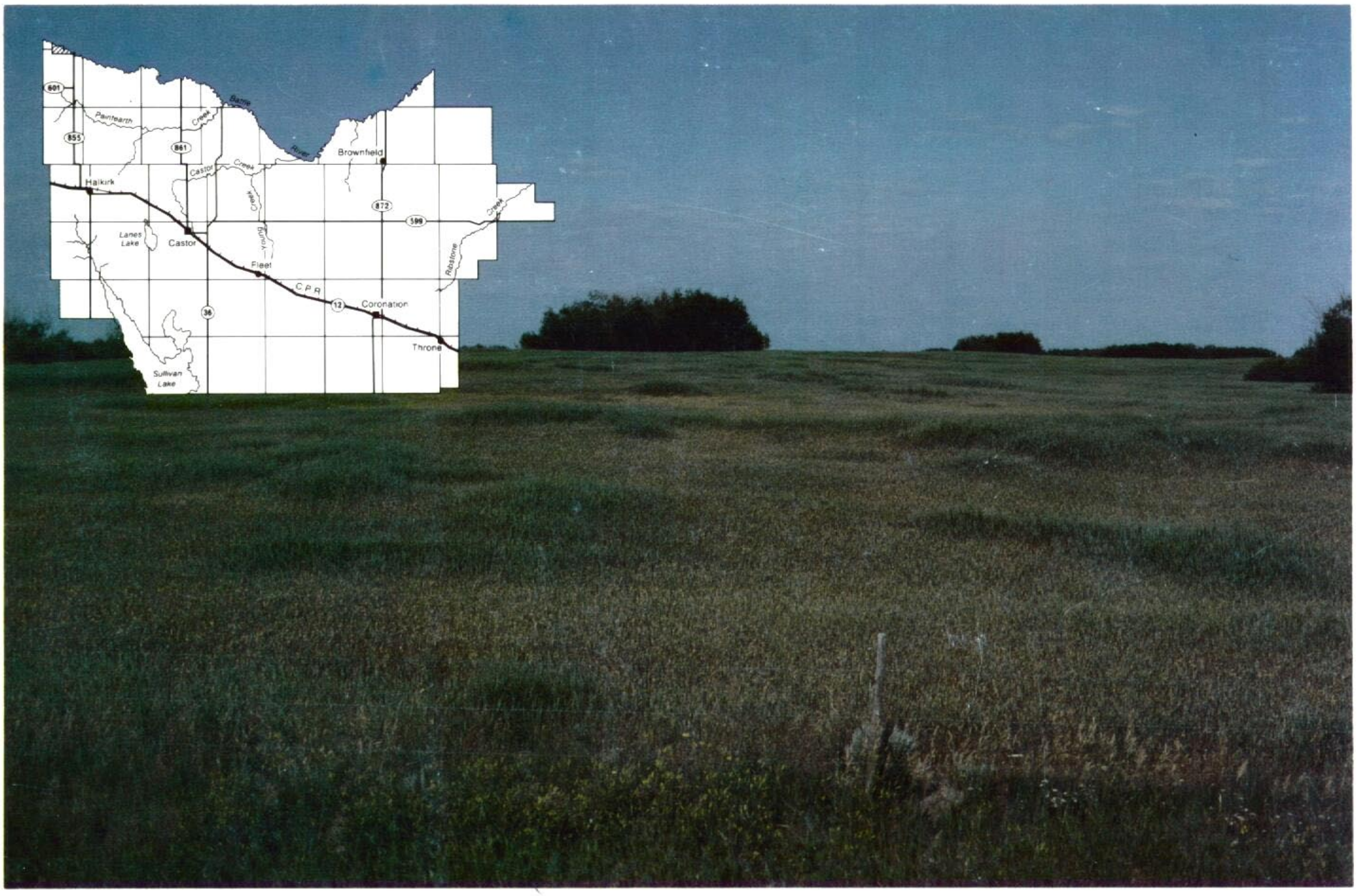
Soil survey of the

County of Paintearth, Alberta

Alberta Soil Survey Report No. 49



ALBERTA RESEARCH COUNCIL

Terrain Sciences Department

ERRATA

Page 6, column 2, line 13: "when the soil is result" should read "when the soil is wet, it will result."

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R.E. Wells and W.L. Nikiforuk

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Cover:
Typical crop pattern of
Solonetzic soil landscape.
Photo: W.L. Nikiforuk

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Summary

A soil survey of the County of Paintearth was initiated at the request of the Soils Branch, Alberta Agriculture. The soils of the county were originally mapped as part of the soil surveys of the Sullivan Lake (Wyatt et al., 1938) and Red Deer map sheets (Bowser et al., 1951). These reconnaissance surveys were broad scale maps, lacking the detail required for many current land use decisions. The purpose of the soil survey of the County of Paintearth was to re-map the soils at a scale of 1:50 000 and provide interpretations of the soil units for deep tillage suitability and agricultural capability. This new survey benefits from advantages derived from more intensive examination of soils in the field and use of new aerial photographs.

The report consists of three parts. Part I includes a description of the location and the physical environment of the county. Part II contains a description of the soils and soil units, which are used to describe the composition of delineations on the map. In Part III, the soil units are interpreted for soil capability for agriculture. Appendices include data pertinent to the classification, interpretation, and evaluation of the soil units.

A separate report (Wells, 1985) provides interpretations for deep plowing and ripping, deep plow suitability maps and a map of surface soil acidity in the county. Twenty-eight aerial photo mosaics accompany this report. The mosaics, presented at a scale of 1:50 000, show the location and extent of individual soil delineations, major towns and roads. Township and range numbers as well as mosaic number are shown on the margins of each mosaic. The relationship of mosaics with respect to one another and with respect to townships and ranges for the whole county is presented in figure 8 (appendix 4) which is an index to the map sheets.

How to use the soil maps and interpretations table

The soil maps of the County of Paintearth are included in this report (appendix 4). Each outlined area on a map contains a notation indicating the soil unit and phase which best describes that area. This notation acts as a key which allows the user to locate a description of that area in the legend and in the report.

Interpretations have been made for each unique soil unit notation found on the maps. Thus, a user has only to determine the symbol which describes a particular area of interest and then locate that symbol in the soil capability interpretations table. All soil unit symbols are arranged alphabetically within the tables to allow for easy location. In order to fully understand the interpretations for any unit, it is recommended that the user read carefully the description of that unit found in the preceding chapter. The descriptions provide information about the complexity of soils and parent materials found within the units and include statements relating to the variability of important unit properties.

Limitations in the use of the maps and report

The user is cautioned against uncritical acceptance of the information contained on the maps and of interpretations based on them. It should be noted that more than 99 percent of the area covered by a soil map is never investigated below the surface. Thus, most of each outlined area is described on the basis of a few observations within that area. Obviously soils may exist within a delineation which may not have been encountered during investigations of that area. These soils may differ considerably from those which are described as having been found in the area. Thus, the map is not intended to show site specific data and should not be used in lieu of site investigations. For design purposes, a site investigation by specialists should always be made. The information given here can be used for general assessment, and, for the specialist, it should prove to be an excellent guide for planning effective investigations.

Each mosaic represents a composite made from many individual aerial photographs and is uncontrolled with respect to scale. Due to distortions in the photography, scale may vary, very slightly, across individual mosaics. This is often reflected in small discrepancies across the length of a boundary between adjoining mosaics. This discrepancy must be accounted for by shifting mosaics slightly to ensure registration of any particular area.

Acknowledgments

The soil survey of the County of Paintearth was conducted by the Terrain Sciences Department, Alberta Research Council, as part of a joint project also involving the Soils Branch, Alberta Agriculture. Funds for the fieldwork and for compilation of the soils maps were supplied jointly by Alberta Agriculture and Alberta Research Council. Costs for laboratory analysis were similarly shared. Aerial photography and topographic maps were obtained from Alberta Energy and Natural Resources. The final maps were compiled and drafted by the Alberta Research Council. The Alberta Research Council funded the publication of this report.

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B. Sawyer, for help in completing data collection for the surface soil acidity map of the county.

The report was produced by the Publishing and Graphics Section of Alberta Research Council.

J. Lutz, for editing and compilation of the report.

Note: Reports such as this often use virtually intact passages extracted from previously published material. The authors would like to acknowledge the following soil survey reports which were used as source documents:

Soil survey of the County of Beaver no. 9, Alberta. Howitt, R.W. (in press)

Soil survey of the County of Warner no. 5, Alberta. Kjearsgaard et al. (1984).

Part 1. General description of the area

Location and extent

The County of Paintearth is located within the Solonetzic soil belt in east-central Alberta (figure 1). The western edge of the county is located approximately 100 km east of the City of Red Deer and the eastern edge borders on special area 4. Major towns, Castor and Coronation, are located along Highway 12 in the west-central and east-central portions of the county.

The county comprises approximately 36 townships and has a total area of 339 050 ha. It extends eastward from range 16 to range 8, west of the 4th meridian and northward from township 35 to the Battle River. Most of the county lies within the Vermilion (73d) 1:250 000 nts mapsheet, but a small portion falls within the Edmonton (83A) 1:250 000 mapsheet.

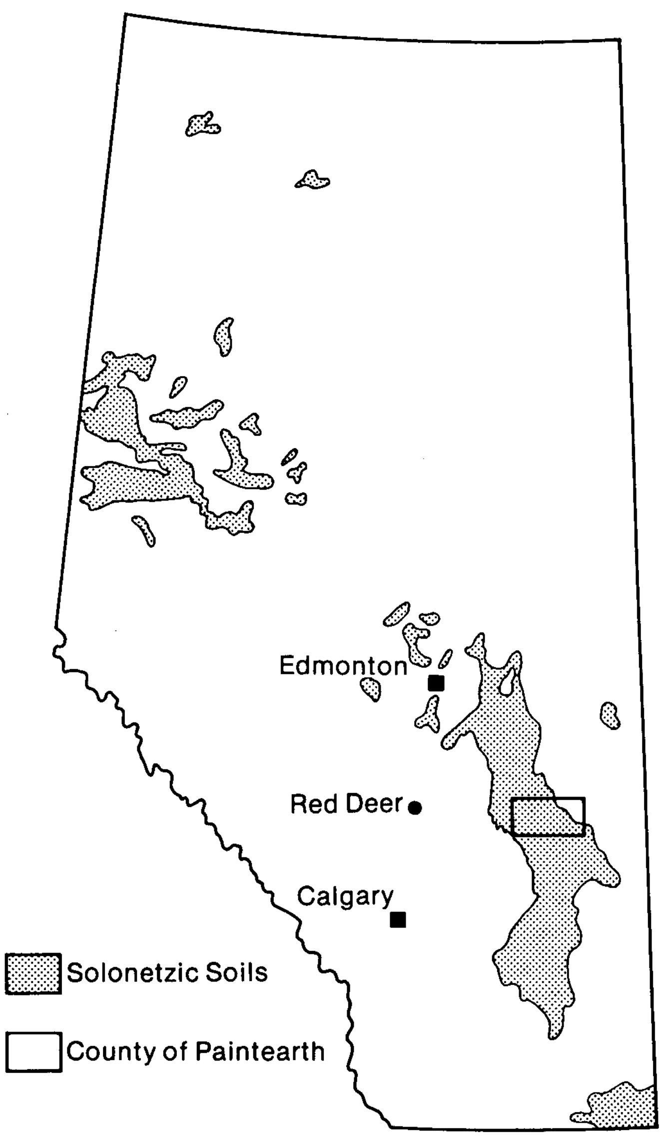


Figure 1. Location of project area.

Physiography, relief and drainage

The County of Paintearth lies within the Eastern Alberta Plain, a physiographic region delineated by Bostock (1970). Within the county, this region is further divided into sections and districts (table 1 and figure 2).

The Castor and Daysland Plain districts are both low-relief, undulating bedrock plains covered with morainal blankets and veneers. Thin or discontinuous morainal veneer is predominant in the Castor Plain unit, but continuous morainal blanket is more common in the Daysland Plain unit.

The major drainage for these two physiographic units is to the northeast. The Castor Plain unit is drained by Paintearth, Castor and Ribstone creeks and several lesser streams that all flow into the Battle River. Similarly, Nelson Creek drains the northern portion of the Daysland Plain unit.

The Sounding Creek Plain unit is characterized by major amounts of sandy glaciofluvial and eolian blanket veneer deposits overlying undulating bedrock or till. Drainage is to the southeast along Sounding Creek and other major creeks in the unit.

The Berry Creek Plain unit is distinct in having predominant morainal blanket and veneer deposits over an undulating bedrock surface. Drainage is southward into Berry Creek.

The Neutral Upland is characterized by rolling to steeply sloping uplands with slopes of 9 to 30 percent and deep, hummocky till deposits. This unit has frequent occurrences of ice-thrust bedrock ridges that have a thin cover of stagnation moraine. Major

Table 1. Physiographic characteristics of the County of Paintearth.

Region	Section	District	Landform
Eastern Alberta Plain	Sullivan Lake Plain	Castor Plain 700 to 820	morainal blanket and veneer over undulating bedrock
		Daysland Plain 610 to 730	morainal blanket over undulating bedrock
		Sounding Creek Plain 670 to 790 m	fluvial blanket and veneer over undulating bedrock or till
		Berry Creek Plain 700 to 820 m	morainal blanket and veneer over undulating bedrock
	Neutral Hills Upland	Neutral Upland 670 to 790 m	hummocky moraine and morainal blanket over rolling, ice-thrust bedrock
		Neutral Hills 730 to 880 m	morainal blanket and veneer over hilly, ice-thrust bedrock

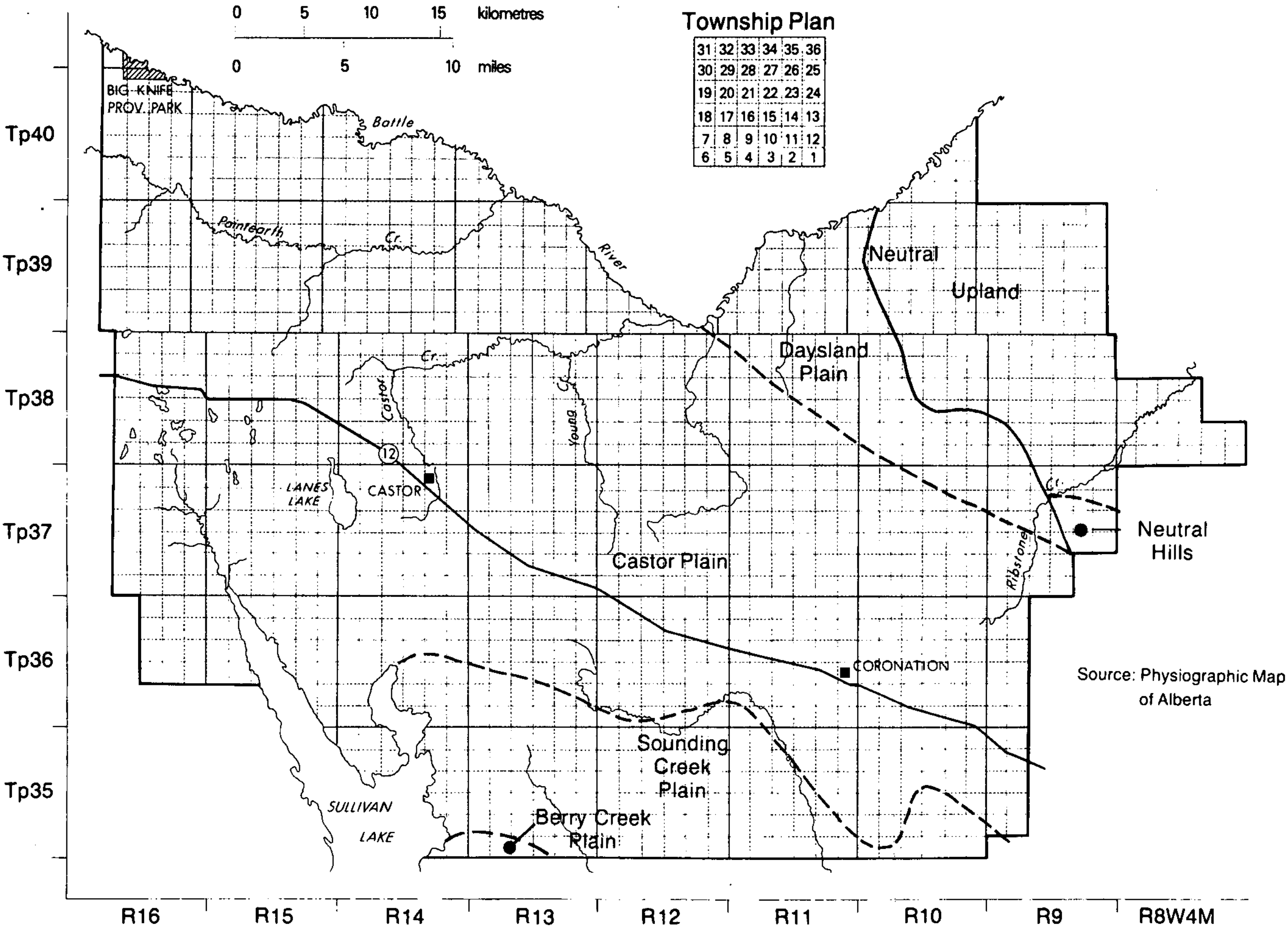


Figure 2. Physiographic units in the County of Paintearth.

through drainage is found only along the Ribstone Creek in the southern part of the unit.

The highest elevations in the county occur in the Neutral Hills unit. This unit comprises steeply sloping, ice-thrust bedrock ridges with a thin or discontinuous cover of morainal materials on their summits.

Five slope classes were delineated in the County of Paintearth (table 2). The presence of low, undulating topography throughout the Sullivan Lake Plain Section accounts for the large amount of lower slope classes in the County. The higher slope classes occur within the Neutral Hills Upland Section with its steep, hummocky and ridged landforms.

Table 2. Extent of each slope class in the County of Paintearth

Slope class	Slope range (%)	Hectares	Percent of total
2	2	31 820	9.4
3	2 - 5	178 700	52.7
4	5 - 9	51 760	15.2
5	9 - 15	16 630	4.9
6	15 - 30	3 920	1.2
Undifferentiated		56 220	16.6

Bedrock geology

The three bedrock units that occur in the County of Paintearth (figure 3) are all of Late Cretaceous age. These include the Horseshoe Canyon, Bearpaw and Belly River formations. The following descriptions are those provided by Green (1972):

Horseshoe Canyon Formation: gray, feldspathic, clayey sandstone; gray bentonitic mudstone and carbonaceous shale; concretionary ironstone beds, scattered coal and bentonite beds of variable thickness, minor limestone beds; mainly nonmarine.

Bearpaw Formation: dark gray blocky shale and silty shale; greenish glauconitic and gray clayey sandstone; thin concretionary ironstone and bentonite beds; marine.

Belly River Formation: gray to greenish gray, thick-bedded, feldspathic sandstone; gray clayey siltstone, gray and green mudstone; concretionary ironstone beds; nonmarine.

The Horseshoe Canyon and Bearpaw formations underlie all but a small portion of the county and were a major influence on the distribution of soils in the area. Most of the Solonetzic soils occur in the western, central and southeastern portions, where these two bedrock units formed the local source materials for shallow overlying morainal veneer and blanket deposits. Normal Chernozemic soils are found only in the northeast portion, where overlying till deposits are thicker and other source materials have been involved.

Surficial materials

The distribution of surficial materials in the County of Painteearth (figure 4) is the result of continental glaciation (late Wisconsin) approximately 10 000 years ago. During this period, Keewatin ice was present in southern and central Alberta as three contemporaneous lobes (Shetsen, 1984). The county is located near the middle of the portion once occupied by the central ice lobe. The direction of ice advance in this central portion was mainly from the north rather than from the northeast or northwest. Large areas of hummocky moraine present immediately east and west of the county were formed between the major ice lobes.

From the center of the county outward, the general pattern of surficial material includes: discontinuous till veneer over bedrock representing the most active ice near the center of the lobe; continuous, but not very thick (1 to 6 m), till blanket representing ground moraine deposited by active ice, interspersed at intervals by large sections of coarse-textured glaciofluvial materials; and progressively thicker till deposits, ranging in expression from undulating stagnation moraine to strongly rolling stagnation moraine, at the northeast corner of the county. Most of the strongly developed stagnation moraine lies within the Neutral Upland district and is broken by ridged, high-relief features representing ice-thrust bedrock segments with a thin covering of stagnation moraine.

More than half of the county is covered by till (table 3). Three kinds of till are present. The first is a grayish, clay loam to clay, very weakly calcareous, moderately to strongly saline and sodic till that is characteristic of the discontinuous till veneer (TR) areas. The second is a brownish, clay loam, weakly calcareous, moderately saline and sodic till that occurs in significant amounts in association with the gray till but is predominant in morainal blanket and weakly developed stagnation moraine (Ts) areas. The third, a yellowish brown, loam to sandy clay loam, moderately calcareous, nonsaline till, occurs in the rolling to hummocky, moderately to strongly developed stagnation

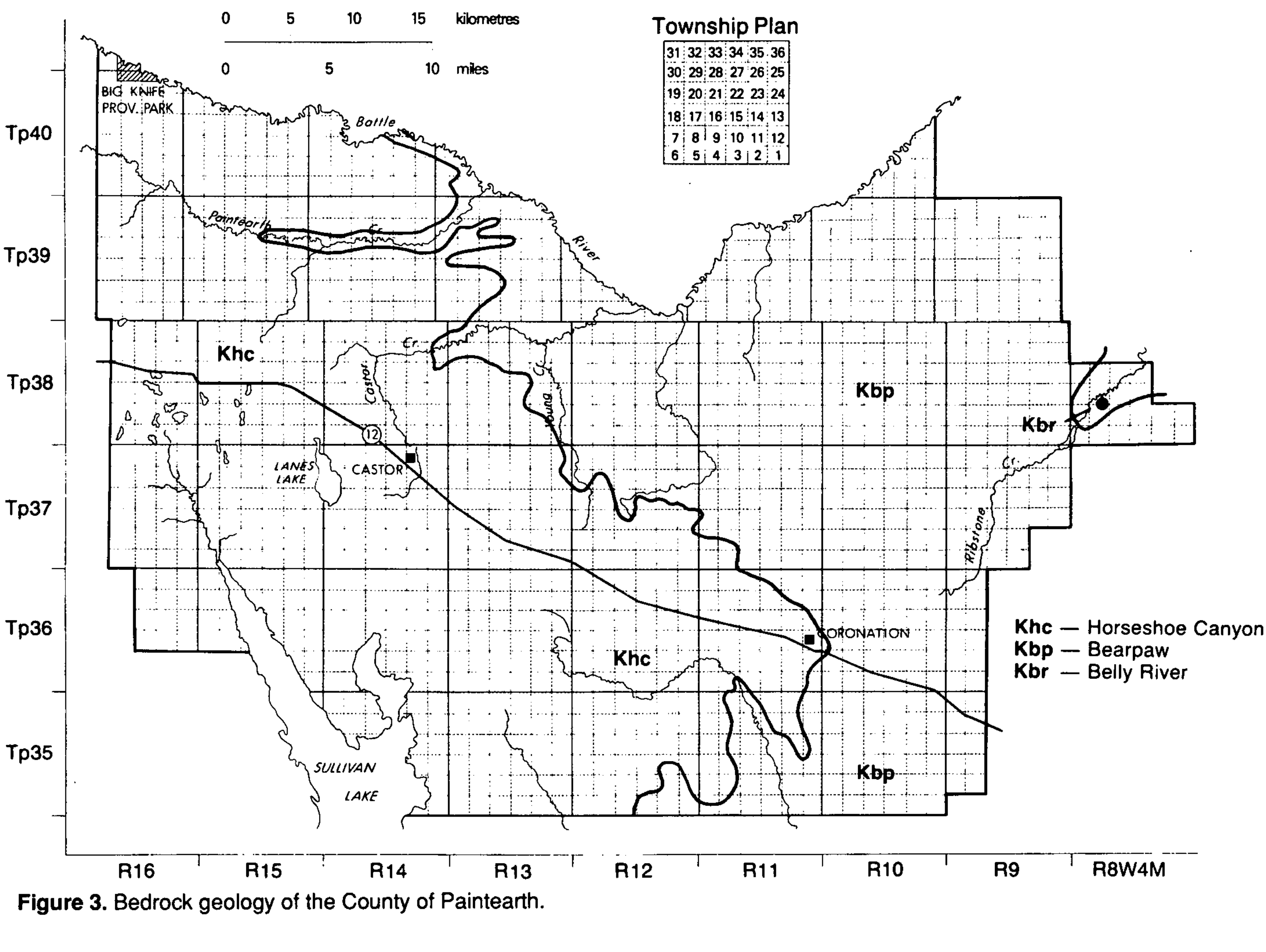


Figure 3. Bedrock geology of the County of Painteearth.

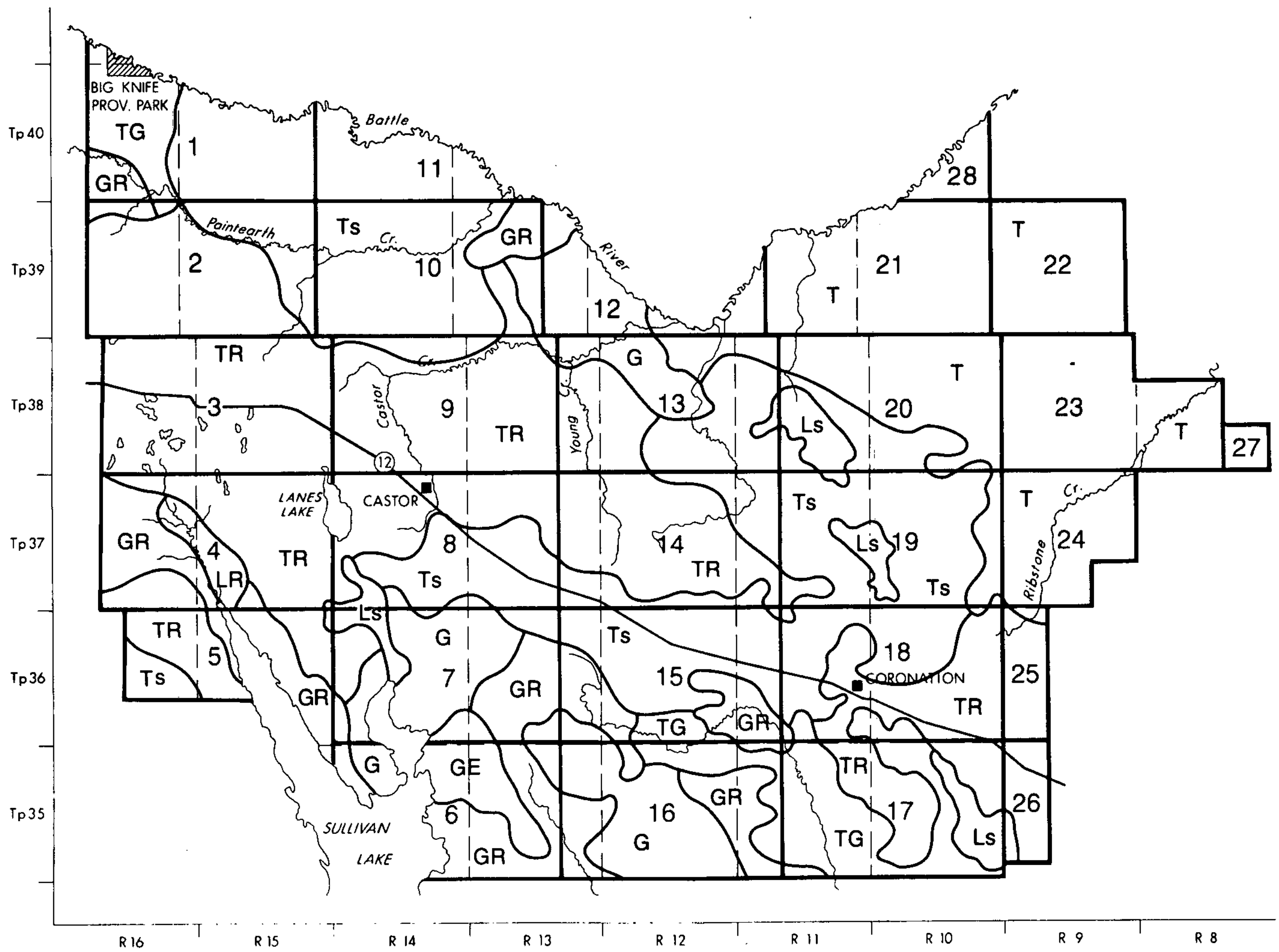


Figure 4. Surficial materials of the County of Paintearth.

