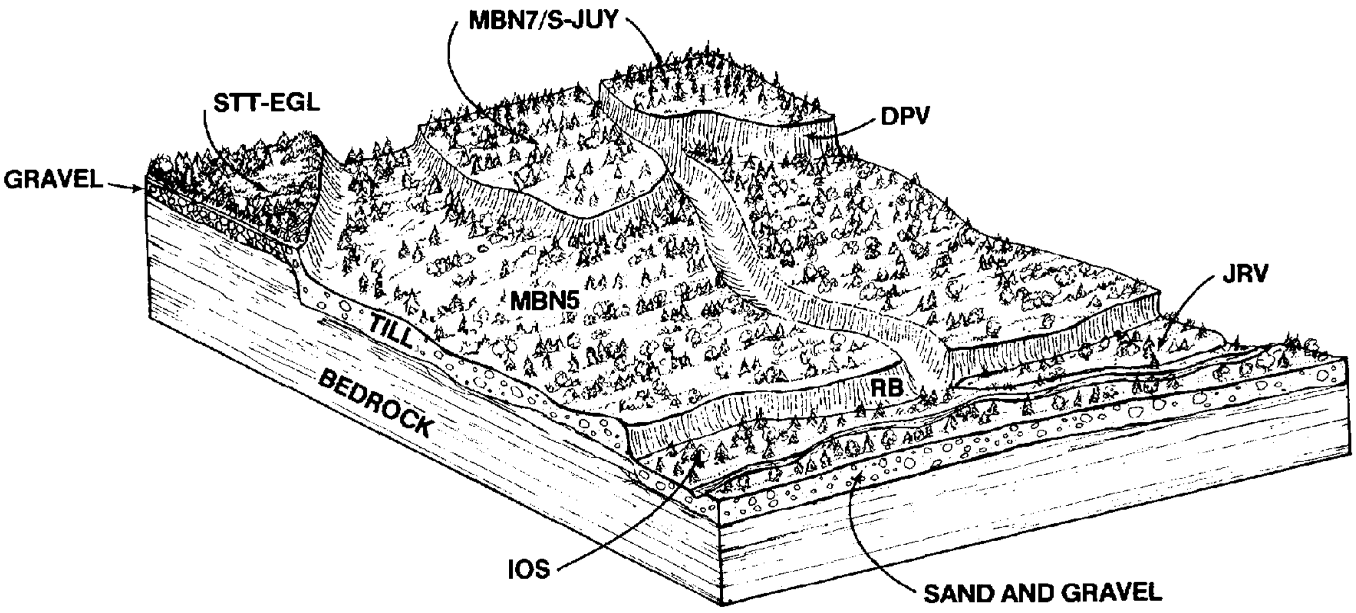


FIGURE 14. Block diagram of Little Smoky Plateau.

Soils of the Little Smoky Plateau, Berland Plateau and Mayberne Plateau

Three distinctive landscape elements can be recognized in the Little Smoky Plateau (figure 14), Berland Plateau, and Mayberne Plateau divisions of the Alberta Plateau-Benchland: (a) the fairly level tops of the plateaus and benches; (b) the very steeply sloping escarpments; and (c) the valleys included in the division.

The most common soils on the plateaus are Brunisolic and Podzolic Gray Luvisols developed on till (Mayberne Soil Units). The till often overlies tableland gravels at shallow depths and is generally very stony. On plateaus where the till cover is discontinuous or absent, the soils are developed on the gravels or on soft bedrock. Well drained Brunisolic and Podzolic Gray Luvisols on gravels (Judy Soil Units) and poorly drained peaty Gleysols on gravels (Simonette Soil Units) are common. Brunisolic and Orthic Gray Luvisols are developed on the soft bedrock (Torrens Soil Units). Organic soils on fens (Eaglesham Soil Unit) and on bogs (Kenzie Soil Unit) occupy large portions of the level plateaus.

On the very steeply sloping plateau escarpments, Brunisols, Luvisols and Regosols occur on colluvium and till (Deep Valley Soil Unit).

In the valleys included in these physiographic divisions, soils developed on glaciofluvial and organic materials are most common. Brunisolic Gray Luvisols on sands (Blackmud Soil Units) and Brunisols and Podzolic Gray Luvisols on gravels (Jarvis Soil Units) are common in the valley of the Little Smoky River. Poorly drained Gleysolic soils on deltaic silts and fine sands (Wanham Soil Units) are also common in the Little Smoky River valley. Organic soils on bogs (Kenzie Soil Unit) occupy large portions of the valleys. Regosolic and Gleysolic soils (Iosegun Soil Units) occur on the active floodplains of creeks and rivers.

Descriptions of the soil units

The soils information gathered during the survey of the Iosegun map area has been delineated on maps and interpreted in this report. However, it should be emphasized that the soils of the map area cannot be

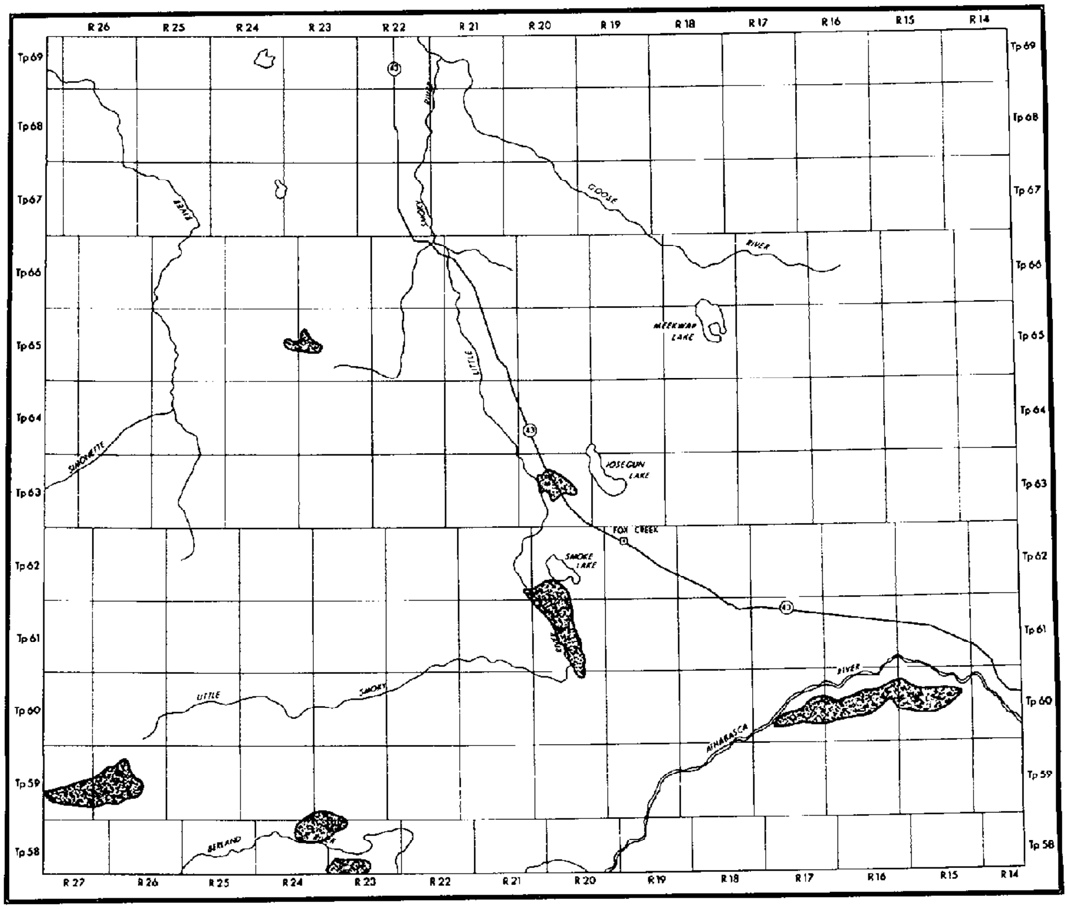


FIGURE 15. Distribution of Blackmud Soil Units.

understood by studying the soil map and legend alone. Neither can they be understood properly by studying only the report.

Although the soil descriptions are given in the report, their distribution over the landscape (dominant and significant) is generally only described in the legend. Thus both the report and the soil map containing the legend are necessary to understand and apply the work of the soil survey.

Blackmud (BKM) Soil Units

Soil landscapes dominated by Brunisolic and Luvisolic soils developed on glaciofluvial sands are described by the BKM Soil Units. The units are named after the Blackmud Soil Association (Dumanski *et al.*, 1972) and include Culp, Bickerdike, and other soil series.

Location in the Landscape

Blackmud soils occur on glaciofluvial deltas and outwash plains in several physiographic divisions (figure 15). The soils, on thick sand deposits, are often associated with Heart, Lodge, Toad and Kenzie soils.

Landforms and Materials

BKM Soil Units occur on thick glaciofluvial sands on ancient deltas, terraces, and outwash plains. Topography is usually undulating to gently rolling but may be ridged. These soils are distinguished from Heart soils by the absence of dunes and the presence of isolated, rounded pebbles and pebbly layers in the fluvial sediments. The thick sand deposits of the BKM Units distinguish these soils from Lodge soils which are developed on sand veneers that are generally less than 50 cm thick.

Parent material of the Blackmud Association is an olive brown to grayish brown (2.5Y 4/4 - 10YR 5/2) sand occasionally containing quartzite pebbles up to 5 cm in diameter. Lenses of interbedded gravel or clay or both may also be present. The material commonly is associated with present-day drainage courses or with

Pleistocene or pre-Pleistocene channels. It commonly overlies till or lacustrine deposits and may be overlain by organic materials.

Soils and Vegetation

Blackmud soils have sand, loamy sand and occasional sandy loam textures throughout the profile. As a result of these coarse textures, the soils are rapidly permeable, have low moisture supply capability, and low nutrient availability. These soils occur mainly within the relatively warmer region of the map sheet.

Lodgepole pine and aspen forests regenerate after fire and may form an edaphic climax on the well drained members of BKM Soil Units. Black spruce stands are most common on the poorly drained Gleysolic soil inclusions.

The soils of BKM 6 are dominantly Brunisolic Gray Luvisols (no series established) and Orthic Gray Luvisols (Culp series). BKM 7 has significant inclusions (15 to 30 percent of area) of poorly drained Gleysolic soils (including Gunderson series). BKM 6 and 7 were mapped mostly on the Iosegun Plain. BKM 8 consists of mostly Eluviated Eutric Brunisols (Bickerdike series) and weak Brunisolic Gray Luvisols. BKM 9 is similar to BKM 8 but includes Gleysolic soils (including Gunderson series) on significant portions of the landscape. BKM 8 and 9 were mapped in the southeastern portion of the map sheet, mostly on the Windfall Plain.

Copton (COP) Soil Units

COP Soil Units identify landscapes of Brunisolic and Luvisolic soils developed on weathered, soft sandstone and on colluvium derived from sandstone. The units are named after the Copton Soil Series—Eluviated Dystric Brunisols developed on weathered Paskapoo Formation sandstone.

Location in the Landscape

Copton soils are most common along the edges of the Little Smoky Plateau and the Swan Hills where Paskapoo Formation sandstones are exposed. These exposures occur at elevations of 900 to 1000 m above sea level and often form ridges and escarpments. Copton soils are usually mapped in association with thin Mayberne soils.

Landforms and Materials

Copton soils are developed in weathered sandstone of the Paskapoo Formation and in colluvium derived from sandstone. The soils reflect the nature of the bedrock and exhibit variable chemical and physical characteristics. In general, the materials are sandy loam to loam textured, strongly to slightly acid in reaction, and lack carbonates. The sandstones are soft and friable to depths of 2 m or more in most areas, with hard layers and lenses occurring at greater depths. Finer textured layers are of common occurrence in the bedding sequence.

The common landforms are smooth, elongate ridges with moderate to high relief as in the case of Snuff Mountain; and highly dissected plateaus such as those in the western Swan Hills and Tony Creek areas.

Soils and Vegetation

Copton soils occur in the uplands where amounts of precipitation are greater and the number of heat units are less than on the Wapiti Plain.

Soil development is highly variable and is strongly affected by steep topography, reaction of the parent material, and the processes of mass wasting. Eluviated Dystric and Eluviated Eutric Brunisols predominate the COP 1 Soil Unit on gently to strongly rolling terrain; Orthic and Brunisolic Gray Luvisols occur as significant (20 to 40 percent) inclusions. These soils are characterized by an eluvial horizon (Ae) overlying a B horizon. In many cases there has been insufficient downward movement of clay from the upper part of the profile into the B horizon to produce a Bt horizon. The solum varies from sandy loam to loam in texture and strongly acid to slightly acid in reaction. Lithic soils are present on very steep slopes where consolidated bedrock is encountered near the surface. Surface and internal soil drainage of Copton soils is fairly rapid. COP 2 is similar to COP 1 but has significant inclusions of poorly drained Gleysolic soils.

Vegetation communities are diverse on COP Soil Units. Aspen, lodgepole pine and spruce-fir forests form the common cover, responding to exposure and elevation changes.

Davis (DVS) Soil Units

Soil landscapes dominated by Orthic Gray Luvisols developed in medium textured glaciofluvial sediments are described by the DVS Soil Unit. The unit is named after the Davis Soil Series (Orthic Gray Luvisol on silt loam glaciofluvial sediments) which is the dominant soil in the landscape. The DVS 2 Soil Unit mapped in the Iosegun area has inclusions of poorly drained Wanham soils.

Location in the Landscape

The DVS 2 Soil Unit was mapped in the Two Creek and Chickadee Creek valleys on the edge of the Fox Creek Benchland, and in the Deep Valley Creek area on the Simonette Benchland. This soil unit comprises a very small portion of the total map sheet. The Davis Soil Series is more widespread as an inclusion in Wanham Soil Units.

Landforms and Materials

The DVS Soil Unit occurs on glaciofluvial deltas and terraces associated with late glacial lakes. The land surfaces are usually undulating or gently sloping and are often confined in a broad valley.

The materials are stratified deltaic sediments that tend to silty textures. Silt loam and very fine sandy loam textured materials are dominant in the upper 1 m but silty clays, clays, sands and gravels may occur below. The materials are moderately to strongly calcareous and are moderately permeable.

Soils and Vegetation

The well drained members of the DVS 2 Unit are well aerated and usually occur in a cool, moist, upland climate. Cold air drainage and frost pooling are common in the valley bottom soil areas.

DVS soils are characterized by strongly developed Gray Luvisol features; morphological variations, however, are evident in the upper portions of the profile. Some profiles exhibit the standard LH - Ae - Bt horizon sequence, while others have an Ae1, Ae2 horizon sequence overlying the Bt horizon. The surface horizons are characterized by a pale brown to yellowish brown color, silt loam texture, platy structure, and medium acid soil reaction. The illuvial (Bt) horizon is yellowish brown to brown, silt loam to silty clay textured, slightly acid in reaction, and exhibits moderately developed subangular blocky structure.

Luvic Gleysols (Wanham series) occupy 20 to 40 percent of the area of landscapes labelled DVS 2.

Aspen, lodgepole pine, and white spruce forests are common on DVS 2 soil areas. The greatest limitation to agricultural use of these soils is climate.

Deep Valley (DPV) Soil Units

The DPV Soil Unit describes a variety of soils that occur on the eroded plateau escarpments in the Little Smoky Plateau, Berland Plateau and Mayberne Plateau physiographic divisions. The unit is named after the modal soils, Eluviated Eutric Brunisols developed on sandy clay loam colluvium (Deep Valley series).

Location in the Landscape

The DPV Soil Unit has been restricted to the very steeply sloping escarpments of Tertiary Plateau remnants in the Alberta Plateau-Benchland. These escarpments occur at elevations ranging from 980 to 1220 m above sea level.

Landforms and Materials

The distinctive landforms of this soil unit are colluvial veneers and blankets occurring on the very steeply sloping escarpments of Tertiary-aged plateaus. Mass wasting and gullying are active processes in these landscapes.

The materials consist of colluvium, till, weathered sandstone, and Saskatchewan Gravels overlying Paskapoo Formation at varying depths (often less than 1 m). The soils are moderately to exceedingly stony and tend to sandy clay loam or sandy loam textures, with moderate to fairly rapid permeability rates.

Soils and Vegetation

Soils tend to be fairly weakly developed with Brunisols and Regosols being more common than Luvisols. The weak profile development is attributed to mass wasting and water erosion processes which periodically rejuvenate the landscape. Slopes tend to be unstable and are subject to slumping, especially in areas of groundwater seepage.

Lodgepole pine forests are the common cover on these soil areas, but aspen replaces the pine on some south-facing slopes and black spruce becomes abundant on north-facing slopes and in seepage areas.

DPV Soil Units have severe limitations for agriculture, road locations or timber harvesting because of very steep slopes and unstable soils. The climate is also severely limiting for agricultural production.

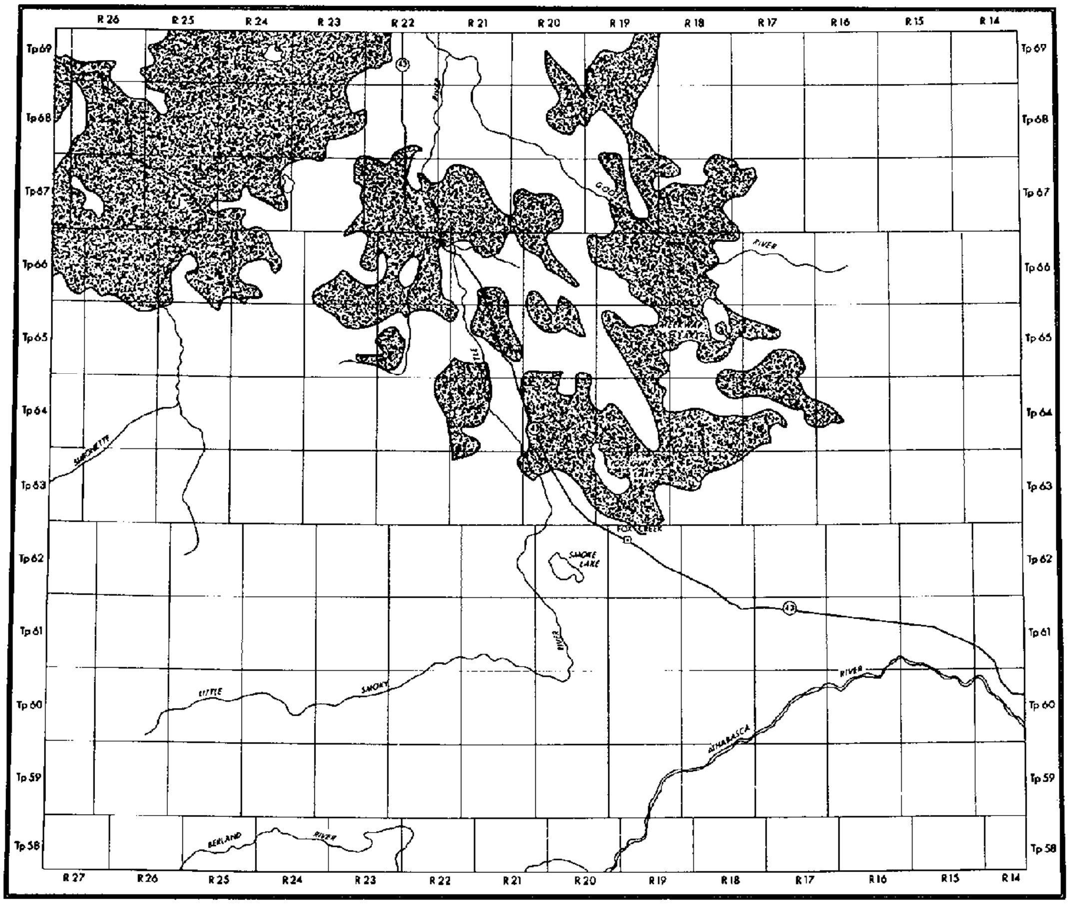


FIGURE 16. Distribution of Donnelly Soil Units.

Donnelly (DON) Soil Units

DON Soil Units describe land areas in which the soils are dominantly Gleyed Solonetzic Gray Luvisols developed on glaciolacustrine clays that contain scattered pebbles. The Soil Units are named after the dominant soil series (Donnelly) but Snipe, Goose and Esher soil series are important components of DON Soil Units.

Location in the Landscape

DON Soil Units cover most of the Iosegun Plain, an area that was inundated by late glacial lakes (figure 16). The soils are generally restricted to elevations below 850 m above sea level, the upper limit of the main glacial lakes on the plain, but occur at elevations of up to 890 m in areas where proglacial ponding occurred in valleys on the eastern edge of the plain.

DON Soil Units occur on gently undulating landscapes with long, low-gradient slopes.

Landforms and Materials

DON Soil Units occur on glaciolacustrine clays that form blankets or veneers over undulating morainal materials. These glacial lake sediments are usually in the order of 2 to 3 m thick, but depths are variable because of erosion and redeposition, and irregularity of the underlying surface. The materials are dominantly clay and silt-sized with the sand fraction generally being less than 5 percent. Textures are usually clay or heavy clay (45 to 75 percent clay-sized particles) but silty clay textured lenses and layers are common. Because of the high clay content, these materials are very slowly permeable, very sticky when wet, and dry slowly. These are the "gumbo" soils of the Peace River country that cause severe problems for road construction and cultivation.

Pebbles and cobbles are scattered in the glaciolacustrine sediments, but pebble-free deposits are also common.

Soils and Vegetation

DON Soil Units occur on the Iosegun Plain where the frost-free period is approximately 60 to 75 days. May to September precipitation is approximately 350 to 400 mm. Surface drainage is slow and the soils are slowly permeable to water and air resulting in imperfectly drained soils that dry slowly after wetting and warm slowly in the spring. The soils are often saturated in the early part of the growing season.

Aspen forests cover most of the DON Soil Units with balsam poplar replacing the aspen in depressional areas. White spruce and balsam fir stands occur in scattered locations that have not experienced recent fires. Willow-sedge and black spruce communities occur on the poorly drained soils.

Donnelly soils are utilized for agricultural production in the Little Smoky-Valleyview area. Coarse grains, canola and forage crops are produced and large areas of these soils are utilized for improved pasture. Soil wetness and heavy clay textures ("gumbo") often cause problems for tillage, planting, and harvesting of crops.

Because of the clay textures and slow infiltration rates, DON soils are very erodible. Careful management of surface runoff waters is required to prevent erosion of agricultural lands and road ditches. These soils are also highly susceptible to slumping along deep road cuts.

The DON 1 Soil Unit has very few poorly drained soils, and often occurs in higher positions on the landscape than other DON units. DON 1 units are often mapped in association with Edson (EDS) Soil Units in areas of discontinuous glaciolacustrine veneers overlying morainal ridges. The DON 2 Soil Unit is most common in the map sheet. Soils of this unit have stronger solonetzic characteristics and poorly drained Luvic Gleysols (Snipe series) occupy 20 to 40 percent of the landscape. The DON 3 Soil Unit is similar to the DON 2 unit but the poorly drained soils are mostly Orthic Humic Gleysols (Goose series). The DON 4 Soil Unit differs from the DON 3 unit by having significant (20 percent) inclusions of Gleyed Dark Gray Solods (Esher series).

Eaglesham (EGL) Soil Units

Soil landscapes dominated by Organic soils developed on fens are identified by the EGL Soil Unit. This unit is a grouping of several unnamed series on fen peatlands.

Location in the Landscape

Eaglesham soils occur on fens in all physiographic divisions of the map sheet. They occupy the lowest position of the local landscape in depressions and drainage channels. Eaglesham soils are often mapped in association with Kenzie soils on gradational fen-bogs, where the fen portion may be dominant or sub-dominant. Eaglesham soils also occur as inclusions in Simonette (STT) and Jarvis (JRV) Soil Units where the fens occupy abandoned drainage channels.

Landforms and Materials

Fens are peat-covered or peat-filled areas with a water table that is usually at the surface. The dominant peat materials are formed from sedges and brown mosses ("fen peat"). The waters are nutrient-rich, minerotrophic seepage waters from the surrounding mineral soils. The materials are higher in nutrients and pH than the peat from bogs. The peat is partially decomposed (mesic) to well decomposed (humic).

The peat varies from about 1 m to several metres in depth, but is usually fairly shallow. Many of the fens on the plateaus have patterned surface morphology (string fens).

Soils and Vegetation

Eaglesham soils are water saturated and cold; anaerobic conditions predominate. This is a favorable environment for organic materials to accumulate at rates faster than which they decompose.

The dominant soils are Mesisols developed on peat materials at an intermediate stage of decomposition. The peat is composed mostly of sedge (*Carex* spp.) and brown moss (*Drepanocladus* spp.) materials. Typical horizon sequence is Of, Om, Oh, Om. Many of these soils have a shallow depth to mineral material (Terric subgroups) and some of the soils are quite well humified (Humisols). The Terric soils are often associated with peaty phases of gleysols.

The vegetation is dominated by sedges. Many of the fens are sparsely treed, especially around the edges, by tamarack and occasionally black spruce. The vegetation of fens in the Goose Mountain area was described by Vitt, Achuff and Andrus (1975).

Eaglesham soils have severe limitations for agricultural or forestry production but they provide important wildlife habitat, especially for moose.