Table 3. Extent of surficial materials in the County of Paintearth.

	Hectares	Percent of Total
Till		
non saline	57 830	17.1
saline	69 520	20.5
Ice-contact materials	8 790	2.6
Till and residual	53 860	15.9
Till and glaciofluvial	6 440	1.9
Glaciofluvial		
sandy loams	25 050	7.4
loamy sands, sands	5 940	1.8
gravels	420	0.1
Glaciofluvial and residual	27 880	8.2
Eolian sands	1 180	0.3
Glaciolacustrine	23 770	7.0
Glaciolacustrine and residual	2 150	0.6
Undifferentiated (AV, D.L., GY, RB, towns)	56 220	16.6

moraine (T) areas in the northeast part of the county. The small amounts of sandy to gravelly ice-contact materials occur in association with this nonsaline till.

Approximately 17 percent of the county is covered by sandy loam glaciofluvial deposits (table 3). Nearly half of this consists of discontinuous sandy loam veneer, less than 1 m thick, over sodic bedrock (GR) areas located in the southern part of the county. The loamy sand to sand glaciofluvial materials are greater than 1 m thick and are found in association with sandy eolian materials (GE area) on the east side of Sullivan Lake. Gravelly outwash materials are very limited in extent and are found along shallow spillway complexes (TG area) in mosaics 16 and 17 (appendix 4). Glaciolacustrine deposits (Ls) occur in several shallow lake basins in the southern and east-central parts of the county. The silty clay loam to silty clay glaciolacustrine materials in these basins are often strongly saline.

Postglacial fluvial material occurs in channels of active streams where there is periodic flooding and deposition of fresh materials. These materials are sandy to silty, although clayey materials can be found in ponded sections of most stream channels.

Hydrologic regime

On a regional to intermediate scale, the system is characterized by low permeability and sluggish response. Hydrologic gradients are generally downward. Upward gradients occur only in the deeper valleys (for example, those of the Battle River, Paintearth Creek and Castor Creek). Lateral flow occurs only in permeable beds (for example, sand or coal beds) and contributes to discharge in the deeper valleys.

Locally, there may be some lateral water movement in sandy lenses occurring within till deposits. Generally, however, till deposits are very thin and such lateral movement is not common.

Sloughs and wet depressions in the area cannot be considered discharge areas because the overall hydrologic gradient is also downward at these locations. The salinity that occurs in and around depressional areas is not the result of discharge. Instead, the upward movement and deposition of salts at the surface occur as the result of capillarity and evaporation.

Climate and vegetation

Most of the County of Paintearth lies within agroclimatic zone 2A (figure 5) (Bowser, 1967). This zone includes an area where the amount of precipitation, in approximately 50 percent of the years, is a limiting factor to crop growth. The frost-free period is usually more than 90 days, long enough to allow wheat crops to mature without damage. The small remaining portion, at the northwest corner of the county, lies within agroclimatic zone 1. At the edge of the zone, the amount of precipitation is higher than in zone 2A and the frost-free period is long enough to permit successful cultivation of all dryland crops typical of the region.

Meteorological data (Environment Canada) for stations within or near the county (table 4) are presented to characterize the climate of the area. Data from more distant stations are included for comparison.

The climate is typical of the high plains region of Western Canada, having the differences between summer and winter temperatures (table 4). Most of the precipitation occurs as rainfall during the growing

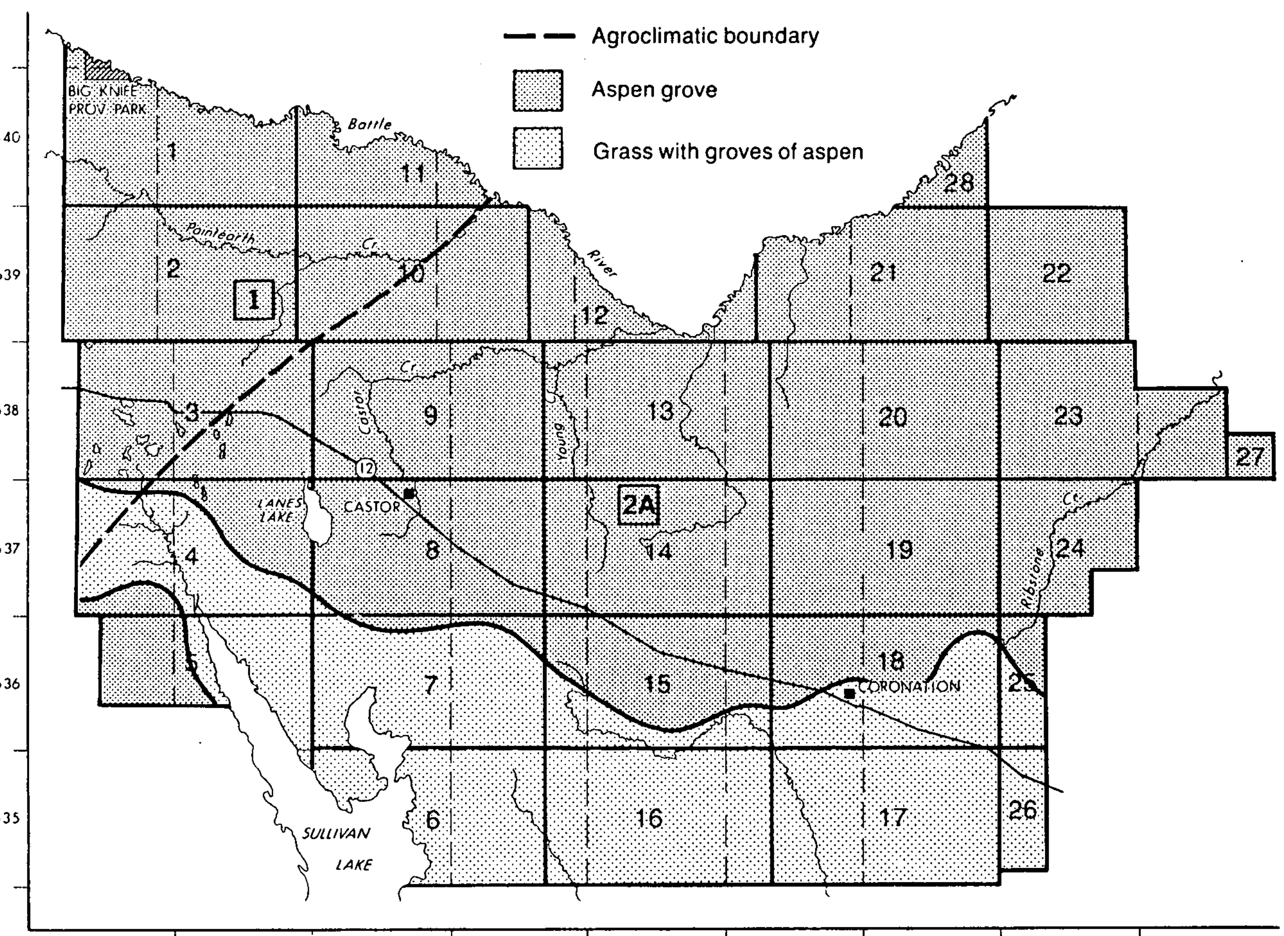


Figure 5. Climate and vegetation zones in the County of Paintearth.

Table 4. Precipitation and temperature for selected stations, 1951-1980.

		Precipitation mm			Temperature °C			
	Soil Zone	Mean Annual	May Sept.	Snow	Jan.	July	Mean Annual	Frost free Period (days)
Brownfield	Dk. Brown	446	285	144	-16.7	16.8	2.0	92
Camrose	Black	453	314	117	-16.9	16.7	1.9	113
Consort Wades	Dk. Brown	339	240	86	-18.6	16.9	1.0	88
Coronation A	Dk. Brown	374	241	137	-16.5	17.3	2.0	115
Hanna	Dk. Brown	388	253	113	-15.6	17.8	2.5	119
Hughenden	Dk. Brown	412	261	99	-16.8	17.0	2.0	97
Oyen Cappon	Brown	354	221	108	-15.8	17.6	2.6	124
Stettler	Black	431	303	109	-15.2	17.0	2.5	118
Viking	Black	454	326	107	-18.0	17.1	1.8	107

season. High standard deviations for mean monthly precipitation (not shown in table) are indicative of extremes in precipitation during the growing season.

Four locations within the county were instrumented to obtain climatic data. Growing season precipitation, monthly maximum-minimum air temperatures and soil temperatures were monitored for three years. This information is not presently available, but is being compiled as part of an Alberta soil climate data base.

All of the county lies within the Aspen Parkland Ecoregion. However, a transition to the Mixed Grass Ecoregion is present in the southern part of the county (figure 5). Here, the predominance of aspen groves is replaced by grassland and scattered aspen groves. This essentially grassland area includes the Sounding and Berry Creek physiographic districts and shallow to bedrock portions of the Castor district.

Land use

Land use was separated into two major categories (table 5). Improved and unimproved land amounts to 62 and 38 percent respectively, of the total farm area.

The use of summerfallow differs across the county. There is more summerfallow acreage in the southern part of the county where conditions are drier. The practice varies from one summerfallow every two or three years in the south to nearly continuous cropping in the north. A typical rotation in the northern part of the county would be summerfallow, canola, wheat, wheat and canola. The canola in the last year would be replaced by summerfallow if a weed problem had developed.

There is increased use of fertilizer by farmers in the county. The majority of fertilizers are being applied by banding in autumn. Fall banding is required because the larger fertilizer amounts needed cannot be applied in the spring without damage to the emerging crop.

Some farming practices appear to be peculiar to the area, for example, early spring cultivation prior to seeding is much more prevalent here than in other regions. If this early treatment is done when the soil is result in a poor seed bed. If left too late, the soil dries out and becomes too hard to develop a good seed bed. The practice is one of adaptation to Solonetzic soil conditions common in the area.

Table 5. *Land Use in the County of Paintearth.

Improved land			Unimproved land		
	Hectares	(%)		Hectares	(%)
Crops	30 312	(67.9)	Woodland	4 396	(2.0)
Pasture	48 061	(9.9)	Other	292 792	(98.0)
Summerfallow	98 410	(20.2)			
Other	9 612	(2.0)	Total	297 188	(100.0)
Total	486 395	(100.0)			

Total farm area = 783 583 acres

* From: 1981 Census of Agriculture for Alberta

Part 2 - The soils

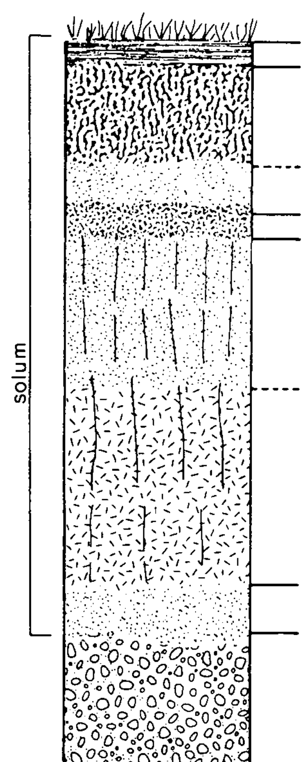
Soil formation

Soil is the product of climate, vegetation and topography acting on the parent material over a long period of time. The degree and variability of any or all factors and their interaction is reflected in the numerous kinds of soils that exist in any given area. Climatic influences are through precipitation, temperature and erosion by wind and water. Climate determines the type of vegetative cover and degree of biological activity. Different plant species produce different kinds and amounts of residues, which in turn determine soil color. Topography governs drainage and moisture conditions thus producing microclimatic variations which in turn produce variability in vegetative cover. Another major influence on soil formation is by parent material and its inherent variability in such characteristics as texture and mineralogy.

Weathering processes produce many varied but observable and measurable soil characteristics such as color, structure, texture and consistence. Color itself has little direct influence on the functioning of the soil, but much can be inferred from color when it is considered with other observable features. Dark colors are the result of high organic matter content and indicate high fertility. Reddish colors are the result of hydrated iron oxide and are associated with good drainage and well-aerated soils. Shades of gray, brown or yellow, in a mottled arrangement are associated with soils of poor drainage. Soils with light gray colors are lacking in organic matter, indicating low fertility. Soil colors that result from soil development must not be confused with colors inherited from the parent material.

Soil structure (the way soil particles aggregate) is important because it influences the movement of water and air, and the workability and tilth of cultivated soils. Other physical characteristics such as texture, moisture content and chemical characteristics, help determine the type of structure in soils. Soil consistence (the ability of a soil to resist structural breakdown) is important because it relates to various management practices.

These, and other features (clay films, concretions, carbonates, salts, reaction, coarse fragments, roots and pores) of the soil profile can be observed and measured, both quantitatively and qualitatively. They form a record of the kind and degree of weathering that has occurred. Therefore, soils can be divided horizontally into horizons based on the fact that weathering becomes less pronounced with depth. Such stratification results in the soil profile which is the basis of the soil classification system. The major horizons into which a soil profile can be divided are depicted (figure 6).



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 coloured horizon in which there is an accumulation of humus (Ah), or a light coloured 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 colour or structure(Bm). Usually lime and salts have been leached out of this horizon.(4) The symbol "j" is used with the above suffixes to denote a failure to meet the specified 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 6. Diagram of a soil profile.

Soil classification

Soil classification is the orderly arrangement (or groupings) of soil characteristics according to the processes involved in their formation as displayed in the soil profile. In the soil survey of the County of Paintearth, soils were classified according to the guidelines established by the Canadian System of Soil Classification (Canada Soil Survey Committee, 1978). The basic unit in soil classification is the soil series, which consists of soils that are alike in all major profile characteristics.

The major identifying characteristics of the four soil orders mapped in the county are as follows:

Chernozemic order:
- has dark surface horizons rich in organic matter (3 to 8 percent organic carbon in County of Paintearth)
- has a C:N ratio of less than 17 in the A horizon
- has a high base saturation in the A horizon
- calcium is the dominant exchangeable cation
- has a brownish solum
- all horizons are friable
- is well to imperfectly drained
- has developed under spear, grama and wheat grass
- the mean annual soil temperature is between $0^{o}C$ and $8^{o}C$

Solonetzic order:
- has a hard and impermeable B horizon
- has strong columnar or prismatic structure in the B horizon
- has dark coatings on peds in the B horizon
- has an exchangeable Ca:Na ratio of 10 or less in the B horizon
- has a neutral to acid A horizon
- is associated with saline parent materials high in sodium salts
- has moderate to imperfect drainage
- has developed under grama and wheat grass

Regosolic order:
- has weak or no profile development
- has no structural development
- is rapidly to imperfectly drained
- has a variable vegetative cover

Table 6. Soil distribution at the Great Group level in the County of Paintearth

Great group	Hectares	Percent of total
Dark Brown Chernozemic	103 525	30.6
Black Chernozemic	1 794	0.5
Total Chernozemic	105 319	31.1
Dark Brown Solonetzic	154 527	45.6
Black Solonetzic	421	0.1
Total Solonetzic	154 948	45.7
Gleysolic	35 676	10.5
Regosolic	5 795	1.7
Undifferentiated (RB, AV, DL, towns)	37 310	11.0
Total	339 048	100.0

Gleysolic order:
- occupies depressional position in landscape
- has dull soil colors and mottling indicative of gleying
- soil horizons are often indistinct
- has hydrophytic vegetation

General soil distribution

Most of the soils in the County of Paintearth belong to the Solonetzic order (table 6). They are the dominant soils in all but the Neutral Hills Upland section in the northeast corner of the county.

Here, Chernozemic soils replace the Solonetzic soils as dominants, although Solonetzic soils are present at scattered locations. Areas dominated by Chernozemic soils occur at scattered locations in the remainder of the county but are associated with significant amounts of Solonetzic soils. All but a small portion of the Solonetzic and Chernozemic soils have topsoil colors and organic matter contents that place them within the Dark Brown great group. The few that occur in the northwest corner of the county and in one or two locations adjacent to the south side of the Battle River Valley belong to the Black great group. Gleysolic soils are distributed as small, isolated areas throughout the county. The small portion of Regosolic soils occurs on sandy glaciofluvial and eolian materials in the Sounding Creek physiographic unit in the southern part of the county.

Map symbols and legend

The purpose of soil mapping is to divide the landscape into units which differ from one another in some aspect, with particular attention being placed on soil and landscape features. These units, called map units, represent a portion of the area being mapped, which is represented by a polygon or area on the soil map. The map unit is defined in terms of the soil and landscape features that it represents. On the soils map, each map unit is identified by a map unit symbol.

The map unit symbols used in this soil survey have a fraction format with the soil component in the numerator, and topography and soil phase in the denominator. Because all of the information gathered during a soil survey cannot be shown on the published map, a simplified map symbol is used to maintain map legibility and to refer to more detailed descriptive information in the soil map legend and soil report. The main part of this symbol is the soil series.

Standard practice involves identification of soil series by names derived from a named feature (town, post office, river, lake and so on) in the vicinity where a series is first identified. Each established series is given a unique three-letter symbol (for example, HKR for the Halkirk series). When a soil area has been delineated and identified as being dominantly com-

composed of soils belonging to the Halkirk series, that area is identified as a HKR area on the soil map. Similarly, all mapped soil areas are identified by their dominant series.

Because soil areas are never composed entirely of one series, some method is required to show variability within map units. Three general kinds of soil variability are depicted in the soil symbol and are essentially the same as those devised for the soil survey of the County of Warner (Kjearsgaard et al., 1984). These include:

- A complex of two series. For such areas, the soil unit symbol combines the first two letters of each of the two series symbols into a four-letter symbol. A Halkirk-Torlea (HKR, TLA) area is identified by the HKTL symbol.
- Areas with significant amounts of other soils. Units for such areas are designated by adding a different numeric suffix to the series symbol. The system allows for five variations in addition to the suffix 1 used for the relatively pure unit.
  - 1 a relatively pure unit; named dominant(s) occupy approximately 80 percent (HND1, HKTL1)
  - 2 has significant amounts (15 to 40 percent) of gleyed or Gleysolic soils and sloughs (HND2, HKTL2)
  - 4 has significant amounts (20 to 40 percent) of Rego and/or Calcareous Chernozemic soils (HND4)
  - 6 has significant amounts (15 to 40 percent) of coarse-textured soils; used in this survey to indicate the presence of significant amounts of coarse-textured, ice-contact materials (HND6)
  - 7 has significant amounts (20 to 40 percent) of Solonetzic soils (FST7, HNSC7)
  - 8 has significant amounts (15 to 40 percent) of Rego and/or Calcareous Chernozemic soils and significant amounts of Gleyed subgroups, Gleysolic soils and sloughs (HND8)

Areas in which a soil phase of the dominant series is prevalent. In these units, a lower case letter is added to the topographic class number in the symbol denominator:

- e has greater than 30 percent of the surface occupied by eroded pits.
- d has greater than 10 percent of steep-sided gullies or narrow ravines
- p has greater than 3 percent of the surface covered by stones and boulders

Topographic characteristics are depicted in the denominator of the symbol by using the appropriate slope class number for the various slope classes (table 2).

This symbology has been adopted to facilitate correlation and information transfer among county level (level 3) soil surveys in Alberta. A wide variety of areas can be symbolized using this method. However, the number of combinations is purposely limited to maintain a controlled legend and prevent unnecessary proliferation of map units with limited areal extent.

The soil map legend (appendix C) is an extension of the individual map symbols. It provides basic information on both soil and landform characteristics and identifies any minor soils or landform features (inclusions) that form 10 to 15 percent of the units. These inclusions do not affect interpretations but are useful identifying features for particular map units.

Mapping procedures

Mapping was done using 1:31 680 scale, black and white aerial photographs taken in 1977. Initial stereoscopic examination of the photos was done in the office followed by a general field reconnaissance. This was followed by more intensive photo interpretation and ground truthing in the field. During mapping, all roads and trails in the county were traversed. Traverses by foot were necessary to verify soil and landscape conditions in areas without vehicle access. Soils were examined to the 1 m depth using a shovel and hand auger. Soil inspections were done at an intensity of roughly one recorded observation per quarter section. Each recorded observation was supplemented by information obtained from several digs to determine the local distribution and variability of different soils at each inspection site.

As mapping progressed, transects were run on randomly selected delineations of major Solonetzic map units. This additional work was done because of the extreme soil variability encountered in the Solonetzic portions of the county. The main objectives of this work were to check visual estimates of map unit composition and obtain statistical measures of map unit variability. Transects were 800 m long and soil observations were 80 m apart. Approximately 40 transects were completed amounting to about 4 to 7 transects per major Solonetzic unit. Analysis of transect data showed that there were too few observations to obtain sufficiently reliable measures of variability. Some 15 to 20 transects per unit would have been required to obtain reliable estimates. How- ever, the transect work was judged worthwhile for two reasons. First, it improved mapping accuracy and control by providing some detailed and unbiased field verification of map units. Second, the samples of diagnostic soil horizons taken at transect observation points provided valuable information about the range and variability of Solonetzic soil parameters related to deep tillage suitability interpretations (Wells 1985; Wells and Lickacz, 1986).

Soil sampling formed an integral part of the survey operations. Approximately 2800 surface composite soil samples, taken at a standardized depth of 0 to 5 cm, were collected during the survey. These included surface soil samples from most of the recorded soil inspection sites during the regular survey and at each observation point along soil transects. The pH determinations were done in the field office using a standard glass electrode pH meter. Approximately 560 samples were collected from diagnostic soil horizons at alternate observation points along transects. Complete profile samples together with bulk density samples were collected from pedons representing five major soil series. Transect samples and pedon samples were air dried, ground to pass 2 mm sieve and submitted for routine soil analyses.

Soil and landscape characteristics for each inspection site were recorded either directly in electronic form, using a Polycorder field data logger, or on coded field sheets for later input into computer files. Five data files were established to help manage information obtained from the survey. These include:

- Daily file - includes summaries of soil and landscape information from routine soil survey inspection sites. Data entered include location, soil profile characteristics, parent material, landform and landscape features such as slope steepness and position. Surface soil pH is included in this file.
- Map unit file - contains a list of all map unit delineations made during the survey. Planimeter measurements of polygon areas were joined to this file to obtain the areal extent of map units and of map unit interpretative ratings, such as deep tillage suitability.
- Transect data file - contains soils and site information collected at observation sites along transects. This information was analyzed to obtain a statistical measure of the variability of soil map unit composition.
- Laboratory data file - contains the results of laboratory chemical and physical analyses. This file can be joined with the transect file to determine the variability of soil properties by series and map units. The data were manipulated statistically to obtain estimates on the range and variability of soil series properties important for deep tillage suitability (Wells, 1985).
- Map legend file - contains the soil map legend.

Soil and map unit descriptions

Each of the map units delineated on the accompanying soil maps is described on the following pages. These descriptions include location, extent, landscape features, diagnostic soil characteristics and distinguishing features of map units. Descriptions of miscellaneous landscape units, including Alluvium, Gleysol and Rough Broken, are found in this section. Descriptions are arranged in alphabetical order to correspond with their order in the map legend.

Detailed descriptions and laboratory analytical characteristics of selected representatives of the more important soils are given in appendix A of this report. Also included are descriptions and analyses for two new soil series, Coronation (CNN) and Fleet (FLT), defined during this project. Not all major soil series could be sampled during the time available. The soils sampled, however, collectively represent approximately 80 percent of the area of the County of Paintearth.

All major soil series are described in sufficient detail to enable users to become familiar with their diagnostic features and their relationships to specific use and management practices. Distinguishing characteristics of dominant soil series are described in alphabetical order of soil names in the map legend. Major associated soil series are described where they first occur in a map unit symbol as the named associate to the dominant series. For example, diagnostic features of Brownfield soils are given in the description of the HKBF1 unit. This is done to present the user with a minimum amount of essential detail, to avoid needless repetition and to integrate soil descriptions more closely with actual soil occurrence in the landscape.

Special attention should be paid to the descriptions Halkirk and Torlea, two of the major Solonetzic soils in the County of Paintearth. The reader should be aware that their series definitions have been considerably narrowed in light of criteria deemed important for deep tillage suitability recommendations. The deep tillage interpretations reported by Wells (1985) are based on these updated descriptions.

Alluvium (AV) landscape

General setting and description

Alluvium is a descriptive term that identifies land areas consisting of existing or recent floodplains and fluvial terraces along rivers and streams. Such areas are characterized by diversity of material texture, drainage and soil development, reflecting past periodicity of inundation and material deposition. Approximately 7600 ha of Alluvium are mapped in the County of Paintearth.

Alluvium map units

Two map units are separated on the basis of dominant texture, drainage and soil development. Because these units are considered to be landscape rather than soil units, topographic phases are not designated.

AV1 - This unit is characterized by the dominance of medium to moderately coarse-textured materials on level to very gently undulating (0 to 5 percent slopes) floodplains and fluvial terraces. Well to moderately well drained, undifferentiated Regosolic or Chernozemic soils are dominant with significant portions of Gleyed subgroups and Gleysolic soils. Inclusions of taxajuncts or variants of adjacent upland soils are common in areas of Alluvium mapped along small streams. Nearly 1000 ha are mapped as AV1.

AV2 - This unit is wetter than AV1 and is separated by having dominant Gleysolic soils developed on level to nearly level (0 to 2 percent slopes), moderately fine to fine-textured materials. Inclusions of water are common along stream and oxbow channels. Inclusions of better drained Regosolic soils are common in AV2 units mapped along the Battle River. Thinly developed

A horizons and the presence of recent fluvial deposits at these better drained sites, however, indicate frequent inundation during river flood periods. Approximately 6600 ha are mapped as AV2.

Land use - Most of the area mapped as Alluvium is used as unimproved pasture. A large portion of the area along major streams, however, is used to grow high quality forage and a minor amount is seeded to grain and oilseed crops. Farmers using AV2 units along the Battle River for grain and oilseed crops report major losses from flooding once every three to five years.

Bigknife (BKF) soils

General setting and description

These well to moderately well drained soils occur on shallow, weakly saline, finely banded fluvial apron materials below exposed bedrock escarpments. Material textures in bands range from fine sand to sandy and silty clay loams. Depths to bedrock are less than 1 m on mid to upper apron slopes but range over 2 m on lower slopes. These soils are mapped as dominant components on slightly more than 4600 ha. Most are mapped in association with Rough Broken terrain.