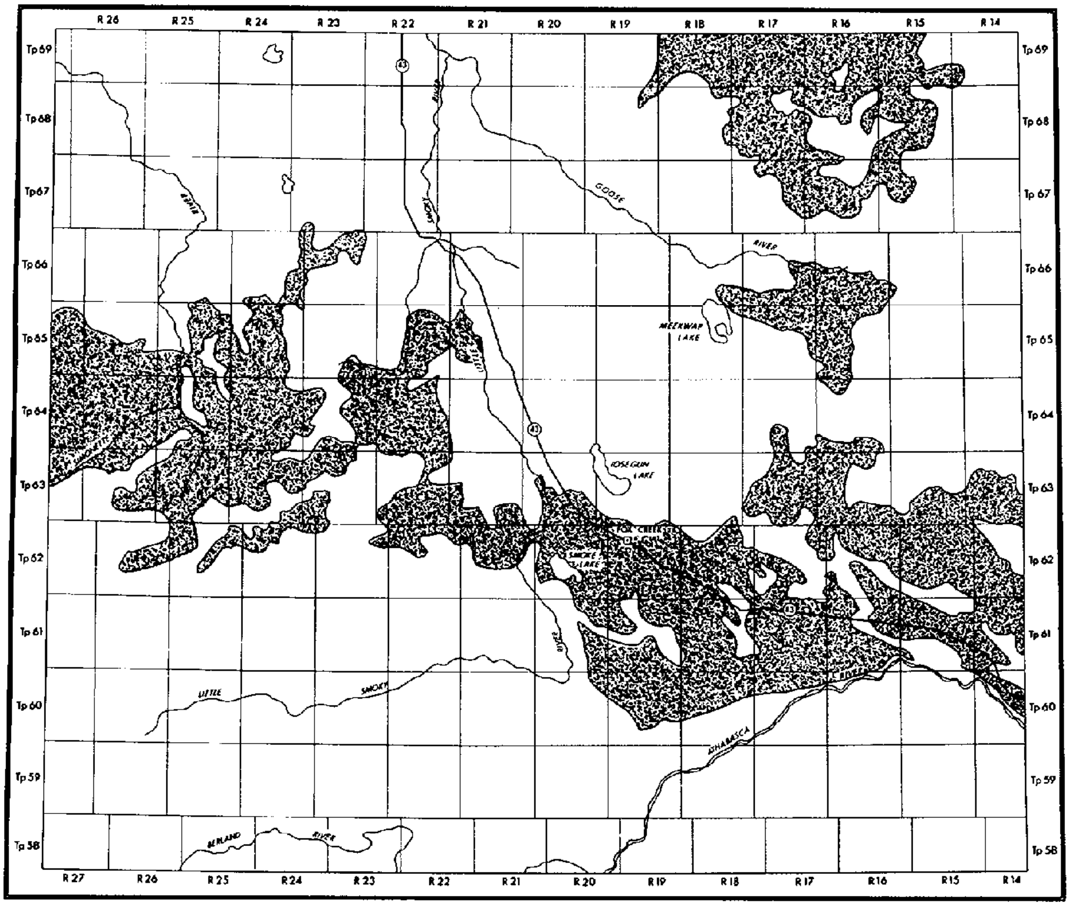


FIGURE 17. Distribution of Edson Soil Units.

Edson (EDS) Soil Units

The EDS Soil Units describe soil landscapes dominated by Orthic Gray Luvisols developed on clay loam textured till. Varying amounts of "bleached" Gray Luvisols, Brunisolic Gray Luvisols and Gleysolic soils occur as inclusions in the three EDS Soil Units recognized. The Soil Units are named after the Edson Soil Association (Dumanski *et al.*, 1972), and include Hubalta, Braeburn and Ansell Soil Series as dominant soils.

Location in the Landscape

EDS Soil Units occur on the morainal landscapes of the Iosegun Plain, Simonette, Fox Creek, and Driftpile Benchlands at elevations of 820 to 980 m above sea level (figure 17). The topography (surface expression) of these soils varies from rolling to hummocky. Gleysolic and Organic soils occupy depressional areas in the landscape (figure 12).

Landforms and Materials

EDS Soil Units are located on morainal landforms that are comprised of clay loam textured till overlying weathered bedrock of the Wapiti Group and occasionally of the Paskapoo Formation. The till is generally dark grayish brown to olive brown in color, slightly to moderately stony, moderately to slowly permeable and weakly to moderately calcareous. The till was deposited by Laurentide ice and contains pebbles and stones from the Precambrian Shield although quartzites and Saskatchewan Gravels are most common. The till is of variable thickness but it usually forms a blanket of 2 to 5 m, thinning to a veneer of less than 1 m in areas where resistant bedrock forms a topographic high. The underlying bedrock is usually soft mudstone or weathered shale with coal layers and local sandstone beds.

The land surface is usually rolling or ridged but small hummocky areas also occur.

Soils and Vegetation

The major occurrence of EDS Soil Units is in the upland marginal to the Iosegun Plain. The average frost-free period is less than 75 days and the May to September precipitation is from 375 to 425 mm.

The freely drained soils are characterized by strongly developed Luvisolic features. A prominent light gray, or light yellowish brown Ae horizon underlies a thin leaf litter layer. The Ae is commonly silt loam or fine sandy loam textured and has strongly expressed, fine, platy structure. The underlying Bt horizon is typically clay loam or clay textured and has a coarse prismatic macro structure which breaks to strong, fine or medium, subangular structure. The higher clay content, denser structure, and higher bulk density of the Bt make it less permeable than the Ae and percolating water may be "perched" at the top of the B horizon for short periods of the year. The peds of the illuvial Bt are coated with well-developed clay skins and clay flows are evident. The Bt horizons are generally 50 to 80 cm thick and overlie a thin BC and a Ck horizon at about 1 m.

Aspen and mixedwood forests are prevalent on EDS Soil Units. Lodgepole pine stands occur on some of the higher soil areas and black spruce communities occupy the poorly drained landscape positions.

These soils have severe limitations for agriculture because of a short frost-free period, topographic limitations and adverse soil structure. They are usually only slightly stony (S2) which does not interfere with cultivation. EDS Soil Units that have been cleared and cultivated are mostly used for pasture.

The EDS 4 Soil Unit describes soil landscapes that have very few poorly drained depressional areas. The soils are dominantly Orthic Gray Luvisols with significant inclusions of Brunisolic Gray Luvisols in many areas. The EDS 5 Soil Unit describes areas with 20 to 40 percent poorly drained Gleysolic soils. The EDS 6 Soil Unit has a dominance of Brunisolic Gray Luvisols with 20 to 40 percent inclusions of Gleysolics.

Enilda (EID) Soil Units

Soil landscapes dominated by Orthic Humic Gleysols developed on loamy, post-glacial, fluvial sediments are described by the EID Soil Unit. The Soil Unit is named after the Enilda Soil Series (Odynsky, Wynnyk and Newton, 1952).

Location in the Landscape

Enilda soils are of limited extent, occurring marginal to the Little Smoky River south of Valleyview. The soils occupy a portion of the post-glacial fluvial plain which has been dissected by the river. The elevation range of these soils is from 640 to 670 m above sea level. Enilda soils are closely associated with their well-drained counterpart, the High Prairie soils.

Landforms and Materials

The general landform on which the EID 2 Soil Unit occurs is a level to undulating fluvial plain which has been dissected by the Little Smoky and Goose Rivers. Meandering channel scars are evident on these plains which are probably of early Holocene age.

The materials are stratified, stone-free sediments of highly variable texture. Clay loam, sandy loam, loamy sand, and silt loam textures are common. The materials are generally fairly permeable and moderately plastic to non-plastic.

Soils and Vegetation

Enilda soils have a high water table due mainly to ponding of surface waters on the level to undulating plains. Impermeable clays occur at considerable depth in some of these soils. The soil profile is characterized by a thick dark gray Ahg overlying either a yellowish brown Bg or Cg horizon, typical of Humic Gleysols. Buried Ah horizons are often evident in the upper 60 cm and B horizons are discontinuous. Textures are variable due to the stratified nature of the fluvial sediments, but loamy textures are most common. The soils are permeable but are poorly aerated due to high water table levels. The climate of these soils areas is the most favorable for agriculture within the map sheet.These soils have an estimated frost-free period of 70 to 80 days and a growing season precipitation of approximately 350 to 375 mm. Most of the EID 2 Soil Units have been cleared and cultivated and are producing coarse grains and canola.

Esher (ESH) Soil Units

The ESH 1 Soil Unit describes soil landscapes dominated by Gleyed Dark Gray Solods (Esher Soil Series) and variants of Dark and Solonetzic Gray Luvisols developed on glaciolacustrine clays. The unit is named after the dominant soil series but Goose and Donnelly soils are included in the map delineations labelled ESH 1.

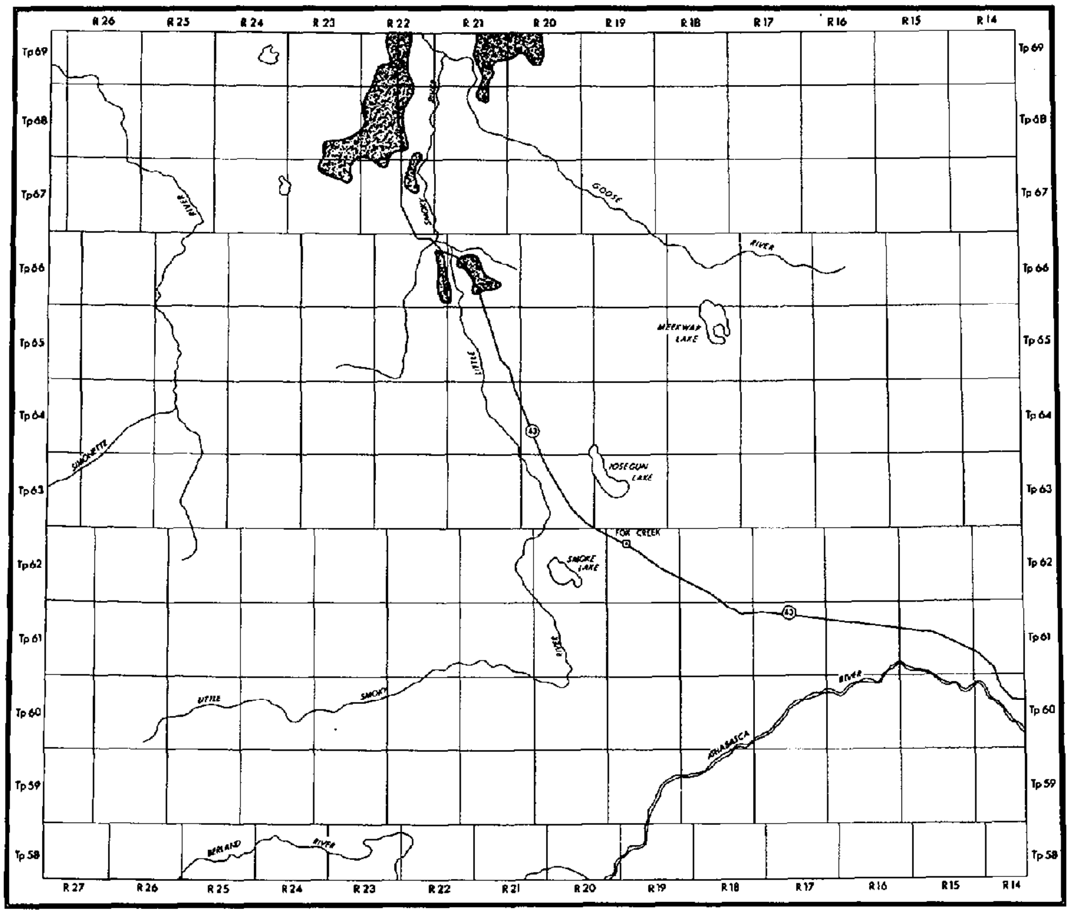


FIGURE 18. Distribution of Esher Soil Units.

Location in the Landscape

Esher soils are confined to a limited acreage on the Iosegun Plain near the Little Smoky River in the north-central portion of map sheet 83K (figure 18). These soils are closely associated with Donnelly, Goose and Snipe Soil Units, occurring on the same glaciolacustrine plain. Esher soil areas occur at elevations of 670 to 770 m above sea level.

Landforms and Materials

The ESH 1 Soil Unit occurs on glaciolacustrine clays that form a blanket or veneer over an undulating moraine. These glacial lake sediments are usually in the order of 2 to 3 m thick but depths are variable due to erosion and redeposition, and irregularity of the underlying surface. The materials are dominantly clay and silt-sized with the sand fraction generally being less than 5 percent. Textures are usually clay or heavy clay (45 to 75 percent clay-sized particles) but silty clay textured lenses and layers are common. Because of the high clay content, these materials are very slowly permeable, very sticky when wet, and dry slowly. These "gumbo" soils of the Peace River country cause severe problems for road construction and cultivation.

Pebbles and cobbles are of scattered occurrence in the glaciolacustrine sediments but pebble-free deposits are also common.

Soils and Vegetation

Soils of the ESH 1 Unit occur on the Iosegun Plain where the frost-free period is approximately 60 to 75 days and the May to September precipitation is approximately 350 to 400 mm. Frost pockets are found in depressional areas and adjacent to stream valleys and bogs, which significantly modifies the local climate (Longley and Louis-Byne, 1967).

The ESH 1 Soil Unit is distinguished from DON Soil Units by the presence of soils with a dark gray Ahe horizon (plate 6). The dark surface horizon ("topsoil") has developed as a result of incorporation of decomposition products from a willow-grass-sedge plant cover under imperfectly drained conditions. Esher soils often appear to be drainage intergrades between Donnelly and Goose soils and the ESH 1 Soil Unit contains significant proportions of Donnelly and Goose series. Surface drainage is slow and the soils are slowly permeable to water and air resulting in imperfectly drained soils that dry slowly after wetting and warm slowly in the spring. The soils are often saturated in the early part of the growing season.

Willow-grass-sedge communities, and balsam poplar, and aspen poplar forests are the common cover types on ESH 1 Soil Units that have not been cleared for cultivation.

ESH 1 soil areas are utilized for agricultural production in the Little Smoky-Valleyview area. Coarse grains, canola and forage crops are produced and occasionally areas of these soils are utilized for improved pasture. Soil wetness and heavy clay textures ("gumbo") often cause problems for tillage, planting, and harvesting of crops.

Because of the clay textures and slow infiltration rates, soils of the ESH 1 Soil Unit are very erodible. Careful management of surface runoff waters is required to prevent erosion of agricultural lands and road ditches. These soils are also highly susceptible to slumping along deep ditch cuts.

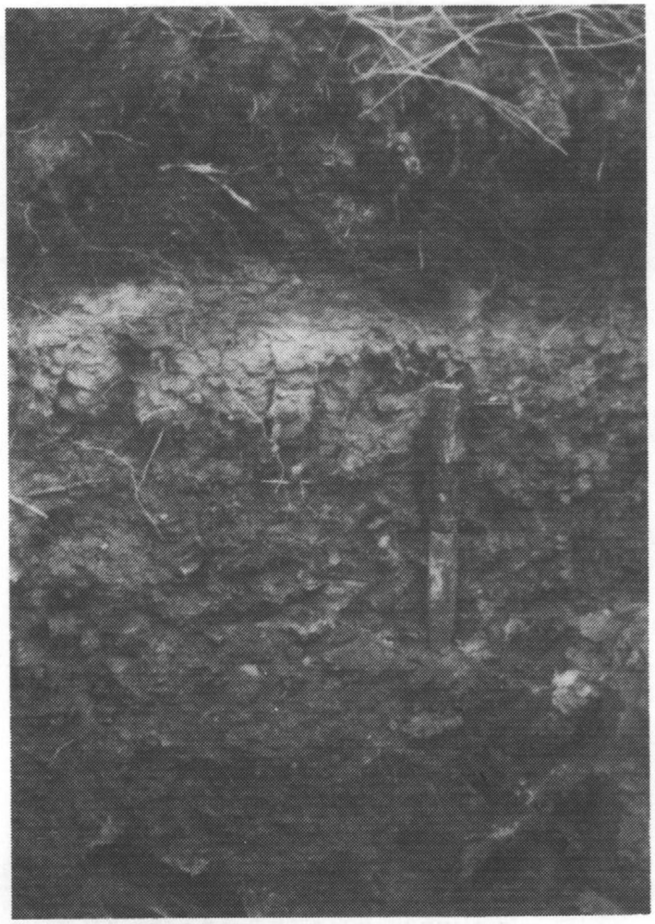


PLATE 6. The profile of the Esher Soil Series displays eluviated remains of a columnar hardpan B horizon beneath the dark gray Ahe.

Goose (GOS) Soil Units

Soil areas dominated by poorly drained Orthic Humic Gleysols developed on glaciolacustrine clays (Goose series) are identified by GOS Soil Units. The GOS Soil Units usually have inclusions of peaty phases of Orthic Gleysols as well as better drained soils on the same parent material.

Location in the Landscape

GOS Soil Units occur on level to depressional areas and on lower slopes of the Iosegun Plain (figure 19) where groundwater discharges or surface waters pond. Goose soils are associated with Donnelly, Esher, Tri-Creek and Kenzie soils. The Goose Soil Series is also a significant inclusion in DON 3 and ESH 1 Soil Units.

Landforms and Materials

GOS Soil Units occur on glaciolacustrine plains and on glaciolacustrine blankets and veneers overlying undulating morainal landforms. The land surface is usually level, depressional or gently sloping.

The materials are stratified, dark gray, glaciolacustrine clays that are moderately calcareous and slightly saline. These materials may be free of stones or may contain occasional pebbles and cobbles. Because of high clay content (45 to 75 percent), these materials are very slowly permeable, very sticky when wet and hard when dry, and exhibit large volume change due to wetting and drying. They are very susceptible to water erosion and are unstable in roadcuts. Since the soils are usually water-saturated they cause significant problems for construction and have trafficability limitations.

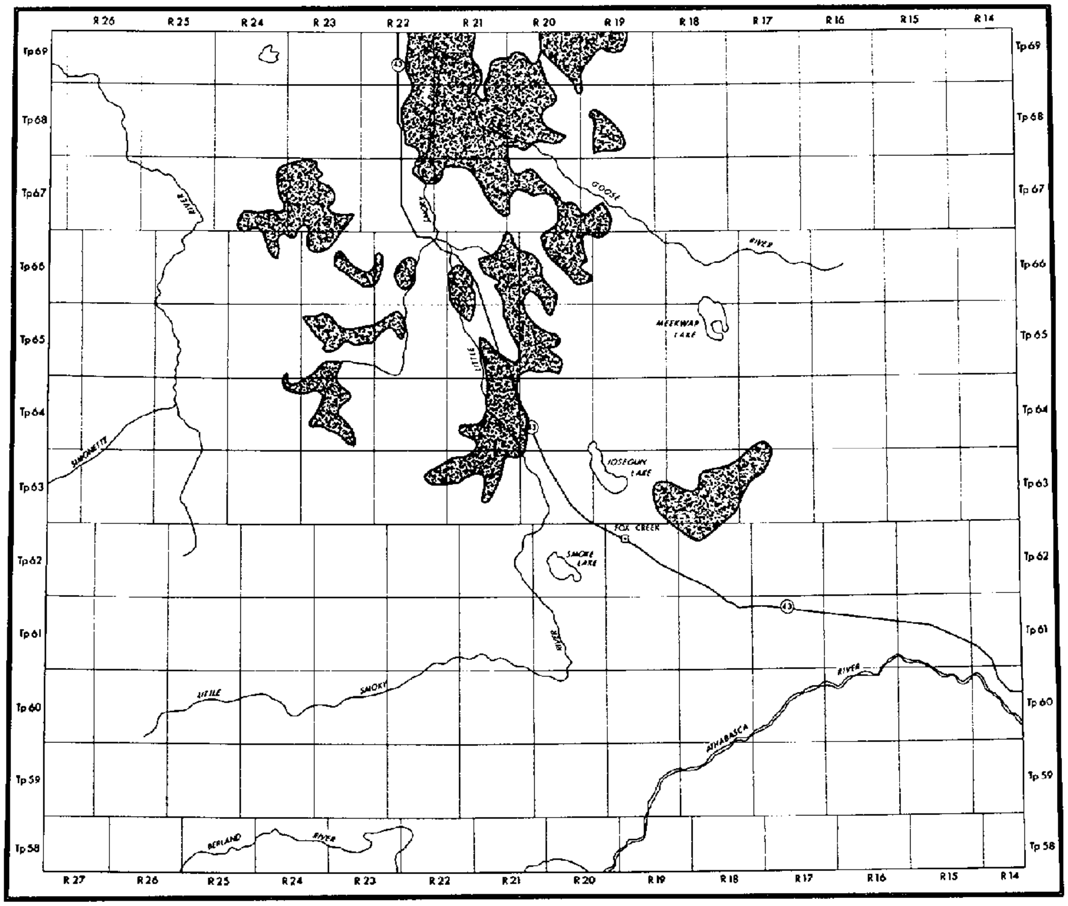


FIGURE 19. Distribution of Goose Soil Units.

Soils and Vegetation

GOS Soil Units occur in areas of groundwater discharge and ponded surface waters. The rate of water addition is greater than the rate of removal, saturating the soils throughout the growing season, with a water table near the surface.

The soils have a black or very dark gray Ahg or H surface horizon which has a high organic matter content and a low bulk density. The surface horizon overlies a dense, heavy clay Bg that is very slowly permeable to water, and is either massive or has fine subangular (shotty) structure. The matrix of the Bg is usually a dull gray color, indicative of saturation and anaerobic conditions. Prominent mottles develop when the water table drops. The underlying Ckg is also dark gray in color and is heavy clay textured. The soils are classified as Orthic Humic Gleysols and peaty Orthic Gleysols.

The common plant communities on the poorly drained members of the GOS Soil Units include willow-sedge-grass, balsam poplar, and white spruce types.

Some areas of Goose soils have been cleared and cultivated, and occasionally improved by surface drainage. Incorporation of the H-Ahg surface horizon into a plow layer provides a well-structured seedbed, but proper soil management is required to maintain organic matter levels. These soils tend to be wet and cold due to the slow rates of water and air permeability, which limits productivity and tillage. Frost pockets and cold air pooling are common because of depressional locations and proximity to bogs. Coarse grains, canola, and forage crops are produced on these soils in the Little Smoky-Valleyview area.

These soils are productive for white spruce because of a constant groundwater supply of moisture and nutrients.

There is, however, a severe limitation, due to wetness and clay textures, for summer timber harvesting operations.

Gunderson (GUN) Soil Units

GUN Soil Units describe soil landscapes dominanted by poorly drained Gleysolic soils developed on sands. The units are named after the Gunderson Soil Series (Rego Humic Gleysol developed on sand).

Location in the Landscape

GUN Soil Units occur on poorly drained fluvial landscapes, mainly on the Windfall Plain. Gunderson soils are associated with Wanham, Enilda and Heart soils and occur as inclusions in other soil units.

Landforms and Materials

Gunderson soils are developed on sand, loamy sand, and sandy loam textured fluvial deposits of Pleistocene and Holocene age. These soils are rapidly permeable but have a high water table due to groundwater seepage and ponded surface runoff. The sandy materials are non-plastic and are not sticky when wet. Pebbles and pebbly layers are not common but are occasionally present. Thin layers of interbedded silts and clays may also be present. The materials are usually moderately calcareous.

Soils and Vegetation

Because of high water table levels, these soils are cold and experience anaerobic conditions most of the growing season. A thin peat surface layer is often present. The soils are gleyed or mottled and vary considerably in horizonation. Rego Humic Gleysols, Orthic Gleysols, and occasional Orthic Luvic Gleysols are common.

Black spruce forests, white spruce forests, and willow-sedge-paper birch stands are the most common vegetation types.

Two GUN Soil Units were recognized in the area. The GUN 1 unit identifies fairly uniform Gunderson soil areas. The GUN 2 unit labels areas of dominantly Gunderson soils with inclusion of Orthic Gray Luvisols on sand veneers overlying till.

Heart (HRT) Soil Units

The HRT Soil Units describe sand dune landscapes. Eluviated Dystric Brunisols and occasional Humo-Ferric Podzols are the dominant soils on the stabilized dunes. The units are named after the Heart "soil complex" described in several Alberta Soil Survey Reports.

Location in the Landscape

Heart soils occur in areas where glaciofluvial deltaic sediments have been blown into dunes. These soils are most common on the Windfall Plain (figure 20) at elevations of approximately 790 to 980 m above sea level. Heart soils also occur as inclusions in Blackmud, Kenzie and Toad Soil Units.

Landforms and Materials

The distinctive landform of HRT Soil Units is a U-shaped or longitudinal dune (plate 7).

The dunes are tree covered and no longer active.

Sands deposited near the edge of the post-glacial lakes were formed into U-shaped and longitudinal dunes by northwesterly winds after the lakes receded. The dunes vary in size, with average relief in the range of 3 to 5 m. Topography is undulating to strongly ridged with long, gentle windward slopes and short, steep, lee slopes.

The coarse and medium-sized sands are very rapidly permeable, stone-free and weakly calcareous. The dunes are often associated with non-duned sands (Blackmud Soil Units) or silty materials (Toad Soil Units).

Soils and Vegetation

The sandy textured soils of the HRT Soil Units are rapidly permeable, with very low plant-available water holding capacity. Soils located in freely drained positions of the landscape (dune crests) are droughty. Plant communities are usually dominated by lodgepole pine which regenerates after fire and can form an edaphic climax. If the vegetation is removed and the dune disturbed, such as in road construction, it is extremely difficult to revegetate the exposed area.