Bigknife soils are classified as Orthic Regosols. These soils show weak morphological evidence of solonetzic B horizon development but lack the necessary proportion of exchangeable sodium to be classified as sodic B horizons. Increased clay contents of these horizons with some structural development is believed to result from deposition of bands of heavier-textured fluvial apron materials at depths where B development is evident in Solonetzic soils.

These well-drained soils have a dark brown, fine sandy loam to silt loam A horizon that is 5 to 8 cm thick and is moderately acid to neutral. A thin (1 to 3 cm thick), eluvial (Aej) horizon may be present and is underlain by a dark grayish brown, silty or sandy clay loam BC transition horizon showing subangular blocky structure and some organic staining. The coarser-textured BC layer does not show structural development, and at greater depths, is separated by buried A horizons. A finely banded appearance (0.5 to 5 mm thick) is evident in most layers below the A horizon and reflects the recent depositional nature of these soils. Minor salt accumulations occur at the bedrock contact in shallower materials or at depths greater than 70 cm in the deeper materials on lower slopes.

Bigknife map units

BKF1 - These relatively pure units are composed dominantly of Bigknife soils on uniform slopes of 3 to 9 percent. Inclusions of bands of recent sandy or gravelly wash occupy from 5 to 10 percent of the area. This unit accounts for only 4 percent of the area occupied by these soils.

Two topographic phases are mapped:

- BKF1/3: 2 to 5 percent slopes; approximately 50 ha in mosaic 2.
- BKF1/4: 5 to 9 percent slopes; approximately 120 ha in mosaic 10.

BKRB1 - This unit is separated from BKF1 by having a significant component (15 to 40 percent) of Rough Broken terrain present as very steep, eroding bedrock escarpments that are the source of the Bigknife fluvial apron materials. Topographic phases are not designated for this unit. Slopes on apron segments range from 5 to 9 percent and bedrock escarpments have slopes greater than 35 percent.

Land use - Most of the Bigknife areas are being used as unimproved pasture but a few scattered small portions of BKF1 are included with dryland cultivated areas. The Bigknife-Rough Broken areas appear to be very important as bird and mammal habitat.

Coronation (CNN) soils

General setting and description

Coronation soils are mapped on the eastern side of the county. They are found on well-drained, medium to moderately fine textured fluvial apron deposits around the base of Nose Hill, an outlier of the Neutral Hills to the east. They are limited in extent, and only 125 ha are mapped within the county. They are, however, highly suited to production of dryland agriculture crops and are correlated the same as soils found in greater areal extent in the adjoining special area 4.

Coronation is classified as an Orthic Dark Brown Chernozemic soil. The moderately to strongly acid dark grayish brown A horizon averages 15 cm and overlies dark brown to dark yellowish brown subsoil. Textures range from loam to silty clay loam. Loams are prevalent in soils on mid to upper apron slopes and clay loams are dominant in soils on lower slopes. Reaction ranges from weakly acid to alkaline with increasing depth in the subsoil. A weakly calcareous lime horizon is found at depths greater than 70 cm in medium-textured materials.

Coronation map units

CNN1 - This is the only unit mapped to date. Coronation soils are dominant and occupy 60 to 80 percent of the unit. This unit contains 10 to 30 percent Solonetzic Dark Brown Chernozemics (unnamed) developed on silt loam to silty clay loam materials that occur frequently at mid to lower apron slope positions. Inclusions of Solonetzic soils (less than 10 percent of the areas), occur along apron margins. Some surface salinity is noticeable along margins adjoining till areas with dominant Solonetzic soils.

Land use - These soils have high agricultural value for dryland grain and oilseed crops. They are stone free, easily tilled, and except for the apron margin areas mentioned above, appear to have few management problems.

Disturbed (D.L.) land

General setting and description

Disturbed land is a term used to describe areas that have been disrupted by surface mining of coal deposits. The total area of disturbed land, is in mosaic 1 (appendix D) in the northwest corner of the county. Three surface coal mining projects, namely Diplomat, Vesta and Paintearth, are active in this area and supply coal for the nearby Alberta Power Corporation's Battle River generating station.

Disturbed land areas within the county are due to recent and ongoing mining activity. As a result, such areas include fresh mounds of bedrock spoil, stockpiled surface soil materials and bulldozer-levelled portions being spread with a layer of surface soil materials as part of the reclamation process. Approximately 1130 ha are outlined within this landscape unit.

Edgerton (ERT) soils

General setting and description

Most of the 1176 ha of Edgerton soils occur immediately to the east of the Sullivan Lake Basin. Smaller areas of these soils, similarly situated south and east of smaller lake basins, are located farther east along the southern edge of the county. These soils have developed on sandy eolian materials, are rapidly drained and have very low moisture-holding capacities. Gently undulating and gently rolling areas of Edgerton soils have originated as sand dunes that have been recently stabilized by grassland and aspen groves. Level to gently undulating areas of these soils have low, stabilized dunes occurring in association with thin veneers of sandy glaciofluvial and eolian materials overlying bedrock or till.

Edgerton soils are classified as Orthic Regosols and are associated with inclusions of Cumulic Regosols. The Orthic Regosols have a dark brown A horizon that averages 10 cm. A pale brown C horizon is found below the A horizon but a brownish-gray transition AC horizon is sometimes present between the A and C horizons. The Cumulic Regosols have one or more buried A horizons within the top 50 cm of the soil profile. Fine sand texture and loose, single grain structure are characteristic of both profile types.

Edgerton map units

ERT1 - This unit is dominantly composed of Edgerton soils that have up to 20 percent inclusions of Orthic Dark Brown Chernozemic (Wainwright) and Rego Dark Brown Chernozemic (Houcher) soils on sandy glaciofluvial or fluvial and eolian materials. ERT1 units account for slightly more than half (approximately 260 ha) of the area dominated by Edgerton soils.

Only one topographic phase is mapped:

- ERT1/2: undulating; 3 to 6 percent slopes.
- ERFN2 - Edgerton soils and Dark Brown Solodized Solonetz soils of the Fenner (FNR) series are dominant in this unit with significant amounts of Gleyed Fenner and undifferentiated Gleysols.

The Fenner soils are developed in a thin veneer (50 cm or less) of sandy glaciofluvial and eolian material overlying sodic softrock or moderately saline till. The tough, compact solonetzic B horizon of the Fenner soils is formed in the finer-textured materials underlying the sandy veneer.

Two topographic phases of this unit are mapped:

- ERFN2/2: 0 to 2 percent slopes; approximately 370 ha.
- ERFN2/3: 0 to 5 percent slopes; approximately 160 ha.

These two phases are separated because the unit with lower slopes has greater amounts of Gleysols and Gleyed subgroups.

Land use - The extremely droughty nature of Edgerton soils and their susceptibility to wind erosion restricts their use to unimproved pasture and, occasionally, improved pasture or forage.

Elnora (EOR) soils

General setting and description

These soils occur only in the northwest corner of the county in agroclimatic zone 1, where they are mapped as the dominant soils on approximately 1500 ha. Elnora soils are well drained, black, grassland soils that have developed on fine loamy till. No units of pure Elnora were delineated in the county. Areas delineated as Elnora are gently undulating (slopes less than 5 percent) and have significant proportions (20 to 40 percent) of thin, discontinuous, sandy loam glaciofluvial materials overlying till. Till in these areas is fluvially modified and includes bands of sandy materials at depth.

Elnora is classified as an Orthic Black Chernozemic soil. It has a black, granular A horizon up to 15 cm, a brown to yellowish brown, prismatic B horizon with no or slight organic matter staining on vertical ped faces and a moderately to strongly calcareous lime horizon at depths near 60 cm. The well-drained till parent materials range from clay loam to loam in texture. Elnora soils mapped in this county are not typical because their parent materials show evidence of fluvial sorting and redeposition.

Elnora map units

Relatively pure units of Elnora do not occur to an extent mappable at the 1:50 000 scale. Complex units include the following:

EORO1 - Orthic Black Chernozemics comprise two series, Elnora (EOR) and Rosebank (ROS), and are dominant in combined amounts of 60 to 80 percent. Soils of the newly named Rosebank series have solum characteristics equivalent to those of the Irma soil series but are distinguished from it by having a till contact at depths less than 1 m from the soil surface. Rosebank soils are developed on a sandy loam glaciofluvial veneer and occur in close association with the Elnora soils. Frequent inclusions of Solonetzic Black Chernozemic soils of the Heisler (HER) series are present in amounts of 15 to 30 percent. Gleyed subgroups in amounts less than 15 percent may be present as minor inclusions.

Two topographic phases are mapped:

- EORO1/2p: 0 to 2 percent slopes; surface stones greater than 3 percent; approximately 70 ha.)
- EORO1/3: 2 to 5 percent slopes; approximately 130 ha.

EORO2 - This unit differs from EORO1 by having significant amounts (15 to 40 percent) of soils with imperfect and poor drainage. These include Gleyed Solonetzic Black and Gleyed Black Chernozemic soils, and undifferentiated Gleysols, respectively. Inclusions of Black Solodized Solonetz developed on sandy loam glaciofluvial veneer over till are present in amounts up to 15 percent.

Two topographic phases are mapped:

- EORO2/2: 0 to 2 percent slopes; occupies approximately 1230 ha.
- EORO2/3p: 2 to 5 percent slopes; surface stones greater than 3 percent; approximately 60 ha.

Land use - The Elnora-Rosebank soil units are limited in extent but are among the most productive for dryland agriculture in the county. A major management constraint is their susceptibility to wind erosion especially the sandier Rosebank soils. Severe local soil drifting occurs under bare soil conditions and is a problem during spring seeding operations.

Fenner (FNR) soils

General setting and description

Small areas composed of dominantly Fenner soils are found in mosaics 6, 15 and 18, and together amount to about 200 ha or 0.1 percent of the county. The largest area, around 100 ha, is found along the southern edge of mosaic 6 just east of the Sullivan Lake Basin.

Soils belonging to the Fenner series are classified as Dark Brown Solodized Solonetz. Fenner soils have developed on a veneer (50 cm or less in thickness) of loamy sand to sand glaciofluvial and eolian materials overlying sodic shales and sandstones or, to a minor extent, on saline till derived from them.

A typical Fenner profile has a dark brown surface A horizon that averages 15 cm, lighter colored, eluviated A horizons (Ahe, Ae) of variable thickness and a compact solonetzic B horizon at an average depth of 40 to 45 cm. Fenner soils bear a close overall resemblance to soils of the Sullivan Lake series but are differentiated from them by having sandy rather than loamy textures in the A horizons.

Fenner Map Units

FNTL1 - This is the only Fenner unit mapped in the county. Fenner soils are dominant with significant amounts (15 to 40 percent) of eroded Dark Brown Solodized Solonetz (eroded phase Torlea soils) present in micro-depressions. Overall, topography is gently undulating with slopes of 2 to 5 percent. Inclusions of Dark Brown Chernozemic soils, Wainwright (WWT) series, occur on upper slope positions where the sandy glaciofluvial or eolian veneer is sometimes greater than 1 m.

Land use - Extreme droughtiness coupled with shallow depth to the solonetzic hardpans largely restricts use to unimproved or improved pasture.

Flagstaff (FST) soils

General setting and description

Approximately 36 510 ha, representing nearly 11 percent of the County of Paintearth, are delineated with Flagstaff soils as the dominant map unit component. Over the main Solonetzic portion of the county, Flagstaff soils are evenly distributed, ranging from 500 to 1000 ha per full-size mosaic. Substantially larger amounts, from 1500 to 6000 ha per mosaic are found in mosaics 13, 14, 15, 19, 20, 23 and 24. Higher concentrations of Flagstaff soils in these map sheets mark a transition from dominantly Solonetzic to dominantly Chernozemic soils in the northeast portion of the county.

Flagstaff soils are classified as Solonetzic Dark Brown Chernozemic. They are well drained and have developed on weakly saline (2 to 4 ds/m), weakly sodic (SAR less than 8), brown, slightly stony, clay loam till. They have loam or sandy loam textured, dark brown, A horizons that average about 15 cm. They differ from Orthic Dark Brown Chernozemic soils developed on till, (Hughenden soils), by having eluvial A horizon development and a B horizon that shows appreciable illuvial clay accumulation associated with weak solonetzic morphology. This weak solonetzic B morphology is evident as prismatic structure that breaks to fine angular blocky with some dark organic matter staining on ped surfaces. Flagstaff is separated from Solonetzic soils developed on till, namely Halkirk and Brownfield soils, by having a B horizon that lacks both the strong structure and exchangeable cation chemistry typical of the solonetzic B horizon. The Canadian System of Soil Classification recognizes an exchangeable Ca/Na ratio of less than 10 as the dividing line between solonetzic and non-solonetzic B horizons. The Halkirk and Brownfield B horizons have exchangeable Ca/Na values that are below 10. The exchangeable Ca/Na values of the Flagstaff B horizon range from 10 to 60.

Another Solonetzic Dark Brown Chernozemic, the Onnevue series, is found in appreciable quantities in association with Flagstaff. Onnevue has B and C horizons similar to those of Flagstaff but differs by having no eluvial A horizon development. It is found on upper slope positions between normal Chernozemics on slope crests and Solonetzic soils on mid- to lower slopes. Because Flagstaff and Onnevue soils occur together and have similar management considerations, they are treated as a single mapping association.

Difficulty is sometimes encountered in separating Flagstaff soils from soils of the Lanfine series. Lanfine soils are classified as Eluviated Dark Brown Chernozemic. They have developed on loam to clay loam till and have a sequence of horizons similar to those of the Flagstaff soil. Flagstaff soils, however, can be recognized by dark organic staining on B horizon ped surfaces and the usual presence of salts and secondary carbonates in the C horizon. Identification and mapping of these soils is aided in that Flagstaff soils are found together with their Solonetzic associates, Halkirk and Brownfield, whereas Lanfine soils occur, for the most part, as inclu- sions in Hughenden dominant soil areas.

Flagstaff Map Units

FST1 - This unit accounts for approximately 20 percent of the Flagstaff-dominant area of the county. Flagstaff is dominant with significant amounts (20 to 40 percent) of Onnevue. Inclusions of Orthic Dark Brown Chernozemic (Hughenden) soils are present in amounts ranging from 10 to 30 percent. Minor inclusions, less than 10 percent, of Eluviated Dark Brown Chernozemic (Lanfine) soils may be present.

Two topographic phases are mapped:

- FST1/3: 3 to 5 percent slopes; approximately 2700 ha.
- FST1/4: 5 to 12 percent slopes; approximately 4850 ha.

FST2 - This unit includes nearly 40 percent of the Flagstaff-dominant area. Dominant proportions of Flagstaff and Onnevue are very similar to those of FST1 and inclusions of Hughenden are similarly common. This unit, however, has significant proportions (15 to 40 percent) of Gleyed Flagstaff soils on lower slopes and Humic Luvic Gleysols (Cordel) in depressions. Inclusions of Solonetzic soils, mainly Dark Brown Solod (Brownfield), are present in amounts less than 20 percent.

Two topographic phases are mapped:

- FST2/3: 0 to 4 percent slopes; approximately 9300 ha.
- FST2/4: 5 to 12 percent slopes; approximately 4850 ha.

FST7 - This unit accounts for another 40 percent of the Flagstaff-dominant area in the county. The proportions of dominant soils and inclusions very similar to those of FST1. This unit, however, is characterized by having significant proportions (20 to 40 percent) of Solonetzic soils, including both Halkirk and Brownfield soils.

Two topographic phases are mapped:

- FST7/3: 3 to 5 percent slopes; approximately 6430 ha.
- FST7/4: 6 to 9 percent slopes; approximately 7890 ha.

FSHE1 - This map unit is characterized by having significant amounts (30 to 50 percent) of Solonetzic Black Chernozemic soils (Heisler) in association with the dominant Flagstaff soils. Inclusions of Humic Luvic Gleysols (Cordel) are present in amounts less than 15 percent. The unit is found only in mosaic 11, where small areas transitional to the black soil zone have been delineated on uplands just south of the Battle River.

Two topographic phases are mapped:

- FSHE1/3: 3 to 5 percent slopes; approximately 70 ha.
- FSHE1/4: 6 to 10 percent slopes; approximately 80 ha.

FSHE2 - This map unit is separated from FSHE1 by having significant amounts (15 to 40 percent) of Gleyed subgroups and Gleysols, namely, Gleyed Flagstaff and Heisler together with Humic Luvic Gleysols (Cordel), on lower slopes and in depressions.

Only one topographic phase is mapped:

- FSHE2/4: 5 to 12 percent slopes; found only in mosaic 11; approximately 210 ha.

Land use - Flagstaff soils are used for dryland agricultural crops. They are considered good arable soils and, because of their somewhat heavier textured but friable B horizons, they appear to be more drought resistant than Hughenden soils. They do, however, have more strongly acid surface horizons than does Hughenden, and may require lime and fertilizer applications for best yields.

Fleet (FLT) soils

General setting and description

These are the major poorly drained soils in the County of Paintearth. They are evenly distributed throughout the county, are found in low-lying areas and are developed on thin (less than 2 m) glaciolacustrine materials or on local inwash materials derived from surrounding till deposits. Approximately 15 820 ha, representing nearly 5 percent of the project area, have Fleet as the dominant soil component.

Fleet soils are classified as Orthic Humic Gleysols. They have an unmottled black A horizon, a dark gray, gleyed B horizon with numerous, prominent, fine reddish mottles and an olive gray, gleyed C horizon that has few reddish mottles and shows secondary accumulations of salts and carbonates. The A horizon exhibits tonguing to the bottom of the B horizon but averages less than 20 cm. The firm, massive or very coarse columnar structure of the B horizon exhibits organic matter staining and a sticky consistence indicative of early stages of solonetz formation. Average depth to salts is around 30 cm. Average depth to lime is approximately 40 cm. A detailed description of a representative Fleet profile and results of chemical and physical analyses of the profile horizon samples are given in appendix A.

FLFM1 - This is the only unit mapped. The unit is found in low-lying areas with level to depressional and nearly level topography. The dominant soils (60 to 70 percent) include Orthic Humic Gleysols of the Fleet series and more poorly drained variants that lack the prominent mottling and very coarse columnar B horizon development characteristic of Fleet soils. The Fleet soils in this unit are associated with significant amounts (30 to 40 percent) of Foreman soils along the imperfectly drained margins of these low-lying areas or at slightly higher topographic positions within such areas. Foreman soils are classified as Gleyed Black Solonetz and have developed on moderately to strongly saline clay till. They have a black, silt loam A horizon that averages 10 cm and is formed directly above a solonetzic B horizon. Gleyed equivalents of well-drained soils in adjacent map units are common inclusions (up to 20 percent) in this unit. Minor inclusions of Forestburg soils (Orthic Humic Gleysols developed on residual materials) were identified at scattered locations. These were too limited in extent and not sufficiently different in management constraints to warrant designation as a separate map unit.

Two topographic phases are mapped:

- FLFM1/2: 0 to 2 percent slopes; approximately 11 910 ha.
- FLFM2/3: 0 to 4 percent slopes; approximately 3900 ha.

Land use - Wetness together with high subsoil salinity and sodicity are major overall constraints in FLFM1 map areas. Surface soil salinity may be a problem, especially when adjoining upland map areas are strongly Solonetzic and depths to sodic bedrock are less than 2 m. As indicated earlier in the report section on general hydrology, these low-lying areas should not be considered discharge areas. Although permeability is very low, the overall hydrologic gradient is downward. Surface salt accumulation is the result of upward salt movement during capillary moisture flow from an underlying saturated zone at shallow depth (30 to 60 cm) and concentration at the surface by evaporation. Delivery of salts to these low-lying areas is accomplished by lateral movement from adjacent areas. Evidence for this can be seen in the form of progressively shallower depths to salt accumulation layers in Fleet soils located away from the centers of depressions and in the occurrence of Gleyed Solonetz (Foreman) soils along the margins where salt flux variations are greatest.

Further evidence of the importance of lateral transport for salt accumulation problems in FLFM1 areas comes from field and aerial photo observations. Such observations suggest that salt encroachment in these areas is occurring where adjacent upland areas have Solonetzic soils with strongly saline subsoils. The encroachment may be aggravated by a cropping regime with frequent summerfallow. Because frequent summerfallow is regarded as a necessary practice in the drier southern half of the county and because the most severe Solonetzic soil conditions are also present in this portion, salt encroachment problems in FLFM1 and other units, namely HKTL2 and HKBF2, may prove difficult to solve.

Uncultivated FLFM1 areas are characterized by a luxuriant cover of sedge and sporadic clumps of willows along their margins. With cultivation only the wettest central portions, those that cannot be tilled with modern, large-scale, dryland farming equipment, still remain as small islands of wetland. Such areas have appreciable standing water only in wetter-than-average years and are frequently dry to depths of a meter or more after two or three summers of low rainfall. As a result, these areas frequently serve as a source of cattle forage.

One example is found in the extensive FLFM1 area along the western edge of mosaic 20. Here, during the present dry cycle, the sedge in the formerly inundated central area is cut and baled for hay. Another large area of FLFM1 is found in the Lanes Lake Basin, a short distance southwest of the town of Castor. Here, only the wettest portions with standing water remain unused for forage. Some cultivation of cereals occurs along the margins of these larger low-lying areas, but its continued success depends on continuing drier-than-average weather conditions.

The FLFM1 units occupy only 5 percent of the county. Together with other wetland areas, however, their nature and extent are very important considerations when dealing with problems of drainage consolidation, soil salinity and wetland management.

Gleddies (GLS) soils

General setting and description

Approximately 5040 ha, representing only 1.5 percent of the County of Paintearth, are occupied by soils belonging to the Gleddies series. The largest concentrations of Gleddies soils are found along the margin of the Sullivan Lake Basin (mosaic 6), in the basin directly southeast of Bulwark (mosaics 14 and 19) and in the Hamilton Lake Basin (mosaic 17) in the southeast corner of the county.

Gleddies soils are classified as saline Rego Gleysols and are poorly drained. These soils are characterized by having an AC horizon sequence. Some prominent iron oxide mottling is evident in the subsoil, but the abundant mottling common to B horizons of Orthic Gleysols is absent. The A horizon of Gleddies soil is less than 10 cm and contains salts or has salt crusts at the surface. These soils are developed on level to very gently undu- lating, saline, clayey glaciolacustrine materials.

Gleddies map units

GLS1 - This unit accounts for more than 90 percent of the Gleddies soils mapped in the county. Gleddies soils comprise about 80 percent or more of the unit. Inclusions of Dark Brown Solonetz soils (Victor) are found in amounts up to 20 percent along the margins of these basin areas. This unit is found in low-lying glaciolacustrine basins and is recognized by its characteristic salt-tolerant vegetation and common, extensive occurrence of whitish surface salt accumulations. Upon drying, such salt accumulations are often eroded by wind and are deposited with deleterious effects on nearby upland soils.

One topographic phase is mapped:

- GLS1/2: less than 2 percent slopes; approximately 4730 ha

GLLS1 - This unit is characterized by having a significant component of Dark Brown Solodized Solonetz (Lakesend) developed on a silty clay loam glaciolacustrine veneer overlying till. Inclusions of undifferentiated soils on recent fluvial materials and small water bodies (streams and sloughs) occupy approximately 20 percent of the area. The single delineation of this unit is found adjoining the northern extension of Sullivan Lake.

Only one topographic phase is mapped:

- GLLS1/3: 0 to 4 percent slopes; approximately 310 ha in mosaic 7.

Land use - Gleddies soils remain as uncultivated, saline wetlands within areas of dryland cultivation. Cultivation occasionally extends into these areas but yields are marginal because of the high soil salinity. Gleddies soils support only sparse, poor-quality salt-tolerant grasses and herbs.

Gleysol (GY) landscape

General setting and description

Approximately 14 460 ha, constituting about 4 percent of the county, consists of wet, low-lying areas, having soils not identified with named soil series. This unit is used partly as a mapping convenience because not all wet areas could be visited in the time available for field survey. The proportion of undifferentiated Gleysol areas in any particular mosaic is, therefore, partly a function of the total amount of wetland present in that mosaic. However, although a certain proportion of these areas might have been identified as, say FLFM1, most of them have significant amounts (20 to 40 percent) of standing water and Gleysolic soils that cannot be classified as named soil series. Characteristically, high soil variability appears to result largely from the effects of fluctuating moisture regimes on complex, stratified materials apparently unique in each separate basin.

Gleysol map units

GY1 - This unit is composed dominantly of undifferentiated Gleysolic soils and includes a significant, though variable, proportion of shallow standing water. This unit is a landscape rather than a soil map unit; therefore, topographic phases are not designated in the mapping symbol. Slopes range from 0 to 2 percent.

Land use - Because of their wetness, GY1 areas remain uncultivated. They do, however, provide some water for livestock and are used for pasture and forage.

Halkirk (HKR) soils

General setting and description

Map units dominated by Halkirk soils cover approximately 114 570 ha, almost 34 percent of the County of Paintearth. These are the major soils of the county and are dominant in the areas encompassed by the Castor Plain and Daysland Plain physiographic units.

Halkirk soils are classified as Dark Brown Solodized Solonetz. They have good to moderate drainage and have developed on brownish, weakly calcareous, moderately to strongly saline and sodic, clay loam till, shallow thickness (1 to 6 m), over sodic softrock. Halkirk soils have a dark brown, loam to sandy loam A horizon that averages about 13 cm. Eluviated A horizons, including a brown or pale brown Ahe and a light gray Ae, are present in varying thicknesses and range from sandy loam to loam in texture. Depth to the tough, compact solonetzic B horizon averages between 18 and 20 cm. The B horizon is characterized by having strong, coarse, round-topped columnar structure that does not readily break down into finer blocky aggregates. Dark brown organic staining is characteristically concentrated on upper column sides. Depths to secondary lime and salt accumulations in the C horizon averages approximately 40 cm. Halkirk soils are further characterized by having distinct and continuous horizons of secondary lime-salt accumulations that average close to 4 percent calcium carbonate equivalent. Sodium absorption ratios (SAR) vary widely and range from 12 to 24. Finally, the brown, dominantly clay loam parent materials of the Halkirk soils are clearly identifiable as till and do not contain sizeable inclusions of slightly altered or unaltered sodic bedrock materials.

Halkirk map units

Relatively pure units of Halkirk could not be delineated at the 1:50 000 mapping scale. Halkirk dominant areas are extremely complex but like other soil units they are designated using Halkirk and one other major soil associate. Units so designated include the following:

HKBF1 - This unit constitutes approximately 20 percent of the Halkirk dominant area in the county. The dominant Halkirk soils in this unit are associated with significant amounts (20 to 40 percent) of Dark Brown Solod (Brownfield) on similar till parent materials. Brownfield soils are recognized by the presence of a solonetzic B horizon which retains its solonetzic chemistry but has lost its tough, coherent, round-topped columnar structure and readily breaks down into smaller, blocky aggregates. A transition AB horizon is present in cases where B structure breakdown is more advanced. Depth to lime-salt layers in the C horizons averages 55 to 60 cm, substantially greater than that for Halkirk soils. Inclusions (10 to 30 percent) of Solonetzic Dark Brown Chernozemic (Flagstaff) soils are present as a minor part of the complex. Slope position occurrences of component soils are largely unpredictable in this unit.

Two topographic phases are mapped:

- HKBF1/3: 3 to 5 percent slopes; approximately 19 740 ha.

- HKBF1/4: 5 to 9 percent slopes; approximately 1880 ha.

HKBF2 - This unit includes nearly 30 percent of the area mapped with Halkirk as the dominant soil series. It differs from HKBF1 by having significant amounts (15 to 40 percent) of Gleyed soils, including Gleyed Black Solonetz (Foreman) and Gleyed Halkirk together with Orthic Humic Gleysols of the Fleet series.

Two topographic phases are mapped:

- HKBF2/3: 2 to 5 percent slopes; approximately 32 560 ha.
- HKBF2/4: 2 to 7 percent slopes; approximately 680 ha.

HKLS2 - This unit occupies only 1 percent of the Halkirk-dominant area. Occurrences are located in mosaics 2, 7, 8 and 9. Halkirk and Lakesend (LSD) soils are dominant in this unit. Significant proportions (15 to 40 percent) of Gleyed subgroups of Halkirk and Lakesend together with Orthic Humic Gleysols (Fleet) are characteristic of this unit. Lakesend (LSD) soils are classified as Dark Brown Solodized Solonetz and have developed on silty clay loam glaciolacustrine veneer overlying till at depths ranging from 30 to 100 cm. Lime-salt horizons occur at about 40 cm in Lakesend soils, and depth to till is greater, averaging approximately 60 cm.

Two topographic phases are mapped:

- HKLS2/2: 0 to 2 percent slopes; approximately 520 ha.
- HKLS2/3: 2 to 5 percent slopes; approximately 570 ha.

HKSU1 - This unit covers between 2 to 3 percent of the area designated primarily as Halkirk. Characteristic occurrence is in transition areas between till and glaciofluvial deposits. Significant amounts (20 to 40 percent) of Sullivan Lake, a Dark Brown Solodized Solonetz developed on sandy loam glaciofluvial veneer less than 0.5 m thick over till, are found on upper slopes and low ridges in close association with Halkirk. Inclusions (10 to 30 percent) of Dark Brown Solod (Brownfield) and Solonetzic Dark Brown Chernozemic (Flagstaff) are common.

Two topographic phases are mapped:

- HKSU1/3: 2 to 5 percent slopes; approximately 2350 ha.
- HKSU1/4: 4 to 9 percent slopes; approximately 370 ha.

HKSU2 - This unit accounts for approximately 3 percent of the area of Halkirk dominant soils. It is separated from HKSU1 by having significant amounts, (15 to 40 percent) of Gleyed and Gleysolic soils. Gleyed components include imperfectly drained versions of dominant soils and some Foreman (FMN). Fleet (FLT) is the major Gleysolic component, although inclusions of undifferentiated Gleysols are common.

Two topographic phases are mapped:

- HKSU2/2: 0 to 2 percent slopes; approximately 460 ha.
- HKSU2/3: 0 to 5 percent slopes; approximately 3035 ha.

HKTL1 - This unit constitutes nearly 25 percent of the Halkirk-dominant area in the county. A complex of three Dark Brown Solodized Solonetz soils are dominant in this unit. These include typical Halkirk soils developed on brown till, typical Torlea soils developed on residual materials and Solodized Solonetz soils developed on gray till and recognized as a variant of the Halkirk series.

The Halkirk variant is dominant in this unit. It is developed on grayish till that is higher in clay and salts and lower in lime than the usual brownish Halkirk till parent materials. Typical profiles have an A horizon that averages about 10 cm; eluvial A horizons (Ahe, Ae) of variable thickness; and a compact solonetzic B horizon that occurs at an average depth of 15 cm and has round-topped columnar structure with organic staining intermediate in color between that of Halkirk and Torlea soils. Accumulations of secondary lime carbonates and salts occur at depths between 35 and 40 cm.

Although its areal extent would probably warrant naming a new series, this Halkirk variant is not presently given series recognition because its complex association with Halkirk and Torlea soils make consistent separate mapping impractical at 1:50 000 scale. Recognition as a separate soil variant intermediate in properties between Halkirk and Torlea, however, helps to clarify series level differences between these soils in a manner useful for deep tillage suitability interpretations. Field site inspections to make deep tillage recommendations will be aided by recognition of this variant. Recognition as a new soil series may be possible at mapping scales larger than 1:50 000.

Time considerations prevented sampling and analysis of a representative Halkirk variant profile. Samples of diagnostic horizons were collected during transect sampling. Results of laboratory analysis of these samples are presented in the deep tillage suitability report (Wells, 1985).

The HKTL1 map unit has inclusions, ranging from 10 to 30 percent, of Dark Brown Solods (Brownfield) and Solonetzic Dark Brown Chernozemics (Flagstaff). Gleyed and Gleysolic soils occupy less than 15 percent of the unit.

Eight separate phases, some rather limited in areal extent, are mapped in the county:

- HKTL1/3: 2 to 5 percent slopes; approximately 10 070 ha.
- HKTL1/3e: 2 to 5 percent slopes; eroded pits cover 30 percent of the surface; approximately 8240 ha.
- HKTL1/3ep: 2 to 5 percent slopes; stones and boulders occupy more than 3 percent of the area; approximately 170 ha.
- HKTL1/4: 6 to 9 percent slopes; approximately 2820 ha.

- HKTL1/4d: 6 to 9 percent slopes; slopes frequently dissected and subject to continuing erosion; approximately 5340 ha.
- HKTL1/4e: 6 to 9 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 280 ha.
- HKTL1/4p: 6 to 9 percent slopes; stones and boulders occupy more than 3 percent of the surface; approximately 60 ha.
- HKTL1/4ep: 6 to 9 percent slopes; stones and boulders occupy more than 3 percent of the surface; eroded pits occupy more than 30 percent of the surface; approximately 30 ha in mosaic 9.

HKTL2 - This unit accounts for approximately 22 percent of the area of Halkirk-dominant soils. The occurrence of dominant soils is similar to that of HKTL1. This unit is separated from HKTL1 by having significant amounts (15 to 40 percent) of Gleyed soils. These Gleyed soils include Foreman and gleyed versions of Halkirk, Halkirk variant and Torlea soils. Map unit inclusions are similar to those of HKTL1.

Seven separate phases are mapped:

- HKTL2/2: 0 to 2 percent slopes; approximately 360 ha.
- HKTL2/2e: 0 to 2 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 520 ha.
- HKTL2/2ep: 0 to 2 percent slopes; stones and boulders occupy more than 3 percent of surface; approximately 180 ha.
- HKTL2/3: 2 to 5 percent slopes; approximately 11 640 ha.
- HKTL2/3e: 2 to 5 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 12 060 ha.
- HKTL2/3ep: 2 to 5 percent slopes; stones and boulders occupy more than 3 percent of surface; approximately 240 ha.
- HKTL2/4: 5 to 9 percent slopes; approximately 270 ha.

Land use - Halkirk soils are used for dryland crop production. The success varies as a result of differing severity of Solonetzic soil conditions. Well-drained areas of Halkirk in association with Brownfield appear to have the highest potential crop yields. Their inherent solonetzic conditions can be ameliorated by deep plowing. Subsoiling or ripping produces some improvement in crop yields, but the yield increase does not equal that of deep plowing unless lime is added to counteract the strong surface soil acidity and to improve soil structure.

Areas of Halkirk soils in association with Torlea soils present some of the severest Solonetzic soil conditions in the county. Because of shallowness to sodic bedrock, these areas have only marginal response to deep tillage.

Halkirk map areas with significant amounts of imperfect and poorly drained soils should not be deep plowed because deep plowing aggravates conditions of high salinity and sodicity present at these sites. Ripping appears less likely to cause such damage but is still not recommended. More information about deep tillage suitability of soils can be obtained in the interpretative report for the soil survey of the County of Paintearth (Wells, 1985).

Hughenden (HND) soils

General setting and description

Areas of Hughenden-dominant soils occupy nearly 13 percent of the County of Paintearth. Most of these areas are concentrated in mosaics 20 to 24 in the Neutral Hills physiographic section at the northeastern side of the county.

Hughenden soils are classified as Orthic Dark Brown Chernozemic. They have a dark brown, loam-textured A horizon that averages 15 cm. Its brownish B horizon has coarse prismatic structure that breaks into subangular blocky and granular aggregates. This B horizon has little or no illuvial clay accumulation and organic staining on aggregates is minimal. Slight clay accumulations however, can be found in the B horizon of Hughenden soils that occur in association with Solonetzic Chernozemics, such as Flagstaff or Onnevue. Depths to secondary lime accumulations in the C horizon average about 50 cm in Hughenden soils. Salts are absent, or present only in low quantities at greater depth. Hughenden soils are found as dominant soil landscape components on well-drained, brownish loam to clay loam till, greater than 6 m on undulating, rolling and hummocky topography. Till thickness ranges over 15 m in these deposits (Gravenor and Bayrock, 1955).

Hughenden map units

HND1 - This unit accounts for almost 17 percent of the Hughenden-dominant area. Hughenden soils are dominant (70 to 80 percent) with inclusions (10 to 30 percent) of Eluviated Dark Brown Chernozemic (Lanfine) and Calcareous or Rego Dark Brown Chernozemic (Neutral) soils.

Four topographic phases are mapped:

- HND1/3: 2 to 5 percent slopes; approximately 4250 ha.
- HND1/4: 6 to 9 percent slopes; approximately 2230 ha.
- HND1/5: 10 to 15 percent slopes; approximately 620 ha.
- HND1/5d: 10 to 15 percent slopes; frequent steep-sided gullies; unique area mapped only in mosaic 24; approximately 35 ha.

HND2 - This unit constitutes 32 percent of the area of Hughenden-dominant soils. Proportions of dominant soils and inclusions are very similar to those of HND1. This unit is separated from HND1 by having significant amounts (15 to 40 percent) of basin-like areas with imperfect and poorly drained soils. Humic Luvic Gleysols belonging to the Cordel soil series occupy the central basin areas and Gleyed Hughenden soils are found on immediately adjacent lower slopes.

Four topographic phases are mapped:

- HND2/3: 2 to 5 percent slopes; approximately 4000 ha.
- HND2/4: 6 to 9 percent slopes; approximately 4160 ha.
- HND2/5: 10 to 15 percent slopes; approximately 5070 ha.
- HND2/6: 16 to 35 percent slopes; approximately 410 ha in mosaics 20 and 23.

HND4 - This unit covers approximately 13 percent of the area mapped with Hughenden as the dominant soil. It is separated by having significant amounts (20 to 40 percent) of Calcareous and Rego Dark Brown Chernozemic soils belonging to the Neutral series, on upper slopes and knolls. Neutral soils are classified as Calcareous Dark Brown Chernozemic. Lesser amounts of Rego Dark Brown Chernozemic are included with the Neutral series as a mapping convenience. Neutral soils are characterized by having a brownish (10YR, 7.5YR Hues), calcareous B horizon under a dark brown A horizon. The associated Rego Dark Brown Chernozemic lacks the calcareous B horizon and is calcareous to the top of the thin (10 cm or less) A horizon. Inclusions of eroded Neutral (truncated or missing A horizon) occur with increased frequency on steeper slope phases. In- clusions (less than 15 percent) of coarse-textured soils developed on ice-contact materials are also common on steep slope phases.

Three topographic phases are mapped:

- HND4/3: 3 to 6 percent slopes; only two areas are mapped, one in mosaic 24 the other in mosaic 28; approximately 210 ha.
- HND4/4: 6 to 9 percent slopes; approximately 1940 ha.
- HND4/5: 10 to 20 percent slopes; approximately 3380 ha.

HND6 - This unit accounts for 15 percent of the Hughenden-dominant soil area mapped in the county. This unit is identified by having significant amounts (15 to 40 percent) of Orthic Dark Brown Chernozemics (Hughenden variants) with good to rapid drainage developed on sandy ice-contact materials. Proportions of included soils are similar to those of HND1 and HND2 units. These inclusions are generally sandy in texture.

Four topographic phases are mapped:

- HND6/3: 3 to 5 percent slopes; one area is delineated in mosaic 28; approximately 40 ha.
- HND6/4: 6 to 10 percent slopes; approximately 1720 ha.
- HND6/5: 10 to 15 percent slopes; approximately 3700 ha.
- HND6/6: 15 to 35 percent slopes; approximately 960 ha.

HND8 - This unit includes approximately 18 percent of the Hughenden-dominant area in the county. It is equivalent to the HND4 unit but has significant amounts (15 to 40 percent) of Humic Luvic Gleysols (Cordel) and Gleyed Hughenden soils in and around depressional areas.

Three topographic phases are mapped:

- HND8/4: 6 to 10 percent slopes; approximately 1510 ha.
- HND8/5: 10 to 15 percent slopes; approximately 3790 ha.
- HND8/6: 15 to 35 percent slopes; approximately 2550 ha.

HNSC7 - This unit accounts for only about 5 percent of the Hughenden-dominant area in the county. It is equivalent to a HND6 unit but has significant amounts (20 to 40 percent) of Halkirk and Sullivan Lake soils. Smaller proportions of Scollard soils are present as part of dominant soil complex. Most of HNSC7 is mapped in mosaics 15 and 17.

Two topographic phases are mapped:

- HNSC7/3: 2 to 5 percent slopes; approximately 1270 ha.
- HNSC7/4: 6 to 9 percent slopes; approximately 1080 ha.

Land use - Hughenden soils on gentle to moderate slopes constitute some of the best arable land in the county. However on steeper slopes, especially in combination with coarse-textured ice-contact materials, there are severe restrictions to dryland farming. Steeper topographic phases, in addition to posing direct physical difficulties to farming operations, are more subject to damage by soil erosion. The proportion of limy knolls that have eroded Neutral soils appears to increase with increasing amount of time under cultivation. Non-cultivated or freshly broken areas with few or no limy knolls can be observed immediately adjacent to cultivated fields having sizeable areas of such eroded soils. Because more of these soils are presently being brought under cultivation, there is now a large potential for serious erosion in the northeastern part of the county.

Irma (IRM) soils

General setting and description

Areas dominated by Irma soils amount to about 300 ha. These are all found in mosaic 1 and lie within the Dark Brown-Black transition zone at the northwest corner of the county.

Irma soils are well to rapidly drained Orthic Black Chernozemics developed on sandy glaciofluvial materials that contain a few pebbles. They have a black, sandy loam A horizon that ranges from 15 to 20 cm overlying a yellowish brown, sandy loam to loamy sand, structureless B horizon and a loamy sand to sand C horizon. Till may be found at depths as shallow as 70 cm but occurs at depths greater than 1 m.

Irma map units
No relatively pure units of Irma are mapped in the county.

IRRO1 - This well-drained unit accounts for approximately 30 percent of the Irma-dominant area. Irma and Rosebank soils are codominant on level to nearly level terrain. Rosebank soils occur where depths of the sandy loam to loamy sand glaciofluvial materials are less than 70 cm over the clay loam till. Inclusions of Solonetzic Black Chernozemics (Heisler) occur (10 to 30 percent of the area) where till is present at the soil surface. Imperfectly drained soils are present as inclusions in amounts less than 15 percent.

Only one topographic phase is mapped:
- IRR01/2: 0 to 3 percent slopes; approximately 100 ha.

IRR02 - This unit includes approximately 70 percent of the Irma-dominant area. Irma and Rosebank soils are dominant with significant amounts of (15 to 40 percent) undifferentiated Gleysols and Gleyed Black Chernozemics.

Two topographic phases are mapped:
- IRR02/2: 0 to 2 percent slopes; approximately 30 ha.
- IRR02/3: 0 to 5 percent slopes; approximately 180 ha.

Land use - The Irma-dominant areas mapped in this county are almost all cultivated for dryland agricultural crops. Soils in these areas have low moisture-holding capacities, dry out rapidly and are subject to wind erosion if summerfallowed during extended dry weather cycles.

Islands (INS) soils

General setting and description
The total extent of Islands soils is limited to approximately 360 ha in the sandy portion of the county immediately east of Sullivan Lake. Only two separate areas are mapped: one in mosaic 6, the other in mosaic 7.

Islands soils are classified as imperfect to poorly drained Rego Humic Gleysols developed on dominantly sandy glaciofluvial materials. Textures range from loamy sand and sand to sandy clay loam. These soils have a darker colored A horizon that averages around 20 cm. The underlying A C or C horizon is gray and strongly gleyed with few visible reddish iron oxide mottles. The surface horizon is loamy sand to sand in texture but thin (10 to 15 cm) sandy clay loam layers are interspersed with the sandier materials to give a banded appearance throughout the profile. These higher clay layers may have brownish colors and weak blocky structure when they occur at depths normally occupied by B horizons. Layers immediately under the A horizon are lighter gray in color, presumably because of intense gleying in contact with organic matter. Secondary lime carbonates and salts are absent. Because of their high variability and limited extent these soils are presently correlated as variants of the Islands series.

Islands map units
INWW1 - This is the only Islands unit mapped in the county. Islands soils are dominant on level to depressional portions interspersed with significant amounts (20 to 40 percent) of Orthic Dark Brown Chernozemic (Wainwright) soils on low, sandy, glaciofluvial or eolian ridges. Inclusions of rapidly drained sandy Orthic Regosols (Edgerton) and Rego or Dark Brown Chernozemics (Houcher) are also present on these low ridges.

Only one topographic phase is mapped:
- INWW1/2: 0 to 3 percent slopes; approximately 360 ha or about 0.1 percent of the county.

Land use - Most of the Islands-Wainwright soil areas are used for dryland agriculture. They are, however, susceptible to wind erosion during dry weather cycles. Evidence of wind erosion is most pronounced on the low ridges occupied by rapidly drained Wainwright and Edgerton soils. Trafficability may be a problem during wet weather cycles because of the presence of a water table near the surface of the Islands soils in between the low ridges or dunes.

Kehol (KHO) soils

General setting and description
Kehol occurs as the dominant soil on approximately 1050 ha, about 0.3 percent of the county. Small areas of these soils are found on thin (less than 2 m deep) glaciolacustrine materials at scattered locations in the southwestern part of the county. A few more small areas of these soils are mapped on moderately fine textured glaciofluvial apron deposits in the northeastern part of the county.

Kehol soils are classified as Dark Brown Solodized Solonetz. They have developed on weakly calcareous, moderately saline, silty clay loam glaciolacustrine materials (1 to 2 m deep) over till. The underlying till is similar in composition to that of the Halkirk soil parent materials.

Typical Kehol soils have a dark brown, silt loam A horizon that averages between 10 and 15 cm; an eluviated A horizon (Ahe, Ae) of variable thickness and similar silt loam texture; a tough compact solonetzic B horizon with increased clay content and round-top columnar structure; and a silty clay loam C horizon with secondary accumulations of salts and lime immediately under the solonetzic B. Average depth to solonetzic B is around 20 cm while average depth to salts and lime is between 45 and 50 cm. Depth to till is greater than 1 m.

Kehol map units
No relatively pure units of Kehol are mapped in the county.

KHIM1 - This unit accounts for only about 15 percent of the area occupied by Kehol soils. Kehol soils are dominant with significant amounts (20 to 40 percent)of Dark Brown Solonetz (Idamay) soils. Dark Brown Solods (Arrowwood) are present as inclusions. Small Kehol-Idamay soil areas are mapped in mosaics 23 and 24 on silty clay loam glaciofluvial apron deposits around the margins of hilly residual or ice-thrust residual terrain.

Idamay soils have a strongly developed solonetzic B horizon but lack an eluvial A horizon. They have moderate to imperfect drainage and are found on lower slope positions.

Two topographic phases are mapped:

- KHIM1/2: 1 to 2 percent slopes; approximately 100 ha.
- KHIM1/3: 2 to 5 percent slopes; approximately 60 ha.

KHLS2 - This unit includes 85 percent of the Kehol-dominant area in the county. Lakesend is present with Kehol because the till surface is uneven and is present at depths less than 100 cm. The near-surface occurrence of less permeable till may contribute to the significant occurrence (15 to 40 percent) of undifferentiated Gleyed and Gleysolic soils in this unit. Dark Brown

Solods (Arrowwood) are found as minor inclusions closely associated with the Kehol and Lakesend soils.

Two topographic phases are mapped:

- KHLS2/2: 0 to 2 percent slopes; approximately 740 ha.
- KHLS2/3: 2 to 5 percent slopes; approximately 150 ha.

Land use - Kehol-dominant soil areas are totally used for dryland agriculture crops. They do have compact, slowly permeable solonetzic hardpans, but their silty or silty clay loam surface horizon textures make them less drought susceptible than, for example, Halkirk soil areas with their loam surface textures.

Killam (KIM) soils

General setting and description

Killam-dominant soil areas occupy about 420 ha within the Dark Brown-Black transition zone in the northwest corner of the county. Killam soils are classified as Black Solodized Solonetz and are developed on brown, thin (1 to 6 m), weakly calcareous, moderately saline, clay loam to clay till that contains less than 5 percent coarse fragments.

Representative Killam profiles have a black, loamy, surface A horizon 10 to 15 cm thick, discontinuous ashy gray eluvial A horizon and a brown, compact, round- topped columnar B horizon with dark, organic staining. Significant accumulations of secondary lime and salts are found immediately under the solonetzic B horizon.

Killam map units

No relatively pure areas of Killam soils are mapped in the County of Paintearth. Instead, Killam-dominant map areas are associated with soils developed on a thin (50 cm or less) sandy loam glaciofluvial veneer over clay loam till. These associated soils have their solonetzic B horizon developed in the underlying till material. Because of their limited areal extent, they are classified as variants of the Sullivan Lake series although their surface horizons are darker than those of the Sullivan Lake soils.

KISU2 - This unit includes all of the Killam-dominant area in the county. Killam and Sullivan Lake soils are dominant with significant amounts (15 to 40 percent) of undifferentiated Gleyed and Gleysolic soils. Solonetzic Black Chernozemic (Heisler) soils are found as inclusions (up to 20 percent) on the well-drained portions of the unit.

Only one topographic phase is mapped:

- KISU2/2: 0 to 3 percent slopes; approximately 420 ha.

Land use - Except for remaining uncleared portions with depressions surrounded by aspen and willows, these Killam-Sullivan Lake areas are used for cultivated dryland agricultural crops.

Lakesend (LSD) soils

General setting and description

Areas dominated by Lakesend soils amount to approximately 2150 ha, or less than 1 percent of the total area of the county. Lakesend-dominant soil areas, 100 ha or more in size, are found only in mosaics 4, 9 and 17.

Lakesend soils are classified as Dark Brown Solodized Solonetz. They have good to moderate drainage and have developed on a silty clay loam glaciolacustrine veneer less than 100 cm thick over clay loam to clay till or residual softrock materials. The Lakesend soil profiles have a dark brown, silt loam, upper A horizon that averages about 10 cm; a lighter and grayer eluvial A horizon (Ahe, Ae) of variable thickness; a brown, compact, round-topped columnar structured, B horizon with increased clay content and darker organic staining at an average depth of about 20 cm; and a C horizon with secondary lime and salt accumulations at about 40 cm, at least 5 cm shallower than similar lime-salt layers in the closely related Kehol soils.

Lakesend map units

No relatively pure units of Lakesend soils are mapped in the county. The Lakesend units described here are closely associated with Torlea soils and, as a result, sodic softrock materials instead of till underlie the silty clay loam glaciolacustrine veneer materials. These thin glaciolacustrine materials appear to have been deposited on scoured bedrock surfaces in shallow glacial spillways and to have been subject to erosion and partial removal after deposition. Glacial stones and boulders at scattered locations and parallel, finely striated patterns on the aerial photographs are evidence of shallow fluting and further modification of these deposits during local ice readvance. The resulting pattern of discontinuous glaciolacustrine veneer and residual materials is extremely complex and difficult to discern without detailed excavation. The significant presence of surface microrelief in the form of eroded pits further adds to the complexity of these units.

LSTL1 - Significant amounts (20 to 40 percent) of Torlea are present with the dominant Lakesend soils in this unit as described above. Inclusions of Kehol (up to 20 percent) occur on glaciolacustrine materials deeper than 100 cm. This unit accounts for more than half of the Lakesend-dominant area.

Three topographic phases are mapped:

- LSTL1/2e: 0 to 2 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 620 ha.
- LSTL1/3e: 2 to 4 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 450 ha.
- LSTL1/3: 2 to 4 percent slopes; eroded pits occupy less than 30 percent of the surface; approximately 100 ha.

LSTL2 - This unit has significant amounts (15 to 40 percent) of undifferentiated Gleyed and Gleysolic soils with the dominant Lakesend and Torlea soils. Inclusions of Kehol are present on portions with deeper glaciolacustrine materials. Slightly less than half of the Lakesend-dominant area is included in this unit.

Three topographic phases of this unit are mapped:

- LSTL2/2e: 0 to 2 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 400 ha.
- LSTL2/2: 0 to 2 percent slopes; eroded pits occupy less than 30 percent of the surface; approximately 350 ha.
- LSTL2/3e: 0 to 4 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 240 ha.

Land use - Lakesend-Torlea soil areas are seeded with dryland grain and oilseed crops. Portions of some units having eroded pits greater than 30 percent of the surface still remain as unimproved pasture. Uneven or patchy crop growth is characteristic of these units in either dry or wet growing seasons. The presence of imperfect or poor drainage reduces trafficability and makes their management even more difficult.

Leithead (LHD) soils

General setting and description

The area mapped with Leithead as the dominant soil series amounts to approximately 6490 ha, roughly 2 percent of the area of the county. The largest concentrations of these soils occur within the Sounding Creek Plain physiographic district in the southern part of the county and smaller concentrations are found at scattered locations within the Castor Plain district. Mosaics 6, 7, 13 and 17 each include Leithead-dominant areas totalling more than 500 ha.

Leithead soils are classified as Dark Brown Solodized Solonetz. They have good to moderate drainage and are developed on weakly calcareous, weakly saline, sandy loam glaciofluvial materials greater than 100 cm. A typical Leithead soil profile has a dark brown, sandy loam, surface A horizon averaging about 16 cm; a yellowish brown and light yellowish brown eluvial A horizon (Ahe, Ae); and a brown, sandy clay loam B horizon with slightly firm, very coarse columnar structure and some darker organic staining. Depth to the B horizon averages about 35 cm, while depths to lime-salt accumulations in the C horizon range from 40 to 70 cm. The B horizon is thin and has a weak structure. As a result, when these soils are moist and their colors subdued, the solonetzic nature of such a horizon may not be immediately apparent and careful probing is necessary for their identification. The presence of salts and lime in the underlying C horizon helps to verify the presence of a solonetzic B horizon in these soils.

Leithead map units

No relatively pure units of Leithead soils are mapped in the County of Paintearth.

LHGL1 - This unit accounts for about 16 percent of the Leithead-dominant area. Its occurrence is restricted to mosaics 6 and 7 along the eastern side of the Sullivan Lake Basin. Significant amounts (20 to 40 percent) of saline Rego Gleysols (Gleddies) are present on highly saline glaciolacustrine clay deposits in close association with the dominant Leithead soils. Sullivan Lake soils (up to 30 percent) are the main inclusions where portions of the sandy loam glaciofluvial materials cover an uneven till surface. Inclusions of Victor soils, located along the margins of small basins and lying between the Gleddies and Leithead soils, replace Sullivan Lake soils as the main inclusion on more level topography. Inclusions of shallow water bodies (saline sloughs) are common in the spring or during extended rainy periods.

Two topographic phases are mapped:

- LHGL2/2: 0 to 2 percent slopes; approximately 450 ha.
- LHGL1/3: 0 to 5 percent slopes; approximately 610 ha.