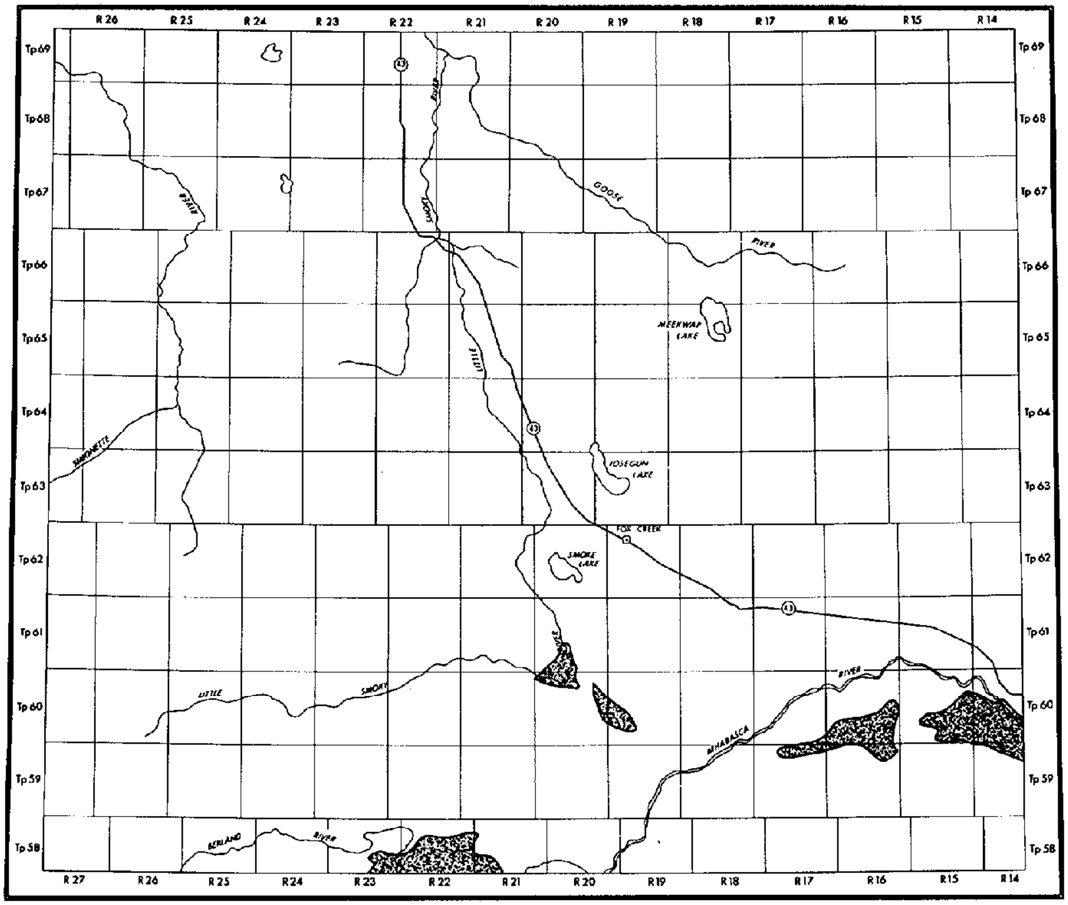


FIGURE 20. Distribution of Heart Soil Units.

PLATE 7. U-shaped sand dune in a Heart-Kenzie soil area.

The soils of the HRT 1 Soil Unit are predominantly Eluviated Dystric (base-poor) Brunisols (plate 8). Also included are occasional soils with strongly colored B horizons with significant contents of iron and aluminum (Humic-Ferric Podzols). Drainage systems are poorly integrated in dune fields. Areas of Gleysolic soils and shallow bogs often occur in the interdune areas. The HRT 2 Soil Unit describes areas with 20 to 40 percent occurrence of Gleysolic soils on sand. All HRT Units are often mapped in combination with Kenzie soils and Organic soils on bogs. HRT 3 Soil Units have Bt horizons which hold more plant-available water and result in slower permeability rates.

High Prairie (HPR) Soil Units

Soil landscapes dominated by Orthic Dark Gray Chernozemic soils developed on loamy, post-glacial, fluvial sediments are described by the HPR Soil Units. The soil units are named after the High Prairie Soil Series (Odynsky, Wynnyk and Newton, 1952).

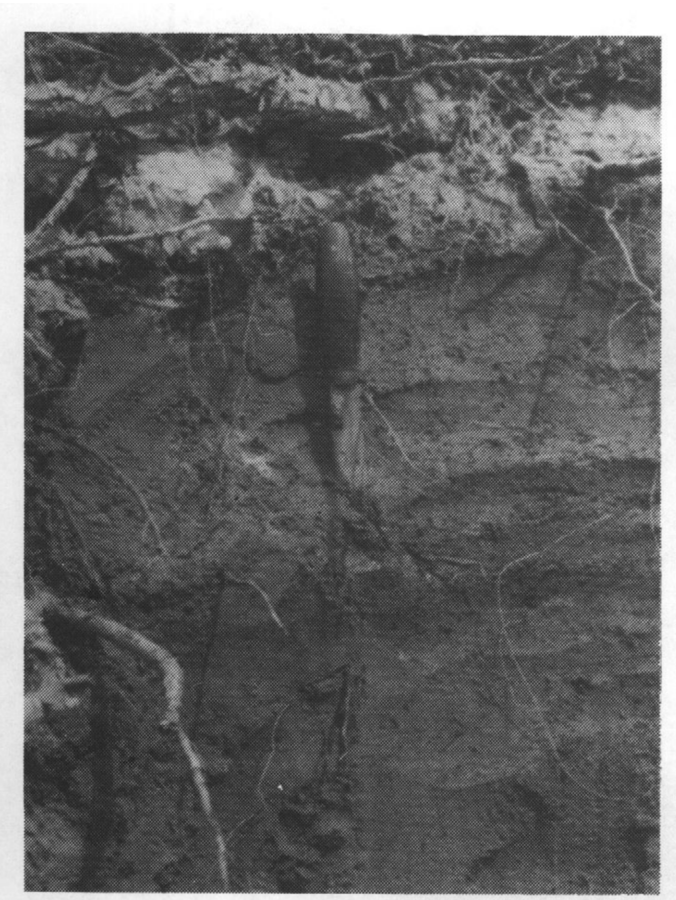


PLATE 8. Eluviated Dystric Brunisol profile of a Heart soil on a sand dune.

Location in the Landscape

High Prairie soils are of limited extent, occurring on the Iosegun Plain marginal to the Little Smoky River south of Valleyview. The soils occupy a portion of a post-glacial fluvial plain which has been dissected by the river. The elevation range of these soils is from 640 to 670 m above sea level. High Prairie soils are closely associated with their poorly drained counterpart, Enilda soils.

Landforms and Materials

The landform characteristic of High Prairie soils is a level to undulating fluvial plain which has been dissected by the Little Smoky and Goose Rivers. Meandering channel scars are evident on these plains which are probably of early Holocene age.

The materials are stratified, stone-free sediments of highly variable texture. Clay loam, sandy loam, loamy sand, and silt loam textures are common. The materials are generally fairly permeable and are moderately plastic to non-plastic.

Soils and Vegetation

High Prairie soils are the only Chernozemic soils recognized in the Iosegun Lake Sheet. The soils have a fairly thick, dark gray Ahe horizon underlain by a discontinuous Bm and a calcareous Ck (plate 9). Textures are variable because of the stratified nature of the fluvial sediments, but loamy textures are most common. The soils are well structured and well aerated except when intergrading to poorly drained Enilda soils. The climate of these soil areas is the most favorable for agriculture within the map sheet. The frost-free period is estimated to be approximately 70 to 80 days and growing season precipitation is approximately 350 to 750 mm.

Most of the High Prairie soil areas have been cleared and cultivated and are producing coarse grains and canola (plate 10).

Iosegun (IOS) Soil Units

The IOS Soil Units identify the collection of soils present on the terraces and floodplains of modern (Holocene) streams. These soil landscapes were identified by the Alluvium land unit in earlier soil survey reports.

PLATE 9. A Rego Dark Gray profile representative of the High Prairie Soil Unit.

Location in the Landscape

Iosegun soils occur on the floodplains and terraces of rivers and creeks in all physiographic divisions of the area. Iosegun soil areas are often bordered by RB land units.

Landforms and Materials

Fluvial terraces and floodplains form the distinctive landform of IOS Soil Units. The land surface is level to dissected in form and the fluvial processes of erosion and deposition are actively modifying these landscapes.

The materials are sands, silts and gravels that are stratified and highly variable over short distances.

Soils and Vegetation

Large portions of Iosegun soil areas are subject to periodic flooding. Many of the soils also have high seasonal water table levels. The soils of the IOS 1 Soil Unit are dominantly Cumulic Regosols which lack horizon development, but exhibit a series of buried surface layers. Weakly developed Brunisolic and Luvisolic soils occasionally occur on well drained, raised terraces. Gleysolic soils are common in IOS 2 soil areas where surface waters pond in meander scars and level or depressional positions.

PLATE 10. Canola (rapeseed) and coarse grains are grown on the level to gently undulating High Prairie soil landscapes.

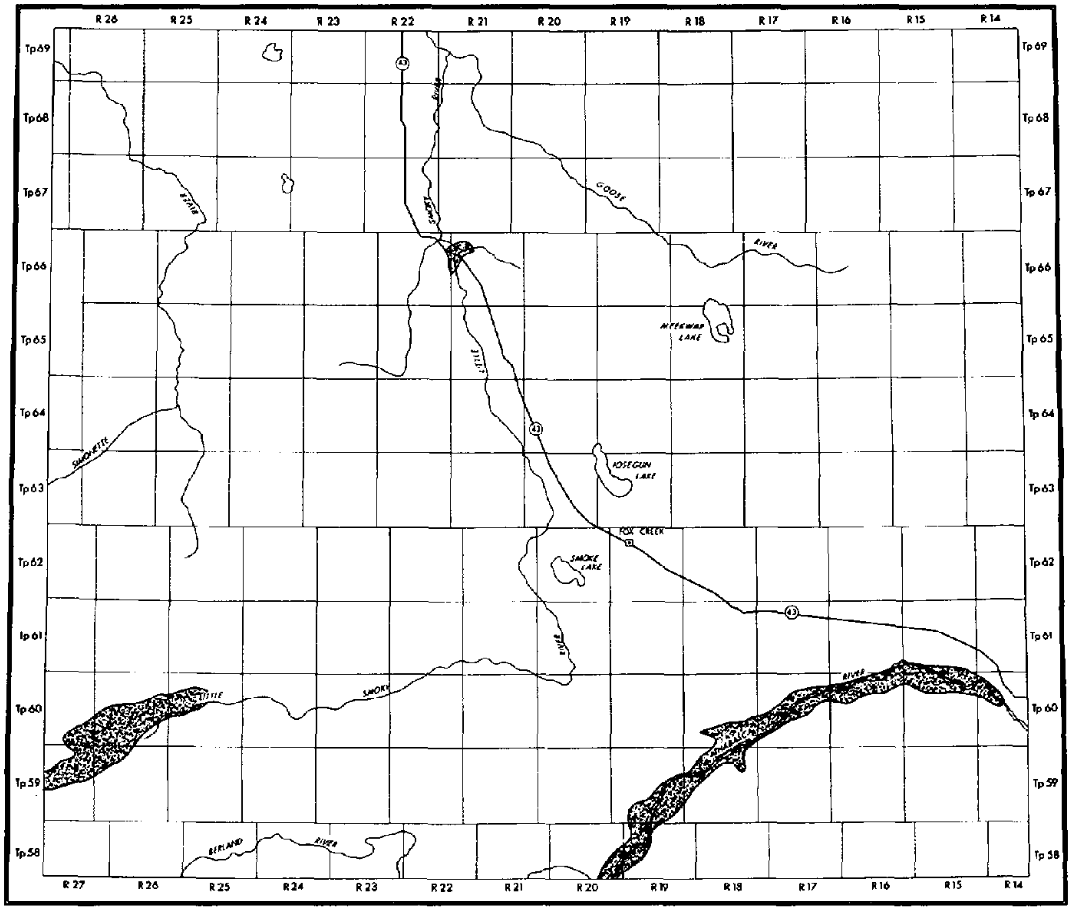


FIGURE 21. Distribution of Jarvis Soil Units.

Most of the Iosegun landscapes are under natural vegetation which provides important winter habitat for ungulates. Balsam poplar and white spruce forests form the common forest cover on Iosegun soil areas. Willows, sedges, and marsh reed grass are common elements in successional communities.

Iosegun soils have severe limitations for agriculture or intensive forestry applications due to flooding hazard, high water table levels, and because of the importance of native cover to streambank protection. The flooding hazard, wetness, and environmental sensitivity severely limit their suitability for many other land uses as well.

Jarvis (JRV) Soil Units

Soil landscapes dominated by Eluviated Dystric Brunisols and Podzolic Gray Luvisols developed on glaciofluvial gravels are described by JRV Soil Units. The units are named after the Jarvis Soil Series and have inclusions of Hightower and Nose soils as well as an unnamed poorly drained series.

Location in the Landscape

Jarvis soils were mapped on glaciofluvial terraces of the Athabasca River (800 to 900 m above sea level) and on a large kame and esker complex in the upper Little Smoky River valley (1 100 to 1 200 m above sea level). The distribution of JRV Soil Units is shown in figure 21.

Landforms and Materials

Jarvis soils occur on two distinctive landforms; on glaciofluvial terraces of the Athabasca River, and on glaciofluvial eskers and kames in the Little Smoky valley. On the level terraces, the materials consist of thin sand veneers overlying gravelly sands and gravels. The gravels are mostly rounded quartzites 3 to 10 cm in diameter with large cobbles being common. The materials in the eskers and kames are mostly gravels and gravelly sands.

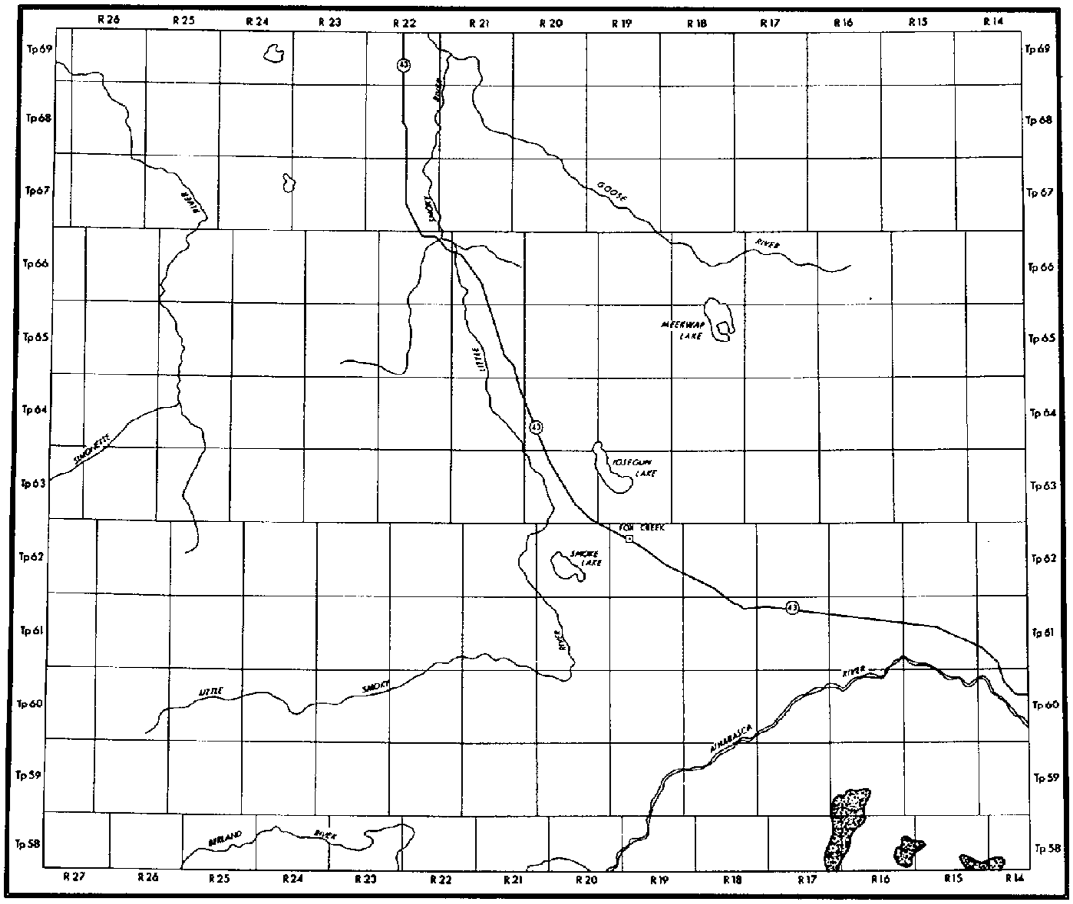


FIGURE 22. Distribution of Judy Soil Units.

Soils and Vegetation

Jarvis soils are rapidly permeable and the gravelly, sandy materials have low moisture and nutrient supply capability. A typical Jarvis profile has an LH, Ae, Bm, C horizon sequence. The B horizon is strong brown to yellowish brown and occasionally has sufficient translocated clay to qualify as a Bt. The solum is usually 25 to 50 cm thick. Upper horizons may or may not contain stones, depending on whether a sand veneer is present or absent. Jarvis soils are usually covered by lodgepole pine forests, with aspen forests occurring in some areas.

The JRV 4 Soil Unit describes areas that are uniformly well drained. The JRV 5 Unit has inclusions of poorly drained soils.

Judy (JUY) Soil Units

The JUY Soil Units describe soil landscapes dominanted by Brunisolic and Podzolic Gray Luvisols developed on the Saskatchewan Gravels. These soil units are named after the Judy Soil Series (Wynnyk, Lindsay and Odynsky, 1969) and correlate with the Summit Soil Association of Dumanski *et al.*, (1972).

Location in the Landscape

JUY Soil Units occur on the Mayberne Plateau and in the Swan Hills on the summit of Goose Mountain (figure 22). These plateaus occur at elevations of 1 100 to 1 370 m above sea level which are the highest elevations in the area. Judy soils are often associated with their poorly drained equivalent, Simonette soils, and with thin, stony, Mayberne soils.

Landforms and Materials

The regional landforms on which Judy soils occur are elevated plateaus which are flanked by erosional escarpments (figure 14). These plateaus are remnants of a Tertiary landscape which was dissected by fluvial erosion. The materials consist of mostly rounded quartzite cobbles and gravels named the Saskatchewan Gravels which overlie Paskapoo Formation sandstones at depths of 1 to 4 m. The coarse fragment content of the soils is approximately 80 percent by volume and the intercobble spaces are filled with olive brown colored sand and lesser amounts of clays and silts. The gravels on these plateaus are often overlain by a discontinuous till veneer. The land surface is generally undulating to gently rolling and is often dissected by eroded channels.

Soils and Vegetation

The cobbly, gravelly, soils are rapidly permeable and have low nutrient and moisture supply capability.

Judy soils consist primarily of Brunisolic and Podzolic Gray Luvisols, although occasional Orthic Humo-Ferric Podzols have been recognized. Soils of the Judy series are characterized by a thin organic (LH) surface layer, a light brownish gray Ae1 horizon, a strong brown to yellowish red Bm horizon, a yellowish brown Ae2 horizon, and a yellowish brown Bt horizon. The Bt horizon is encountered 30 to 45 cm below the surface. The upper horizons (Ae1 and Bm) may be developed in a stone-free sandy overlay but the Bt horizon normally lies in the cobbly gravels where the finer textured material tends to cling to the pebbles and to plant rootlets. The texture of the surface horizons is normally sandy loam to loam, whereas the Bt horizon is sandy loam to sandy clay loam in texture. The upper Ae-Bm sequence present in these soils suggests the development of a Podzol mini-profile in the Ae horizon of an older Orthic Gray Luvisol. These soils have variable levels of pyrophosphate-extractable Fe + Al in the upper B horizon and therefore both Brunisolic and Podzolic Gray Luvisols are included in the legend.

Judy soils occur in the areas of coolest temperature and highest precipitation within the map sheet. The frost-free period is generally less than 60 days and May to September precipitation usually exceeds 450 mm.

Successional lodgepole pine forests cover many of these soil areas. Engelmann spruce-subalpine fir form the climax forest in areas that have escaped recent fires. The plant communities on these soils have several Cordilleran elements.

Kenzie (KNZ) Soil Units

Soil landscapes dominated by Organic soils on bogs are identified by the KNZ Soil Unit. This unit includes several unnamed soil series developed on bog peatlands.

Location in the Landscape

Kenzie soils are common in all physiographic areas, occurring in very poorly drained concave or level topographic positions (plate 11). Kenzie soils are often associated with, and are gradational to Eaglesham soils on bog-fen peatlands. These soils are also common inclusions in Snipe, Goose, Smoky, Gunderson, Mayberne, Wanham and Heart Soil Units.

Landforms and Materials

The common landforms on which Kenzie soils occur are bowl bogs, blanket bogs, and occasionally raised bogs. These bogs occur on morainal and glaciolacustrine landscapes where surface runoff is ponded, on fluvial landscapes where underfit streams occupy large outwash channels, and on eolian landscapes between dunes and ridges.

Bogs are peat-covered or peat-filled areas, generally with a high water table. The peat is derived from mosses, and the groundwater is acidic and low in nutrients (ombrotrophic). The peat consists dominantly of sphagnum moss with minor amounts of feather mosses, stems and leaves of ericaceous shrubs, and wood from black spruce. The peat is undecomposed (fibric) near the surface and partially decomposed (mesic) at greater depths. The material is usually extremely acid (pH 3.5 to 4.5) and has bulk densities of less than 0.1 g/cm^3. Peat depths vary considerably from less than 1 m to as much as 4 m. Many of the bogs in the Iosegun Lake area are not classical ombrotrophic bogs due to the calcareous nature of the surrounding soils, and might be better described as poor fens.

Soils and Vegetation

Kenzie soils are cold, water-saturated, and under anaerobic conditions. The environment is favorable for organic materials to accumulate at rates faster than they decompose. The most common plant community on these soils is a black spruce-labrador tea-sphagnum moss type. Tree cover is usually less in the center of the bog.

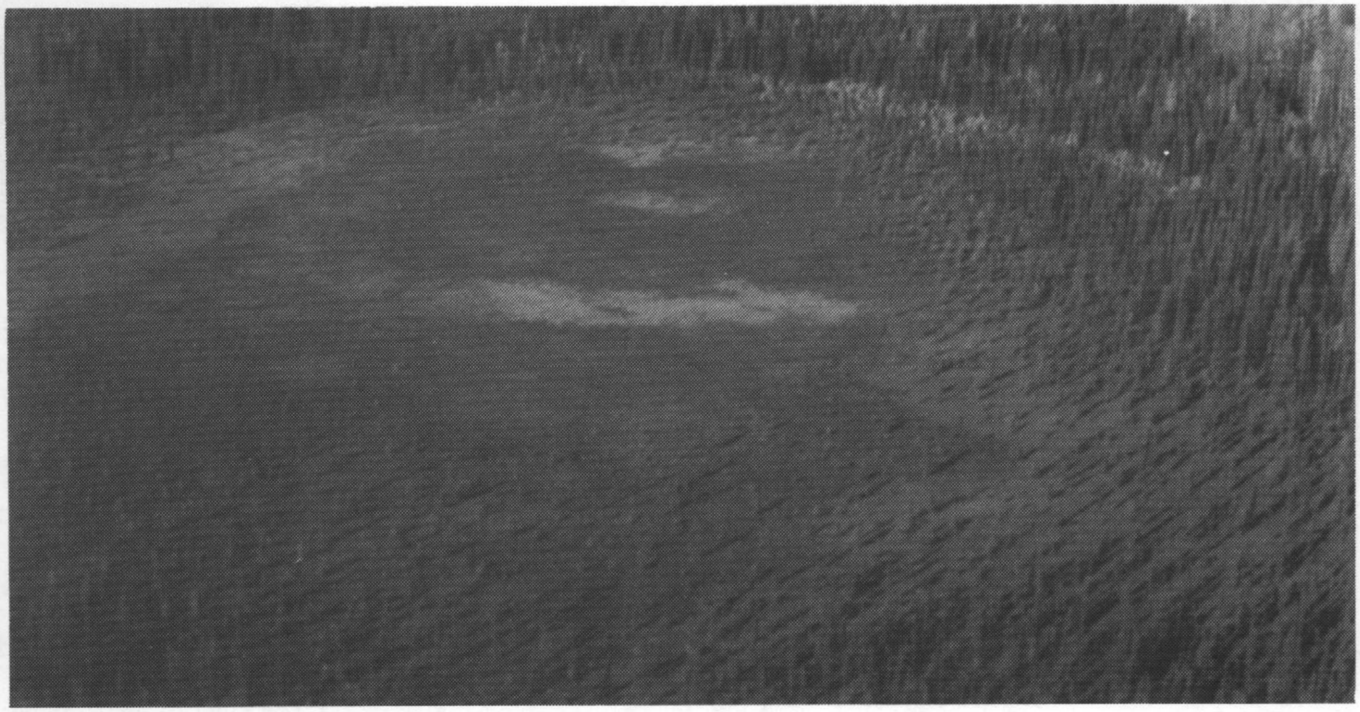


PLATE 11. A bog with treed edges and open center mapped as a Kenzie soil area.

Frozen layers may persist in some shaded areas at high elevations until mid summer.

Frost pooling occurs in many bog areas which are located in the lower landscape positions. The local climate and soil climate is often more important to plant growth than the regional climate.

Lodge (LDG) Soil Units

LDG Soil Units describe soil landscapes dominated by Orthic Gray Luvisols and Brunisolic Gray Luvisols developed on thin sand veneers that usually overlie till or glaciolacustrine clays. The units are named after the Lodge Soil Association (Dumanski *et al.*, 1972).

Location in the Landscape

Lodge soils have been mapped in all physiographic divisions of the area (figure 23). Lodge soils usually occur on level or gently rolling plains or lower slope locations. These soils occur in combination with Blackmud, Donnelly, Edson, Goose, Kenzie, Mayberne, Smoky, Snipe, and Wanham soils. The most common location for Lodge soils is adjacent to drainage channels or downwind from dune fields.

Landforms and Materials

Lodge soils occur on landforms on which a sand veneer overlies a strongly contrasting material. In most cases, this veneer is fluvial or eolian overlying glaciolacustrine clays or a clay loam till. There are instances, however, where the sand overlies silt loam or fine sandy loam textured fluvial sediments.

The 20 to 50 cm layer of sand or loamy sand has very different properties than underlying clay loam or clay textured materials. The surface layer is non-stony and rapidly permeable whereas the underlying materials may be stony and are usually slowly permeable. The nature of the underlying material may be interpreted from the associated soils on the soil map.