LHKH1 - This unit includes only about two percent of the Leithead-dominant area in the county. It is found only in mosaic 17 along the northern side of the Hamilton Lake Basin. Leithead soils are dominant on higher, gently undulating topographic segments with sandy loam, glaciofluvial materials and significant amounts (20 to 40 percent) of Kehol soils are interspersed on lower, smoother surfaces with silty clay loam, glaciolacustrine materials. Inclusions of Sullivan Lake and Arrowwood soils are associated with the Leithead and Kehol soils, respectively. Inclusions of imperfect or poorly drained soils occupy less than 15 percent.

Only one topographic phase is mapped:

- LHKH1/3: 1 to 4 percent slopes; approximately 150 ha.

LHKH2 - This unit includes almost 10 percent of the Leithead-dominant area. Its main occurrence is in mosaic 7 although there are lesser amounts in mosaics 5 and 6. Significant amounts (15 to 40 percent) of Orthic Humic Gleysols (Fleet) and undifferentiated Gleyed soils are associated with Leithead and Kehol soils. This unit differs from the LHKH1 unit by having residual materials rather than till underlying the glaciofluvial and glacio- lacustrine deposits.

Two topographic phases are mapped:

- LHKH2/2: 0 to 2 percent slopes; approximately 480 ha.
- LHKH2/3: 0 to 4 percent slopes; approximately 140 ha.

LHSU1 - This map unit accounts for approximately 27 percent of the Leithead-dominant area in the county. Most of this unit is mapped in mosaics 6, 7 and 17.

Dark Brown Solodized Solonetz soils are dominant in this unit. Significant amounts (20 to 40 percent) of Sullivan Lake soils are present with the dominant Leithead soils. Inclusions (up to 20 percent) of Orthic Dark Brown Chernozemic (Metisko) soils are present on nonsaline, sandy loam glaciofluvial materials in close association with the Leithead soils. The Sullivan Lake soils in this unit have residual materials rather than till underlying the sandy loam, glaciofluvial veneer materials at the surface. There are no eroded pits.

Only one topographic phase is mapped:

- LHSU1/3: 2 to 5 percent slopes; approximately 1740 ha.

LHSU2 - This map unit includes approximately 40 percent of the Leithead-dominant area in the county. Areas amounting to 400 ha or more are found in mosaics 6, 7 and 13, and areas totalling 100 ha or more are located in mosaics 14, 15, 16, 17 and 26.

Significant amounts (15 to 40 percent) of undifferentiated Gleyed and Gleysolic soils with the dominant Leithead and Sullivan Lake soils are present in this unit. Inclusions of Metisko and the occurrence of sodic soft- rock rather than till under the glaciofluvial veneer materials found in the LHSU1 unit are characteristic of this less well drained unit. Saline sloughs are present in some delineations of this unit.

Two topographic phases are mapped:

- LHSU2/2: 0 to 2 percent slopes; approximately 360 ha.
- LHSU2/3: 0 to 4 percent slopes; approximately 2200 ha.

LHVT1 - This unit occupies a small but unique portion of the area dominated by Leithead soils. Its occurrence is limited to mosaic 15.

Leithead soil variants are dominant on low, sinuous ridges. These variants are classified as Dark Brown Solodized Solonetz but differ from the typical Leithead soils by being formed on about two-thirds to one-third proportions of banded, fine sandy loam and silty clay materials. Leithead soil variants in this unit have solonetzic morphology but may or may not have solonetzic chemistry. These soils were not sampled because of their limited extent. They are included within the Leithead series because of the general solonetzic tendency of the soils in this unit. Significant amounts (20 to 40 percent) of Dark Brown Solonetz (variants of Victor series) are pre- sent on segments with silty clay materials between the low ridges. Inclusions of Halkirk and Sullivan Lake soils occur where till materials are at or near the surface. The unit represents sandy shoals underlain by till in shallow lacustrine basins. Inclusions of Rego Dark Brown (Houcher) soils occur on sandy eolian materials in close association with the Leithead variants.

Only one topographic phase is mapped:

- LHVT1/3: 0 to 4 percent slopes; approximately 60 ha.

LHVT2 - This unit accounts for about 5 percent of the Leithead-dominant area in the county. It is separated from LHVT1 by having significant amounts (15 to 40 percent) of saline Rego Gleysols (Gleddies) in the lowest topographic positions. The dominant soils, variants of Leithead and Victor, are as described for LHVT1. The largest proportion of LHVT2 occurs in mosaic 15, but smaller amounts are found in mosaics 17 and 19.

Two topographic phases are mapped:

- LHVT2/2: 0 to 2 percent slopes; approximately 230 ha.
- LHVT2/3: 0 to 4 percent slopes; approximately 80 ha.

Land use - A significant portion of the Leithead-dominant soil area is used only as unimproved pasture although the greatest proportion is devoted to dryland grain crops. Droughtiness associated with the low moisture-storage capacity of sandy loam textures, the presence of strong surface soil acidity associated with solonetzic development and the presence of, or potential for, surface salinity in less well drained segments combine to give these soil units only poor to fair potential for agricultural use.

Metisko (MET) soils

General setting and description

Approximately 20 830 ha, constituting over 6 percent of the County of Paintearth, have Metisko as the dominant soil component. The largest portion of this area is concentrated in mosaics 6, 7, 15, 16 and 17 within the Sounding Creek physiographic district in the southern part of the county. Metisko-dominant soil areas are widely distributed and occur to an extent throughout much of the county.

Metisko soils are classified as Orthic Dark Brown Chernozemics. They are well drained and have developed on sandy loam glaciofluvial materials over 1 m thick. Typical Metisko profiles have a dark brown, sandy loam A horizon that averages about 18 cm. They lack an eluvial A horizon (Ahe or Ae) but have a yellowish brown, sandy loam B horizon that averages about 40 cm. Its B horizon is structureless or has weak, very coarse, prismatic structure without dark organic staining. Its light, yellowish brown C horizon ranges from sandy loam to loamy sand in texture. Depth to secondary lime carbonates averages about 65 cm, and salts are absent or present in small quantities at depths greater than 1 m.

Metisko map units

No relatively pure units of Metisko are mapped in the county. Metisko soils are mapped in association with significant amounts of Chernozemic or Solonetzic soils on different parent materials.

MEDC1 - This unit accounts for approximately 5 percent of the area with Metisko as the dominant soil component. Most of this unit is mapped in mosaics 10 and 13, but an appreciable amount (160 ha) is found in mosaic 16.

Because of an uneven bedrock or till surface underlying the sandy loam glaciofluvial materials, this unit has significant amounts (20 to 40 percent) of Dolcy soils in close association with the dominant Metisko soils. Dolcy soils are classified as Orthic Dark Brown Chernozemic and have developed sandy loam glaciofluvial materials similar to those of Metisko but less than 1 m thick over residual sandstone and, to a lesser extent, till. Inclusions of Dark Brown Solodized Solonetz (Sullivan Lake) soils are present in amounts up to 15 percent. Depth to bedrock or till averages greater than 50 cm for Dolcy soils and less than 50 cm for Sullivan Lake soils.

Two topographic phases are mapped:

- MEDC1/3: 2 to 5 percent slopes; approximately 640 ha.
- MEDC1/4: 5 to 9 percent slopes; approximately 320 ha.

MEDC2 - This unit includes about 6 percent of the Metisko-dominant area in the county. Most of this unit is mapped in mosaics 6, 7 and 20, although amounts of 100 ha or less are found in other mosaics.

This unit has significant amounts (15 to 40 percent) of undifferentiated Gleyed and Gleysolic soils on lower slopes and in depressions. Residual sandstone, rather than till, is the predominant underlying material; this is especially so in the southern part of the county.

Two topographic phases are mapped:

- MEDC2/2: 0 to 2 percent slopes; approximately 50 ha.
- MEDC2/3: 0 to 5 percent slopes; approximately 1280 ha.

MEHN1 - This unit includes about 11 percent of the Metisko-dominant area in the county. Nearly three-quarters of this unit (200 to 500 ha) is found in mosaics 4, 7, 10, 13, 15 and 16, primarily in areas of transition between glaciofluvial and till deposits.

A discontinuous blanket of sandy loam glaciofluvial materials over till is responsible for the occurrence of significant amounts (20 to 40 percent) of Hughenden soils in this unit. Depending on local differences in elevation, Hughenden soils occupy the upper slopes and knolls and the dominant Metisko soils occur on mid- to lower slopes. Inclusions of Solonetzic Dark Brown Chernozemics (Flagstaff, Onnevue) are present in some localities.

Three phases are mapped:

- MEHN1/3: 2 to 5 percent slopes; approximately 140 ha.
- MEHN1/3p: 2 to 5 percent slopes; stones occupy more than 3 percent of surface; approximately 240 ha in mosaic 16.
- MEHN1/4: 5 to 9 percent slopes; approximately 1960 ha.

MEHN7 - This unit includes 8 percent of the Metisko-dominant area of the county. Most of this unit is mapped in mosaics 7, 8, 15 and 16 with the largest amount, nearly 1000 ha, found in mosaic 16.

Significant amounts (20 to 40 percent) of Dark Brown Solodized Solonetz (Halkirk and Sullivan Lake) soil are present on mid- to lower slopes in this unit. The dominant occurrence of Metisko and Hughenden with inclusions of Flagstaff and Onnevue is similar to the MEHN1 unit.

Two topographic phases are mapped:

- MEHN7/3: 2 to 5 percent slopes; approximately 870 ha.
- MEHN7/4: 5 to 9 percent slopes; approximately 800 ha.

MEKH1 - This unit accounts for about 1 percent of the Metisko-dominant area of the county. It is mapped only in mosaic 6 at the northern side of the Sullivan Lake Basin.

The dominant Metisko soils on mid- to upper slopes are associated with significant amounts (20 to 40 percent) of Kehol soils on lower slopes and nearly level segments. Inclusions (up to 20 percent) of Leithead soils are found on mid- to lower slopes immediately above and adjacent to Kehol segments.

Only one topographic phase is mapped:

- MEKH1/3: 1 to 5 percent slopes; approximately 200 ha.

MELH1 - Approximately 6 percent of the Metisko dominant area in the county is included in this unit. Most of this unit (150 to 350 ha) is mapped in mosaics 4, 6, 7, 13 and 15.

This unit has dominant Metisko soils in association with significant amounts (20 to 40 percent) of Dark Brown Solodized Solonetz (Leithead) soils. Inclusions (up to 20 percent) of Dolcy and Sullivan Lake soils are present at locations where residual or till materials occur at 50 cm depths. Less than 15 percent of Gleyed and Gleysolic soils are present in this unit.

Only one topographic phase is mapped:

- MELH1/3: 2 to 5 percent slopes; approximately 1190 ha.

MELH2 - Between 7 and 8 percent of the Metisko-dominant area is found in this unit. It is mapped only in mosaics 7, 13 and 15.

This unit has significant amounts (15 to 40 percent) of undifferentiated Gleyed and Gleysolic soils in association with the major soils. The distribution of Metis ko and Leithead soils with inclusions of Dolcy and Sullivan Lake soils is similar to the MELH1 unit.

Only one topographic phase is mapped:

- MELH2/3: 0 to 5 percent slopes; approximately 1560 ha.

MESC1 - Nearly 12 percent of the Metisko-dominant area of the county is mapped within this unit. Mosaic 16 has the largest concentration (nearly 700 ha) and mosaics 4, 12 and 15 each have over 200 ha. To--gether, this amounts to about two-thirds of the area occupied by this unit. The remaining one-third is scat tered through other mosaics in amounts ranging from about 50 to 150 ha. Less than 50 ha of this, however, is mapped within the Neutral Upland section in the northeast part of the county.

Significant amounts (20 to 40 percent) of Scollard soils occur in complex association with the dominant Metisko soils in this unit. Scollard soils are classified as Orthic Dark Brown Chernozemics. They have developed on gravelly glaciofluvial materials and, as a result, are rapidly drained. Both soils occur on all topographic positions on gently undulating to gently rolling terrain. Soils developed on predominantly glaciofluvial materials separate this unit from soils formed on more steeply sloping, ice-contact materials of the HND6 map unit.

Two topographic phases are mapped:

- MESC1/3: 3 to 5 percent slopes; approximately 1060 ha.
- MESC1/4: 5 to 9 percent slopes; approximately 1400 ha.

MESC7 - This unit accounts for only about 3 percent of the Metisko-dominant area in the county. Nearly all of this unit is mapped in mosaics 15 and 16 in the southern part of the county.

In this unit, significant amounts (15 to 40 percent) of Solonetzic soils, including Sullivan Lake and Torlea, are found in channels or on lower slope segments. Residual sodic shales and sandstone rather than till, occur at depths less than 50 cm under the sandy and gravelly glaciofluvial materials at these locations. Gravel and cobbles occupy more than 3 percent of the surface area of this unit.

Two topographic phases are mapped:

- MESC7/3: 3 to 5 percent slopes; approximately 430 ha.
- MESC7/4: 5 to 9 percent slopes; approximately 120 ha.

MESU1 - Approximately 3860 ha, constituting nearly 19 percent, of the Metisko-dominant area of the county are included in this unit. About 3400 ha are mapped in mosaics 6, 13, 16 and 17. The largest concentration, nearly 2100 ha, is located in mosaic 16. The remainder is found in amounts of about 100 ha or less in mosaics 11, 12, 15, 18 and 19.

This unit has significant amounts (20 to 40 percent) of Solonetzic soils of the Sullivan Lake series associated with the dominant Chernozemic Metisko soils. Inclusions of Chernozemic soils shallow to bedrock (Dolcy) and Solonetzic soils on sandy loam glaciofluvial materials deeper than 1 m (Leithead) are associated with the Metisko and Sullivan Lake soils, respectively. Deep and shallow glaciofluvial deposition and greater relief is characteristic of MESU1 units. The pattern is used to separate them from LHSU1 units that show a less distinct topographic pattern.

Two topographic phases are mapped:

- MESU1/3: 2 to 5 percent slopes; approximately 3670 ha.
- MESU1/4: 5 to 8 percent slopes; approximately 190 ha.

MESU2 - This unit comprises approximately 1840 ha, about 9 percent, of the Metisko-dominant area in the county. Nearly three-quarters of this is mapped in mosaics 10, 12 and 19 with the largest concentration (750 ha) is in mosaic 19.

This unit has significant amounts (15 to 40 percent) of imperfect to poorly drained, undifferentiated Gleyed and Gleysolic soils on lower slopes and in depressions. The distribution of Metisko and Sullivan Lake soils and their inclusions is similar to that of the MESU1 unit. Its distinct deep and shallow pattern of surficial materials and great- er overall relief can be used to distinguish it from LHSU2.

Two topographic phases are mapped:

- MESU2/2: 0 to 2 percent slopes; only about 50 ha.
- MESU2/3: 0 to 5 percent slopes; approximately 1790 ha.

MEWW1 - This unit accounts for approximately 2870 ha, nearly 14 percent of the Metisko-dominant area in the county. Over 80 percent of this amount is mapped in mosaics 1, 6, 12, 13 and 16. The largest concentration (1330 ha) is found in mosaics 12 and 13 extending south from the Battle River valley.

Significant amounts (20 to 40 percent) of Wainwright soils are present in close association with the dominant Metisko soils on a complex mixture of glaciofluvial and eolian materials. Material textures range from sandy loam to loamy sand and sand. As a result, there is a continuous variation from the sandy loam textures of the Metisko soils to the loamy sand and sand textures of the Wainwright soils. This textural complexity seems to explain the presence of appreciable amounts of Metisko soil variants that retain their loamy A horizons but have sandy B and C horizons. These sandy Metisko variants are present in other Metisko map units but only as minor, random inclusions.

Three topographic phases are mapped:

- MEWW1/2: 0 to 2 percent slopes; approximately 150 ha.
- MEWW1/3: 2 to 5 percent slopes; approximately 1450 ha.
- MEWW1/4: 5 to 9 percent slopes; approximately 1270 ha.

Land use - Most of the Metisko-dominant area is cultivated for dryland cereal crops. Fall rye is frequently included in rotations, on the more droughty areas, such as the MEWW1 unit. Evidence of recent wind erosion in many of the Metisko units is indicative of the need for special management considerations for these soils under current dryland farming practice in the county.

Rough Broken (RB) landscape

General setting and description

Areas mapped as Rough Broken amount to approximately 27 900 ha, about 8 percent of the county. All but mosaics 6, 7, 17 and 27 have at least 100 ha of Rough Broken terrain. Rough Broken landscape identifies land with steep to precipitous slopes and considerable local relief that may be associated with exposures of bedrock or overlying surficial materials and derived colluvium. Because of the extreme slopes there is an intricate pattern of heterogeneous and thinly developed soils on these materials. Rough Broken landscape may include dissection remnants or slender extensions of contiguous upland soils and bottomland soils characteristic of narrow valleys or ravines. The largest concentrations of Rough Broken landscape are mapped in mosaics either bordering the Battle River valley or containing major stream valleys.

Rough Broken map units

RB1 - This unit accounts for approximately 7920 ha, roughly 28 percent of the Rough Broken landscape in the county. Undifferentiated mixtures of well-drained Orthic and Rego Dark Brown Chernozemic soils with inclusions of Orthic Regosolic, Solonetzic and Gleysolic soils predominate on slopes of 15 to 70 percent. Inclusions of exposed bedrock or surficial materials on steep slopes or escarpments constitute less than 10 percent of the unit.

RB2 - This unit includes approximately 8370 ha, about 30 percent of the Rough Broken landscape in the county. The unit is characterized by the presence of undifferentiated mixtures of soils similar to those of RB1, together with variable amounts (10 to over 50 percent) of exposed bedrock or surficial materials on steep slopes or escarpments. Inclusions (10 to 30 percent) of Regosolic soils on fluvial aprons (Bigknife) are present in this unit.

RB5 - Approximately 2020 ha, about 7 percent of the Rough Broken landscape in the county are included in this unit. The largest concentration of this unit, approximately 1250 ha, is mapped in mosaic 21 along the south side of the Battle River in the northeast part of the county. This unit is characterized by undifferentiated mixtures of Chernozemic, Regosolic and Solonetzic soils on steep slopes affected by slope failure and slumping. Significant amounts (10 to 30 percent) of Gleyed and Gleysolic soils are present in the depressional areas between slump blocks and ridges. Slope failure and slumping appear to be the result of undercutting by major streams.

RBAV1 - This unit occupies approximately 9600 ha, about 34 percent of the Rough Broken landscape in the county. The largest concentrations of this unit are mapped in mosaics that contain portions of major stream valleys. The largest amounts (500 and 2000 ha) are found in the mosaics that contain significant portions of the Paintearth, Castor, Young and Ribstone Creek valleys. Undifferentiated mixtures of soils similar to those of RB1 are dominant and have significant amounts (20 to 40 percent) of Gleysolic soils along narrow, floodplain channels. Inclusions of exposed bedrock escarpments are present at irregular intervals. A typical example is delineated in mosaic 8, immediately southeast of the Castor townsite.

Land use - Rough Broken landscape units are used as unimproved pasture. The vegetative cover is native grassland or alternating grassland and aspen woodland on south- and north-facing slopes, respectively. The original grassland communities, dominated by spear grass with lesser quantities of grama grass and wheat grass, have been altered by grazing, or, in many cases, by overgrazing. Significant amounts of white spruce occur with the dominant aspen along major stream valleys in the northern half of the county. The vegetation diversity provided by these units, especially by the RB5 units on failed slopes, makes them very important as habitat for sustaining key upland game bird and mammal popu- lations in the county.

Scollard (SCD) soils

General setting and description

Only about 420 ha are mapped with Scollard as the dominant soil and most of this is found in mosaics 16 and 17 in the southern part of the county.

Scollard soils are classified as Orthic Dark Brown Chernozemic. They are rapidly drained and have developed on gravelly glaciofluvial materials. The Scollard soil profiles have a dark brown, sandy loam A horizon that averages 15 cm, a yellowish brown, sandy loam to loamy sand B horizon that averages about 20 cm and contains between 15 and 35 percent by volume of gravel and cobbles, and a very pale brown gravel or very gravelly coarse sand, coated with secondary lime carbonates and containing from 35 to more than 60 percent by volume of gravel and cobbles.

Scollard map units

SCD1 - This unit accounts for all of the Scollard-dominant area mapped in the county. Scollard soils are predominant with only minor inclusions of Orthic and Rego Dark Brown Chernozemics (Wainwright and Houcher) present on sandy glaciofluvial and eolian materials.

Two topographic phases are mapped:

- SCD1/3: 2 to 5 percent slopes; approximately 260 ha.
- SCD1/4: 5 to 8 percent slopes; approximately 160 ha.

Land use - Undisturbed Scollard areas are used as unimproved pasture. Many of these have been or are presently being excavated for their commercial gravel content. Very little or no reclamation has been carried out, and gravel pits remain as landscape scars.

Sullivan Lake (SUL) soils

General setting and description

Approximately 25 020 ha, constituting between 7 and 8 percent of the county, have Sullivan Lake as the dominant soil. By far, the greatest proportion of this extent is mapped within the Sounding Creek physiographic district in the south and southwest portions of the county.

Sullivan Lake soils are classified as Dark Brown Solodized Solonetz. They are well to moderately well drained and have developed on sandy loam, glaciofluvial veneer materials less than 50 cm thick overlying either weakly calcareous, moderately to strongly saline and sodic, clay loam till or residual sodic shales and sandstones. Sullivan Lake soils in Sullivan Lake dominant areas mapped in this county are associated with Torlea soils and, therefore, are underlain by residual materials. Solonetzic con- ditions in these Sullivan Lake soils may be more severe than those associated with Halkirk soils that are unde lain by till.

The Sullivan Lake soil profiles have a dark brown, sandy loam A horizon that averages 15 cm, a yellowish brown and ashy gray, sandy loam to loamy sand, eluvial horizon (Ahe and Ae, respectively) of variable thickness, a solonetzic B horizon, with strong, round-topped columnar structure, developed in the underlying residual or till materials and occurring at an average depth of about 30 cm, and accumulations of secondary lime carbonates and salts present under the solonetzic B at an average depth of 50 cm from the soil surface.

Sullivan Lake map units

No relatively pure units of Sullivan Lake are mapped in the County of Paintearth.

SUTL1 - This unit accounts for approximately 12 430 ha, about 50 percent of the Sullivan Lake-dominant area of the county. Most of this unit is mapped in mosaics 4, 5, 6, 7, 15 and 16 in the southwest part of the county.

Significant amounts (20 to 40 percent) of Torlea are present in close association with the dominant Sullivan Lake soils. Torlea soils are present at locations where the sandy loam glaciofluvial veneer is less than 10 cm thick over residual materials. The presence of this thin, sandy loam veneer is responsible for coarser than average surface soil textures for most Torlea soils in this unit. Inclusions of Dark Brown Solodized Solonetz (Leithead) are found on minor amounts of deeper sandy loam glaciofluvial materials in this unit. Eroded phases of this unit have eroded pits occupying more than 30 percent of the surface area.

Ten separate phases are mapped for this unit. Only five of these, however, have an appreciable extent. The minor phases could have been grouped with other phases but were maintained because of their possible importance for deep tillage suitability recommendations.

Ten separate phases are mapped:

- SUTL1/2: 0 to 2 percent slopes; approximately 110 ha in mosaic 5.
- SUTL1/2e: 0 to 2 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 1310 ha
- SUTL1/3: 2 to 5 percent slopes; approximately 2340 ha.
- SUTL1/3e: 2 to 5 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 4190 ha.
- SUTL1/3ep: 2 to 5 percent slopes; eroded pits occupy more than 30 percent of the surface; stones and boulders occupy more than 3 percent of the surface; approximately 1960 ha.
- SUTL1/3p: 2 to 5 percent slopes; stones and boulders occupy more than 3 percent of the surface; approximately 20 ha in mosaic 16.
- SUTL1/4: 5 to 9 percent slopes; approximately 80 ha.
- SUTL1/4d: 5 to 9 percent slopes; frequent, steeper, dissected slopes subject to further erosion; approximately 2210 ha.
- SUTL1/4dp: 5 to 9 percent slopes; frequent, steeper, dissected slopes subject to further erosion; stones and boulders greater than 3 percent of the surface; approximately 40 ha in mosaic 2.
- SUTL1/4e: 5 to 9 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 170 ha in mosaic 7.

SUTL2 - This unit extends over approximately 12 590 ha, about 50 percent of the Sullivan Lake-dominant area. Most of this unit is mapped in mosaics 5, 6, 7, 15, 16, 17 and 18 throughout the southern part of the county.

Significant amounts (15 to 40 percent) of undifferentiated Gleyed and Gleysolic soils are present with the dominant Sullivan Lake and Torlea soils in this unit. Inclusions of Leithead and eroded pits (eroded phase Torlea) are present in amounts up to 15 or 20 percent.

Eight separate phases are mapped:

- SUTL2/2: 0 to 2 percent slopes; approximately 1700 ha.

- SUTL2/2e: 0 to 2 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 2250 ha.
- SUTL2/2ep: 0 to 2 percent slopes; eroded pits occupy more than 30 percent of the surface; stones and boulders occupy more than 3 percent of the surface; stones and boulders are more than 15 percent by volume in the upper 60 cm of the soil profile; approximately 260 ha in mosaic 9.
- SUTL2/3: 0 to 5 percent slopes; approximately 2720 ha.
- SUTL2/3e: 0 to 5 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 4190 ha.
- SUTL2/3ep: 0 to 5 percent slopes; eroded pits occupy more than 30 percent of the surface; stones and boulders occupy more than 3 percent of the surface and frequently more than 15 percent by volume in the upper 60 cm; approximately 1280 ha.
- SUTL2/3p: 0 to 5 percent slopes; stones and boulders occupy more than 3 percent of the surface and frequently more than 15 percent by volume in the upper 60 cm; approximately 90 ha in mosaic 15.
- SUTL2/4d: 0 to 9 percent slopes; frequent steeper dissected slopes subject to further erosion; approximately 100 ha in mosaics 1 and 5.

Land use - The Sullivan Lake-Torlea map areas have some of the most severe Solonetzic soil conditions in the county. Sandy loam textures give reduced moisture storage above the solonetzic hardpan, and the hardpan itself is formed in strongly sodic residual materials. As a result, these areas, even when well drained, have inherent low potential under cultivation and are unsuited to improvement by deep tillage. Significant occurrences of eroded pits, stones and conditions of imperfect or poor drainage result in even greater problems for sustained agricultural use.

Torlea (TLA) soils

General setting and description

The area mapped with Torlea as the dominant soil component covers approximately 4270 ha, more than 1 percent of the area of the county. The largest proportion of Torlea-dominant area occurs within the Castor Plain physiographic district. A smaller but significant concentration of Torlea-dominant soil areas occur within the Sounding Creek district.

Torlea soils are classified as Dark Brown Solodized Solonetz. They are moderately well drained and have developed on weakly calcareous, moderately to strongly saline and sodic, clay loam to clay residual materials (weathered shales and sandstones), or on a thin (less than 50 cm) discontinuous till veneer of similar composition overlying these residual materials. The Torlea profiles have a dark brown loam A horizon averaging 10 to 12 cm; lighter colored eluvial A horizons (Ahe, Ae) that together average only 4 to 6 cm; a very compact, solonetzic B horizon that occurs at an average depth of 15 cm and has coarse to very coarse, round-topped columnar structure with intense dark gray or dark grayish brown organic matter staining on column sides. The columnar structure may break down into angular blocky aggregates that are also darkly stained. A Halkirk B horizon, by comparison, has medium to coarse round-topped columns with brownish rather than grayish organic staining. Depth to secondary lime carbonate and salt accumulations in the Torlea C horizon averages about 35 cm as compared to 42 cm for Halkirk. Lime carbonate accumulations in Torlea soils, however, average less than 3 percent as compared to an average of 4 percent for Halkirk soils. Salinity and sodicity values of the C horizon are similar to those of Halkirk soils. The low lime content of Torlea soils may be correlated to a high incidence of continued poor seedbed quality observed after deep plowing of Torlea-dominant areas.