Soils and Vegetation

The sand veneer, of 20 to 50 cm, allows rapid infiltration of surface waters. The permeability of the underlying materials is slower than that of the sands. Perched

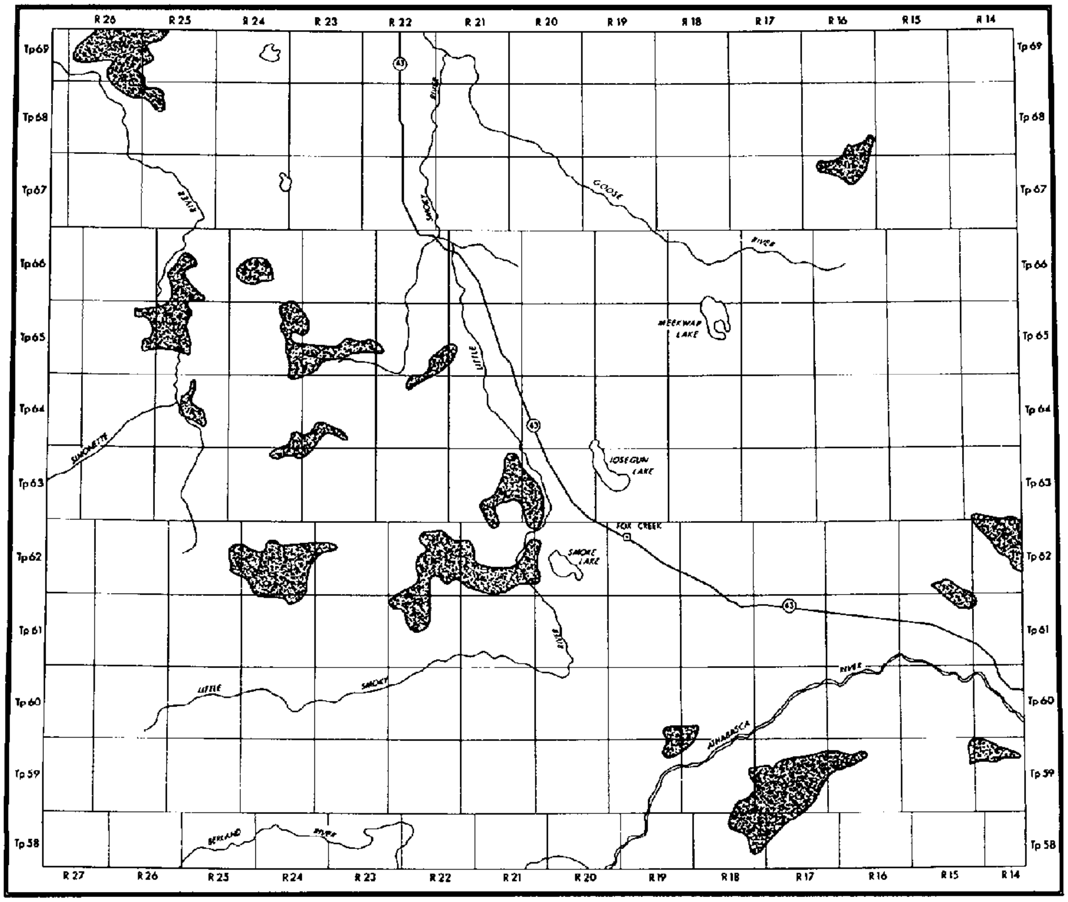


FIGURE 23. Distribution of Lodge Soil Units.

water tables, therefore, may exist early in the growing season, and the upper horizons are often found to be weakly mottled.

On the Iosegun Plain (at elevations of 800 to 900 m) LDG 6 and LDG 7 Soil Units support aspen forest communities and the dominant soils are Orthic Gray Luvisols. These soils have a relatively thick, light gray or pale brown Ae horizon overlying an AB and a textural Bt horizon. On the Mayberne Plateau at elevations of 1 100 to 1 200 m, lodgepole pine forests are dominant and the soils (LDG 9 Soil Unit) are typically Brunisolic Gray Luvisols. These soils have either a Bm-Ae-Bt sequence or an Ae1-Bm-Ae2-Bt horizon sequence with a mini-profile developing in the upper part of the former Ae horizon. The illuvial (Bt) horizons generally occur below the sand veneer.

Mayberne (MBN) Soil Units

MBN Soil Units have a dominance of Orthic and Brunisolic Gray Luvisols developed on till. Several soil series are included in these units which have been named after the Mayberne Soil Association (Dumanski *et al.*, 1972).

Location in the Landscape

MBN Soil Units occur in the Swan Hills at elevations of 900 to 1 400 m above sea level and on the Little Smoky Plateau, Berland Plateau and Mayberne Plateau at elevations of 900 to 1 300 m above sea level (figure 24). The MBN Soil Units are confined to physiographic uplands underlain by Paskapoo Formation with elevations greater than 900 m. Mayberne soils are often associated with Judy and Simonette soils on the flat-topped plateaus (figure 14).

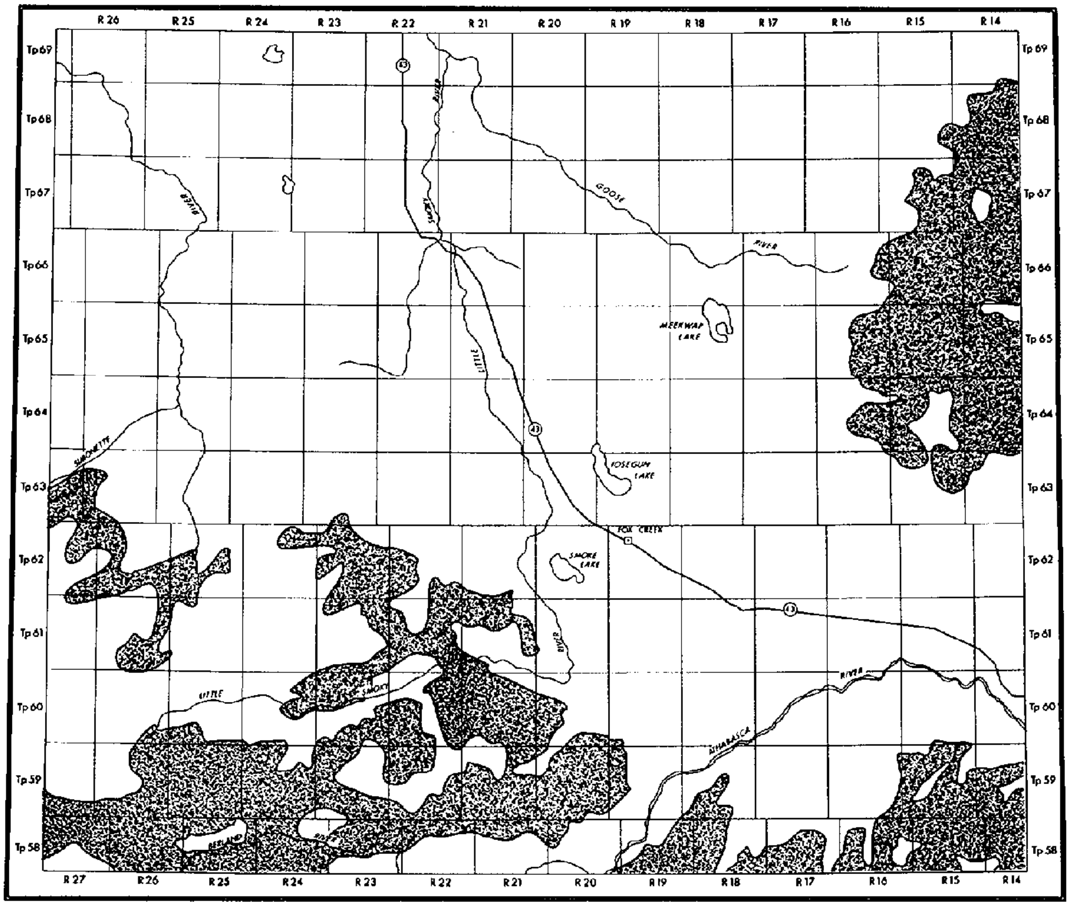


FIGURE 24. Distribution of Mayberne Soil Units.

Landforms and Materials

MBN Soil Units occur on a variety of morainal landforms in the benched and highly dissected uplands. In most areas, the landforms consist of morainal blankets and veneers overlying Paskapoo Formation or Saskatchewan Gravels. The till is usually sandy clay or clay loam textured but sandy loam variants are present. Mayberne till may appear identical to Edson till, but occurs above the 900 m contour. Mayberne till that is closely associated with the tableland gravels is sandier, excessively stony, and a yellowish brown color (plate 12). Physical properties of this till are highly variable.

Soils and Vegetation

Pedogenic development of these soils varies with elevation, climate, and vegetation. Orthic and Brunisolic Gray Luvisols (Soil Units MBN 4 and 5) predominate in the Swan Hills and in the eastern and northern portions of the Little Smoky, Berland and Mayberne Plateaus. In the southern and southwestern portions of these plateaus, Brunisolic and Podzolic Gray Luvisols (Soil Units MBN 6 and 7) are most common, which appears to reflect cooler, moister, climatic conditions.

The upper sola of soils included in the MBN Soil Units vary in horizonation: an LF, Ae1, Ae2, Bt sequence occurs in the Tom Hill Series; an LF, Ae1, Bm, Ae2, Bt sequence occurs in the Brunisolic Gray Luvisol unnamed series; and an LF, Ae1, Bf, Ae2, Bt sequence occurs in the Nosehill series. Profile descriptions and chemical and physical data of Tom Hill and Nosehill soils are included in Appendix B.

Stony (/s) and thin (/t) phases of MBN Soil Units were mapped in many areas. The MBN/t designation indicates soils developed on morainal veneers. The underlying material may be bedrock or tableland gravels and is indicated by the associated soils in the label on the map delineation. The MBN/s designation indicates excessively stony Mayberne soils, which are usually closely associated with Judy or Simonette soils.

Forest cover on MBN Soil Units is typically spruce-fir, lodgepole pine, or lodgepole pine-black spruce. Mayberne soils have severe climatic limitations for agricultural production as well as soils and topographic limitations.

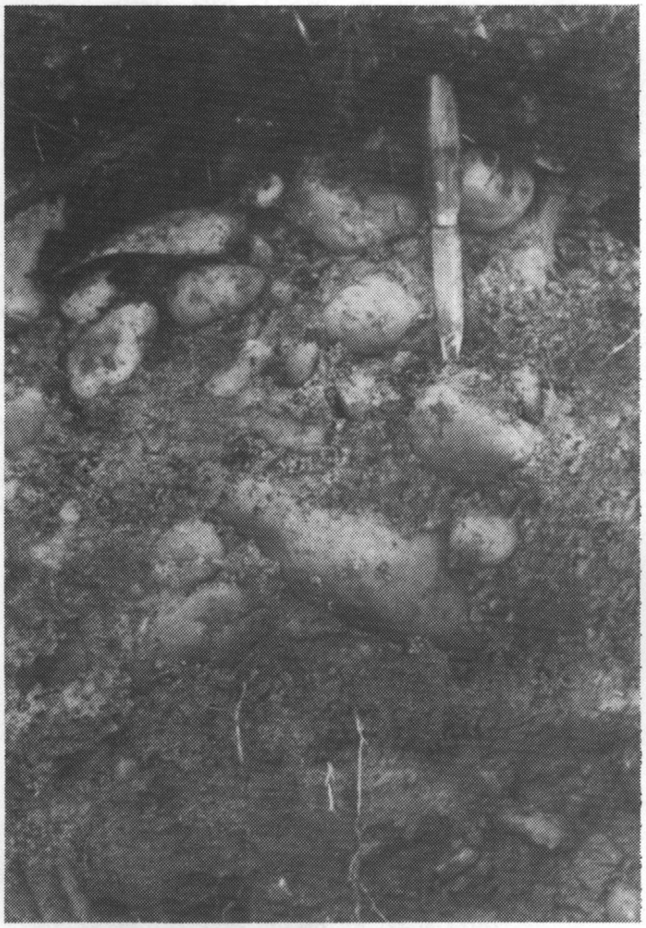


PLATE 12. Rounded quartzite cobbles are abundant in Mayberne/stony (MBN/ s) Soil Units.

Simonette (STT) Soil Units

Soil landscapes dominated by poorly drained, peaty Orthic Gleysols developed on Tertiary-aged Saskatchewan Gravels are described by the STT Soil Units. The units are named after the Simonette Soil Series (Orthic Gleysol-peaty phase on Tertiary gravels). Simonette soils are the poorly drained equivalent of Judy soils.

Location in the Landscape

The STT Soil Units occur on the level surfaces of the Little Smoky Plateau and in one small area on the Mayberne Plateau (figure 25). These soils occur in close association with Judy, Mayberne (thin and stony phase), Kenzie and Eaglesham soils.

Landforms and Materials

The regional landforms on which Simonette soils occur are elevated fluvial plateaus which are flanked by erosional escarpments. These plateaus are remnants of a Tertiary landscape which was dissected by late Tertiary fluvial erosion. The materials consist of mostly rounded quartzite cobbles and gravels named the Saskatchewan Gravels which overlie Paskapoo Formation sandstones at depths of 1 to 4 m. The coarse fragment content of the soils is approximately 80 percent by volume and the inter-cobble spaces are filled with olive brown colored sands and lesser amounts of clays and silts. The gravels on these plateaus are often overlain by a discontinuous till veneer (Mayberne till). The land surface is generally undulating to gently rolling and is often dissected by eroded channels.

Soils and Vegetation

Simonette soils are poorly to very poorly drained with a water table near the surface most of the growing season. A modal profile has a 30 cm Fibric (Of) horizon overlying a thin Ahg, and extremely stony Bg and Cg horizons. These soils are frozen early in the growing season and warm slowly because of the insulating surface peat layer and saturated conditions. The soils experience anaerobic conditions due to the saturated conditions, for most or all of the unfrozen period and exhibit strongly gleyed features.

Black spruce-sphagnum or lodgepole pine-black spruce-labrador tea forest types are predominant on Simonette soil areas. The trees have shallow rooting systems due to the peat layer and the high water table, and are subject to blowdown.

Smoky (SKY) Soil Units

SKY Soil Units describe morainal soil landscapes dominated by poorly drained Gleysolic soils. SKY units are named after the Smoky Series, peaty Orthic Gleysols on clay loam till.

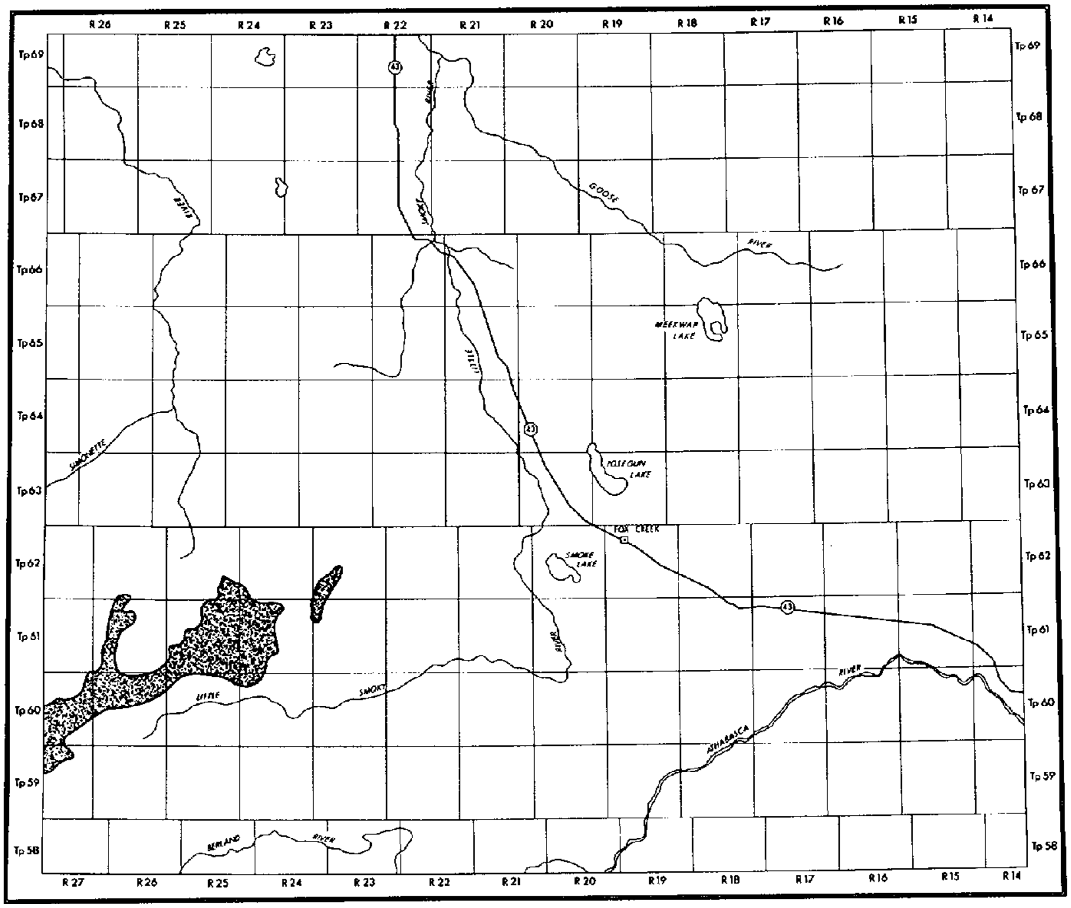


FIGURE 25. Distribution of Simonette Soil Units.

Location in the Landscape

SKY soils occur on morainal landscapes in all physiographic divisions (figure 26). These soils usually occur on level areas with poor surface drainage or in depressions where runoff waters collect and groundwater discharges. Soils of the Smoky Soil Series also occur as inclusions in EDS and MBN Soil Units.

Landforms and Materials

The landforms and materials of the SKY Soil Units are the same as those for Edson and Mayberne soils. The association of soils on the map, and the soil unit number, will indicate whether the Smoky soils at a particular location occur on Edson (SKY 1 and 2) or Mayberne (SKY 3 and 4) till.

Smoky soils located on lower slopes and in depressions often have a surface veneer of slopewash deposits overlying the till.

Soils and Vegetation

The water-saturated condition of these soils throughout the growing season results in soils that are cold and anaerobic. The soils are frozen until late May and warm slowly.

A peaty surface layer of varying thickness is usually present on these soils. A thin, loamy Ahg may be present and a clay loam Bg that is massive or weakly structured is usually differentiated from the underlying C horizon by color changes.

Black spruce, black spruce-lodgepole pine, white spruce and balsam poplar forests are most common on Smoky soils.

Soil wetness severely limits the productivity and use of these soils.

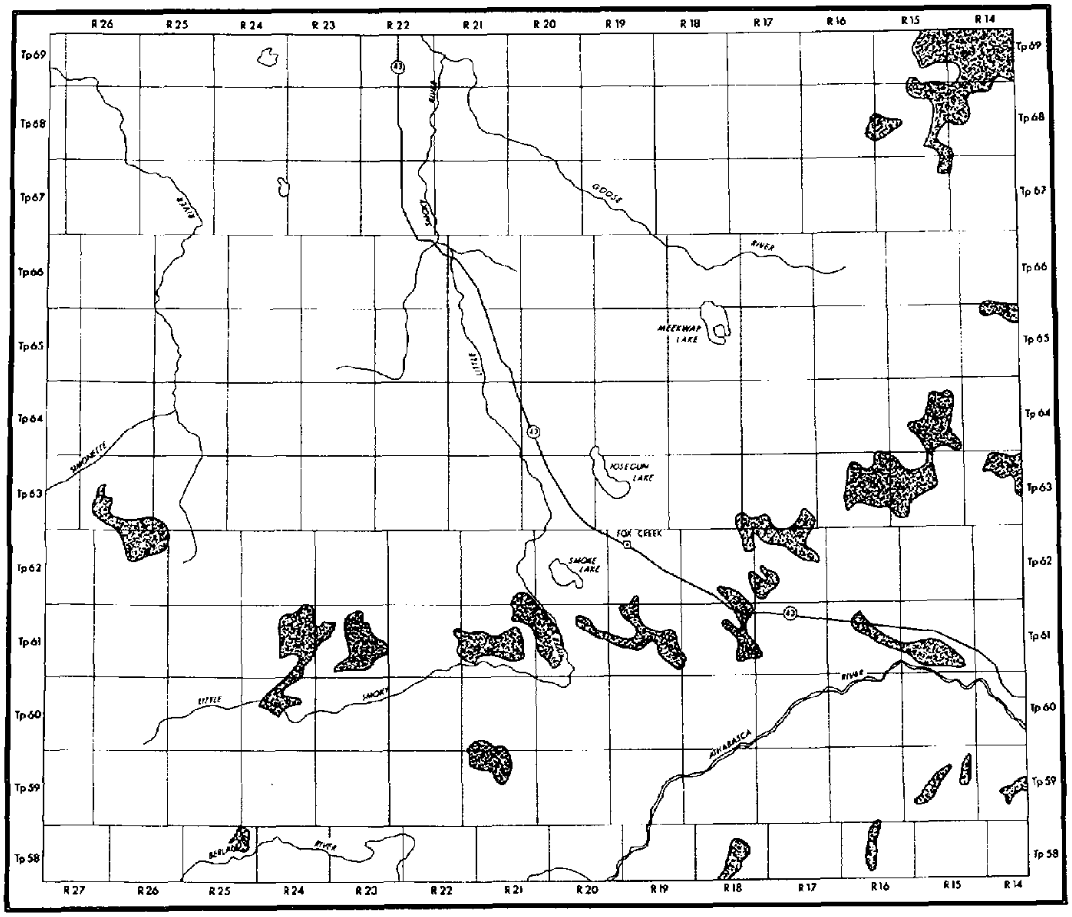


FIGURE 26. Distribution of Smoky Soil Units.

Snipe (SIP) Soil Units

The three SIP Soil Units describe soil landscapes dominated by poorly drained Orthic Luvic Gleysols on glaciolacustrine clays. The soil units are named after the Snipe series.

Location in the Landscape

Snipe soils have been recognized in widespread poorly drained areas of the glaciolacustrine basins on the Iosegun Plain and in small basins in the Simonette and Driftpile Benchlands (figure 27). SIP Soil Units occur on level to gently undulating plains, often associated with Donnelly, Esher, Goose and Kenzie Units. Soils of the Snipe soil series also occur as inclusions in Donnelly and Tri-Creek soils.

Landforms and Materials

SIP Soil Units occur on glaciolacustrine plains and on glaciolacustrine blankets and veneers overlying undulating moraines. The land surface is usually level, depressional or gently sloping.

The materials are stratified, dark gray, glaciolacustrine clays that are moderately calcareous and slightly saline. These materials may be free of stones or may contain occasional pebbles and cobbles. Because of the high clay content (45 to 75 percent) these materials are very slowly permeable, very sticky when wet and hard when dry, and exhibit large volume change due to wetting and drying. They are very susceptible to water erosion and are unstable in roadcuts. Because the soils are usually water-saturated, they cause significant problems for construction and have trafficability limitations.

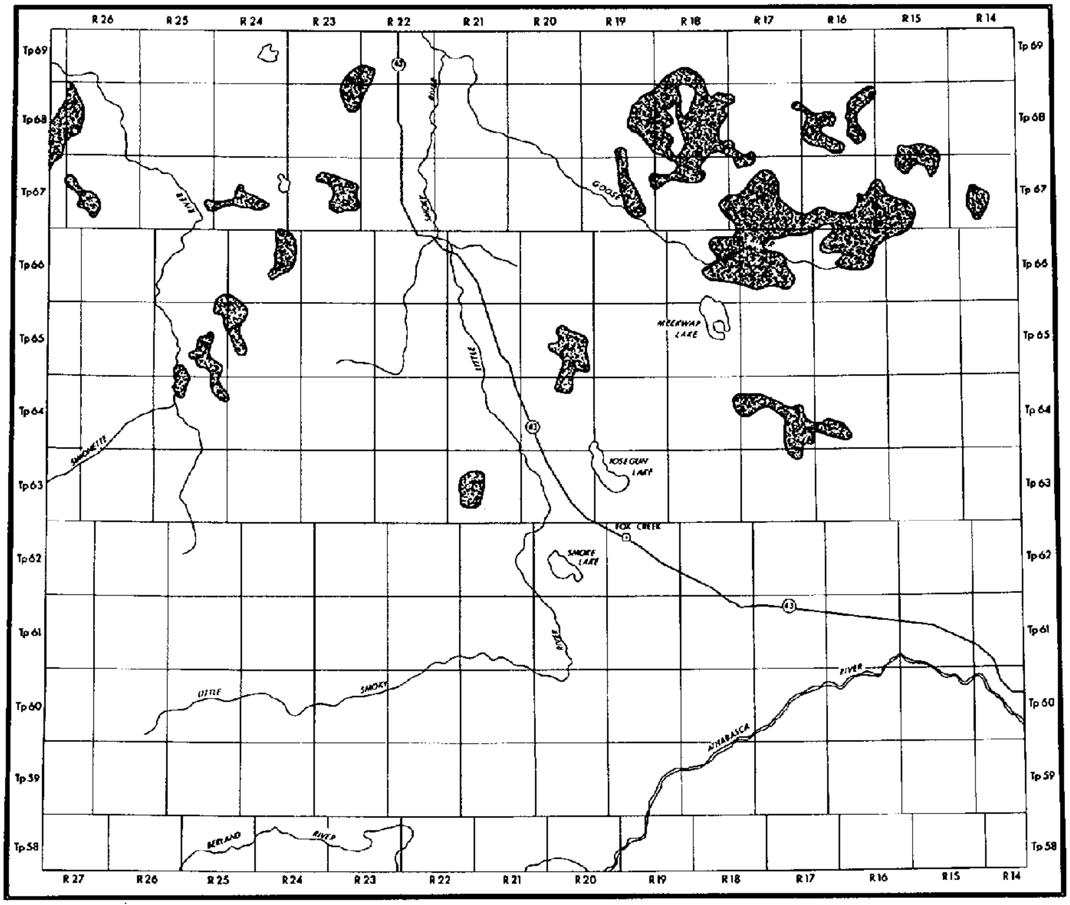


FIGURE 27. Distribution of Snipe Soil Units.

Soils and Vegetation

Snipe soils are saturated early in the growing season because of slow surface drainage and slow permeability.

A modal profile has a prominent, light gray colored Aeg horizon, 10 to 15 cm thick (plate 13), which underlies a thin leaf litter layer under natural conditions or constitutes most of the plow layer when cultivated. This strong eluviated Aeg horizon contains very low amounts of organic matter and clay-sized particles. It is friable and platy structured under natural conditions, but forms a hard crust upon drying after cultivation. This crust can severely limit seedling emergence. Underlying the fine sandy loam or silt loam textured Aeg is a heavy clay textured, dark gray Btg which is dense and very slowly permeable to water and air. Roots of most plants penetrate only as far as the upper B horizon. Both the Aeg and Btg display prominent mottling. The underlying clay to heavy clay textured Ckg is dense, slowly permeable and moderately calcareous.