Torlea map units

TLA1 - This unit accounts for about 40 percent, approximately 1610 ha, of the Torlea-dominant area. Most of this is mapped in discontinuous till areas of the Castor Plain physiographic district, but some is found in glacially scoured areas within the Sounding Creek Plain. Amounts of TLA1, ranging between 100 to 400 ha, are mapped in mosaics 1, 3, 4, 10, 14 and 16.

This unit consists of Torlea soils with inclusions (10 to 30 percent) of Halkirk soils. Eroded phases of this unit have more than 30 percent of their surface area occu- pied by eroded pits. Stony phases of this unit have from 10 to 40 percent surface stones and boulders and have more than 15 percent by volume stones and boulders in the upper 60 cm.

Five phases of this unit are mapped:

- TLA1/3: 2 to 5 percent slopes; approximately 400 ha.
- TLA1/3e: 2 to 5 percent slopes; eroded pits occupy more than 30 percent of the surface; approximately 190 ha in mosaics 3, 11 and 18.
- TLA1/3ep: 2 to 5 percent slopes; eroded pits, stones and boulders as described in previous paragraph; approximately 760 ha.
- TLA1/2e: 0 to 2 percent slopes; eroded pits occupy more than 30 percent; approximately 160 ha in mosaic 4.
- TLA1/4d: 5 to 9 percent slopes, intersected at intervals with steeper gullies subject to continuing erosion; approximately 100 ha in mosaic 1.

TLSC1 - This unit includes approximately 1750 ha, about 40 percent of the Torlea-dominant area of the county. More than 1000 ha of this unit are mapped in mosaic 10, while amounts ranging between 100 and 200 ha are found in mosaics 12, 16 and 17. This unit is characteristic of scoured, glacial outwash areas.

Torlea soils are dominant and have significant amounts (20 to 40 percent) of Orthic Dark Brown Chernozemic soils (Scollard) on gravelly glaciofluvial materials. Inclusions (10 to 20 percent) of Halkirk soils are present. Surface cobbles, stones and boulders range from about 3 to 15 percent and are more than 15 percent by volume in the upper 60 cm. Extreme soil variation is characteristic of this unit.

Two topographic phases are mapped:

- TLSC1/3: 2 to 5 percent slopes; approximately 1640 ha.
- TLSC1/4: 5 to 8 percent slopes; approximately 60 ha.

TLSC2 - This unit accounts for 20 percent, approximately 910 ha, of the Torlea-dominant area. Most of this unit is mapped in mosaics 12, 16 and 17.

Significant amounts (15 to 40 percent) of undifferentiated Gleyed and Gleysolic soils are found on lower slopes and depressions in association with the major Torlea and Scollard soils. Inclusions of Halkirk soils are present on segments with significant till cover over the residual materials. Extreme soil variation is characteristic of this unit.

Two topographic phases are mapped:

- TLSC2/2: 0 to 2 percent slopes; approximately 30 ha.
- TLSC2/3: 0 to 4 percent slopes; approximately 880 ha.

Land use - Only the non-eroded, non-stony, Torlea-dominant areas (about 10 percent of the total Torlea-dominant area) are used for cultivated crops. The remainder is used as unimproved pasture, and much of what was once cultivated has reverted to unimproved pasture. Results of deep tillage field trials established by Alberta Agriculture, together with observations over the course of the survey, suggest that deep tillage of these soils may be only marginally successful.

Victor (VTR) soils

General setting and description

Areas mapped with Victor as the dominant soil amount to only about 780 ha, less than 1 percent of the area of the county.

Victor soils are classified as Dark Brown Solonetz. They have moderate to imperfect drainage and have developed on weakly calcareous, moderately saline, silty clay glaciolacustrine materials that are greater than 1 m thick. The Victor soils have a dark brown, silty clay loam A horizon that averages less than 10 cm. Eluvial A horizon development (Ahe, Ae), if present, is less than 1 or 2 cm. Usually, Victor soils have a compact solonetzic B horizon immediately under the thin surface A horizon. This B horizon has strong, round-topped columnar structure that breaks into fine angular blocky aggregates. Columnar and angular blocky aggregate surfaces have dark gray organic staining. Depth to secondary lime carbonates and salts averages between 30 and 35 cm.

Victor map units

No relatively pure units of Victor are mapped in the county.

VTGL1 - This unit accounts for all of the Victor-dominant area in the county. Significant amounts (15 to 40 percent) of saline Rego Gleysol (Gleddies) are present in the wet, depressional segments of the unit. Minor inclusions of Dark Brown Solodized Solonetz (Wiese) are found in close association with Victor soils on the better drained positions. In areas where streams, such as Rib- stone Creek, traverse these glaciolacustrine deposits, inclusions of Rego Humic Gleysols are present in abandoned stream channels.

Only one topographic phase is mapped:

- VTGL1/2: 0 to 2 percent slopes; approximately 780 ha.

Land use - Victor-Gleddies areas are used as unimproved pasture. The minor amount of cultivation practiced appears severely limited by conditions of imperfect drainage and high salinity. Carrying capacity of unimproved pastures is low.

Wainwright (WWT) soils

General setting and description

Approximately 2700 ha, representing about 1 percent of the county, are mapped with Wainwright as the dominant soil component. Most of the Wainwright-dominant area is located within the Sounding Creek Plain physiographic district in the southern part of the county.

Wainwright soils are classified as Orthic Dark Brown Chernozemic. They are rapidly drained and have developed on a mixture of sandy glaciofluvial and eolian materials. Wainwright soil profiles have a dark grayish brown, loamy sand to sand A horizon that averages 20 cm, a brown or yellowish brown loamy sand to sand B horizon, and a pale brown sand C horizon. Depth to secondary lime carbonates is greater than 60 cm and is often greater than 100 cm.

Wainwright map units

No relatively pure units of Wainwright are mapped in the county.

WWFN1 - This unit includes about 20 percent of the Wainwright-dominant area. Most of this is mapped in mosaics 6, 7 and 16 at locations where the mixture of sandy glaciofluvial and eolian materials is alternately deep and shallow over residual materials. The dominant Wainwright soils occupy mid to upper slopes on segments with deep (greater than 1 m) sandy materials, and significant amounts (20 to 40 percent) of Fenner soils are found on lower slopes where the sandy materials are less than 50 cm thick over sodic bedrock. Inclusions of sandy loam materials may be present with the result that minor amounts (10 to 20 percent) of Metisko and Sullivan Lake soils can be found in association with their coarser-textured equivalents. Overall, loamy sand to sand textures of WWFN units serve to separate them from MESU units that are characteristically less droughty and have predominantly sandy loam textures.

Only one topographic phase is mapped:

- WWFN1/3: 2 to 5 percent slopes; approximately 600 ha.

WWFN2 - This unit accounts for about 20 percent of the Wainwright-dominant area in the county. It is mapped in mosaics 6, 13 and 17. The Fenner soils of this unit mapped in mosaic 13 has till rather than residual materials underlying the sandy glaciofluvial-eolian mixture.

Significant amounts (15 to 40 percent) of undifferentiated Gleyed and Gleysolic soils are present on lower slopes and depressions in association with the dominant Wainwright and Fenner soils. Inclusions of Metisko and Sullivan Lake soils are present in amounts up to 20 percent.

Only one topographic phase is mapped:

- WWFN2/3: 0 to 4 percent slopes; approximately 490 ha.

WWHC1 - This unit accounts for nearly 40 percent of the Wainwright-dominant area. Nearly all of this is mapped within mosaics 6 and 7.

Wainwright soils are dominant with significant amounts (20 to 40 percent) of Rego Dark Brown Chernozemic soils (Houcher) and inclusions of Orthic Regosols (Edgerton) on sandy eolian materials. The slope positions of these soil components are unpredictable and appear to depend on the extent of eolian activity that has occurred at any specific location. The coarse sandy textures of WWHC units serve as a basis for separating them from MEWW units.

Three topographic phases are mapped:

- WWHC1/3: 3 to 5 percent slopes; approximately 900 ha.
- WWHC1/4: 5 to 9 percent slopes; approximately 100 ha.
- WWHC1/5: 9 to 15 percent slopes; approximately 40 ha in mosaic 1.

WWHC2 - This unit includes just under 10 percent of the Wainwright-dominant area. All of it is mapped in mosaic 17.

Significant amounts (15 to 40 percent) of Rego Humic Gleysols (Islands) and undifferentiated Gleyed soils are present on lower slopes and in depressions in this unit. Inclusions of Edgerton soils are again present in association with the dominant Wainwright and Houcher soils.

Only one topographic phase is mapped:

- WWHC2/3: 0 to 5 percent slopes; approximately 220 ha.

WWSC1 - This unit includes about 10 percent of the Wainwright-dominant area in the county. All of it is mapped in mosaic 17.

Surficial deposits in this unit are a complex mixture of sandy and gravelly glaciofluvial materials modified by eolian redeposition of some of the sandy glaciofluvial materials. Wainwright soils are dominant and have significant amounts of gravelly Orthic Dark Brown Chernozemic soils recognized as Scollard variants rather than typical Scollard soils. Such soils could be considered a gravelly phase of the Wainwright series but have been recognized here as having properties of Scollard soils.

Two topographic phases are mapped:

- WWSC1/3: 2 to 4 percent slopes; approximately 340 ha.
- WWSC1/4: 5 to 7 percent slopes; approximately 20 ha.

Land use. Most of the Wainwright-dominant area has been cultivated at an earlier time. However, much of it is now maintained as improved pasture or forage. Areas still cultivated for annual crops show considerable evidence of recent wind erosion.

Part 3 - Interpretations for specific uses

Each of the soil units recognized and mapped in the County of Paintearth differs in some way from the others. All of the units, to a varying degree, have different management requirements, use capabilities and yield potential. However, many soil units have certain similarities that allow them to be grouped together in estimating their suitabilities or limitations for particular uses.

These groupings are based on evaluations of data accumulated during the soil survey and on related applied research and experience. All interpretations are derived from soil ratings based on the properties and characteristics of the soil units. Some of the more commonly used criteria are slope, drainage, perviousness, texture, pedological classification, stoniness and depth to bedrock.

The data collected during the soil survey are of value for making other interpretations that were not deemed relevant at the time of writing, based on current land use. These interpretations include ratings for nonagricultural uses, such as road location, urban services, septic fields, sanitary landfills, permanent buildings, source of topsoil, source of gravel and source of road fill.

Soil unit interpretations are intended only to serve as guides for planners and managers. They are not intended as recommendations for land use and do not eliminate the need for on-site evaluations by qualified professionals.

Soil capability for dryland agriculture

The soil capability classification for agriculture is an interpretive soil grouping that can be made from soil survey data (Canada Land Inventory, 1972). This classification system provides a method of evaluating the potential of a soil to produce certain crops.

The capability classification consists of two main categories: (1) the capability class - a grouping of subclasses having the same relative degree of limitation and hazard, and (2) the capability subclass - a grouping of soils with similar kinds of limitations and hazards. Mineral soils are grouped into seven classes, according to their potentials and limitations for agricultural use. The classes are defined as follows:

Class 1 - Soils in this class have no significant limitations in use for crops.

Class 2 - Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices.

Class 3 - Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.

Class 4 - Soils in this class have severe limitations that restrict the range of crops or require special conservation practices.

Class 5 - Soils in this class have severe limitations that restrict their capability to produce perennial forage crops; improvement practices are feasible.

Class 6 - Soils in this class are capable only of producing perennial forage crops; improvement practices are not feasible.

Class 7 - Soils in this class have no capability for arable agriculture or permanent pasture.

Organic soils are not placed in capability classes and are indicated by the letter "O".

The Capability subclasses are based on characteristics which place limitations on the agricultural use of the soil. They are as follows:

Subclass C: adverse climate
Subclass D: undesirable soil structure and/or low permeability
Subclass E: erosion damage
Subclass F: low natural fertility
Subclass I: inundation (flooding by streams or lakes)
Subclass M: moisture (low moisture-holding capacity)
Subclass N: salinity
Subclass P: stoniness
Subclass R: shallowness to solid bedrock
Subclass S: soil limitations - a combination of two or more subclasses, D, F, M and N
Subclass T: adverse topography
Subclass W: excess water
Subclass X: minor cumulative limitations

Climate, soil properties and topography are the prime considerations in assessing areas for agricultural use. Factors not considered in developing the rating include distance to market, kind of roads, size of farms, type of ownership, cultural patterns, skill or resources of individual operators and hazard of crop damage by storms. Because soils having different limitations are not always separable in the field at the scale of mapping used, groupings are made for the agricultural capability classification.

Generalized information on soil capability for agriculture in the county is available on maps at 1:250 000 scale (Canada Land Inventory, 1970, 1971). That information is based largely on early reconnaissance soil survey information supplemented by some additional field checking. This report provides soil capability information based on the soil survey at 1:50 000 scale. Preparation of separate capability maps at 1:50 000 scale, however, was judged not cost effective. Including the capability ratings on the soil map would have reduced its legibility. The ratings are, therefore, provided in table form (table 7) where all soil map units in the area are listed alphabetically with their ratings. All combinations of topography, stoniness and erosion phases mapped with each unit are included. The use of a tabular format for the ratings is convenient but does have the disadvantage that each individual area cannot be judged specifically on its own characteristics.

The following examples are provided as an aid to understanding the soil ratings. The large arabic numerals denote capability classes. Letters placed after class numerals denote the subclasses or limitations. Arabic numeral superscripts placed after a class letter give the approximate proportion of the class out of a total of 10.

Rating	Description
1	Denotes an area of Class 1 soils with no limitations.
1^{8}2D^{2}	Denotes an area of Class 1 soils with no limitation and Class 2 soils with undesirable structure limitations in the proportion of 8:2.
3D^{7}6WN^{3}	Denotes an area of Class 3 soils with undesirable structure limitations and Class 6 soils with excess moisture and salinity in the proportion of 7:3.

Table 7. Soil capability ratings for dryland agriculture.

Map unit	Soil rating	Map unit	Soil rating
AV1	5I	HKBF1/3,4	3D
AV2	6I	HKBF2/3,4	3D^{6}5WN^{4}
BKF1/3,4	5ND	HKLS2/2,3	3D^{6}4W^{4}
BKRB1	5ND^{7}7RT^{3}	HKSU1/3,4	3D^{6}4M^{4}
CNN1/3	3M	HKSU2/2,3	3D^{4}4M^{3}5WN^{3}
EORO1/2,3	1^{6}2M^{4}	HKTL1/3,4	3D^{4}4D^{3}5D^{3}
EORO1/2p	2P^{6}2M^{4}	HKTL1/3e	4D^{6}5D^{4}
EORO2/2,3	1^{4}2M^{3}4W^{3}	HKTL1/3ep, 4ep	5DP^{6}6DP^{4}
EORO2/3p	2P^{4}2M^{3}4W^{3}	HKTL1/4d	4DE^{6}6DE^{4}
ERT1/3	6M	HKTL1/4p	4DP^{6}5DP^{4}
ERFN2/2,3	6M^{4}5M^{3}5W^{3}	HKTL2/2,3,4	3D^{4}5D^{3}5WN^{3}
FLFM1/2,3	5WN	HKTL2/2e,3e	4D^{4}5D^{3}5WN^{3}
FNTL1/3	5MD	HKTL2/2ep,3ep	5DP^{4}6DP^{3}5WN^{3}
FNTL1/3e	6MD	HND1/3,4	3M
FST1/3,4	3M	HND1/5	4MT
		HND1/5d	5TE
FST2/3,4	3M^{6}4W^{4}	HND2/3,4	3M^{6}4W^{4}
FST7/3,4	3MD	HND2/6	5MT^{6}4W^{4}
FSHE1/3,4	3M^{6}2D^{4}	HND4/3,4	3M
FSHE2/4	3M^{4}2D^{3}4W^{3}	HND4/5	4MT
GLS1/2	6NW	HND6/3,4	4M
GLLS1/3	6NW^{6}3D^{4}	HND6/5,6	5MT
GY1	6W	HND8/4	3M^{6}4W^{4}
HND8/5	4MT^{6}4W^{4}	MELH1/3	3M^{6}4M^{4}
HND8/6	5MT^{6}4W^{4}		
HNSC7/3,4	3M^{4}4M^{3}3D^{3}	MELH2/3	3M^{4}4M^{3}5WN^{3}
INWW1/2	5W^{6}5M^{4}	MESC1/3,4	3M^{6}4M^{4}
IRRO1/2	3M	MESC7/3,4	4M^{6}3M^{4}
IRRO2/2,3	3M^{7}4W^{3}	MESU1/3,4	3M^{6}4M^{4}
KHIM1/2,3	3D^{7}5D^{3}	MESU2/2,3	3M^{4}4M^{3}5WN^{3}
KHLS2/2,3	3D^{6}5WN^{4}	MEWW1/2,3,4	4M
KISU2/2	3D^{4}4M^{3}5WN^{3}	RBAV1	6T^{7}6I^{3}
LHGL1/2,3	4M^{6}6NW^{4}	RB1	6T
LHKH1/3	4M^{6}3D^{4}	RB2	7RT
LHKH2/2,3	4M^{4}3D^{3}5WN^{3}	RB5	6T
LHSU1/3	4M	SCD1/3,4	4M
LHSU2/2,3	4M^{6}5WN^{4}	SUTL1/2,3,4	4M^{6}5D^{4}
LHVT1/2,3	4M^{6}5D^{4}	SUTL1/2e,3e,4e	5MD
LHVT2/2	4M^{4}5D^{3}6NW^{3}	SUTL1/3ep	5MP^{6}6DP^{4}
LSTL1/2,3	3D^{6}5D^{4}	SUTL1/3p	5MP^{6}5DP^{4}
LSTL1/2e,3e	4D^{6}5D^{4}	SUTL1/4d	4M^{4}5D^{3}6DE^{3}
LSTL2/2,3	3D^{4}5D^{3}5WN^{3}	SUTL11/4dp	5MP45DP^{3}6DE^{3}
LSTL2/2e,3e	4D^{4}5D^{3}5WN^{3}	SUTL2/2,3,4	4M^{4}5D^{3}5WN^{3}
MEDC1/3,4	3M^{6}4M^{4}	SUTL2/2e,3e	5MD^{6}5WN^{4}
MEDC2/2,3	3M^{4}4M^{3}4W^{3}	SUTL2/2ep,3ep	5MP^{4}5DP^{3}5WN^{3}
MEHN1/3,4	3M	SUTL2/3p	4MP^{4}5DP^{3}5WN^{3}
MEHN1/3p	4MP	SUTL2/4d	4M^{4}6DE^{3}5WN^{3}
MEHN7/3,4	3M^{6}3D^{4}	TLA1/3	5D
MEKH1/3	3M^{6}3D^{4}	TLA1/2e,3e	5D
TLA1/3ep	6DP		
TLA1/4d	6DE		
TLSC1/3,4	5DP^{7}5MP^{3}		
TLSC2/2,3	5DP^{4}5MP^{3}5WN^{3}		
VTGL1/2	5D^{6}6NW^{4}		
WWFN1/3	5M		
WWFN2/3	5M^{6}5WN^{4}		
WWHC1/3,4	5M		
WWHC1/5	6MT		
WWHC2/3	5M^{7}5W^{3}		
WWSC1/3,4	5M		

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Appendix A. Detailed descriptions and analytical data for sampled representative soil profiles from major soil series.

Brownfield Series (BFD)

Location: SW1/4, Sec 17, Tp 37, R 13, W 4 Mer

Classification: Dark Brown Solod

Parent material: Weakly calcareous, moderately saline, clay loam till

Profile description:

Horizon	**Depth, cm**	
Ap	0 to 11	Very dark brown (10YR2.5/2m); loam; weak, medium cloddy and weak, fine granular; friable; plentiful, very fine, random roots; abrupt, smooth boundary; 9 to 15 cm thick; strongly acid.
Ahe	11 to 17	Brown to dark brown (10YR4/3m); loam; weak, fine granular; friable; plentiful, very fine, random roots; clear, smooth boundary; 5 to 11 cm thick; strongly acid
AB	17 to 25	Brown (10YR3.5/3); clay loam; weak, fine to medium, subangular blocky; friable; few, very thin clay films on ped faces; few, very fine, vertical, exped roots; clear, smooth boundary; 6 to 10 cm thick; moderately acid.
Bnt	25 to 58	Dark Brown (10YR3/2.5 m); clay loam; strong, medium prismatic breaking to moderate, fine to medium, angular blocky; firm; many, moderately thick clay films in many voids, channels and on vertical and horizontal ped faces; few, very fine, vertical, exped roots; clear, wavy boundary; 15 to 35 cm thick; neutral.
Ccas	58+	Dark grayish brown (10YR4/2 m); clay loam; structureless, massive; firm; no roots; moderately calcareous; moderately alkaline.

Horizon	Depth (cm)	pH ($CaCl_2$)	Organic C(%)	Exchangeable Cations (me/100g) Na	K	Ca	Mg	T.E.C. (me/100g)	Ca/Na	$CaCO_3$ Equiv.(%)	EC (dSm^{-1})	Soluble Cations (meq/L) Na	K	Ca	Mg	SO_4	SAR	Particle Size %S	%Si	%C	Texture
Ap	0-11	4.7	3.10	0.3	0.7	8.1	2.9	19.2	30.1	-	-	-	-	-	-	-	-	48	34	18	L
Ahe	11-17	4.9	1.34	0.5	0.4	8.6	2.7	16.7	19.1	-	-	-	-	-	-	-	-	43	31	26	L
AB	17-25	5.3	1.03	1.0	0.4	8.8	4.5	16.8	9.1	-	-	-	-	-	-	-	-	42	30	28	CL
Bnt	25-58	6.7	1.03	2.2	0.7	11.1	7.1	20.2	5.0	-	0.62	6.4	0.2	10	0.7	3.9	7.0	37	34	29	CL
Ccas	58+	7.7	-	-	-	-	-	-	-	3.12	2.82	23.3	0.7	9.4	5.7	32.8	8.5	44	29	27	CL

Appendix A. (continued)

Coronation Series (CNN)

Location: SE1/4, Sec 10, Tp 37, R 9, W 4 Mer

Classification: Orthic Dark Brown Chernozemic

Parent material: Weakly calcareous, glaciofluvial loam to silt loam

Profile description:

Horizon	**Depth, cm**	
Ap	0 to 16	Very dark brown (10YR2/2 m); loam; weak, medium cloddy and weak, fine granular; friable; abundant very fine, random roots; abrupt, smooth boundary; 14 to 16 cm thick; strongly acid.
Bm	16 to 56	Dark brown (10YR3/3 m); loam; weak, coarse prismatic; friable; plentiful, very fine, random roots; clear, smooth boundary; 36 to 41 cm thick; weakly acid.
BC	56 to 79	Dark brown (10YR3/3 m); clay loam; very weak, coarse prismatic; friable; plentiful, very fine, random roots; clear, smooth boundary; 23 to 26 cm thick; neutral.
Ck	79+	Brown to dark brown (10YR4/3 m); loam to fine sandy clay loam; structureless; firm; few, very fine, random roots; weakly calcerous; mildly alkaline

Horizon	Depth (cm)	pH ($CaCl_2$)	Organic C(%)	Exchangeable Cations (me/100g) Na	K	Ca	Mg	T.E.C. (me/100g)	Ca/Na	$CaCO_3$ Equiv.(%)	EC (dSm^{-1})	Soluble Cations (meq/L) Na	K	Ca	Mg	SO_4	SAR	Particle Size %S	%Si	%C	Texture
Ap	0-16	4.7	4.08	-	1.6	10.8	2.1	23.3	537.5	-	-	-	-	-	-	-	-	43	38	19	L
Bm	16-56	5.7	1.05	0.2	0.6	11.4	4.6	19.5	51.7	-	-	-	-	-	-	-	-	46	30	24	L
BC	56-79	6.8	-	0.5	0.8	12.1	5.3	18.2	24.8	-	-	-	-	-	-	-	-	35	35	30	CL
Ck	79+	7.4	-	-	-	-	-	-	-	1.45	0.54	3.0	0.4	2.0	1.1	1.3	2.4	39	36	25	L

Appendix A. (continued)

Fleet Series (FLT)

Location: SE1/4, Sec 10, Tp 38, R 11, W 4 Mer

Classification: Orthic Humic Gleysol

Parent material: Weakly calcareous, moderately saline, glaciolacustrine clay

Profile description:

Horizon	Depth, cm	
Of	5 to 0	Dark reddish brown (5YR 2.5/2 m); very slightly decomposed organic material of sedge and reed origin; abrupt smooth boundary; 3 to 7 cm thick.
Ahg	0 to 9	Black (2.5YR 2.5/0 m); silty clay; weak, coarse, subangular blocky and weak fine subangular blocky; sticky and plastic; abundant very fine and fine, random inped and exped roots; clear, wavy boundary; 5 to 15 cm thick; mildly alkaline.
Bg	9 to 20	Black (5Y 2.5/2 m); many, fine, prominent (5YR4/6 m) mottles; clay; moderate to strong, very coarse columnar breaking to moderate, fine to medium, angular blocky; firm; plentiful, very fine, random inped and exped roots; clear smooth boundary; 8 to 15 cm thick; moderately alkaline.
Cgsak	20 to 45	Dark olive gray (5Y 3/2 m); few, fine, faint (5Y4/3 m) mottles; clay; moderate, very fine to fine, angular blocky; firm; few, very fine, vertical, inped and exped roots; clear, smooth boundary; 20 to 25 cm thick; strongly alkaline.
Cgsk	45 to 75	Dark olive gray (5Y 3/2 m); few, fine, distinct (5Y 4/3 m) mottles; clay; moderate very fine to fine, angular blocky; firm; moderately saline; few, very fine, vertical, inped and exped roots; clear, smooth boundary; strongly alkaline.
Cgk	75 to 130	Olive gray (5Y 4.5/2 m); many, medium prominent (2.5Y 5/6 m) mottles; stratified fine sandy loam and silty clay loam; structureless; single grain and massive; very friable; weakly saline; no roots; clear, smooth boundary; strongly alkaline.
Cgsk	130+	Dark olive gray (5Y 3/2 m); clay loam; structureless, massive; firm; weakly saline; strongly alkaline.