PLATE 13. Profile of Snipe Soil.

Balsam poplar, white spruce, black spruce and aspen forests form the most common vegetation cover on SIP Soil Units. Black spruce forests on peaty Snipe soils form a transition to Organic soils on bogs.

Some areas of Snipe soils have been cleared and cultivated and are presently being used for pasture or forage production. Wetness, heavy clay textures, and surface crusting limit the production of grain crops. The frost-free period is generally between 60 to 75 days and precipitation during May to September averages 350 to 400 mm.

Toad (TOD) Soil Units

The TOD Soil Unit identifies glaciofluvial landscapes dominated by Brunisolic Gray Luvisols developed in medium textured materials. The soil unit is named after the dominant soil series but the landscapes have significant inclusions of Wanham soils and the TOD Soil Unit is usually associated with Blackmud or Heart soils.

Location in the Landscape

The TOD 2 Soil Unit occurs on the Windfall Plain on deltaic landforms at elevations of approximately 800 to 900 m above sea level.

Landforms and Materials

The TOD 2 Soil Unit occurs on glaciofluvial deltas and terraces associated with late glacial-aged lakes. The land surfaces are usually undulating to gently sloping, and occur within the confines of wide valleys.

The materials are stratified, deltaic sediments that tend to be predominantly fine sandy loam or silt loam textured. The stone-free materials may contain thin layers or lenses of clayey sediments, and are often associated with well-sorted sands which are duned in some areas.

Soils and Vegetation

The dominance of Brunisolic Gray Luvisols in the TOD 2 Soil Unit indicates cool, moist climatic conditions and coniferous forest cover. The sandy, silty textures ensure fairly rapid rates of infiltration and percolation and the soils in freely drained slope positions are well drained. Poorly drained Wanham soils occupy depressional areas of the TOD 2 soil landscapes.

The Toad Soil Series is identified by a LH, Ae, Bm, Bt, BC, Ck horizon sequence on fine sandy loam and silt loam materials.

Lodgepole pine, lodgepole pine-black spruce, and occasional aspen forests cover these soils.

Torrens (TOR) Soil Units

TOR Soil Units describe soil landscapes with Orthic Gray Luvisols and Eluviated Dystric Brunisols developed on weathered mudstones and shales. The units are named after the dominant series, Torrens.

Location in the Landscape

TOR Soil Units occur on the lower slopes of eroded escarpments of upland areas and on fairly level areas of the Simonette Benchland, Driftpile Benchland and the Berland Plateau (figure 12). These soils are usually associated with a discontinuous veneer of Edson or Mayberne till.

Landforms and Materials

The landforms associated with TOR Soil Units are steeply sloping elongate ridges, meandering erosional escarpments, and fairly level bedrock plains. Discontinuous morainal veneers are often present in Torrens soil areas, and colluvial veneers and blankets are associated with lower slopes of ridges and escarpments.

The parent geological materials are soft, weathered mudstones and shales of the Wapiti Group, and colluvium derived from these sedimentary bedrocks. The materials are light olive brown to dark brown in color, clay loam to silty clay in texture, weakly to moderately calcareous, and often contain weathered mudstone or shale fragments which can be crushed easily by hand. The Torrens parent material is usually stratified and can easily be mistaken for a glaciolacustrine deposit, but position in the landscape and the presence of bedrock fragments differentiates Torrens soils from those developed on glaciolacustrine materials. The Torrens landscapes have been glaciated and quartzite pebbles and remnant till deposits may be found.

Soils and Vegetation

TOR Soil Units come under the influence of the cool, moist climate of the benchlands and plateaus. The soils are usually moderately well drained and well aerated. Aspect has considerable influence on the micro-climate of steep slope locations. South and west-facing slopes are warmer and drier than north and east-facing slopes.

Lodgepole pine and lodgepole pine-black spruce forests are most common on TOR Soil Units. Aspen forests occur on some south-facing slopes.

The predominant soils in the TOR 1 Soil Unit are Orthic Gray Luvisols which often have a double Ae horizon sequence. These soils are characterized by a thin LF or LH organic horizon, a well-developed light brownish gray Ae1 horizon, and a yellowish brown Ae2 horizon. The eluvial horizons are generally silt loam to silty clay loam in texture and very strongly acid in reaction. At 20 to 35 cm below the surface lies a light olive brown, strongly acidic, clay loam to silty clay Bt horizon. This horizon is generally well developed and exhibits subangular blocky structure and thick clay skin development on the ped surfaces. Eluviated Dystric Brunisols are also common. These soils have a reddish brown colored Bm developed between the Ae1 and Ae2 horizons. The Bm normally has insufficient pyrophosphate-extractable Fe + Al to be called a Bf horizon. Surface drainage of these soils is fairly rapid but internal drainage may be impeded by the fine textures. The TOR 2 Soil Unit includes significant amounts of poorly drained Gleysolic soils.

Torrens soils are highly erodible because of the stratified nature of the materials, clayey textures and slow rates of infiltration and permeability. Gullying and mass movements (landslides and slumps) occur frequently as a result of removal of the forest cover and disturbance of the soil surface.

Tri-Creek (TRC) Soil Units

The TRC Soil Units are used to identify glaciolacustrine landscapes dominated by Gray Luvisols developed on silty clays and clays. The units are named after the Tri-Creek Soil Association (Dumanski *et al.*, 1972) and include Orthic Gray Luvisols (Wampus series), Brunisolic Gray Luvisols (unnamed series), Luvic Gleysols (Snipe series), and Orthic Humic Gleysols (Goose series).

Location in the Landscape

Tri-Creek soils were mapped in small glaciolacustrine basins in the Driftpile Benchland and the Simonette Benchland (850 to 900 m above sea level) where glacial meltwaters were ponded. These soils are seldom dominant and are usually mapped as inclusions of SIP and GOS Soil Units.

Landforms and Materials

Tri-Creek soils occur on clayey glaciolacustrine veneers and blankets overlying clay loam till or weathered mudstone. The small basins in which these soils occur are separated from the main glaciolacustrine basin on the Iosegun Plain, and represent the former site of small proglacial lakes. The land surfaces are usually undulating to gently rolling, reflecting the underlying morainal topography.

The materials are dominantly silty clays and clays that have scattered pebbles and cobbles. These materials are very slowly permeable and surface drainage is often poorly developed. Because of the high clay content, the materials are very sticky when wet and dry slowly.

The deposits are usually stratified, dense, and weakly to moderately calcareous. Interbedded sand layers and lenses are common in some areas. The materials vary in thickness from 50 cm to 3 m, but are generally less than 1 m thick.

Soils and Vegetation

Moderately well drained Orthic and Brunisolic Gray Luvisols are the dominant soils in the TRC Soil Units. These soils are typical of a cool, moist, climate and boreal forest cover.

The soils have an LF, Ae, Bt, BC, Ck horizon sequence in the Orthic Gray Luvisols (Wampus series) and a LF, Bm, Ae, Bt, BC, Ck sequence in the Brunisolic Gray Luvisols.

Tri-Creek soils have a shorter frost-period, and experience less heat units and possibly greater summer precipitation than Donnelly and Esher soils which occur at lower elevations on the Iosegun Plain. Climatic conditions severely limit agricultural production possibilities.

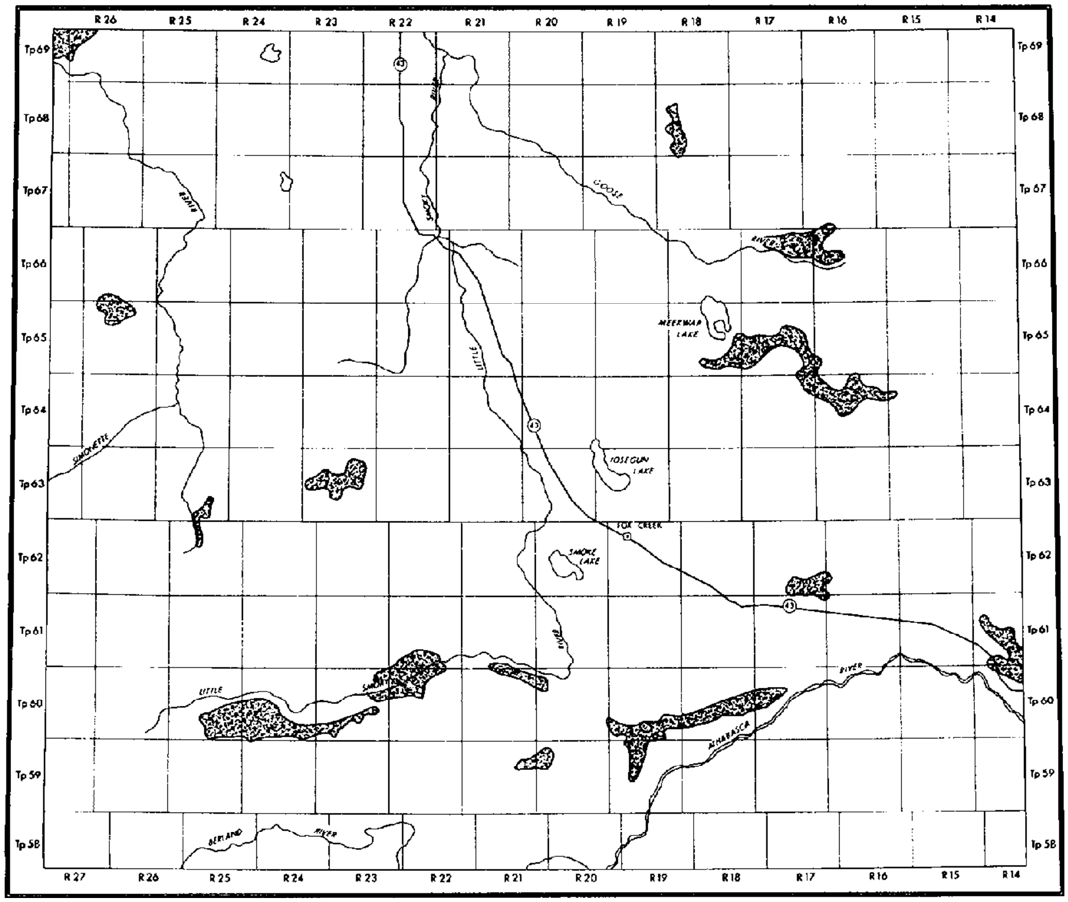


FIGURE 28. Distribution of Wanham Soil Units.

Tri-Creek soil areas are usually covered with lodgepole pine, aspen or spruce-fir forest types.

Wanham (WHM) Soil Units

The WHM Soil Units describe glaciofluvial landscapes dominated by Orthic Luvic Gleysols developed in medium textured materials. The units are named after the dominant soil series.

Location in the Landscape

WHM Soil Units are fairly extensive on the Windfall Plain and along the margins of the Iosegun Plain in locations where deltas were deposited at the margins of glacial lakes (figure 28). The Wanham Soil Series also occurs as an inclusion in DVS and TOD Soil Units.

Landforms and Materials

WHM Soil Units occur on glaciofluvial deltas and terraces associated with late glacial-aged lakes. The land surfaces are usually undulating or gently sloping and are often confined in a broad valley.

The materials are stratified, deltaic sediments that tend to have mostly silty textures. Silt loam and very fine sandy loam textured materials are dominant in the upper 1 m but silty clays, clays, sands and gravels may occur below. The materials are moderately to strongly calcareous and are moderately permeable.

Soils and Vegetation

Wanham soils are water-saturated most of the growing season because of the poor surface drainage and groundwater seepage. The soils have a thin peaty surface horizon overlying a fairly thick, iron stained, brown Aeg that is neutral in reaction. This horizon rests on a dark yellowish brown to dark gray silt loam to silty clay loam textured Btg which shows evidence of iron staining and is neutral to mildly alkaline in reaction. The subsoil is usually dull colored and exhibits bright mottles. Profile characteristics of the Wanham soils are relatively similar throughout the area with the exception of texture which ranges from silt loam to sandy loam to silty clay loam.

White spruce, black spruce, and balsam poplar forests form the common cover on these soils.

Soil wetness, due to a high water table, limits the agricultural potential of Wanham soils. Facility-oriented uses are also limited by wetness.

Rough Broken (RB) miscellaneous land unit

The RB Miscellaneous Land Unit describes very steeply sloping river banks. The materials and soils are highly variable, and have not been separated during the inventory. The height of the river banks varies from a few metres to tens of metres on rivers such as the Little Smoky and Athabasca. The stream channels have been eroded through glacial deposits and are often incised into the underlying bedrock. The glacial deposits include sands, silts, clays and clay loam textured till. The materials along the banks are often slumped and tend to be unstable in many areas due to slope steepness and undercutting of slopes by active erosion.

Soils present in this land unit include Regosols, Brunisols and Luvisols.

The RB land units have severe limitations for facility-oriented uses because of steep slopes and unstable soil conditions. These land units, provide important winter habitat for ungulates.

Soils and land use

Soils and associated attributes of land constitute our most important continuing natural resource. Man depends on land for food and fiber production, for watershed, as a physical site on which to live, work and enjoy recreational pursuits, for building materials, and for places to dispose of garbage and sewage. Misuse of land resources can result in drastic economic, social and environmental costs. Sound land-use planning must be based on a knowledge of soil properties, soil distribution and soil performance.

Land capability for agriculture

Land capability for agriculture ratings are based on climatic, soil and landscape limitations. In the rating scheme used in this report (Canada Land Inventory, 1972), mineral soils are grouped into seven classes according to their limitations for agricultural use. Class 1 soils, having few limitations, can be used for the widest range of agricultural activities with the least risk of damage. The soils in the other classes have progressively greater natural limitations.

Soils in the first three classes are capable of sustained production of common field crops; soils in the fourth class are marginally suitable for sustained crop production. Soils of the fifth class can support improved permanent pasture and hay production, but soils of the sixth class are suitable only for unimproved pasture. Soils of the seventh class have no capability for arable culture or permanent pasture. Organic soils are not rated in this system.

Under the Canada Land Inventory (CLI) rating system, soils are assigned to a capability class and a capability subclass. The class is a grouping of soils having the same relative degree of limitations and hazards, while a subclass is a grouping of soils with similar kinds of limitations and hazards. The major kinds of limitations are: adverse climate (C), undesirable soil structure and low permeability (D), susceptibility to inundation (I), moisture limitation due to coarse texture (M), excessive stoniness (P), adverse topography, slope and pattern (T), and wetness (W).

Climate, soil properties, and topography are prime considerations when assessing areas for agricultural use. Climate is severely limiting in most of the area because of a short frost-free period but assessment of macroclimate is difficult because good climatic data are scarce. Significant differences occur between agroclimatological maps prepared by various authors. Bowser (1967) recognized two agroclimatic areas in the Iosegun Lake Map Sheet: Area 5H which covers about a quarter of the sheet mainly in the southwestern corner and in a narrow band along the eastern margin; and Area 3H which occupies the remainder of the sheet. Climate Area 2H touches the northwestern corner.

Agroclimate subregion 2H describes areas where the amount of precipitation has usually been adequate, but where wheat has suffered some frost damage in approximately 30 percent of the years. The frost-free period has averaged between 75 and 90 days.

Agroclimate subregion 3H describes areas where the amount of precipitation has usually been adequate but where it is not considered practical to grow wheat because of the frequency of damaging frosts. The frost-free period averages between 60 to 75 days, and annual precipitation is approximately 450 mm. The best agricultural capability class that can be applied to soils in Climatic Region 3 is Class 3.

In agroclimatic subregion 5H precipitation is usually adequate, but the frost-free period is so short (generally less than 60 days) it is impractical to grow cereal crops. Hay crops are all that is recommended. Mean annual precipitation in these areas is 500 to 750 cm.

The Canada Land Inventory Map (Wynnyk and Lindsay, 1971) places a considerable portion of the northwestern corner in subregion IICh and the extent of subregion VCh along the eastern side is considerably greater. The parameters defining these areas correspond to those of Bowser's Areas 2H and 5H, respectively. Ojamaa (1978), considered the Canda Land Inventory ratings to be overly optimistic and reduced the extent of subregion IICH. If climatic subregion IICh is confined to coincide with the occurrence of soils with dark gray Ah horizons then Ojamaa's assessment is more correct. Since soils with dark gray Ah horizons are usually fine textured and imperfectly drained it may be that the dark humus-enriched surface horizons reflect moist, cool soil conditions rather than a warmer climate. If this is true, then Bowser's classification (3H) of this region is the most realistic.

The soil units have been assigned CLI subclass ratings for climatic regions 2, 3 and 5 as listed in table 6. Although ratings are given for climatic region 2, the author favors Bowser's (1967) assessment which does not include climatic subregion 2H in the Iosegun Lake map sheet. The CLI climatic boundaries (Wynnyk and Lindsay, 1971) which delineate more land in climatic subregion 5H than Bowser's (1967) maps are also preferred. Slight modifications of these lines are suggested to conform with the physiographic divisions recognized in the area. To summarize, a composite map has been prepared, figure 29, showing the proposed agro-climatic subregions.

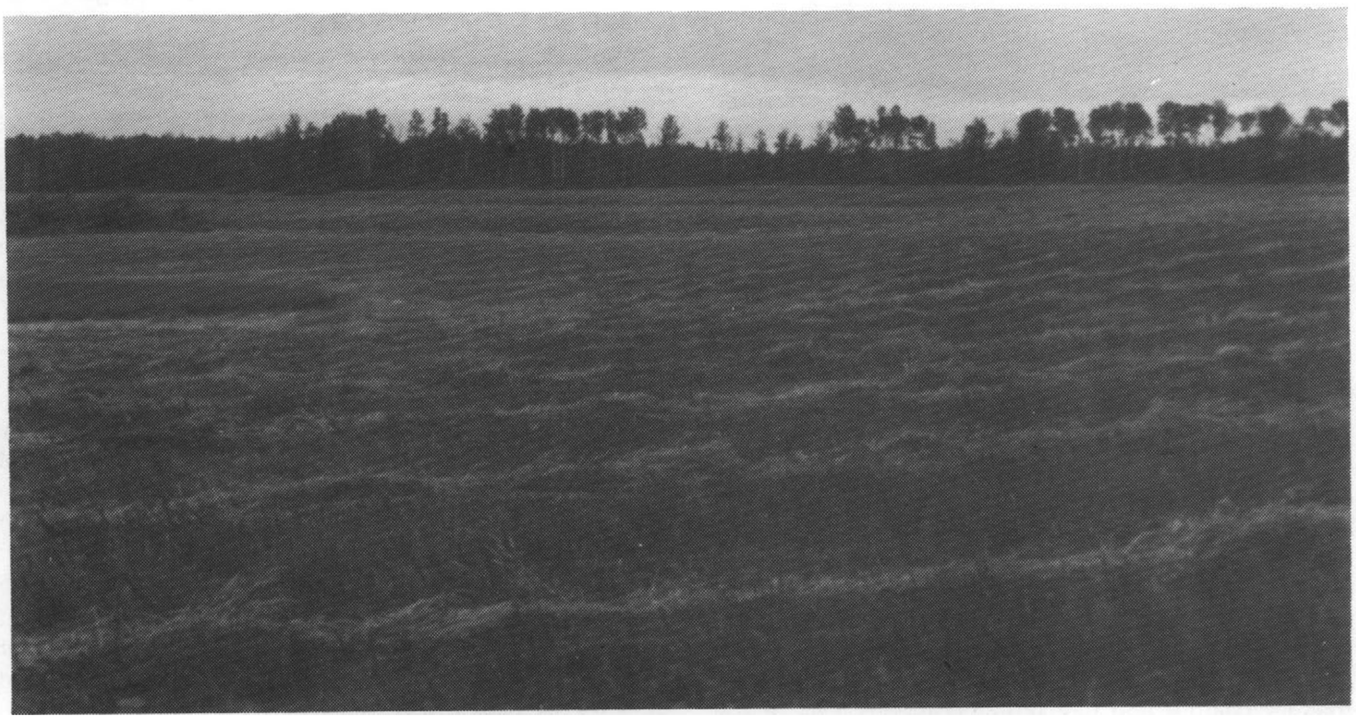


PLATE 14. Extensive areas of Donnelly soils have been cultivated south of Valleyview. Coarse grains, canola (rapeseed), and forage crops are grown on the undulating soil landscapes.

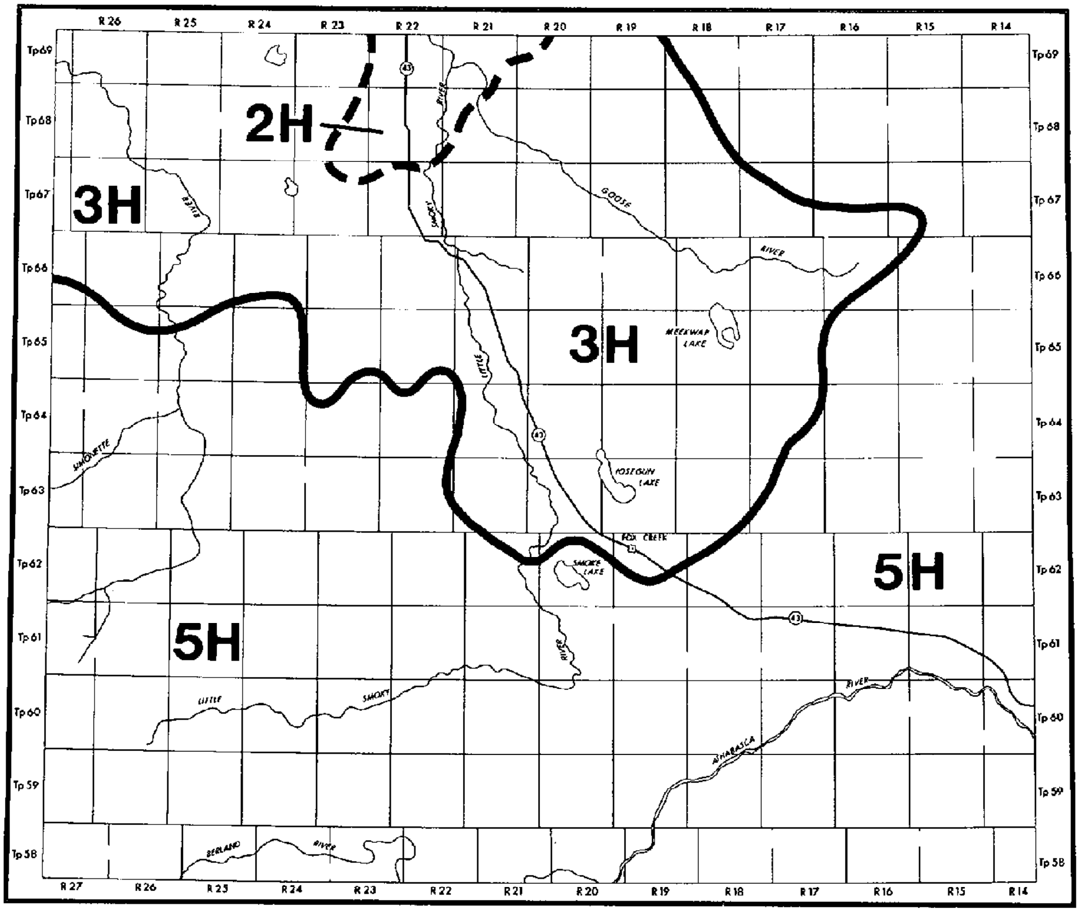


FIGURE 29. Proposed agroclimatic subregions.

Interpretation of soil erosion potential

Soil erosion includes many complex processes which result in surface movement of soil particles or mass movement of soils on slopes. Many variables are involved in soil erosion including topography, rainfall characteristics, geology, vegetation and soil properties. In agricultural areas, surface soil erosion of cultivated fields by wind and water are of most interest to land managers. In forested areas, surface erosion associated with roads, forest harvesting and mineral exploration is of concern (Rothwell, 1978; Lengellé, 1976) but slope stability is also important (Burroughs, *et al.*, 1976).

A comprehensive treatment of the complexities of erosion potential of the entire Iosegun Lake area is beyond the scope of this report. General estimates of soil susceptibility to water erosion are presented in table 7. The susceptibility to erosion is described in relative terms (slight, moderate, severe) based on a knowledge of soil properties and steepness of slope. The main soil parameters used in this evaluation were particle size distribution (texture), estimates of infiltration and permeability rates, soil structure, and soil wetness. These estimates of soil erodibility are intended to provide guidelines for assessments of a general nature, not data for site planning. Many soil and non-soil parameters must be evaluated on a site-specific basis when planning intensive management. Rothwell (1978) details watershed management guidelines for logging and road construction.