				Exchangeable Cations (me/100g)								Soluble Cations (meq/L)						Particle Size			
Horizon	Depth (cm)	pH ($CaCl_2$)	Organic C(%)	Na	K	Ca	Mg	T.E.C. (me/100g)	Ca/Na	$CaCO_3$ Equiv.(%)	EC (dSm^{-1})	Na	K	Ca	Mg	SO_4	SAR	%S	%Si	%C	Texture
Ap	0-9	7.1	14.41	22.4	0.8	23.3	17.2	55.0	1.0	-	-	-	-	-	-	-	-	16	41	43	SiC
Bg	9-20	7.9	2.72	17.2	1.0	16.9	13.3	37.7	1.0	-	3.32	42.0	0.1	2.6	2.8	39.7	25.3	11	38	51	C
Csakg	20-45	8.0	-	-	-	-	-	-	-	2.29	8.29	83.5	0.7	21.8	17.1	125.0	18.9	15	35	50	C
Cskg	45-75	8.1	-	-	-	-	-	-	-	2.69	7.11	13.3	0.2	4.3	2.8	20.9	7.0	22	30	48	C
Ckg	75-130	8.2	-	-	-	-	-	-	-	2.54	5.80	62.6	0.5	5.7	6.5	75.0	25.4	71	22	7	SL

Appendix A. (continued)

Halkirk Series (HKR)

Location: NE1/4, Sec 7, Tp 37, R 13, W 4 Mer

Classification: Dark Brown Solodized Solonetz

Parent material: Weakly calcareous, moderately saline, clay loam till

Profile description:

Horizon	Depth, cm	
Ap	0 to 11	Very dark grayish brown (10YR 3/1.5 m); sandy loam; moderate, medium cloddy and weak to moderate, fine to medium granular; very friable; abundant, very fine, random roots; abrupt, smooth boundary; 10 to 13 cm thick; strongly acid.
Ahe	11 to 18	Brown (10YR 4/2.5 m); sandy loam; weak, fine, granular; very friable; plentiful, very fine, random roots; clear, smooth boundary; 5 to 8 cm thick; weakly acid.
Ae	18 to 19	Light yellowish brown (10YR 6/3 m); sandy loam; very weak, fine granular; friable; plentiful, very fine, random roots; abrupt, smooth boundary; 1 to 2 cm thick; weakly acid.
Bnt	19 to 37	Very dark grayish brown (10YR 3/1.5 m); clay loam; strong, coarse columnar breaking to weak, medium, angular blocky; very firm; continuous, thick clay skins in all voids or channels and on vertical and horizontal ped faces; few, very fine, vertical, exped roots; clear smooth boundary; 15 to 23 cm thick; moderately alkaline.
Ccas	37 to 50	Brown (10YR 5/3 m); loam to clay loam; weak, coarse prismatic; firm, weakly saline; weakly calcareous; few, very fine, vertical, exped roots; clear, smooth boundary; 10 to 15 cm thick; strongly alkaline.
Csak	50 to 67	Dark brown (10YR 3.5/2.5 m); loam to clay loam; weak, coarse prismatic; firm; strongly saline; weakly calcareous; very few, very fine vertical, exped roots; clear, smooth boundary; 14 to 20 cm thick; strongly alkaline.
Csk	67+	Dark brown (10YR 3/2.5 m); clay loam; weak, coarse prismatic; firm; weakly saline; weakly calcareous; no roots; strongly alkaline.

				Exchangeable Cations (me/100g)								Soluble Cations (meq/L)						Particle Size			
Horizon	Depth (cm)	pH ($CaCl_2$)	Organic C(%)	Na	K	Ca	Mg	T.E.C. (me/100g)	Ca/Na	$CaCO_3$ Equiv.(%)	EC (dSm^{-1})	Na	K	Ca	Mg	SO_4	SAR	%S	%Si	%C	Texture
Ap	0-11	4.5	1.07	0.2	0.8	5.2	1.2	14.0	23.6	-	-	-	-	-	-	-	-	60	30	10	SL
Ahe	11-18	5.9	1.11	0.6	0.2	3.8	1.2	6.7	6.7	-	-	-	-	-	-	-	-	62	31	7	SL
Bnt	19-37	7.9	1.06	5.6	0.8	3.8	6.6	14.0	0.7	-	1.38	17.1	0.1	0.7	0.9	10.3	19.4	41	41	18	L
Ccas	37-50	8.9	-	-	-	-	-	-	-	2.40	5.29	64.4	0.5	1.7	6.4	63.8	31.9	37	33	30	CL
Csak	50-67	8.6	-	-	-	-	-	-	-	1.57	10.03	111.3	1.2	23.3	31.3	165.0	21.3	41	33	26	L
Csk	67+	8.6	-	-	-	-	-	-	-	2.74	6.66	74.8	0.9	8.7	14.3	95.0	22.0	42	32	26	L

Appendix A. (continued)

Torlea Series (TLA)

Location: NW1/4, Sec 34, Tp 38, R 14, W 4 Mer

Classification: Dark Brown Solodized Solonetz

Parent material: Weakly calcareous, moderately to strongly saline, clay loam to clay residual materials (weathered sodic shales and sandstones) or on thin till of similar composition overlying these residual materials.

Profile description:

Horizon	Depth, cm	
Ap	0 to 11	Dark brown (10YR 4/3 m); silt loam; weak, coarse cloddy and weak to moderate, fine granular; friable; abundant, very fine and fine, random inped and exped roots; abrupt, smooth boundary; 10 to 12 cm thick; moderately acid.
Bnt	11 to 28	Very dark brown (10YR 3/2 m); clay loam; weak to moderate, very coarse columnar breaking to moderate to strong; medium, angular blocky; very firm; continuous, thick clay skins in all voids or channels and on vertical and horizontal ped faces; plentiful very fine, random exped roots; clear, smooth boundary; 14 to 19 cm thick; moderately alkaline.
Csa	28 to 48	Very dark gray (10YR 3/1 m) and dark grayish brown (10YR 4/2 m); clay loam; moderate very fine to fine, angular blocky; firm; strongly saline; few, very fine, random, exped roots; clear, wavy boundary; 10 to 22 cm thick; moderately alkaline.
IICsaca	48 to 55	Dark grayish brown (10YR 4/2 m); sandy clay loam; weak fine to medium pseudo platy; firm; strongly saline; weakly calcareous; very few, very fine, vertical roots; clear, wavy boundary; 3 to 10 cm thick; strongly alkaline.
IICs	55+	Pale olive (5Y 6/3d); common, medium, distinct (5Y 6/6 d) mottles; loam to clay loam; weak, fine to medium pseudo platy; firm; weakly saline; no roots; strongly alkaline.

				Exchangeable Cations (me/100g)								Soluble Cations (meq/L)						Particle Size			
Horizon	Depth (cm)	pH ($CaCl_2$)	Organic C(%)	Na	K	Ca	Mg	T.E.C. (me/100g)	Ca/Na	$CaCO_3$ Equiv.(%)	EC (dSm^{-1})	Na	K	Ca	Mg	SO_4	SAR	%S	%Si	%C	Texture
Ap	0-11	5.4	4.42	1.0	0.9	8.4	2.2	17.5	8.1	-	-	-	-	-	-	-	-	42	52	6	SiL
Bnt	11-28	7.6	2.41	9.2	0.7	15.4	6.2	27.1	1.7	-	1.60	22.4	-	5.4	1.7	8.0	11.9	28	43	29	CL
Csa	28-48	7.9	-	-	-	-	-	-	-	1.03	4.13	45.2	0.5	9.8	4.0	48.4	17.9	22	50	28	CL
IICs	55+	8.1	-	-	-	-	-	-	-	1.15	1.04	13.9	0.1	0.7	0.3	7.8	19.9	39	37	24	L

Appendix B. Glossary of terms

Definition of terms

Summary of Canadian System of Soil Classification (1978)

Mineral horizons and layers

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

A – This is a mineral horizon formed at or near the surface in the zone of leaching or eluviation of materials in solution or suspension, or of maximum in situ accumulation of organic matter or both.

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.

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).

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 percent organic C (approximately 30 percent organic matter) by weight. Two groups of these horizons are recognized, the O horizons and the L, F and H horizons.

O – This is an organic horizon developed mainly from mosses, rushes and woody materials.

L – This is an organic horizon that is characterised by an accumulation of organic matter derived mainly 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 materials.

H – This is an organic horizon that is characterized by an accumulation of decomposed organic matter in which the original structures are indiscernible.

Lower case suffixes

ca – A horizon of secondary carbonate enrichment in which the concentration of lime exceeds that in the unenriched parent material.

e – A horizon characterized by the eluviation of clay, Fe, Al or organic matter alone or in combination.

g – A horizon characterized by gray colors, or prominent mottling, or both, indicative of permanent or periodic intense reduction.

h – A horizon enriched with organic matter.

j – This is 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.

k – Denotes the presence of carbonate as indicated by visible effervescence when dilute HC1 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.

p – A horizon disturbed by man's activities such as cultivation, logging and habitation.

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.

sa – A horizon with secondary enrichment of salts more soluble than Ca and Mg carbonates; the concentration of salts exceeds that in the unenriched parent material.

t – An illuvial horizon enriched with silicate clay.

Topography

There are 10 slope classes, and each one is defined in terms of percent and degrees.

Class	Slope (%)	Approximate degrees	Terminology
1	0 to 0.5	0	Level
2	0.5 to 2.0	0.3 - 1.1	Nearly level
3	2 to 5	1.1 - 3	Very gentle slopes
4	5 - 9	3 - 5	Gentle slopes
5	9 - 15	5 - 8.5	Moderate slopes
6	15 - 30	8.5 - 16.5	Strong slopes
7	30 - 45	16.5 - 24	Very strong slopes
8	45 - 70	24 - 35	Extreme slopes
9	70 - 100	35 - 45	Steep slopes
10	100	45	Very steep slopes

Throughout this report, descriptive terms are used repeatedly to describe features of significance within the map area. The following are definitions of some of these descriptive terms.

Soil texture

Soil separates (particle size) on which textural classes are based

Separates	Diameter in millimeters
Very Coarse Sand (V.C.S.)	2.0 - 1.0
Coarse Sand (C.S.)	1.0 - 0.5
Medium Sand (M.S.) Sand (S.)	0.5 - 0.25
Fine Sand (F.S.)	0.25 - 0.10
Very Fine Sand (V.F.S.)	0.10 - 0.05
Silt (Si.)	0.05 - 0.002
Clay (C.)	less than 0.002
Fine Clay (F.C.)	less than 0.0002

Appendix B. (continued)

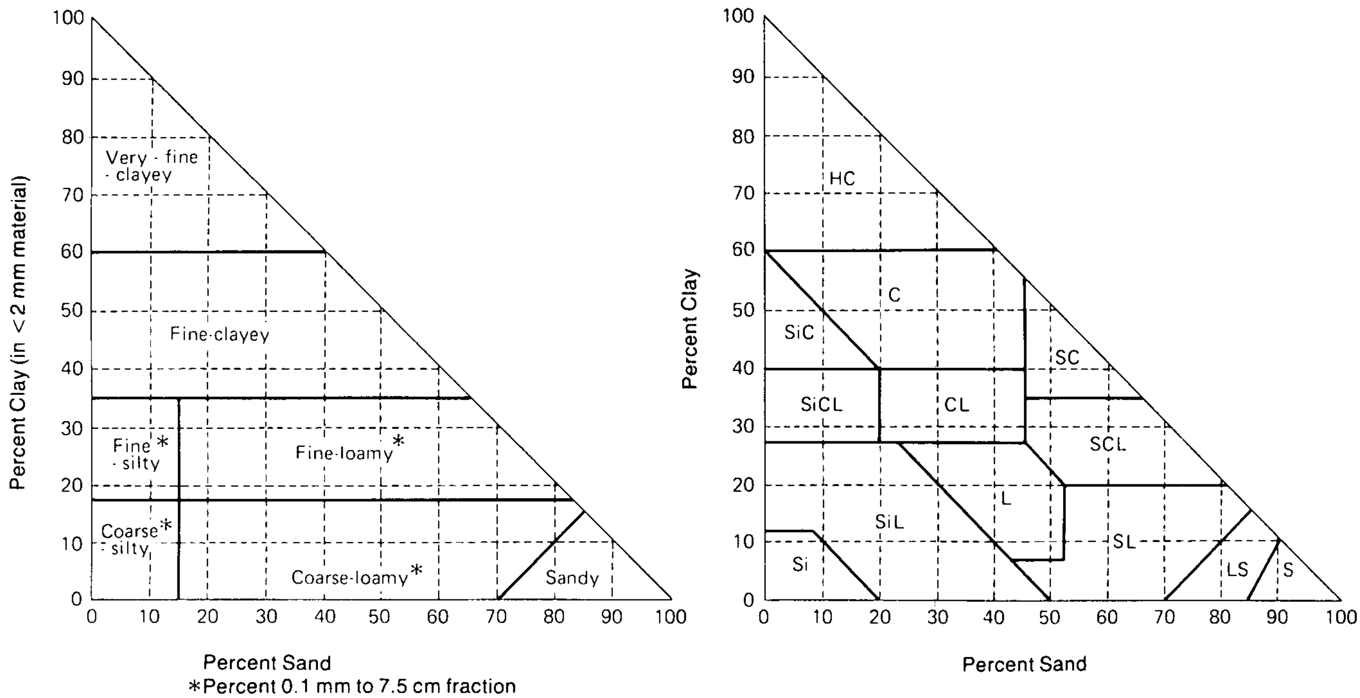

Figure 7. Family particle-size classes and texture classes (C.S.S.C., 1978).

Proportions of soils separates in various soil textural classes

From: Toogood, J.A. (1958): A simplified textural classification diagram; Canadian Journal of Soil Science, vol. 38, p. 54-55. .

Sands are further divided according to the prevalence of differently sized sand fractions. Medium and coarse sands may contain over 25 percent coarse sand but not over 50 percent fine sands. Fine and very fine sands must contain over 50 percent of the respective fine sand fractions.

The Soil textural classes are grouped according to the Canada Soil Survey Committee of Canada as follows:

(a) coarse textured sands, loamy sands

(b) moderately coarse textured sandy loam, fine sandy loam

(c) medium textured very fine sandy loam, loam, silt loam, silt

(d) moderately fine textured sandy clay loam, clay loam, silty clay loam (e) fine textured sandy clay, silty clay, clay (40 to 60 percent)

(f) very fine textured heavy clay (more than 60 percent clay)

The particle-size classes for family groupings are as follows:

Fragmental. Stones, cobbles and gravel, with too little fine earth to fill interstices larger than 1 mm.

Sandy-skeletal. Particles coarser than 2 mm occupy 35 percent or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the sandy particle-size class.

Loamy-skeletal. Particles 2 mm to 25 cm occupy 35 percent or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the loamy particle-size class.

Clayey-skeletal. Particles 2 mm to 25 cm occupy 35 percent or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the clayey particle-size class.

Sandy. The texture of the fine earth includes sands and loamy sands, exclusive of loamy very fine sand and very fine sand textures; particles 2 mm to 25 cm occupy less than 35 percent by volume.

Loamy. The texture of the fine earth includes loamy very fine sand, very fine sand and finer textures with less than 35 percent clay; particles 2 mm to 25 cm occupy less than 35 percent by volume.

Coarse-loamy. A loamy particle size that has 15 percent or more by weight of fine sand (0.25 to 0.1 mm) or coarser particles, including fragments up to 7.5 cm and less than 18 percent clay in the fine earth fraction.

Fine-loamy. A loamy particle size that has 15 percent or more by weight of fine sand (0.25 to 0.1 mm) or coarser particles, including fragments up to 7.5 cm and has 18 to 35 percent clay in the fine earth fraction.

Coarse-silty. A loamy particle size that has less than 15 percent of fine sand (0.25 to 0.1 mm) or coarse particles, including fragments up to 7.5 cm and has less than 18 percent clay in the fine earth fraction.

Appendix B. (continued)

Fine-silty. A loamy particle size that has less than 15 percent of fine sand (0.25 to 0.1 mm) or coarser particles, including fragments up to 7.5 cm and has 18 to 35 percent clay in the fine earth fraction.

Clayey. The fine earth contains 35 percent or more clay by weight and particles 2 mm to 25 cm occupy less than 35 percent by volume.

Fine-clayey. A clayey particle size that has 35 to 60 percent clay in the fine earth fraction.

Very-fine-clayey. A clayey particle size that has 60 percent or more clay in the fine earth fraction.

Soil structure and consistence

Soil structure refers to the aggregation of the primary soil particles into compound particles, or clusters of primary particles, which are separated from adjoining aggregates by surfaces of weakness. The aggregates differ in grade of development (degree of distinctness) and this distinctness is classed as: weak, moderate and strong. The aggregates vary in size and are classed as: very fine, fine, medium, coarse, and very coarse. They also vary in kind; that is, in the character of their faces and edges. The kinds mentioned in this report are: single grain-loose, incoherent mass of individual particles as in sands; blocky-faces rectangular and flattened, vertices sharply angular; subangular blocky-faces subrectangular, vertices mostly oblique or subrounded; columnar-vertical edges near top of columns are not sharp (columns may be flat-topped, round-topped or irregular); granular-spheroidal, characterized by rounded vertices; platy-horizontal planes more or less developed.

Soil consistence comprises the attributes of soil materials that are expressed by the degree and kind of cohesion and adhesion or by the resistance to deformation and rupture. Consistence reflects the strength and nature of the forces of attraction within a soil mass. The terms used in describing soils in this report are: loose-noncoherent; friable (specifies friable when moist) – a soil material crushes easily under gently to moderate pressure between thumb and forefinger, and coheres when pressed together; firm (specifies firm when moist) – soil material crushes under moderate pressure between thumb and forefinger but resistance is distinctly noticeable; hard (specifies hard when dry) – moderately resistant to pressure, can be broken in the hands without difficulty but rarely breakable between thumb and forefinger; compact-term denotes a combination of firm consistence and a close packing or arrangement of particles; plastic (specifies plastic when wet) – soil material can be formed into wires by rolling between the thumb and forefinger and moderate pressure is required for deformation of the soil mass.

Soil moisture classes

Soil moisture classes are defined according to: (1) actual moisture content in excess of field-moisture capacity, and (2) the extent of the period during which such excess water is present in the plant root zone. The classes are:

(a) rapidly drained soil-moisture content seldom ex ceeds field capacity in any horizon except immediately after water additions;

(b) 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;

(c) moderately well-drained soil-moisture in excess of field capacity remains for a small but significant period of the year;

(d) imperfectly drained soil-moisture in excess of field capacity remains in subsurface horizons for moderately long periods during the year;

(e) poorly drained soil-moisture in excess of field capacity remains in all horizons for a large part of the year;

(f) very poorly drained free-water remains at or within 30 cm of the surface most of the year.

Special reference to surface drainage may be designated in terms of runoff and described as high, medium, low or ponded. Similarly, specific reference to the characteristics of horizons within the profile may be designated in terms of permeability or percolation and described as rapid, moderate, slow, very slow and none.

Calcareous classes

The Canada Soil Survey Committee (1978) has set the following nomenclature and limits for calcareous grades:

(a) weakly calcareous: 1 to 5 percent calcium carbonate equivalent

(b) moderately calcareous: 6 to 15 percent calcium carbonate equivalent

(c) strongly calcareous: 16 to 25 percent calcium carbonate equivalent

(d) very strongly calcareous: 26 to 40 percent calcium carbonate equivalent

(e) extremely calcareous: greater than 40 percent calcium carbonate equivalent

Appendix B. (continued)

Reaction classes

The reaction classes and terminology adopted by the Canada Soil Survey Committee (1978) are:

Class	$pH(H_2O)$
(a) Extremely acid	less than 4.5
(b) Very strongly acid	4.6 to 5.0
(c) Strongly acid	5.1 to 5.5
(d) Medium acid	5.6 to 6.0
(e) Slightly acid	6.1 to 6.5
(f) Neutral	6.6 to 7.3
(g) Mildly alkaline	7.4 to 7.8
(h) Moderately alkaline	7.9 to 8.4
(i) Strongly alkaline	8.5 to 9.0
(j) Very strongly alkaline	9.0

Horizon boundaries

The lower boundary of each horizon is described by indicating its distinctness and form as suggested in the USDA Soil Survey Manual (United States Department of Agriculture, 1951). The classes of distinctness are:

(a) abrupt	less than 2.5 cm wide
(b) clear	2.5 to 6 cm wide
(c) gradual	6 to 12.5 cm wide
(d) diffuse	more than 12.5 cm wide

The categories for form are:

(a) smooth	nearly a plane
(b) wavy	pockets are wider than deep
(c) irregular	pockets are deeper than wide
(d) broken	parts of the horizon are unconnected with other parts

Roots

The terminology for describing roots is that adopted by the Canada Soil Survey Committee (1978). In this system both the abundance and diameter of roots are described. The classes of abundance are:

Abundance	Number per unit area surface
(a) very few	less than 1
(b) few	1 to 3
(c) plentiful	4 to 14
(d) abundant	more than 14

The diameter categories are:

(a) micro	less than 0.075 mm
(b) very fine	0.075 to 1 mm
(c) fine	1 to 2 mm
(d) medium	2 to 5 mm
(e) coarse	more than 5 mm

Glossary

This is included to define terms commonly used in soil science: it is not a comprehensive soil glossary.

acid soil – A soil having a pH of less than 7.0.

aggregate – A group of soil particles cohering so as to behave mechanically as a unit.

alkaline soil – A soil having a pH greater than 7.0.

alluvium – A general term for all deposits of modern rivers and streams.

available nutrient – That portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants. ("Available" should not be confused with "exchangeable.")

bedrock – The solid rock underlying soils and the regolith or exposed at the surface.

bog – Permanently wet land with low bearing strength.

bulk density, soil – The mass of dry soil per unit bulk volume.

calcareous soil – Soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervesce visibly when treated with cold 0.1N hydrochloric acid.

capability class (soil) – The class indicates the general suitability of the soils for agricultural use. It is a grouping of subclasses that have the same relative degree of limitation or hazard. The limitation or hazard becomes progressively greater from Class 1 to Class 7.

capability subclass (soil) – This is a grouping of soils with similar kinds of limitations and hazards. It provides information on the kind of conservation problem or limitation. The class and subclass together provide the user with information about the degree and kind of limitation for broad land use planning and for the assessment of conservation needs.

category – Any one of the ranks of the system of soil classification in which soils are grouped on the basis of their characteristics.

cation exchange – The interchange between a cation in solution and another cation on the surface of any surface-active material such as clay colloids or organic colloids.

cation-exchange capacity – The sum total of exchangeable cations that a soil can absorb. Sometimes called "total-exchange capacity," "base-exchange capacity," or "cation-adsorption capacity." Expressed in milliequivalents per 100 grams of soil.

classification, soil – The systematic arrangement of soils into categories and classes on the basis of their characteristics. Broad groupings are made on the basis of general characteristics and subdivisions on the basis of more detailed differences in specific properties.

clay – As a particle-size term; a size fraction .002 mm equivalent diameter.

Appendix B. (continued)

clayey – Containing large amounts of clay or having properties similar to those of clay.

coarse fragments – Rock or mineral particles 2.0 mm in diameter.

coarse texture – The texture exhibited by sands, loamy sands, and sandy loams except very fine sandy loam. A soil containing large quantities of these textural classes.

consistency – (i) The resistance of a material to deformation or rupture (ii) the degree of cohesion or adhesion of the soil mass.

crust – A surface layer on cultivated soils, ranging in thickness from a few millimeters to as much as 3 cm, that is much more compact, hard and brittle when dry than the material immediately beneath it.

degradation – The changing of a soil to a more highly leached and more highly weathered condition, usually accompanied by morphological changes such as the development of an eluviated, light colored Ae horizon.

deposit – Material left in a new position by a natural transporting agent such as water, wind, ice, or gravity, or by the activity of man.

eluvial horizon – A soil horizon that has been formed by the process of eluviation. See illuvial hori- zon.

eolian deposit – Wind deposit; includes both loess and dune sand.

erosion – The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

fertility, soil – The status of a soil with respect to the amount and availability to plants of elements necessary for plant growth.

fertilizer – Any organic or inorganic material of natural or synthetic origin that is added to a soil to supply certain elements essential to the growth of plants.

fertilizer requirements – The quantity of certain plant nutrient elements needed, in addition to the amount supplied by the soil, to increase plant growth to a designated optimum.

fine texture – Consisting of or containing large quantities of the fine fractions, particularly silt and clay.

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, past and present, deposited by flowing water, including glaciofluvial deposits. Wave-worked deposits and deposits resulting from sheet erosion and mass wasting are not included.

friable – A consistency term pertaining to the ease of crumbling of soils.

frost action – Freezing and thawing of moisture in materials and the resultant effects on these materials and on structures of which they are a part or with which they are in contact.

glacial drift – Embraces all rock material trans- ported by glacier ice, glacial meltwater and rafted by icebergs. This term includes till, stratified drift and scattered rock fragments.

glaciofluvial deposits – 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 deposit – Material deposited in lake water and later exposed either by lowering the water level or by uplift of the land. These sediments range in texture from sands to clays.

gravelly – Containing appreciable or significant amounts of gravel.

green manure – Plant material incorporated with the soil while green, for improving the soil.

ground moraine – Generally an unsorted mixture of rocks, boulders, sand, silt and clay deposited by glacial ice. The predominant material is till, though stratified drift is present in places. The till is thought to have accumulated largely by lodgment beneath the ice but also partly by being let down from the upper surface of the ice through the ablation process. Ground moraine is most commonly in the form of undulating plains with gently sloping swells, sags and enclosed depressions.

groundwater – That portion of the total precipitation that 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.

illuvial horizon – A soil layer or horizon in which material carried from an overlying layer has been precipitated from solution or deposited from suspension. The layer of accumulation.

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 substances include silicate clay, iron and aluminum hydrous oxides or organic matter.

immature soil – A soil with indistinct or only slightly developed horizons.

infiltration – The downward entry of water into the soil.

landscape – All the natural features such as fields, hills, forests, water, etc., that distinguish one part of the earth's surface from another part. Usually that portion of land or territory that the eye can comprehend in a single view, including all its natural characteristics.

leaching – The removal of materials in solution from the soil.

liquid limit – (upper plastic limit) – (i) The water content corresponding to an arbitrary limit between

Appendix B. (continued)

the liquid and plastic states of consistency of a soil. (ii) The water content at which a pat of soil, cut by a groove of standard dimensions, will flow together for a distance of 12 mm under the impact of 25 blows in a standard liquid limit apparatus.

marsh – Periodically wet or continually flooded areas with the surface not deeply submerged. Covered dominantly by sedges, cattails, rushes or other hydrophytic plants. Subclass includes freshwater and salt-water marshes.

mature soil – A soil with well-developed soil horizons produced by the natural processes of soil formation.

medium texture – Intermediate between fine-textured and coarse-textured (soils). (It includes the following textural classes: very fine sandy loam, loam, silt loam and silt).

mineral soil – A soil consisting predominantly of, and having its properties determined predominantly by, mineral matter. It contains percent organic matter except for an organic surface layer that may be up to 30 cm thick, if consolidated, or 45 cm if unconsolidated.

mottles – Spots or blotches of different color or shades of color interspersed with the dominant color resulting from reducing conditions.