TABLE 6.
Land Capability for Agriculture Ratings

Soil Units		Climatic Subregion 2Ch	Climatic Subregion 3Ch	Climatic Subregion 5Ch
Blackmud	BKM 6	5M	5M	5C
	BKM 7	5M6W	5M6W	5C6W
	BKM 8	n/a	n/a	5C
	BKM 9	n/a	n/a	5C6W
Copton	COP 1	n/a	6MF	6MF
	COP 2	n/a	6MW	6MW
Donnelly	DON 1	3D	4D	n/a
	DON 2	3D5W	4D5W	n/a
	DON 3	3D5W	4D5W	n/a
	DON 4	3D5W	4D5W	n/a
Deep Valley	DPV	n/a	n/a	6T
Davis	DVS 2	3D4W	4D5W	5C
Edson	EDS 4	3D	4D	5C
	EDS 4/t	3D	4D	5C
	EDS 4/s	n/a	5P	6P
	EDS 5	3D5W	4D5W	5C
	EDS 5/t	3D5W	4D5W	5C
	EDS 6	n/a	n/a	5C
	EDS 6/t	n/a	n/a	5C
Eaglesham	EGL	0	0	0
Enilda	EID 2	4W	5W	n/a
Esher	ESH 1	3D5W	3C5W	n/a
Goose	GOS 1	5W	5W	n/a
	GOS 1/p	6W	6W	n/a
	GOS 2	5W3D	5W4D	n/a
	GOS 3	5W3D	5W4D	n/a
	GOS 4	n/a	5W4D	n/a
Gunderson	GUN 1	5W	5W	6W
	GUN 2	5W4M	5W4M	6W
High Prairie	HPR 1	2C	3C	n/a
	HPR 2	2C4W	3C5W	n/a

TABLE 6 (continued)

Soil Units		Climatic Subregion 2Ch	Climatic Subregion 3Ch	Climatic Subregion 5Ch
Heart	HRT 1	n/a	6M	6M
	HRT 2	n/a	6M6W	6M6W
	HRT 3	n/a	n/a	6M
Iosegun	IOS 1	4I	4I	6IW
	IOS 2	4I5W	4I5W	6I
Jarvis	JRV 4	n/a	6MP	6MP
	JRV 5	n/a	6M6W	6M6W
Judy	JUY1	-	-	6MP
	JUY2	-	-	6PW
Kenzie	KNZ	0	0	0
Lodge	LDG6	4M	4M	5C
	LDG7	4M5W	4M5W	5C6W
	LDG9	-	-	5C6W
Mayberne	MBN4	-	-	5C
	MBN4/s	-	-	6P
	MBN5	-	-	6P
	MBN5/s	-	-	6P6W
	MBN6	-	-	5C
	MBN6/s	-	-	6P
	MBN7	-	-	5C6W
	MBN7/s	-	-	6P6W
Rough Broken	RB	6T7T	6T7T	6T7T
Smoky	SKY1	-	5W	6W
	SKY1/p	-	6W	6W
	SKY2	-	5W4D	-
	SKY2/p	-	6W4D	-
	SKY3	-	-	6W5C
	SKY4	-	-	6W5C
Snipe	SIP1	5W	5W	6W
	SIP1/p	6W	6W	6W
	SIP2	5W3D	5W4D	-
	SIP3	-	5W4D	6W5C

Soil Units		Climatic Subregion 2Ch	Climatic Subregion 3Ch	Climatic Subregion 5Ch
Simonette	STT1	-	-	6WP
	STT2	-	-	6WP
Toad	TOD2	-	-	5C
Torrens	TOR1	-	-	5C
	TOR2	-	-	5C
Tri-Creek	TRC3	-	4D	5C
	TRC4	-	4D5W	5C6W
Wanham	WHM1	5W	5W	6W
	WHM1/p	6W	6W	6W
	WHM2	5W3D	5W4D	6W5C
Water		7W	7W	7W

1. Adverse topography further limits capability ratings of many land areas.

2. The subclass modifiers, which indicate kind of limitation, are defined as follows:

C - climate

M - droughtiness

I - inundation

D - adverse soil structure

P - excessive stoniness

F - poor fertility

W - wetness

T - topography

TABLE 7.
Estimated Water Erosion Hazard of Soils

	Percent Slope				
Soil Units	<5	5 - 9	9 -15	15 -30	30 -60+
Blackmud	S	M	X	-	-
Copton	M	X	X	X	X
Davis	M	X	X	-	-
Deep Valley	-	-	X	X	X
Donnelly	M-X	X	X	-	-
Eaglesham	S	M	X	-	-
Edson	S	S	M	M-X	X
Enilda	S	M	-	-	-
Esher	M-X	X	X	-	-
Goose	M-X	X	X	-	-
Gunderson	M-X	X	X	-	-
Heart	S	S	M	M-X	X
High Prairie	S	M	-	-	-
Iosegun	M	X	X	-	-
Jarvis	S	S	S	-	-
Judy	S	S	S	-	-
Kenzie	S	M	X	X	-
Lodge	S-M	M	X	-	-
Mayberne	S	S	M	M-X	X
Simonette	S	S	M	-	-
Smoky	S-M	M-X	X	X	-
Snipe	M-X	X	-	-	-
Toad	M	X	X	-	-
Torrens	M	X	X	X	X
Tri-Creek	M-X	X	X	-	-
Wanham	M-X	X	X	-	-

Ratings are mean estimates for the Soil Unit based on knowledge of soil properties and experience in the area.

S = slight erosion hazard
M = moderate erosion hazard
X = severe erosion hazard

Donnelly, Esher, Goose, Snipe and Tri-Creek soils developed on glaciolacustrine clays are among the most erodible soils in the area. Severe sheet and gully erosion has occurred on long slopes of less than 5 percent in cultivated areas and as a result of road construction (plate.15).

Copton and Torrens soils developed on soft, sedimentary bedrock are also highly erodible (Lengellé, 1976; Kathol and MacPherson, 1974) in many areas although the bedrock is variable in texture and hardness. Erosion of these soils has resulted in several problems in the Swan Hills.

PLATE 15. The clayey glaciolacustrine sediments upon which Donnelly, Esher, Goose and Snipe soils are developed are highly erodible and care must be taken in controlling runoff to prevent gullying.

Davis, Toad and Wanham soils, developed on glaciofluvial silts and fine sands, were rated moderately erodible on slopes of less than 5 percent and severely erodible on slopes greater than 9 percent. The abundance of surface water in Wanham soil areas can increase the risk and extent of erosion of these soils.

Edson and Mayberne soils, which are developed on till, were rated slightly erodible on slopes of less than 9 percent and moderately erodible on 9 to 15 percent slopes. Stony phases of these soils (EDS/s, MBN/s) are generally more resistant to erosion. Thin phases (EDS/t, MBN/t) are more erodible if the underlying materials are slowly permeable.

Blackmud soils on fluvial sands have rapid infiltration and permeability rates but lack cohesion. These soils are susceptible to gullying when exposed and are unstable in embankments.

Heart soils, which occur on sand dunes, have very rapid infiltration and permeability rates which restrict overland flow and therefore lower erosion risk. If runoff waters are confined (as by a road ditch), these soils will gully severely. Wind erosion can be a problem if these soils are stripped of vegetation.

Jarvis and Judy soils are not susceptible to erosion due to their gravelly, cobbly nature and high infiltration rates unless underlying materials are impermeable.

Soil interpretations for forestry

Soil interpretations for forestry consist of ratings for a number of soil-related characteristics that affect growth and management of trees. Such ratings, although subjective in detail, are useful in planning the soil management programs that are necessary to maintain or enhance the productivity of an area.

Climatic and soil factors exert considerable control on forest productivity. Correlations of soils and forest productivity have been examined in the Hinton-Edson area by Dumanski *et al.* (1972); in the Cynthia-Lodgepole area by Lesko and Lindsay (1973); and in the Wapiti area by Twardy and Corns (1980).

Soil-forest productivity relationships were not examined within the Iosegun Lake area. Estimates of soil productivity are limited to extrapolation of data for similar soils from other parts of western Alberta. Extrapolation of data for common soils from the Hinton-Edson area (Dumanski *et al.*, 1972) yields the soil productivity (for lodgepole pine) groups and ranking shown in table 8. Mayberne and Judy soils having the highest productivity and the poorly drained Gleysolic and Organic soils ranked lowest.

TABLE 8.
Grouping of Soils Based on
Estimated Productivity for Lodgepole Pine
(After Dumanski *et al.*, 1972)

Mayberne	DECREASING PRODUCTIVITY ↓
Judy	
Edson	
Copton	
Torrens	
Lodge	
Heart	
Blackmud	
Jarvis	
Tri-Creek	
Smoky	
Gunderson	
Kenzie	
Eaglesham	

Soils and other aspects of land units should be considered in forest management decisions. Soil and land factors affect forest regeneration, brush hazard, windthrow hazard and susceptibility of the land to damage during harvesting operations. Estimates of soil performance related to management practices are given in table 9.

The rating of moisture status refers to the quantity of moisture that should be available for tree growth during the growing season. This is based on knowledge of water-holding capacities of soils as well as on moisture distribution patterns over the area. Soils are rated as good, moderate or poor (wet or dry).

Windthrow hazard ratings reflect soil characteristics affecting development of tree roots, and hence, the risk of trees being blown over by normal winds. These ratings, cited as high, moderate, or low in table 9 are estimated from knowledge of root development under varying soil conditions and from field observations. It appears that trees are most subject to windthrow on soils having thick organic surface horizons that are affected by high water tables, or on lithic soils having shallow sola overlying consolidated bedrock. Thus windthrow is often a problem on Organic and Gleysolic soils. Soils with deep rooting zones are described as having moderate or low windthrow hazards.

TABLE 9.
Interpretations of Soil Performance for Forest Management

Soil Units	Moisture Status for: lodgepole pine	white spruce	Early Regeneration	Windthrow Hazard	Soil Damage Hazard
Blackmud	poor (dry)	poor (dry)	LP, A[1]	low	low
Copton	moderate	poor (dry)	LP, A	moderate	low
Davis	good	moderate	A	low	low
Deep Valley	good	moderate	LP, A	moderate	high
Donnelly	good	good	A, BP	moderate	high
Eaglesham	poor (wet)	poor (wet)	S, W, L	high	high
Edson	good	good	A, LP	low	low
Enilda	poor (wet)	good	A, BP	low-high	moderate
Esher	good	good	A, BP	moderate	high
Goose	poor (wet)	good	W, S, BP	high	high
Gunderson	poor (wet)	good	BS, BP	high	moderate
Heart	poor (dry)	poor (dry)	LP, A	low	high
High Prairie	good	good	A, W	low	low
Iosegun	variable	good	W, BP	low	high
Jarvis	poor (dry)	poor (dry)	LP	moderate	low
Judy	good	good	LP, ES	moderate	low
Kenzie	poor (wet)	poor (wet)	BS	high	high
Lodge	good	good	A, LP	low	low
Mayberne	good	good	LP	low	low
Simonette	poor (wet)	good	BS	high	high
Smoky	poor (wet)	good	BS, W, BP	high	high
Snipe	poor (wet)	good	W, BP, BS	high	high
Toad	good	moderate	LP	low	low
Torrens	good	good	LP, A	low	high
Tri-Creek	good	good	A, LP	moderate	high
Wanham	poor (wet)	good	BS, BP	high	high

[1] Species code: A; aspen, BP: balsam poplar, BS: black spruce, ES: Engelmann spruce: LP: lodgepole pine, L: larch, S: sedge, W: willow

Soil damage hazard ratings are based on water erosion potential and bearing capacity. Soils with high clay content, soils with fairly high clay content and high water tables, and soils with thick peat layers are rated as having a high damage hazard. Permeable, well drained soils received a low rating. These soils would generally be suitable for summer logging.

Engineering uses of soil

Soils are used for construction sites as well as materials. Consequently, certain soil properties are of special interest to engineers and others concerned with planning construction and maintenance of engineering works (plates 16 and 17). This section of the report describes properties and limitations of the soils that are of special significance for uses such as road location and construction and location of buildings.

Predictions of soil performance reported here must be considered estimates of general soil properties, not as specific site test data. These estimates provide guidelines for area planning and a basis for detailed soil investigations. Due to limitations of scale of the soil map (1 inch equals two miles) small areas of contrasting soils do not appear. On-site inspections are always required prior to development activities. Interpretations of soil properties are based on observations made in the field and related to published guidelines (U.S.D.A., 1972). These observations are usually limited to a depth of one metre, but estimates of deeper materials can be made by applying knowledge of surficial geology and geomorphology.

Information contained on the soil map and legend should be used in conjunction with the written soil unit descriptions to obtain as much information as possible about delineated areas. The available information includes soil material characteristics, steepness of slopes, soil moisture conditions, water table depths, and depth to bedrock. Based on a knowledge of soil and land characteristics, it is possible to make good, though general, evaluations of soil unit limitations for such uses as road or pipeline location, or a source of sand or gravel. Evaluation of environmental sensitivity and estimates of construction and maintenance costs are aided by an understanding of terrain conditions.

The terminology used in pedology and soil engineering is not always consistent, and may be confusing. The terms used in this report are used in the pedological sense and many are defined in the Glossary.

Engineering test data and classification of some of the common soils in the area are shown in table 10. Estimated soil properties of significance for such uses as road location, source of fill, source of sand and gravel, or general building sites are given in table 11. Further information regarding slopes, materials, wetness, presence of muskeg and type of land patterns may be obtained from the soil maps and from the other sections of the report.

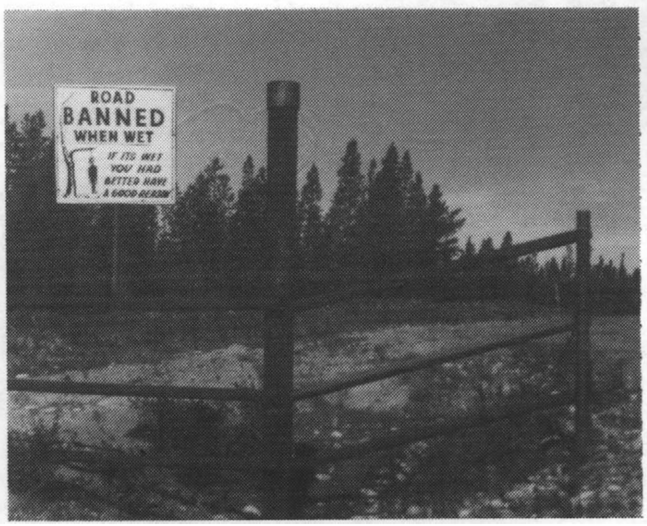


PLATE 16. Maintenance of roads built of highly plastic clayey materials is costly.

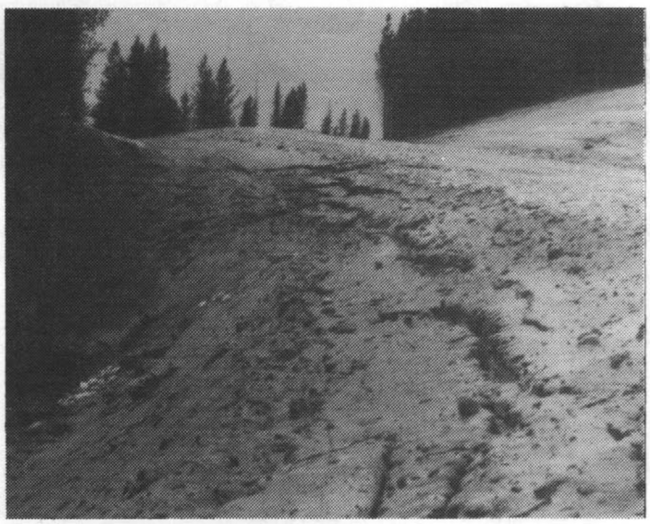


PLATE 17. Very sandy soils tend to be unstable in deep road fills.

TABLE 10.
Engineering Test Data and Classification of Some of the Soils

Soil Unit	Location	Material	Depth (cm)	% Passing Sieve No. 4	10	40	200	% finer than 0.05 mm	0.002 mm	Atterberg Limits Liquid Limit	Plasticity Index	Classification Unified	AASHO	USDA
Bedrock-beneath Edson	10-68-19	mudstone	100+	100	100	100	49	54	33	48	29	CL	A-7-6(11)	SCL
Donnelly	16-67-18	clays	100+	-	-	-	-	87	59	66	31	MH	A-7-5(20)	C
Donnelly	20-67-18	clays	100+	100	100	98	80	77	39	45	20	CL	A-7-6(13)	CL
Donnelly	28-68-19	clays	100+	100	100	97	69	68	34	38	15	CL	A-6(9)	CL
Donnelly	31-68-19	clays	100+	100	100	98	82	81	46	54	31	CH	A-7-6(19)	C
Donnelly	2-68-23	clays	100+	100	100	99	86	81	50	56	32	CH	A-7-6(19)	C
Edson	21-68-19	till	100+	-	-	-	-	67	37	42	18	CL	A-7-6	CL
Edson	35-67-19	till	100+	100	100	97	67	67	39	40	19	CL	A-6(10)	CL
Edson	15-63-19	till		99	99	93	68	71	39	41	18	CL	A-7-6(10)	CL
Edson	7-65-24	till	100+	63	63	60	57	45	27	40	19	CL	A-6(8)	GC
Enilda	5-69-21	fine sands and silts	80-120	100	100	100	64	65	25	31	9	ML-CL	A-4(6)	L
Esher	36-68-21	clays	100+	100	100	98	85	87	53	52	29	CH	A-7-6(18)	C
Esher	34-67-22	clays	100+	95	95	94	84	95	66	63	34	CH	A-7-6(20)	C
Goose	25-67-19	clays	100+	100	100	100	92	96	77	76	40	MH	A-7-5(20)	C
Goose	27-67-23	clays	100+	100	100	100	99	95	82	72	35	MH	A-7-5(20)	C
High Prairie	5-69-22	fine sands, silts and clays	80+	100	100	100	67	58	28	32	12	CL	A-6(7)	CL-L
Torrens		mudstone	100+	100	100	100	80	22	12	34	11	CL,ML	A-6(9)	SL
Torrens	33-64-14	mudstone	60-100	99	99	96	75	73	43	49	25	CL	A-7-6(16)	C

TABLE 11.
Estimated Soil Properties Significant to Engineering Uses

Soil Units	Depth (m) to Bedrock	Depth (m) to Seasonal Water Table	Material Classification USDA Texture	Unified	AASHO	Permeability	Salinity	Shrink Swell	Comments
Blackmud	10	5	sand to sandy loam	SM	A-2-4	rapid	nil	nil	fluvial sands
Copton	1-2	-	loamy sand	SM	A-2-4	rapid-slow	nil	nil	soft sandstone with hard layers
Davis	10	5	silt loam	ML	A-4	moderate	nil	low	fluvial silts and fine sands
Deep Valley	1-2	-	sandy clay loam	CL	A-4	moderate	nil	low	very steep, unstable slopes
Donnelly	5-10	2	clay	CH	A-7	very slow	moderate	high	"gumbo" clays, erodible and slumping hazard
Eaglesham	10	surface	organic	peat	-	rapid	nil	high	open fen bog
Edson	3-5	2-5	clay loam	CL	A-6 or A-7	moderate	nil	moderate	slightly stony till
Enilda	10	0.5	sandy loam to clay loam	SM to CL	A-2-4	moderate	nil	low	variable textures -high water table
Esher	10	1-2	clay	CH	A-7	very slow	moderate	high	"gumbo" clays, erodible and slumping hazard
Goose	10	0.5	clay	CH	A-7	very slow	moderate	high	"gumbo" clays, high water table
Gunderson	10	0.5	sand to sandy loam	SM	A-2-4	rapid	nil	nil	sand with high water table
Heart	10	5	sand	SM	A-2-4	rapid	nil	nil	sand dunes
High Prairie	10	2	clay loam to sandy loam	CL-SM	A-6 to A-4	moderate	nil	low to moderate	level, variable textures
Iosegun	10	variable	sands, silts, occasional gravels	variable	variable	generally rapid	nil	low	floodplains and terraces

Soil Units	Depth (m) to Bedrock	Depth (m) to Seasonal Water Table	Material Classification USDA Texture	Unified	AASHO	Permeability	Salinity	Shrink Swell	Comments
Jarvis	10	5	gravel, gravelly sand	GP	A-1	rapid	nil	nil	good source of gravel
Judy	1-3	5	cobbly, gravelly sandy loam	GP	A-1	rapid	nil	nil	60-80% cobbles and gravels
Kenzie	10	surface	organic	peat	-	slow	nil	high	treed moss bog
Lodge	10	2-5	thin sand over clay or clay loam	SM/ CL-CH	A-2/ A-6	moderate	nil	moderate-high	thin sandy layer over till or clays
Mayberne	2-5	2-5	sandy clay loam to clay loam	CL	A-6 to A-4	moderate	nil	moderate	moderate to very stony till
Simonette	1-3	0.5	cobbly, gravelly loam	-	-	rapid	nil	nil	60-80% cobbles and gravels
Smoky	2-5	0.5	clay loam or sandy clay loam	CL	A-4 to A-6	moderate	nil	moderate	tills with high water table
Snipe	10	0.5	clay	CH	A-7	very slow	moderate	high	"gumbo" clays, high water table
Toad	10	5	fine sandy loam to silt loam	SP-ML	A-4	rapid-moderate	nil	low	fine sands and silts
Torrens	1-2	-	clay loam to silty clay	CL	A-6	moderate-slow	nil	moderate	weathered, soft mudstone, erodible
Tri-Creek	1-5	2-3	clay	CH	A-7	very slow	nil	high	"gumbo" clays, erodible, usually thin to till
Wanham	10	0.5	silt loam	ML	A-4	moderate	nil	low	silts and fine sands, high water table

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Glossary of terms

This is included to define terms commonly used in the report; it is not a comprehensive soil glossary.

Acid soil: a soil having a pH of less than 7.0.
Aeration: the process by which air in the soil is replaced by air from the atmosphere.
Aggregate: a group of soil particles cohering so as to behave mechanically as a unit.
Alkali soil: a soil having a pH greater than 8.5 or an exchangeable sodium percentage of greater than 15.
Alkaline soil: a soil having a pH greater than 7.0.
Aspect: orientation of the land surface with respect to compass direction.
Atterberg limits: Various moisture contents of a soil at which it changes from one major physical state to another. The Atterberg limits which are most useful for engineering purposes are liquid limit and plastic limit. The liquid limit is the moisture content at which a soil passes from a plastic to a liquid state. The plastic limit is the moisture content at which a soil changes from a semi-solid to a plastic state.
Plasticity index (P.I.) is defined as the numerical difference between liquid limit and plastic limit.
Available plant nutrients: that portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants.
Bearing capacity: the average load per unit area that is required to rupture a supporting soil mass.
Bedrock: the solid rock and the unconsolidated mantle of weathered rock that underlies the soil or that is exposed at the surface.
Bleached Orthic Gray Luvisols: An Orthic Gray Luvisol profile which exhibits a highly bleached Ae1 horizon and a yellowish brown lower Ae2 horizon which is equivalent in appearance to the Ae of a "normal" Gray Luvisol.
Bulk density, soil: the mass of dry soil per unit bulk volume.
Cation: an ion carrying a positive charge of electricity. The common soil cations are calcium, magnesium, sodium, potassium and hydrogen.
Cation exchange capacity (C.E.C.): a measure of the total amount of exchangeable cations that can be held by the soil. It is expressed in terms of milliequivalents per 100 grams of soil.
Coarse fragments: rock or mineral particles greater than 2 mm in diameter.
Clod: a compact, coherent mass of soil produced by digging or plowing.
Colluvium: a heterogeneous mixture of material that has been deposited mainly by gravitational action.
Compressibility: the susceptibility of a soil to decreasing in volume when subjected to a load.
Concretion: a local concentration of a chemical compound, such as calcium carbonate or iron oxide, in the form of a grain or nodule of varying size, shape, hardness and color.
Consistence: (a) the resistance of a material to deformation or rupture, (b) the degree of cohesion or adhesion of the soil mass.
Control section: the vertical section upon which soil classification is based.
Creep: slow mass movement of soil material down rather steep slopes primarily under the influence of gravity, but aided by saturation with water and alternate freezing and thawing.
Cretaceous: see Geological Time Scale.
Cutan: a modification of the texture, structure, or fabric at natural surfaces in soil materials due to concentration of particular soil constituents or in situ modification of the matrix. Cutans may be composed of any of the component substances of the soil material.
Drift: all material moved by glaciers and by the action of meltwater streams and associated lakes.
Droughty soil: sandy or very rapidly drained soil.
Edaphic: (i) of or pertaining to the soil, (ii) resulting from, or influenced by, factors inherent in the soil or other substrate rather than by climatic factors.
Eluviation: the removal of soil material in suspension or in solution from a layer or layers of the soil.
End moraine: ridgelike accumulations of material constructed at the margin of an active glacier.
Engineering tests: laboratory tests made to determine the physical properties of soils that affect their uses for various types of engineering construction.
Eolian deposit: material deposited by wind, including both loess and dune sand.
Erosion: the wearing away of the land surface by running water, wind or other erosive agents. It includes both normal and accelerated soil erosion. The latter is brought about by changes in the natural cover or ground conditions, including those due to human activity.
Erratic: a transported rock fragment different from the bedrock beneath it.
Fertility: the status of a soil in relation to the amount and availability to plants of elements necessary for plant growth.

Floodplain: the land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

Fluvial deposits: all sediments deposited by flowing water, including glaciofluvial deposits.

Geologic Time Scale:

ERA	PERIOD	EPOCH	Absolute age in years before present
CENOZOIC (Recent Life)	QUATERNARY	HOLOCENE	10,000
		PLEISTOCENE	1,000,000
	TERTIARY	PLIOCENE	13,000,000
		MIOCENE	25,000,000
		OLIGOCENE	36,000,000
		EOCENE	58,000,000
		PALEOCENE	63,000,000
MESOZOIC (Middle Life)	CRETACEOUS		135,000,000
	JURASSIC		180,000,000
	TRIASSIC		230,000,000
PALEOZOIC (Ancient Life)	PERMIAN		280,000,000
	CARBONIFEROUS: PENNSYLVANIAN		310,000,000
	CARBONIFEROUS: MISSISSIPPIAN		345,000,000
	DEVONIAN		405,000,000
	SILURIAN		425,000,000
	ORDOVICIAN		500,000,000
	CAMBRIAN		600,000,000
PRECAMBRIAN	PROTEROZOIC		2,500,000,000
	ARCHEAN		Age goes back to over four billion years

Frost-free period: season of the year between the last frost of spring and first frost of fall.

Frost heave, in soil: the raising of a surface caused by ice formation in the underlying soil.

Gley: gleying is a reduction process that takes place in soils that are saturated with water for long periods of time. The horizon of most intense reduction is characterized by a gray, commonly mottled appearance, which on drying shows numerous rusty brown iron stains or streaks. Those horizons in which gleying is intense are designated with the subscript g.

Gleysolic soil: soil developed under wet conditions resulting in reduction of iron and other elements and in gray colors and mottles.

Glaciofluvial: material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and may occur in the form of outwash plains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine: lacustrine deposits laid down in glacial times.

Ground moraine: unsorted mixture of rocks, boulders, sand, silt, and clay deposited by glacial ice. Predominantly till with some stratified drift. Ground moraine is usually in the form of undulating plains having gently sloping swells, sags, and enclosed depressions.

Groundwater: that portion of the total precipitation which at any particular time is either passing through or standing in the soil and the underlying strata and is free to move under the influence of gravity.

Horizon: a layer in the soil profile approximately parallel to the land surface with more or less well-defined characteristics that have been produced through the operation of soil forming processes. Soil horizons may be organic or mineral.

Humus: that more or less stable fraction of the soil organic matter remaining after the major portion of added plant and animal residues have decomposed. Usually it is dark colored.

Hummocky dead-ice moraine: a till deposit composed of knobs and depressions with local relief generally in excess of about 12 metres. May also include stratified drift.

Illuviation: the process of deposition of soil material removed from one horizon to another in the soil, usually from an upper to a lower horizon in the soil profile. Illuviated compounds include silicate clay, iron and aluminum hydrous oxides and organic matter.

Immature soil: a soil having weakly developed horizons.

Infiltration: the downward entry of water into the soil.
Jurassic: see Geological Time Scale.
Lacustrine deposit: material deposited in lake water and later exposed either by a lowering of the water or by uplift of the land.
Lacustrotill: clayey glaciolacustrine sediments with scattered pebbles and stones.
Liquid limit: see Atterberg limits.
Lithic: a feature of a soil subgroup which indicates a bedrock contact within 50 cm (20 inches) of the soil surface.
Mass-wasting: a variety of processes by which large masses of earth material are moved either slowly or quickly by gravity.
Mesozoic: see Geological Time Scale.
Morphology, soil: the makeup of the soil, including the texture, structure, consistence, color, and other physical, mineralogical, and biological properties of the various horizons of the soil profile.
Mottles: spots or blotches of different color or shades of color interspersed with the dominant color. Mottling in soils usually indicates poor aeration and drainage.
Mulch: any material, such as straw, that is spread on the surface of the soil to protect the plant roots from the effects of crusting, freezing, evaporation, raindrops.
Organic matter: the decomposition residues of plant material derived from: (i) plant materials deposited on the surface of the soil, and (ii) roots that decay beneath the surface of the soil.
Oxidation: the process and conditions by which the iron in the soil is oxidized.
Parent Material: unconsolidated mineral material or peat from which the soil profile develops.
Plasticity index: see Atterberg limits.
Plastic limit: see Atterberg limits.
Paleocene: see Geological Time Scale.
Pleistocene: see Geological Time Scale.
Seepage (groundwater): the emergence of water from the soil over an extensive area in contrast to a spring where it emerges from a local spot.
Shrink-swell potential: tendency of soils to undergo volume changes with changes in water content.
Soil reaction: the degree of acidity or alkalinity of a soil, usually expressed as a pH value. Descriptive terms commonly associated with certain ranges in pH are: extremely acid, <4.5; very strongly acid, 4.5-5.0; strongly acid, 5.1-5.5; moderately acid, 5.6-6.0; slightly acid, 6.1-6.5; neutral, 6.6-7.3; slightly alkaline, 7.4-7.8; moderately alkaline, 7.9-8.4; strongly alkaline, 8.5-9.0; and very strongly alkaline, > 9.0.
Soil structure: the combination or arrangement of primary soil particles into secondary particles, units, or peds. The secondary units are characterized and classified on the basis of size, shape, and degree of distinctness into classes, types and grades.
Solum (plural - sola): the part of the soil profile that is above the parent material and in which the processes of soil formation are active. It comprises the A and B horizons.
Stratified: composed of or arranged in strata or layers as applied to parent material.
Subsoil: technically, the B horizon; broadly, the part of the profile below plow depth.
Tertiary: see Geological Time Scale.
Texture (soil): the relative proportions of the various sized soil separates in a soil as described by the textural class names.
Till: unstratified glacial drift deposited directly by ice and consisting of non-sorted clay, silt, sand, and boulders.
Tilth: the physical condition of a soil as related to its ease of tillage, fitness as a seedbed, and impedance to seedling emergence and root penetration.
Topsoil: (i) the layer of soil moved in cultivation, (ii) the A-horizon, (iii) the Ah-horizon, (iv) presumably fertile soil material used to topdress roadbanks, gardens and lawns.
Trafficability: the capacity of a soil to withstand traffic by people, horses or vehicles.
Triassic: see Geological Time Scale.
Water-holding capacity: the ability of soil to hold water. The water-holding capacity of sandy soils is usually considered to be low while that of clayey soils is high. Often expressed in inches of water per foot depth of soil.
Water table: the upper limit of the peat of the soil or underlying rock material that is wholly saturated with water.
Weathering: the physical and chemical disintegration, alteration, and decomposition of rocks and minerals at or near the earth's surface by atmospheric agents.

Appendix A

Terminology for describing soils

The following information provides general guidelines for understanding the terminology used in describing soils in this report. For more detailed information, the reader should refer to the CanSIS Manual for Describing Soils in the Field (Expert Committee on Soil Survey, 1983).

Soil Drainage Classes

Soil drainage classes are defined in terms of (a) actual moisture content in excess of field moisture capacity, and (b) the extent of the period during which such excess water is present in the plant root zone (C.D.A., 1974).

Rapidly drained: soil moisture content seldom exceeds field capacity in any horizon, except immediately after water addition.
Well drained: soil moisture content does not normally exceed field capacity in any horizon except possibly the C, for a significant part of the year.
Moderately well drained: soil moisture in excess of field capacity remains for a small, but significant period of the year.
Imperfectly drained: soil moisture in excess of field capacity remains in subsurface horizons for moderately long periods during the year.
Poorly drained: soil moisture in excess of field capacity remains in all horizons for a large part of the year.
Very poorly drained: free water remains at or within 30 cm of the surface most of the year.

Topographic Classes (After Canada Soil Survey Committee, 1978).

b: gently undulating	-	0 to 2% slopes
c: undulating	-	2 to 5% slopes
d: gently rolling	-	5 to 9% slopes
e: moderately rolling	-	9 to 15% slopes
f: strongly rolling	-	15 to 30% slopes
g: hilly	-	30 to 60% slopes

Surface Stoniness Classes (After Canada Soil Survey Committee, 1978).

S0: non-stony land
S1: slightly stony land—there are some stones, but they offer only slight to no hinderance to cultivation
S2: moderately stony land—there are enough stones to cause some interference with cultivation
S3: very stony land—there are enough stones to constitute a serious handicap to cultivation and some clearing is required
S4: exceedingly stony land—there are enough stones to prevent cultivation until considerable clearing is done
S5: excessively stony land—this land is too stony to permit any cultivation (boulder or stone pavement).

Soil Texture Classification

Throughout the report, reference is made to soil texture and to soil drainage classes. Soil texture is according to the United States Department of Agriculture (USDA) textural classification which is described below.

Soil Separates (Particle Size) on which Textural Classes are based:

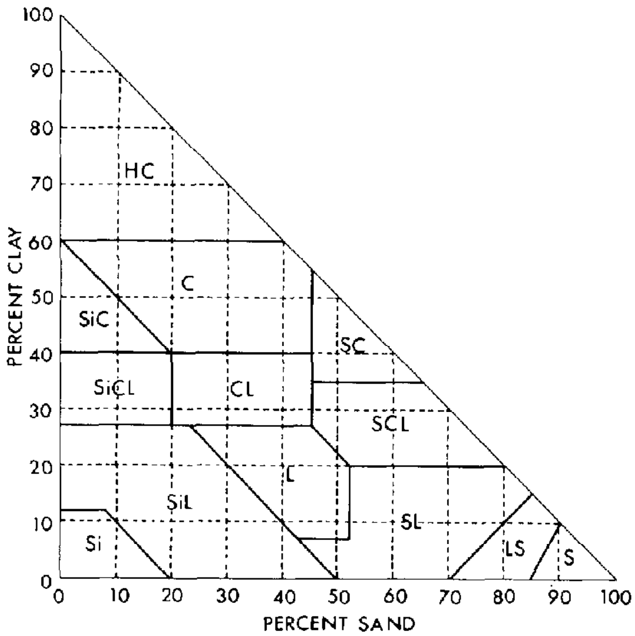
Separates		Diameter in Millimetres
Very Coarse Sand (VCS)	Sand (S)	2.0 - 1.0
Coarse Sand (CS)	Sand (S)	1.0 - 0.5
Medium Sand	Sand (S)	0.50 - 0.25
Fine Sand (FS)	Sand (S)	0.25 - 0.10
Very Fine Sand (VFS)	Sand (S)	0.10 - 0.05
Silts (Si)		0.05 - 0.002
Clay (C)		less than 0.002

By knowing the particle size distribution of the soil separates, one can determine the textural class by using the soil textural triangle shown on the following page.

Definition of soil horizon symbols

Organic Horizons

Organic horizons are found in Organic soils and commonly at the surface of mineral soils. They may occur at any depth beneath the surface in buried soils or overlying geologic deposits. They contain more than 17% organic C (approximately 30% organic matter) by weight. Two groups of these horizons are recognized, the O horizons and the L, F, and H horizons.



S - sand
LS - loamy sand
SL - sandy loam
L - loam
SiL - silt loam
Si - silt
SCL - sandy clay loam
CL - clay loam
SiCL - silty clay loam
SC - sandy clay
SiC - silty clay
C - clay
HC - heavy clay

FIGURE 30. Soil textural classes.

O This is an organic horizon developed mainly from mosses, rushes, and woody materials. It is divided into the following subhorizons.

Of This is an O horizon consisting largely of fibric materials that are readily identifiable as to botanical origin. A fibric horizon (Of) has 40% or more of rubbed fiber by volume and a pyrophosphate index of 5 or more. If the rubbed fiber volume is 75% or more, the pyrophosphate criterion does not apply. Fiber is defined as the organic material retained on a 100-mesh sieve (0.15 mm), except for wood fragments that cannot be crushed in the hand and are larger than 2 cm in the smaller dimension.

Om This is an O horizon consisting of mesic material, which is at a stage of decomposition intermediate between fibric and humic materials. The material is partly altered both physically and biochemically. It does not meet the requirements of either a fibric or a humic horizon.

Oh This is an O horizon consisting of humic material, which is at an advanced stage of decomposition. The horizon has the lowest amount of fiber, the highest bulk density, and the lowest saturated water-holding capacity of the O horizons. It is very stable and changes very little physically or chemically with time unless it is drained. The rubber fiber content is less than 10% by volume and the pyrophosphate index is 3 or less.

L, F, and H: horizons developed primarily from the accumulation of leaves, twigs, and woody materials with or without a minor component of mosses. Usually they are not saturated with water for prolonged periods.

L This is an organic horizon that is characterized by an accumulation of organic matter derived from leaves, twigs, and woody materials in which the original structures are easily discernible.

F This is an organic horizon that is characterized by an accumulation of partly decomposed organic matter derived mainly from leaves, twigs, and woody material. Some of the original structures are difficult to recognize. The material may be partly comminuted by soil fauna as in moder, or it may be a partly decomposed mat permeated by fungal hyphae as in mor.

H This is an organic horizon that is characterized by an accumulation of decomposed organic matter in which the original structures are indiscernible. This horizon differs from the F by having greater humification due chiefly to the action of organisms. It is frequently intermixed with mineral grains, especially near the junction with a mineral horizon.

Master Mineral Horizon and Layers

Mineral horizons contain 17% or less organic C (about 30% organic matter) by weight.

A This is a mineral horizon formed at or near the surface in the zone of leaching or eluvation of materials in solution or suspension, or of maximum in situ accumulation of organic matter or both. The accumulation of organic matter is usually expressed morphologically by a darkening of the surface soil (Ah) and; conversely, the removal of organic matter is usually expressed by a lightening of the soil color—usually in the upper part of the solum (Ae). The removal of clay from the upper part of the solum (Ae) is expressed by a coarser soil texture relative to the underlying subsoil layers. The removal of iron is indicated usually by a paler or less red soil color in the upper part of the solum (Ae) relative to the lower part of the subsoil.

B This is a mineral horizon characterized by enrichment in organic matter, sesquioxides, or clay; or by the development of soil structure; or by a change of color denoting hydrolysis, reduction, or oxidation. The accumulation in B horizons of organic matter (Bh) is evidenced usually by dark colors relative to the C horizon. Clay accumulation is indicated by finer soil textures and by clay cutans coating peds and lining pores (Bt). Soil structure developed in B horizons includes prismatic or columnar units with coatings or stainings and significant amounts of exchangeable sodium (Bn) and other changes of structure (Bm) from that of the parent material. Color changes include relatively uniform browning due to oxidation of iron (Bm), and mottling and gleying of structurally altered material associated with periodic reduction (Bg).

C This is a mineral horizon comparatively unaffected by the pedogenic processes operative in A and B, (C), except the process of gleying (Cg), and the accumulation of calcium and magnesium carbonates (Cca) and more soluble salts (Cs, Csa). Marl, diatomaceous earth, and rock no harder than 3 on Mohs' scale are considered to be C horizons.

R This is a consolidated bedrock layer that is too hard to break with the hands (>3 on Mohs' scale) or to dig with a spade when moist and does not meet the requirements of a C horizon. The boundary between the R layer and any overlying unconsolidated material is called a lithic contact.

Lowercase Suffixes

b A buried soil horizon.

e A horizon characterized by the eluviation of clay, Fe, Al, or organic matter alone or in combination. When dry, it is usually higher in color value by one or more units than an underlying B horizon. It is used with A (Ae).

f A horizon with amorphous material, principally Al and Fe combined with organic matter. It usually has a hue of 7.5YR or redder or its hue is 10YR near the upper boundary and becomes yellower with depth. When moist the chroma is higher than 3 or the value is 3 or less. It contains at least 0.6% pyrophosphate-extractable Al + Fe in textures finer than sand and 0.4% in sands (coarse sand, sand, fine sand, and very fine sand).

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

h A horizon enriched with organic matter. When used with A it must show one Munsell unit of value darker than the horizon below, or have 0.5% more organic matter than the IC. It contains less than 17% organic carbon by weight.

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.

k Denotes the presence of carbonate as indicated by visible effervescence when dilute HCl is added.

m A horizon slightly altered by hydrolysis, oxidation, or solution, or all three to give a change in color or structure, or both.

n A horizon in which the ratio of exchangeable Ca to exchangeable Na is 10 or less. 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. It is used with B as Bn or Bnt.

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

t An illuvial horizon enriched with silicate clay. It is used with B alone (Bt), with B and g (Btg), with B and n (Bnt), etc.

Appendix B

Soil morphological descriptions and analytical data

LOCATION: SE 34-68-26-W5
SOIL UNIT: Blackmud
SOIL SERIES: Bickerdike
CLASSIFICATION: Eluviated Eutric Brunisol

LANDFORM: Fluvial terrace
MATERIAL: Fluvial sand
DRAINAGE: Well drained

ELEVATION: 630 m
TOPOGRAPHIC CLASS: c
PLANT COMMUNITY: Pasture

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
Ae	0-15	10YR 6/2	FS	single grain	loose	-	-
Bm	15-60	10YR 5/6	MFS	single grain	loose	-	-
BC	60-120+	10YR 5/3 mixed colors with darker strata	MFS	single grain	loose	-	no lime, no coarse fragments

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R77	146	Ae	6.3	6.2	0.61	0.03	12	0.01	0.08	2.61	0.23	2.8	77	18	5	-	-	
	147	Bm	6.4	5.6	0.41	0.02	12	0.02	0.14	3.46	0.51	3.4	91	4	5	0.10	0.02	
	148	BC	6.0	5.1	0.41	0.02	12	0.02	0.13	2.64	0.39	3.2	87	9	4	-	-	

LOCATION: NW 11-59-23-W5
SOIL UNIT: Copton
SOIL SERIES: Modeste
CLASSIFICATION: Orthic Gray Luvisol

LANDFORM: Fluvial veneer/rock undulating
MATERIAL: weathered sandstone
DRAINAGE: Well drained

ELEVATION: 1156 m
TOPOGRAPHIC CLASS: b-c
PLANT COMMUNITY: *Pinus contorta, Picea mariana, Ledum groenlandicum, Vaccinium* spp.

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
Ae	0-10	10YR 6/2	SL	single grain	very friable	10%	
Bt	10-50	10YR 5/8	SL	single grain	friable	10%	
BC	50-70	10YR 5/8	LMS-LCS	single grain	friable	-	-
C	70-200	2.5Y 5/3	-	-	-	-	weathered Paskapoo sandstone
R	below	2.5YR 5/3	LCS	-	-	-	-

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R77	210	Ae	4.5	3.5	0.56	0.02	16	0.01	0.05	0.52	0.13	1.6	63	35	2	-	-	
	211	Bt	5.1	4.4	0.72	0.02	21	0.01	0.13	3.19	0.90	5.3	67	23	10	-	-	
	212	BC	5.3	4.5	0.20	0.01	12	0.03	0.11	2.41	0.72	2.5	83	15	2	-	-	

LOCATION: SE 27-67-23-W5
SOIL UNIT: Donnelly
SOIL SERIES: Donnelly
CLASSIFICATION: Gleyed Solonetzic Gray Luvisol

LANDFORM: Glaciolacustrine blanket/morainal undulating
MATERIAL: Glaciolacustrine/till
DRAINAGE: Moderately well

ELEVATION: 721 m
TOPOGRAPHIC CLASS: c
PLANT COMMUNITY: cultivated

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
Ap	0-15	-	SiC	-	loose	-	-
Ae	15-22	10YR 5/2	SiL	moderate, medium platy	friable	-	-
AB	22-28	10YR 3/2	C	strong, coarse, angular blocky	firm	-	-
Btgnj	28-60	10YR 3/2	C	stong, fine, subangular blocky	firm, sticky	-	-
Ck	60-120	10YR 3/3	C	-	firm	-	-

Lab No.		Horizon	pH					Exchangeable Cations me/100 g					% <2mm			Pyrophosphate		$CaCo_3$
			H_2O	$CaCl_2$	OM%	N%	C/N	Na	K	Ca	Mg	TEC DET	Sand	Silt	Clay	Fe%	Al%	equiv.%
R76	67	Ap		6.9	3.84	0.22	10	0.18	0.66	35.1	4.87	39.0	15	42	43	-	-	-
	68	Ae		5.0	0.63	0.05	7	0.10	0.19	4.31	1.49	9.6	15	67	18	-	-	-
	69	AB		5.2	1.03	0.07	12	0.24	0.73	20.4	8.45	37.2	7	32	61	-	-	-
	70	Btgnj		4.9			9	0.34	0.83	26.2	12.0	43.7	3	19	78	-	-	-
	71	Ck		7.5	-	-	-	-	-	-	-	-	18	32	50	-	-	3.4

LOCATION: NW 1-68-24-W5
SOIL UNIT: Edson
SOIL SERIES: Braeburn
CLASSIFICATION: Orthic Gray Luvisol

LANDFORM: Morainal undulating
MATERIAL: till
DRAINAGE: Moderately well

ELEVATION: 766 m
TOPOGRAPHIC CLASS: c
PLANT COMMUNITY: *Populus tremuloides, Picea glauca, Salix* spp., *Epilobium angustifolium*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
LF	2-0	7.5YR 3/2	-	-	-	-	abundant, fine, randomly oriented roots
Ae	0-8	10YR 6/3 d *	SiL	moderate, coarse platy	very friable	-	-
AB	8-20	10YR 4/4	SiCL	strong, coarse sub-angular blocky	slightly firm	-	-
Bt_1	20-40	10YR 3/2	C	strong, fine subangular blocky	firm	-	-
Bt_2	40-100	7.5YR 5/6	CL-C	strong, fine subangular blocky	firm	-	-
Ck	100-160 +	10YR 3/3	CL	-	firm	-	-

Lab No.		Horizon	pH					Exchangeable Cations me/100 g					% <2mm			Pyrophosphate		$CaCo_3$
			H_2O	$CaCl_2$	OM%	N%	C/N	Na	K	Ca	Mg	TEC DET	Sand	Silt	Clay	Fe%	Al%	equiv.%
R76	55	LF		5.8	44.72	1.19	22	-	-	-	-	-	-	-	-	-	-	-
	56	Ae		6.4	1.04	0.04	15	0.02	0.24	6.38	0.87	7.7	21	71	8	-	-	-
	57	AB		5.0	0.79	0.04	11	0.10	0.38	9.16	2.92	8.3	27	47	26	-	-	-
	58	Bt_1		4.6	0.91	0.05	11	0.21	0.49	16.3	6.66	31.6	23	33	44	-	-	-
	59	Bt_2		5.8	1.11	0.04	16	0.37	0.38	19.3	6.92	26.9	26	34	40	-	-	-
	60	Ck		7.4	-	-	-	-	-	-	-	-	25	36	39	-	-	5.3

*d — dry color

LOCATION: NW 15-63-19-W5
SOIL UNIT: Edson
SOIL SERIES: Ansell
CLASSIFICATION: Orthic Gray Luvisol

LANDFORM: Morainal undulating

MATERIAL: till
DRAINAGE: Moderately well

ELEVATION: 900 m

TOPOGRAPHIC CLASS: c-d
PLANT COMMUNITY: *Betula papyrifera, Picea glauca, Rosa acicularis, Epilobium angustifolium*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
Ae_1	0-12	10YR 5/2	SiL	moderate fine platy	very friable		
Ae_2	12-25	10YR 5/4	SiL	moderate fine platy	very friable	5% cobble	
Bt	25-70	10YR 3/4	C	strong medium sub-angular blocky	firm	or	
BC	70-100	10YR 4/4	CL	strong fine subangular blocky	very fine	gravel	
Ck	100+	10YR 4/4	CL		very firm		

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R77	197	Ae_1	5.7	4.7	1.20	0.08	9	0.03	0.48	6.63	1.44	6.9	28	54	18	-	-	
	198	Ae_2	5.3	4.6	1.56	0.09	10	0.03	0.45	7.35	1.72	8.3	25	55	20	-	-	
	199	Bt	5.1	4.8	1.36	0.06	13	0.21	0.52	23.6	7.97	19.9	19	30	51	-	-	
	200	BC	7.5	6.7	1.40	0.05	16	0.23	0.42	30.8	6.94	14.0	28	42	30	-	-	

LOCATION: NE 5-69-21-W5
SOIL UNIT: Enilda
SOIL SERIES: Enilda
CLASSIFICATION: Rego Humic Gleysol

LANDFORM: Fluvial undulating

MATERIAL: Fluvial deposits (L-LS)
DRAINAGE: Imperfectly to poorly

ELEVATION: 646 m

TOPOGRAPHIC CLASS: b
PLANT COMMUNITY: *Populus tremuloides, Salix* spp.

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
LH	-	-	-	-	-	-	-
Ahg	0-15	10YR 3.5/2	L	moderate, medium granular	friable	-	-
Cg	15-80	10YR 5/4	LS	single grain	loose	-	several buried Ah horizons between 30 & 60 cm depth; many, medium distinct mottles (7.5YR 4/4 m)
II Cg	80-120	10YR 5/3	L	single grain	loose	-	many, coarse, distinct mottles (7.5YR 4/4 m)

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R76	75	LH	5.0	69.32	2.12	19	0.11	0.76	17.7	4.10	26.9	-		-	-	-	-	-
	76	Ahg	5.9	2.42	0.10	14	0.07	0.15	6.56	1.64	9.6	40		40	20	-	-	-
	77	Cg	6.2	-	-	-	-	-	-	-	-	89		5	6	-	-	-
	78	II Cg	6.9	-	-	-	-	-	-	-	-	40		37	23	-	-	0.4

LOCATION: NE 17-69-22-W5

SOIL UNIT: Esher
SOIL SERIES: Esher
CLASSIFICATION: Gleyed Dark Gray Solod

LANDFORM: Glaciolacustrine veneer marginal undulating

MATERIAL: Clay/clay loam till
DRAINAGE: Imperfectly

ELEVATION: 683 m

TOPOGRAPHIC CLASS: c
PLANT COMMUNITY: *Populus tremuloides, Amelanchier alnifolia, Epilobium angustifolium*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
L	-	-	-	-	-	-	abundant roots of all sizes
FH	-	-	-	-	-	-	abundant roots of all sizes
Ahe	0-10	10YR 3/2	SiCL	weak medium granular	slightly sticky	-	-
Ae	10-16	10YR 6/3	SiL	weak fine platy	friable	-	-
$Btnjg_1$	16-36	10YR 4/3	C	strong coarse subangular blocky	sticky	-	few, fine, faint mottles
$Btnjg_2$	36-50	10YR 3/1	C	strong fine subangular blocky	sticky	-	occasional pebble, common, fine faint mottles
Ck	50-100	10YR 3/2	C	-	-	-	-
II CK_1	100-130	-	CL	-	-	-	glacial till material,
II Ck_2	130-160	-	CL	-	-	-	occasional coal flecks

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R76	19	L		6.5	37.8	1.65	13	-	-	-	-	-	-	-	-	-	-	-
	20	FH		5.9	34.5	1.73	12	-	-	-	-	-	-	-	-	-	-	-
	21	Ahe		4.5	2.43	0.16	9	0.27	1.14	11.6	3.18	25.0	12	57	31	-	-	-
	22	Ae		4.2	0.57	0.05	7	0.08	0.21	3.56	2.10	10.7	11	72	17	-	-	-
	23	$Btnjg_1$		4.5	1.04	0.06	10	0.72	0.59	18.5	14.0	43.6	5	29	66	-	-	-
	24	$Btnjg_2$		6.8	1.12	0.08	8	1.46	0.58	27.7	17.3	41.3	5	28	67	-	-	-
	25	Ck		7.4	-	-	-	-	-	-	-	-	8	31	61	-	-	3.4
	26	II Ck_1		7.6	-	-	-	-	-	-	-	-	25	36	39	-	-	3.2
	27	II Ck_2		7.3	-	-	-	-	-	-	-	-	26	35	39	-	-	3.4

LOCATION: NW 9-67-23-W5
SOIL UNIT: Goose
SOIL SERIES: Goose
CLASSIFICATION: Orthic Humic Gleysol

LANDFORM: Glaciolacustrine veneer/morainal level
MATERIAL: Glaciolacustrine clays/till
DRAINAGE: Poorly

ELEVATION: 653 m
TOPOGRAPHIC CLASS: b
PLANT COMMUNITY: *Populus tremuloides, Salix* spp., *Rosa acicularis*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
Ahg	0-15	N2	C	moderate, fine, granular	sticky	-	-
Bg	15-60	5Y 4/1	C	strong, fine subangular blocky	very sticky	-	many, fine, prominent mottles (7.5YR 4/4 m)
$IICkg_1$	60-80	5Y 5/1	CL	-	very sticky	-	many, fine, prominent mottles (7.5YR 4/4 m)
$IICkg_2$	80-110	5Y 4/1	CL	-	sticky	5%	many, fine, prominent mottles (7.5YR 4/4 m)

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R76	30	Ahg		6.2	14.12	0.60	14	0.35	1.30	41.5	11.9	58.1	18	39	43	-	-	-
	31	Bg		6.2	1.39	0.06	13	0.23	0.49	22.9	9.12	31.6	34	21	45	-	-	-
	32	$IICkg_1$		7.2	-	-	-	-	-	-	-	-	28	37	35	-	-	3.0
	33	$IICkg_2$		7.4	-	-	-	-	-	-	-	-	26	37	37	-	-	4.3

LOCATION: SW 10-60-19-W5
SOIL UNIT: Heart
SOIL SERIES: Unnamed
CLASSIFICATION: Eluviated Dystric Brunisol

LANDFORM: Eolian ridged
MATERIAL: Deltaic sands
DRAINAGE: Well

ELEVATION: 871 m
TOPOGRAPHIC CLASS: c
PLANT COMMUNITY: *Pinus contorta, Picea mariana, Shepherdia canadensis, Arctostaphylos uva-ursi*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
LH	2-0	-	-	-	-	-	-
Ae	0-6	10YR 5/4	VFLS	single grain	loose to very friable	-	-
Bm_1	6-16	10YR 5/6	LVFS	single grain	loose to very friable	-	-
Bm_2	16-56	2.5Y 5/4	LVFS	single grain	loose to very friable	-	common, faint mottles
BC_1	56-110	2.5Y 4/4	VFSL	single grain	loose to very friable	-	common, faint mottles
BC_2	110-200	-	-	single grain	loose to very friable	-	roots to 80 cm

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R77	33	Ae	5.1	4.5	0.98	0.04	14	0.05	0.28	2.60	0.69	-	81	10	9	-	-	-
	34	Bm_1	5.1	4.5	0.39	0.03	8	0.01	0.27	2.49	0.62	-	82	7	11	0.25	0.05	-
	35	Bm_2	5.2	4.6	0.29	0.02	8	0.41	0.13	3.46	0.98	-	84	5	11	0.11	0.03	-
	36	BC_1	5.4	4.9	0.28	0.02	8	0.02	0.22	4.86	1.44	-	80	7	13	0.11	0.02	-
	37	BC_2	5.5	5.1	0.40	0.02	12	0.03	0.25	5.00	1.31	-	81	8	11	-	-	-

LOCATION: NE 31-68-21-W5
SOIL UNIT: High Prairie
SOIL SERIES: High Prairie
CLASSIFICATION: Orthic Dark Gray Chernozemic

LANDFORM: Fluvial undulating
MATERIAL: Fluvial deposits
DRAINAGE: Moderately well

ELEVATION: 631 m
TOPOGRAPHIC CLASS: b
PLANT COMMUNITY: *Populus tremuloides, Salix* spp., *Rosa* spp., *Fragaria* spp.

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
Ah	0-15	10YR 3/2	SiCL	moderate, fine granular	friable	-	-
Bm	15-40	10YR 4/3	SL	moderate, fine subangular blocky	slightly firm	-	-
BC	40-80	10YR 4/4	SCL	moderate, fine subangular blocky	slightly firm	-	-
Cca	80+	10YR 5/4	L	amorphous	slightly firm	-	strongly effervescent

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Na	K	Ca	Mg	TEC DET	Sand	Silt	Clay	Fe%	Al%	$CaCo_3$ equiv.%
R76	79	Ah		5.5	8.55	0.33	15	0.06	1.37	27.8	3.01	39.6	16	51	33	-	-	-
	80	Bm		4.8	0.69	0.03	15	0.07	0.23	10.6	2.00	16.4	61	21	18	-	-	-
	81	BC		4.9	0.76	0.03	12	0.09	0.22	11.7	1.90	17.8	54	26	20	-	-	-
	82	Cca		7.3	-	-	-	-	-	-	-	-	44	35	21	-	-	7.2

(Na, K, Ca, Mg, TEC DET: Exchangeable Cations me/100 g; Sand, Silt, Clay: % <2mm; Fe%, Al%: Pyrophosphate)

LOCATION: NW 6-69-21-W5
SOIL UNIT: Iosegun
SOIL SERIES: Unnamed
CLASSIFICATION: Cumulic Regosol

LANDFORM: Fluvial terrace
MATERIAL: Fluvial
DRAINAGE: Well drained

ELEVATION: 630 m
TOPOGRAPHIC CLASS: b
PLANT COMMUNITY: *Populus tremuloides, Betula papyrifera,* pasture

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
LH	5-0	10YR 2/1	-	-	-	-	
Ah	0-5	10YR 3/2	L	single grain	friable	-	
C_1	5-20	10YR 4/3	L	single grain	firm	-	
C_2	20-30	10YR 5/4	SL	single grain	firm	-	materials are finer
IIAhb	30-35	10YR 3/2	SL	single grain	friable	-	textured than those
IIC_1	35-70	10YR 5/4	L	single grain	firm	-	generally associated
IIC_2	70-100+	-	S	single grain	loose	-	with Iosegun soils, however, variation is typical

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Na	K	Ca	Mg	TEC DET	Sand	Silt	Clay	Fe%	Al%	$CaCo_3$ equiv.%
R77	223	Ah	5.7	5.4	1.77	0.09	11	0.04	0.77	18.28	4.38	14.0	23	49	28	-	-	
	224	C_1	5.6	5.3	1.30	0.06	13	0.18	0.59	13.00	3.87	10.7	40	40	20	-	-	
	225	IIC_1	6.2	5.9	-	-	-	-	-	-	-	-	47	37	16	-	-	
	226	IIC_2	7.7	6.4	-	-	-	-	-	-	-	-	96	4	0	-	-	

(Na, K, Ca, Mg, TEC DET: Exchangeable Cations me/100 g; Sand, Silt, Clay: % <2mm; Fe%, Al%: Pyrophosphate)

LOCATION: SW 3-60-18-W5

LANDFORM: Glaciofluvial terrace

ELEVATION: 780 m

SOIL UNIT: Jarvis
SOIL SERIES: Jarvis
CLASSIFICATION: Eluviated Dystric Brunisol

MATERIAL: Gravels and sands
DRAINAGE: Rapidly

TOPOGRAPHIC CLASS: b
PLANT COMMUNITY: *Pinus contorta, Picea mariana, Ledum groenlandicum, Cladonia* spp.

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
L	3-0	-	-	-	-	-	-
Ae	0-4	10YR 6/1	GSL	single grain	loose	20%	-
Bm	4-40	7.5YR 5/6	VGSL	single grain	loose	50%	-
BC	40-100	-	VGLS-G	single grain	loose	70%	-
C	100+	-	Gravel	single grain	loose	70-80%	gravel pit sampling site

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Na	K	Ca	Mg	TEC DET	Sand	Silt	Clay	Pyrophosphate Fe%	Pyrophosphate Al%	$CaCo_3$ equiv.%
R77	44	Ae	4.7	3.8	1.60	0.04	23	0.02	0.12	0.97	0.23	5.5	60	36	4	-	-	
	45	Bm	5.3	4.7	1.73	0.05	20	0.04	0.14	1.27	0.34	8.0	58	44	8	0.23	0.09	

(Exchangeable Cations me/100 g: Na, K, Ca, Mg, TEC DET; % <2mm: Sand, Silt, Clay)

LOCATION: SE 34-66-14-W5

LANDFORM: Fluvial blanket/rock undulating

ELEVATION: 1320 m

SOIL UNIT: Judy
SOIL SERIES: unnamed
CLASSIFICATION: Orthic Gray Luvisol

MATERIAL: Tertiary gravels
DRAINAGE: well drained

TOPOGRAPHIC CLASS: c
PLANT COMMUNITY: *Abies lasiocarpa, Picea engelmanni, Vaccinium* spp., *Ribes* spp.

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
LH	15-0	10YR 2/1	-	-	-	-	
Ae	0-12	10YR 5/2	GSL	single grain	very friable	30	
Bt	12-50	10YR 4/8	GC	strong medium subangular blocky	friable	30	common, thin clay films
BC	50-80	10YR 5/8	GCL	moderate fine subangular blocky	friable	50	
C	80+	-	GCL	-	-	- rounded quartzite 2 to 40 cm	

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Na	K	Ca	Mg	TEC DET	Sand	Silt	Clay	Pyrophosphate Fe%	Pyrophosphate Al%	$CaCo_3$ equiv.%
R77	230	LH	3.6	3.1	-	-	-	0.12	0.98	15.6	2.44	66.9	-	-	-	-	-	
	231	Ae	3.8	3.3	0.87	0.04	13	0.00	0.06	0.47	0.10	2.3	71	23	6	-	-	
	232	Bt	4.0	4.3	2.11	-	-	0.00	0.22	0.91	0.31	21.0	6	29	65	0.50	0.49	
	233	BC	4.6	3.9	1.58	0.05	18	0.00	0.14	0.35	0.16	14.0	40	22	38	0.45	0.54	
	234	C	4.6	3.6	-	-	-	0.00	-	-	-	-	32	30	38	0.39	0.26	

(Exchangeable Cations me/100 g: Na, K, Ca, Mg, TEC DET; % <2mm: Sand, Silt, Clay)

LOCATION: NE 34-68-26-W5

LANDFORM: Eolian veneer/glaciolacustrine veneer/morainal rolling

ELEVATION: 645 m

SOIL UNIT: Lodge
SOIL SERIES: Codesa

MATERIAL: loess/glaciolacustrine/till

TOPOGRAPHIC CLASS: d

CLASSIFICATION: Orthic Gray Luvisol

DRAINAGE: Moderately well (internal)

PLANT COMMUNITY: *Populus tremuloides, Picea glauca, Amelanchier alnifolia, Fragaria* spp.

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
LH	3-0	-	-	-	-	-	
Ae	0-5	10YR 6/2	SiL	strong fine platy	very friable	-	
AB	5-20	10YR 5/3	SiL	moderate medium platy	very friable	-	many medium distinct mottles
IIBt	20-60	10YR 4/4	SiCL	strong coarse subangular blocky	firm	-	
IIBC	60-90	10YR 4/4	C	strong coarse subangular blocky	firm	-	
IIICca	90-130+	10YR 4/3	C	massive	firm	-	Thin, discontinuous, buried organic rich material noted on some exposures

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	%<2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCO_3$ equiv.%
R77	141	Ae	6.7	5.8	2.90	0.04	42	0.01	0.42	3.52	0.51	5.0	20	73	7	-	-	-
	142	AB	6.5	5.6	0.60	0.04	9	0.04	0.26	3.85	0.77	5.6	23	66	9	-	-	-
	143	IIBt	5.6	5.2	1.80	0.07	15	1.20	0.51	14.25	4.77	15.2	15	53	32	-	-	-
	144	IIBC	7.9	7.4	2.97	0.09	19	-	-	-	-	-	2	23	66	-	-	-
	145	IIICca	7.9	7.6	-	-	-	-	-	-	-	-	17	35	48	-	-	9.7

LOCATION: NW 10-59-17-W5

LANDFORM: Eolian veneer/fluvial level-Eolian

ELEVATION: 1006 m

SOIL UNIT: Lodge
SOIL SERIES: Peppers

MATERIAL: loess/tertiary sands and gravel

TOPOGRAPHIC CLASS: b

CLASSIFICATION: Brunisolic Gray Luvisol

DRAINAGE: moderately well

PLANT COMMUNITY: *Pinus contorta, Picea mariana*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Other
LH	10-0	-	-	-	-	-	-
Ae	0-15	10YR 6/2	SiL	moderate fine platy	very friable	-	-
Bm	15-30	7.5YR 5/8	SiL	weak, medium platy	friable	-	-
Bt	30-65	10YR 5/8	SiL	weak, fine subangular blocky	friable	-	-
IIC	65+	10YR 5/6	VGLS-SL	single grain	loose	very gravelly	-

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	%<2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCO_3$ equiv.%
R76	333	Ae		3.7	2.42	0.06	23	0.06	0.15	1.28	0.36	11.4	29	65	6	-	-	-
	334	Bm		4.7	1.78	0.06	17	0.01	0.21	1.19	0.31	8.7	34	58	8	-	-	-
	335	Bt		4.5	0.22	0.02	6	0.08	0.22	3.22	1.18	7.7	36	51	13	-	-	-
	336	IIC		4.6	0.03	0.02	1	0.05	0.15	4.09	1.38	7.1	80	10	10	-	-	-

LOCATION: NW 31-64-14-W5
SOIL UNIT: Mayberne
SOIL SERIES: Tom Hill
CLASSIFICATION: Orthic Gray Luvisol

LANDFORM: Morainal blanket/rock rolling
MATERIAL: till/sandstone bedrock
DRAINAGE: Moderately well

ELEVATION: 1110 m
TOPOGRAPHIC CLASS: b
PLANT COMMUNITY: *Pinus contorta, Abies balsamea, Viburnum edule, Linnaea borealis*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Other
LH	7-0	-	-	-	-	-	pine litter, charcoal
Ae	0-6	10YR 5/4	FSL	weak, fine platy	friable	-	abundant, fine, random roots
AB	6-20	10YR 5/4	SL	weak, fine subangular blocky	friable	-	-
Bt_1	20-50	10YR 4/4	SCL	strong, medium subangular blocky	friable - firm	-	-
Bt_2	50-120	2.5Y 4/4	SCL	strong, medium subangular blocky	firm	-	-
IIBC	120-160+	2.5Y 5/4	SL	weak, fine subangular blocky	sticky	-	weathered and mixed sandstone bedrock

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R76	196	LH		4.1	64.67	1.46	26	-	-	-	-	-	-	-	-	-	-	-
	197	Ae		4.0	1.67	0.07	14	0.04	0.31	2.47	0.46	10.3	31	56	13	-	-	-
	198	AB		4.2	1.01	0.06	10	0.05	0.21	4.28	1.08	12.6	41	37	22	-	-	-
	199	Bt_1		4.2	0.86	0.05	10	0.28	0.25	10.1	2.41	20.9	31	37	32	-	-	-
	200	Bt_2		4.4	0.47	0.03	9	0.11	0.23	14.3	2.66	20.0	28	45	27	-	-	-
	201	IIBC		4.9	-	-	-	0.10	0.18	13.5	2.15	15.6	57	33	20	-	-	-

LOCATION: NW 23-61-23-W5
SOIL UNIT: Mayberne
SOIL SERIES: Nosehill
CLASSIFICATION: Podzolic Gray Luvisol

LANDFORM: Morainal undulating
MATERIAL: till
DRAINAGE: Imperfectly

ELEVATION: 1051 m
TOPOGRAPHIC CLASS: c
PLANT COMMUNITY: *Picea glacuca, Ledum groenlandicum*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Other
LH	20-0	-	-	-	-	-	-
Ae	0-8	10YR 5/2	SiL	moderate medium platy	very friable	-	-
Bf	8-18	5YR 3/3	SiL	moderate medium platy	friable	-	-
Bt	18-40	10YR 4/4	CL	moderate fine subangular blocky	slightly firm	-	-
BC	40+	10YR 4/4	CL	-	slightly firm	-	-

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R76	314	Ae		3.5	1.99	0.09	13	0.03	0.28	0.56	0.00	12.6	15	74	11	-	-	-
	315	Bf		3.6	3.85	0.11	20	0.01	0.21	0.81	0.05	23.2	13	73	14	0.53	0.14	-
	316	Bt		4.3	0.77	0.05	9	0.04	0.64	7.34	2.92	23.2	28	37	35	-	-	-
	317	BC		4.6	0.76	0.05	9	0.09	0.58	13.3	4.10	26.4	27	36	37	-	-	-

LOCATION: NW 4-61-2-W6th

SOIL UNIT: Simonette
SOIL SERIES: Simonette

CLASSIFICATION: Peaty Fera Gleysol

LANDFORM: Preglacial fluvial bedrock plateau

MATERIAL: Preglacial fluvial cobbly gravel
DRAINAGE: poorly

ELEVATION: 1300 m

TOPOGRAPHIC CLASS: b

PLANT COMMUNITY: *Picea mariana, contorta, Ledum groenlandicum, Nebernumedule, Vaccinum myrtelloides, Arctostaphylos uva-ursi, Sphagnum spp.*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Other
L	26-13	-	-	-	-	-	-
H	13-0	2.5Y 2.5/0	-	-	-	-	-
Aeg	0-8	10YR 5/3	cobbly loam	moderate, medium platy	friable	excessively cobbly	few, fine roots
Bgf	8-17	10YR 5/2	cobbly sandy loam	single grain	friable	excessively cobbly	no roots
Cg1	17-48	10YR 4/4	cobbly sandy loam	single grain	friable	excessively cobbly	no roots
Cg2	48+	10YR 6/3	cobbly sandy loam	single grain	friable	excessively cobbly	no roots

Lab No.	pH					Exchangeable Cations me/100 g								Pyrophosphate		
										TEC	% <2mm					$CaCO_3$
Horizon	H_2O	$CaCl_2$	OM%	N%	C/N	Na	K	Ca	Mg	DET	Sand	Silt	Clay	Fe%	Al%	equiv.%
L	3.9		12.26	0.52	24	0.18	1.88	11.0	3.8	97.8	-	-	-	-	-	-
H	4.3		41.34	1.07	39	0.04	0.34	1.5	0.4	62.2	-	-	-	-	-	-
Aeg	4.7		1.49	0.07	21	0.03	0.14	0.3	0.1	15.7	33	46	21	-	-	-
Bgf	5.0		0.78	0.04	20	0.00	0.07	0.3	0.1	10.0	73	14	13	1.1	1.38	-
Cg_1	4.9		-	-	-	0.03	0.11	1.0	0.3	13.8	69	14	17	-	-	-
Cg_2	4.9		-	-	-	0.04	0.12	2.2	0.8	9.5	61	24	15	-	-	-

LOCATION: Simonette Ecological Reserve
SOIL UNIT: Snipe
SOIL SERIES: Snipe
CLASSIFICATION: Orthic Luvic Gleysol

LANDFORM: Glaciolacustrine blanket/morainal undulating

MATERIAL: Glaciolacustrine clays
DRAINAGE: Poorly

ELEVATION:

TOPOGRAPHIC CLASS: a-b
PLANT COMMUNITY: *Populus balsamifera*, *Salix* spp.

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Other
F	10-0	10YR 3/4 d	-	-	-	-	fairly well decomposed leaf litter
Ah	0-5	10YR 3/1	C	strong, fine, granular	very friable	-	plentiful, fine to medium roots
Aeg	5-13	10YR 5/2	SiL	strong, medium platy	very friable	-	common, medium faint mottles (10YR 6/6 m)
ABg	13-21	10YR 5/2	SiCL	moderate, fine sub-angular blocky	friable	-	common, medium faint mottles (10YR 6/6 m)
Btg	21-60	10YR 5/1	SiC	weak, medium sub-angular blocky	friable	-	many, faint mottles (10YR 6/6 m)
Ckg	60+	N 5/1	C	amorphous	firm	-	many, faint, medium mottles (10YR 4/3 m)

Lab No.	Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
	F	6.1		-	1.70	-	4.38	1.74	72.7	9.0	121.3	-	-	-	-	-	-
	Ah	5.8		4.36	0.86	3	1.20	1.90	26.8	5.1	46.5	10	42	48	-	-	-
	Aeg	6.1		0.47	0.08	3	1.42	0.47	9.7	2.6	15.6	19	57	24	-	-	-
	ABg	6.6		0.62	0.07	5	1.27	0.43	13.4	4.9	19.4	18	52	29	-	-	-
	Btg	6.8		0.65	0.06	6	0.51	0.43	20.1	6.6	27.5	12	42	47	-	-	-
	Ckg	7.6		-	-	-	-	-	-	-	-	10	25	65	-	-	7.88

LOCATION: NE 4-60-18-W5
SOIL UNIT: Toad
SOIL SERIES: Toad
CLASSIFICATION: Brunisolic Gray Luvisol

LANDFORM: Fluvial ridged

MATERIAL: Duned sands and silts
DRAINAGE: Well drained

ELEVATION: 820 m

TOPOGRAPHIC CLASS: d
PLANT COMMUNITY: *Picea glauca, Populus tremuloides, Ledum groenlandicum, Maianthemum canadense*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Other
LH	-	-	-	-	-	-	
Ae	0-7	10YR 6/1	SiL	strong fine platy	very friable	-	
Bm	7-12	10YR 5/6	SiL	moderate fine platy	very friable	-	
Bt	12-30	10YR 6/4	SiL-Si	moderate, medium subangular blocky	friable	-	
BC	30-60	10YR 5/6	SiL	weak medium sub-angular blocky	friable	-	
IICk	60-150	10YR 4/3	SiCL	blocky	firm	-	

Lab No.			pH					Exchangeable Cations me/100 g						% <2mm		Pyrophosphate		
		Horizon	H_2O	$CaCl_2$	OM%	N%	C/N	Na	K	Ca	Mg	TEC DET	Sand	Silt	Clay	Fe%	Al%	$CaCo_3$ equiv.%
R77	38	LH	5.5	-	69.45	1.31	31	-	-	-	-	-	-	-	-	-	-	-
	39	Ae	4.1	4.2	0.74	0.04	11	0.01	0.08	1.97	0.49	4.3	38	58	4	-	-	-
	40	Bm	5.2	4.8	0.80	0.04	12	0.27	0.11	2.00	0.46	3.9	41	53	6	0.37	0.03	-
	41	Bt	5.0	4.5	0.63	0.03	12	0.02	0.13	3.96	0.87	6.2	3	84	13	0.26	0.02	-
	42	BC	5.5	5.1	0.69	0.03	13	0.16	0.28	7.00	1.33	9.1	23	59	18	-	-	-
	43	IICk	7.1	6.7	-	-	-						1	60	39	-	-	30.2

LOCATION: SW 33-64-14-W5

LANDFORM: Morainal blanket/rock rolling

ELEVATION: 1006 m

SOIL UNIT: Torrens
SOIL SERIES: unnamed
CLASSIFICATION: Eluviated Dystric Brunisol

MATERIAL: till/shales
DRAINAGE: Moderately well

TOPOGRAPHIC CLASS: c-d
PLANT COMMUNITY: *Pinus contorta, Picea glauca, Ledum groenlandicum, Vaccinium uliginosum*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Other
LH	4-0	-	-	-	-	-	-
Ahe	0-4	10YR 3/1	SiCL	moderate, medium granular	friable	-	abundant, fine, horizontal roots
AB	4-17	10YR 4/3	SiC	moderate, medium subangular blocky	firm	-	-
Bm	17-60	5YR 4/2	SiC	strong, medium subangular blocky	firm	-	-
BC	60-100	5YR 5/3	SiCL	moderate, medium subangular blocky	firm	-	-
C	100-140	5YR 5/6	SiC	stratified parent geologic material	firm	weathered shales	-
	200-300	-	-	-	-	-	calcareous yellowish shales
	300-400	-	-	-	-	-	calcareous brown shales

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R76	188	LH		3.2	74.99	0.91	48	-	-	-	-	-	-	-	-	-	-	-
	189	Ahe		3.6	2.85	0.15	11	0.05	0.66	4.75	1.33	18.6	1	68	31	-	-	-
	190	AB		4.1	0.31	0.10	10	0.09	0.53	12.8	3.23	24.7	3	47	50	-	-	-
	191	Bm		4.6	0.77	0.05	9	0.31	0.51	16.9	3.74	20.0	1	63	36			
	192	BC		5.9	-	-	-	0.57	0.97	26.7	6.10	30.3	7	51	42	-	-	-
	193	C		5.9	-	-	-	0.43	0.81	27.5	6.61	29.1	4	45	51	-	-	-
	194	p.g.m. (yellowish shales)		7.2	-	-	-	-	-	-	-	-	5	55	40	-	-	-
	195	p.g.m. (brown shales)		7.3	-	-	-	-	-	-	-	-	3	45	52	-	-	-

LOCATION: SE 10-60-19-W5
SOIL UNIT: Wanham
SOIL SERIES: Wanham

CLASSIFICATION: Orthic Gleysol

LANDFORM: Fluvial level

MATERIAL: Bedded very fine sands and silts
DRAINAGE: Poorly

ELEVATION: 871 m

TOPOGRAPHIC CLASS: b-c

PLANT COMMUNITY: *Picea mariana, Pinus contorta, Ledum groenlandicum, Vaccinium vitis-idaea*

Horizon	Depth (cm)	Moist Color	Texture	Structure	Consistence	Coarse Fragments	Others
L-H	5-0	-	Moss and leaf litter	-	-	-	
Ae	0-5	10YR 5/2	SiL	weak, fine platy	very friable	-	-
Bg	5-40	10YR 5/2	SiL	amorphous	very friable	-	many coarse, prominent mottles (10YR 5/4 m)
BCg_1	40-70	10YR 5/2	SiL	stratified	very friable	-	many coarse prominent mottles (10YR 5/4 m)
BCg_2	70-110	10YR 5/2	SiL SiCL VFS	stratified	very friable	-	many coarse prominent mottles

Lab No.		Horizon	pH H_2O	pH $CaCl_2$	OM%	N%	C/N	Exchangeable Cations me/100 g Na	K	Ca	Mg	TEC DET	% <2mm Sand	Silt	Clay	Pyrophosphate Fe%	Al%	$CaCo_3$ equiv.%
R77	28	LH	4.3	3.6	5.0	0.88	3	-	-	-	-	-		-	-	-	-	-
	29	Ae	4.4	3.8	2.1	0.13	9	0.01	0.08	2.16	0.67	8.0	31	61	8	-	-	-
	30	Bg	5.0	4.4	0.5	0.04	7	0.01	0.02	1.67	0.41	3.0	31	64	5	-	-	-
	31	BCg_1	5.5	5.0	0.4	0.03	8	0.11	0.07	4.27	1.18	5.9	27	62	11	-	-	-
	32	BCg_2	6.0	5.8	1.3	0.03	25	0.04	0.22	21.0	3.87	11.2	34	43	23	-	-	-