Munsell color system – A color designation system that specifies the relative degree of the three simple variables of color: hue, value, and chroma. For example: 10YR 6/4 is a color (of soil) with a hue + 10YR, value 6, and chroma 4. These notations can be translated into several different systems of color names as desired.

neutral soil – A soil in which the surface layer, at least to normal plow depth, is neither acid nor alkaline in reaction.

organic soil – A soil that has developed dominantly from organic deposits. The majority of Organic soils are saturated for most of the year, unless artificially drained, but some of them are not usually saturated for more than a few days. They contain 17 percent or more organic carbon and:

1) if the surface layer consists of fibric organic material and the bulk density is less than 0.1 (with or without a mesic or humic Op less than 15 cm thick), the organic material must extend to a depth of at least 60 cm; or
2) if the surface layer consists of organic material with a bulk density of 0.1 or more, the organic material must extend to a depth of at least 40 cm; or
3) if a lithic contact occurs at a depth shallower than stated in 1) or 2) above, the organic material must extend to a depth of at least 60 cm.

outwash – Sediments 'washed out' by flowing water in front of the glacier and laid down in beds as stratified drift. Particle size may range from boulders to silt.

parent material – The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of a soil is developed by pedo- genic processes.

particle size – The effective diameter of a particle measured by sedimentation, sieving or micrometric methods.

particle size distribution – The amounts of the various soil separates in a soil sample, usually expressed as weight percentages.

peat – Unconsolidated soil material consisting large- ly of undecomposed, or only slightly decomposed, organic matter.

ped – A unit of soil structure such as a prism, block or granule, formed by natural processes (in contrast with a clod, which is formed artificially).

pedology – Those aspects of soil science involving the constitution, distribution, genesis and classification of soils.

percolation, soil water – The downward movement of water through soil. Especially the downward flow of water in saturated or nearly saturated soil at hydraulic gradients of the order of 1.0 or less.

pH, soil – the negative logarithm of the hydrogen-ion activity of a soil. The degree of acidity or alkalinity of a soil as determined by means of a glass, quinhydrone or other suitable electrode or indicator at a specified moisture content or soil-water ratio and ex- pressed in terms of the pH scale.

phase, soil – A subdivision of a soil type or other unit of classification having characteristics that affect the use and management of the soil but which do not vary sufficiently to differentiate it as a separate type. A variation in a property or characteristic such as degree of slope, degree of erosion and content of stones.

physical properties (of soils) – Those characteristics, processes or reactions of a soil which are caused by physical forces and which can be described by, or expressed in, physical terms or equations. Sometimes confused with and difficult to separate from chemical properties; hence, the terms 'physical-chemical' or 'physiochemical' (not used in this report).

plastic limit – (i) The water content corresponding to an arbitrary limit between the plastic and the semisolid states of consistency of a soil. (ii) Water content at which a soil will just begin to crumble when rolled into a thread approximately 3 mm in diameter.

platy – Consisting of soil aggregates that are developed predominately along the horizontal axes; laminated; flaky.

pore space – Total space not occupied by soil particles in a bulk volume of soil.

Appendix B. (continued)

productivity, soil – The capacity of a soil, in its normal environment, for producing a specified plant or sequence of plants under a specified system of management. The "specified" limitations are necessary since no soil can produce all crops with equal success nor can a single system of management produce the same effect on all soils. Productivity emphasizes the capacity of soil to produce crops and should be expressed in terms of yields.

profile, soil – A vertical section of the soil through all its horizons and extending into the parent material.

reaction, soil – The degree of acidity or alkalinity of a soil, usually expressed as a pH value.

saline soil – A nonalkali soil containing soluble salts in such quantities as to interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than 4 mmhos/cm, the exchangeable-sodium percentage is less than 15, and the pH is usually less than 8.5.

sand – A soil particle between 0.05 and 2.0 mm in diameter.

silt – A soil particle between 0.05 and 0.002 mm in diameter.

soil – (i) The unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. (ii) The unconsolidated mineral matter on the surface of the earth that has been subjected to and influenced by genetic and environmental factors of: parent material, climate (including moisture and temperature effects), macro- and microorganisms and topography, all acting over a period of time and producing a product-soil that differs from the material from which it is derived in many physical, chemical, biological and morphological properties and characteristics.

soil conservation – (i) Protection of the soil against physical loss by erosion or against chemical deterioration; that is, excessive loss of fertility by either natural or artificial means. (ii) A combination of all management and land-use methods that safeguard the soil against depletion or deterioration by natural or by man-induced factors.

soil genesis – The mode of origin of the soil with special reference to the processes or soil-forming factors responsible for the development of the solum or true soil, from the unconsolidated parent material.

soil management – The sum total of all tillage operations, cropping practices, fertilizer, lime and other treatments conducted on or applied to a soil for the production of plants.

soil map – A map showing the distribution of soil mapping units in relation to the prominent physical and cultural features of the earth's surface.

soil moisture – Water contained in the soil.

soil morphology – (i) The physical constitution, particularly the structural properties, of a soil profile as exhibited by the kinds, thickness and arrangement of the horizons in the profile and by the textures, structure, consistency and porosity of each horizon. (ii) The structural characteristics of the soil or any of its parts.

soil organic matter – The organic fraction of the soil; includes plant and animal residues at various stages of decomposition, cells and tissues of soil organisms and substances synthesized by the soil population. Usually determined on soils which have been sieved to pass a 2.0 mm sieve.

soil separates – Mineral particles, <2.0 mm in equivalent diameter, ranging between specified size limits.

soil structure – The combination or arrangement of primary soil particles into secondary particles, units or peds. These secondary units may be, but usually are not, arranged in the profile in such a manner as to give a distinctive characteristic pattern. The secondary units are characterized and classified on the basis of size, shape and degree of distinctness into classes, types and grades, respectively.

soil survey – The systematic examination, description, classification and mapping of soils in an area. Soil surveys are classified according to the kind and intensity of field examination.

soil texture – The relative proportions of the various soil separates in a soil. The textural classes may be modified by the addition of suitable adjectives when coarse fragments are present in substantial amounts, for example, 'stony silt loam,' or 'silt loam, stony phase.'

solum (plural sola) – The upper horizons of a soil in which the parent material has been modified and within which most plant roots are confined. It consists usually of A and B horizons.

stones – Rock fragments 25 cm in diameter if rounded and 38 cm along the greater axis if flat.

stony – Containing sufficient stones to interfere with or to prevent tillage.

surface soil – The uppermost part of the soil, ordinarily moved in tillage or its equivalent in uncultivated soils and ranging in depth from 8 or 10 cm to 20 or 25 cm. Frequently designated as the 'plow layer,' the 'Ap layer,' or the 'Ap horizon.'

till – (i) Unstratified glacial drift deposited directly by the ice and consisting of clay, sand, gravel and boulders intermingled in any proportion. (ii) To plow and prepare for seeding; to seed or cultivate the soil.

tilth – The physical condition of soil as related to its ease of tillage, fitness as a seedbed and its impedance to seeding emergence and root penetration.

Appendix B. (continued)

very coarse texture – Consisting of sands and loamy sands.
very fine texture – Consisting of very fine clay particles (more than 60 percent clay.
water logged - 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 C. Map Legend

Legend explanation

Key to map unit numbers

1 – a relatively pure unit
2 – significant amounts (15 to 40 percent) of Gleyed or Gleysolic soils and sloughs
4 – significant amounts (20 to 40 percent of Rego or Calcareous Chernozemic soils
6 – significant amounts (20 to 40 percent) of soils with textures coarser than those of dominants
7 – significant amounts (15 to 40 percent) of Solonetzic soils
8 – significant amounts (20 to 40 percent) of Rego and Calcareous Chernozemic soils and Gleyed or Gleysolic soils and sloughs

Slope classes and range(%)		Map unit phases
2- nearly level	0 - 2	e- eroded pits greater than 30 percent
3- very gentle slopes	2 - 5	
		d- dissected with narrow, steep-sided gullies or ravines greater than 10 percent
4- gentle slopes	5 - 9	
5- moderate slopes	9 - 15	p- stony with surface stones and boulders greater than 3 percent
6 - strong slopes	15 - 30	

Map unit symbol explanation

Soil unit	Unit number
TLA1	HKSU1
3e	3e
Slope class	Map unit phase

- Three-letter symbol denotes a unit with one dominant soil, for example, TLA (Torlea)
- Four-letter symbol is used to emphasize presence of a second major soil. The symbol combines the first two letters of each series forming the soil unit, for example, HKSU from HKR (Halkirk) and SUL (Sullivan Lake).

Appendix C. (continued)

Unit name	Map symbol	Soil components	Landform	Comments
Alluvium	AV1	Undifferentiated Regosolic or Dark Brown Chernozemics with significant Gleyed subgroups and Gleysols	Medium to moderately coarse fluvial materials, level to gently undulating, 0 - 5% slopes	Inclusions of adjacent upland soils
Alluvium	AV2	Undifferentiated Gleysols with inclusions of water along stream channels	Moderately fine to fine fluvial, level to gently undulating 0 - 2% slopes	Inclusions of well-drained Regosolic soils
Bigknife	BKF1/4,3	Orthic Regosols with weak Solonetzic morphology (BKF)	Stratified silt loam, fine sandy clay loam slopewash veneer or blanket over bedrock	Inclusions of recent Alluvium along active slopes and channels
Bigknife-Rough Broken	BKRB1	Orthic Regosol (BKF) with significant Rough Broken, bedrock exposures 10 to 40% of the area	Stratified silt loam, fine sandy clay loam slopewash venner over bedrock, gentle to steep, 5 - 70% slopes	Inclusions of recent Alluvium along active slopes and channels
Coronation	CNN1/3	Orthic Dark Brown Chernozemic (CNN) with inclusions of Solonetzic Dark Brown Chernozemic (unnamed)	Stratified silt loam, fine sandy loam and some silty clay loam fluvial apron, gently sloping, 2 - 4% slopes	Silty clay loam material common in lower areas between coalesced fans and along fan margins
Disturbed land	D.L.	Undifferentiated	Undifferentiated	Land areas disrupted by surface coal mining activity
Edgerton	ERT1/3	Orthic and Cumulic Regosols (ERT) with inclusions of Rego Dark Brown (HCH) and Orthic Dark Brown (WWT)	Loamy sand to sand eolian, ridged undulating, 3 - 6% slopes	None
Edgerton-Fenner	ERFN2/2,3	Orthic and Cumulic Regosols (ERT) plus Dark Brown Solodized Solonetz (FNR) with significant Gleyed and Gleysolic soils	Loamy sand to eolian and glaciofluvial, level to gently undulating, 0 - 5% slopes	None
Elnora-Rosebank	EORO1/2,3(P)	Orthic Black Chernozemics (EOR, ROS) with significant Solonetzic Black Chernozemics (HER)	Discontinuous sandy loam glaciofluvial veneer over clay loam till, 2 - 5% slopes	Inclusions (<15%) of Gleyed subgroups
Elnora-Rosebank	EORO2/2,3(P)	Orthic Black Chernozemics (EOR, ROS) with significant Gleysols and Gleyed subgroups	Discontinuous sandy clay loam glaciofluvial veneer over clay loam till, 0 - 4% slopes	Inclusions of Black Solodized Solonetz with sandy loam veneer
Fenner-Torlea	FNTL1/3(E)	Dark Brown Solodized Solonetz (FNR) with significant eroded Dark Brown Solodized Solonetz (TLA)	Loamy sand glaciofluvial veneer (0.5M) over clay loam to clay residual shale and sandstone, gently undulating, 2 - 5% slopes	Inclusions of Orthic Dark Brown (WWT), eroded pits (<30%)

Appendix C. (continued)

Unit name	Map symbol	Soil components	Landform	Comments
Flagstaff	FST1/4,3	Solonetzic Dark Brown Chernozemics (FST) dominant, Onnevue (OVE) significant	Clay loam till, gently undulating to rolling, 3 - 12% slopes	Inclusions of Orthic or Eluviated Dark Brown Chernozemics (HND, LFE) 10 - 30%
Flagstaff	FST2/3,4	Solonetzic Dark Brown Chernozemics (FST, OVE) with significant Gleysol (COR) and Gleyed subgroups	Clay loam till, gently undulating to rolling (kettled), 3 - 12% slopes	Inclusions of Orthic or Eluviated Dark Brown Chernozemics (HND, LFE) and Dark Brown Solod (BFD) 10 - 30%
Flagstaff	FST7/3,4	Solonetzic Dark Brown Chernozemic (FST, OVE) with significant Solonetzic soils (HKR, BFD)	Clay loam till, gently undulating to rolling, 3 - 9% slopes	Inclusions of Orthic Dark Brown Chernozemic (HND) 10 - 30%
Flagstaff-Heisler	FSHE1/4,3	Solonetzic Dark Brown Chernozemic (FST) with significant Solonetzic Black Chernozemic (HER)	Clay loam till, rolling to undulating, 3 - 10% slopes	Inclusions (<15%) of Humic Luvic Gleysols (COR)
Flagstaff-Heisler	FSHE2/4	Solonetzic Dark Brown and Black Chernozemics (FST, HER) with significant Humic Luvic Gleysol (COR) and Gleyed subgroups	Clay loam till, rolling (kettled), 5 - 12% slopes	Darker equivalent of FST2 unit
Fleet-Foreman	FLFM1/2,3	Orthic and Rego Humic Gleysols (FLT) with significant Gleyed Black Solonetz	Silty clay to clay shallow glaciolacustrine over till or inwash in till areas, level to very gently undulating, 0 - 4% slopes	Inclusions of Gleyed equivalents of well-drianed soils in adjacent map units, water (sloughs)
Gleddies	GLS1/2	Rego Gleysol, saline phase (GLS)	Silty clay glaciolacustrine, level to very gently undulating, 0 - 2% slopes	Inclusions of Dark Brown Solonetz (VTR) along margins
Gleddies-Lakesend	GLS1/3	Rego Gleysol, saline phase (GLS) with significant Dark Brown Solodized Solonetz (LSD)	Silty clay and silty clay loam glaciolacustrine, level to gently undulating, 0 - 4% slopes	Small water bodies (sloughs) less than 20% of area
Gleysol	GY1	Undifferentiated Gleysols with significant shallow water bodies	Variable texture and parent material origin, level to very gently undulating, 0 - 2% slopes	Used for wet areas, 30 acres or larger, without soil data
Halkirk-Brownfield	HKBF1/3,4	Dark Brown Solodized Solonetz (HKR) with significant Dark Brown Solod (BFD)	Clay loam till, gently undulating to rolling, 3 - 9% slopes	Inclusions of Solonetzic Dark Brown Chernozemic (FST, OVE) 10 - 30%
Halkirk-Brownfield	HKBF2/3,4	Dark Brown Solodized Solonetz (HKR) and Dark Brown Solod (BFD) with significant Gleyed subgroups (HKR, FMN) and Orthic Humic Gleysols (FLT)	Clay loam till, gently undulating to gently rolling, 2 - 7% slopes	Inclusions of Solonetzic Dark Brown Chernozemic (FST, OVE) 10 - 30%

Appendix C. (continued)

Unit name	Map symbol	Soil components	Landform	Comments
Halkirk-Lakesend	HKLS2/3,2	Dark Brown Solodized Solonetz (HKR, LSD) with significant Gleyed and Gleysolic soils	Clay loam till and silty clay loam glaciolacustrine veneer over till, gently undulating, 0 - 5% slopes	Inclusions of Dark Brown Solodized Solonetz on deeper glaciolacustrine (KHO)
Halkirk-Sullivan Lake	HKSU1/3,4	Dark Brown Solodized Solonetz, dominant Halkirk (HKR) and significant Sullivan Lake (SUL)	Clay loam till and sandy loam glaciofluvial veneer, gently undulating, 2 - 9% slopes	Inclusions of Brownfield (BFD) Flagstaff (FST) and undifferentiated Gleysol (GY)
Halkirk-Sullivan Lake	HKSU2/3,2	Dark Brown Solodized Solonetz (HKR, SUL) with significant Gleyed and Gleysolic soils	Clay loam till and sandy loam glaciofluvial veneer, gently undulating, 0 - 5% slopes	Inclusions of Brownfield (BFD) and Flagstaff (FST)
Halkirk-Torlea	HKTL1/3,4 (E,D,P)	Dark Brown Solodized Solonetz (complex of HKR variant with HKR and TLA)	Clay loam to clay till veneer over residual shale, gently undulating to rolling, 2 - 9% slopes	Inclusions of Dark Brown Solod (BFD) and Solonetzic Dark Brown Chernozemic (FST), 10 - 30%
Halkirk-Torlea	HKTL2/3,2,4 (E.P)	Dark Brown Solodized Solonetz (complex of HKR variant with HKR and TLA) with significant Gleyed Dark Brown to Black Solonetz (FMN)	Clay loam to clay till and residual, gently undulating to gently rolling, 0 - 9% slopes	Inclusions of Dark Brown Solod (BFD) and Solonetzic Dark Brown Chernozemic (FST), 10 - 30%
Hughenden	HND1/3,4,5 (D)	Orthic Dark Brown Chernozemic (HND)	Clay loam to sandy clay loam till, undulating to rolling, 2 - 15% slopes	Inclusions of Eluviated Dark Brown Chernozemic (LFE) and Calcareous or Rego Dark Brown Chernozemics (NUT)
Hughenden	HND2/5,4,3,6	Orthic Dark Brown Chernozemic (HND) with significant Gleyed subgroups and Humic Luvic Gleysols (COR)	Clay loam to sandy clay loam till, undulating to gently rolling and hummocky, 2 - 35% slopes	Inclusions of Eluviated Dark Brown Chernozemic (LFE) and Calcareous or Rego Dark Brown Chernozemics (NUT)
Hughenden	HND4/5,4,3	Orthic Dark Brown Chernozemic (HND) with significant Calcareous or Rego Dark Brown Chernozemics (NUT)	Sandy clay loam till, strongly rolling to undulating and hummocky, 2 - 20% slopes	Inclusions of Orthic Dark Brown Chernozemics on ice-contact materials
Hughenden	HND6/5,4,6,3	Orthic Dark Brown Chernozemics: HND dominant on till with significant HND variant on ice-contact materials	Loam to clay loam till and ice-contact stratified deposits (sand, silt, gravel) with inclusions of till, strongly rolling hummocky to undulating, 3 - 35% slopes	Inclusions of Calcareous or Rego Dark Brown Chernozemics (NUT)
Hughenden	HND8/5,6,4	Orthic Dark Brown Chernozemic (HND) with significant Calcareous or Rego Dark Brown Chernozemics (NUT) and Humic Luvic Gleysol (COR)	Sandy clay loam till, strongly rolling hummocky, 6 - 35% slopes	Inclusions of Orthic Dark Brown Chernozemics on ice-contact materials (MET, SCD)
Hughenden-Scollard	HNSC7/3,4			

Appendix C. (continued)

Unit name	Map symbol	Soil components	Landform	Comments
		Orthic Dark Brown Chernozemics (HND, HND variant) with significant Dark Brown Solodized Solonetz (HKR)	Loam to gravelly loam ice-contact and clay loam till, gently rolling 2 - 9% slopes	Inclusions of Sullivan Lake (SUL)
Irma-Rosebank	IRRO1/2	Orthic Black Chernozemics (IRM, ROS)	Sandy loam glaciofluvial blanket or veneer over clay loam till, gently undulating, 0 - 3% slopes	Inclusions of Solonetzic Black Chernozemic (HER) and undifferentiated Gleysol (GY)
Irma-Rosebank	IRRO2/2,3	Orthic Black Chernozemics (IRM, ROS) with significant Gleysols and Gleyed Black Chernozemics	Sandy loam glaciofluvial blanket or veneer over clay loam till, level to gently undulating, 0 - 5% slopes	Inclusions of Solonetzic Black Chernozemic
Islands-Wainwright	INWW1/2	Orthic Humic Gleysol (INS) with significant Orthic Dark Brown Chernozemic (WWT)	Loamy sand to sand glaciofluvial and eolian, level to very gently undulating, 0 - 3% slopes	Inclusions of Edgerton (ERT) and Houcher (HCH)
Kehol-Idamay	KHIM1/2,3	Dark Brown Solodized Solonetz (KHO) with significant Dark Brown Solonetz (IMY)	Silty clay loam to silt loam fluvial apron and/or glaciolacustrine, gently sloping, 0 - 5% slopes	None
Kehol-Lakesend	KHLS2/2,3	Dark Brown Solodized Solonetz, (KHO, LSD) with significant Gleyed and Gleysolic soils	Silty clay loam glaciolacustrine blanket and veneer over till, level to very gently undulating, 0 - 5% slopes	Inclusions of Dark Brown Solod (AWD)
Killam-Sullivan Lake	KISU2/2	Black Solodized Solonetz (KIM) and Dark Brown Solodized Solonetz (SUL) with significant Gleyed soils	Clay loam till and sandy glaciofluvial veneer over till, level to gently undulating, 0 - 3% slopes	Inclusions of Solonetzic Black Chernozemic (HER)
Lakesend-Torlea	LSTL1/2,3(E)	Dark Brown Solodized Solonetz, dominant Lakesend (LSD) with significant Torlea (TLA)	Silty clay loam glaciolacustrine veneer over loam to clay residual, gently or very gently undulating, 0 - 4% slopes	Inclusions of Kehol (KHO); eroded phase has more than 30% eroded pits
Lakesend-Torlea	LSTL2/2,3(E)	Dark Brown Solodized Solonetz (LSD, TLA) with significant Gleysols and Gleyed subgroups	Silty clay loam glaciolacustrine veneer over clay loam to clay residual, gently or very gently undulating, 0 - 4% slopes	Inclusions of Kehol (KHO); eroded phase has more than 30% eroded pits
Leithead-Gleddies	LHGL1/2,3	Dark Brown Solodized Solonetz (LHD) with significant saline Rego Gleysol (GLS)	Sandy loam glaciofluvial and silty clay glaciolacustrine, gently undulating, 0 - 5% slopes	Inclusions of Sullivan Lake (SUL), Victor (VTR) and water
Leithead-Kehol	LHKH1/3	Dark Brown Solodized Solonetz, dominant Leithead (LHD) with significant Kehol (KHO)	Sandy loam glaciofluvial and silty clay glaciolacustrine, level to gently undulating, 0 - 4% slopes	Inclusions of Sullivan Lake (SUL) and Arrowwood (AWD)
Leithead-Kehol	LHKH2/2,3			

Appendix C. (continued)

Unit name	Map symbol	Soil components	Landform	Comments
		Dark Brown Solodized Solonetz (LHD, KHO) with significant Rego or Orthic Humic Gleysols (SLY) and Gleyed subgroups	Sandy loam glaciofluvial and silty clay loam glaciolacustrine, level to very gently undulating, 0 - 4% slopes	Minor inclusions of saline Rego Gleysol (GLS)
Leithead-Sullivan Lake	LHSU1/3			
		Dark Brown Solodized Solonetz, dominant Leithead (LHD) with significant Sullivan Lake (SUL)	Sandy loam glaciofluvial blanket and veneer over residual, gently undulating, 2 - 5% slopes	Inclusions of Metisko (MET)
Leithead-Sullivan Lake	LHSU2/3,2			
		Dark Brown Solodized Solonetz (LHD, SUL) with significant Gleyed and Gleysolic soils	Sandy loam glaciofluvial blanket and veneer over residual, gently or very gently undulating, 0 - 4% slopes	Inclusions of Metisko (MET)
Leithead-Victor	LHVT1/3,2			
		Dark Brown Solodized Solonetz (LHD) with significant Dark Brown Solonetz (VTR)	Complex of sandy loam glaciofluvial and clay glaciolacustrine, gently or very gently undulating, 0 - 4% slopes	Inclusions of Halkirk (HKR) or Sullivan Lake (SUL)
Leithead-Victor	LHVT2/2			
		Dark Brown Solodized Solonetz (LHD) and Solonetz (VTR) with significant saline Rego Gleysol (GLS)	Complex of sandy loam glaciofluvial and silty clay glaciolacustrine, level to very gently undulating, 0 - 3% slopes	Inclusions of Kehol (KHO)
Metisko-Dolcy	MEDC1/3,4			
		Orthic Dark Brown Chernozemic, dominant Metisko (MET) with significant Dolcy (DCY)	Sandy loam glaciofluvial blanket and veneer, gently undulating to rolling, 2 - 9% slopes	Minor inclusions of Sullivan Lake (SUL)
Metisko-Dolcy	MEDC2/2,3	Orthic Dark Brown Chernozemics (MET, DCY) with significant Gleyed and Gleysolic soils	Sandy loam glaciofluvial blanket and veneer over residual, gently undulating, 0 - 5% slopes	Minor inclusions of Sullivan Lake (SUL)
Metisko-Hughenden	MEHN1/3,4(P)			
		Orthic Dark Brown Chernozemics (MET, HND)	Sandy loam glaciofluvial and clay loam till, gently undulating to rolling, 2 - 9% slopes	Inclusions of Flagstaff and Onnevue (FST, OVE)
Metisko-Hughenden	MEHN7/3,4			
		Orthic Dark Brown Chernozemics (MET, HND) with significant Dark Brown Solodized Solonetz (HKR, SUL)	Sandy loam glaciofluvial and clay loam till, gently undulating to rolling, 2 - 9% slopes	Inclusions of Flagstaff and Onnevue (FST, OVE)
Metisko-Kehol	MEKH1/3			
		Orthic Dark Brown Chernozemic (MET) with significant Dark Brown Solodized Solonetz (KHO)	Sandy loam glaciofluvial and silty clay loam glaciolacustrine, gently undulating, 1 - 5% slopes	Minor inclusions of Leithead (LHD)
Metisko-Leithead	MELH1/3			
		Orthic Dark Brown Chernozemic (MET) with significant Dark Brown Solodized Solonetz (LHD)	Sandy loam glaciofluvial, gently undulating, 2 - 5% slopes	Inclusions of Sullivan Lake (SUL) and Dolcy (DCY)
Metisko-Leithead	MELH2/3			

Appendix C. (continued)

Unit name	Map symbol	Soil components	Landform	Comments
		Orthic Dark Brown Chernozemic (MET) and Dark Brown Solodized Solonetz (LHD) with significant Gleyed and Gleysolic soils	Sandy loam glaciofluvial, gently undulating, 0 - 5% slopes	Inclusions of Sullivan Lake (SUL) and Dolcy (DCY)
Metisko-Scollard	MESC1/3,4	Orthic Dark Brown Chernozemics, dominant Metisko (MET) and significant Scollard (SCD)	Sandy loam glaciofluvial and gravelly outwash, gently undulating to rolling, 3 - 9% slopes	None
Metisko-Scollard	MESC7/3,4	Orthic Dark Brown Chernozemics (MET, SCD) with significant Dark Brown Solodized Solonetz (SUL, TLA)	Sandy loam glaciofluvial and gravelly outwash, gently rolling, 3 - 9% slopes	None
Metisko-Sullivan Lake	MESU1/3,4	Orthic Dark Brown Chernozemic (MET) with significant Dark Brown Solodized Solonetz (SUL)	Sandy loam glaciofluvial over residual or till, gently undulating, 2 - 8% slopes	Inclusions of Leithead (LHD) and Dolcy (DCY)
Metisko-Sullivan Lake	MESU2/2,3	Orthic Dark Brown Chernozemic (MET) with significant Dark Brown Solodized Solonetz (SUL) and Gleysolic or Gleyed soils	Sandy loam glaciofluvial over residual or till, gently undulating, 0 - 5% slopes	Inclusion of Leithead (LHD) and Dolcy (DCY)
Metisko-Wainwright	MEWW1/2,3,4	Orthic Dark Brown Chernozemics, dominant Metisko (MET) and significant Wainwright (WWT)	Sandy loam to loamy sand glaciofluvial and eolian, gently undulating to rolling, 0 - 9% slopes	None
Rough Broken	RB1	Undifferentiated soils with inclusions (less than 10%) of exposed bedrock ledges and escarpments	Clay loam till and residual, rolling to steep, 15 - 70% slopes	Used for steep dissected areas larger than 30 acres
Rough Broken	RB2	Undifferentiated soils with significant or dominant (10 - 70%) exposed bedrock ledges and escarpments	Clay loam till and residual, rolling to steep, 15 to more than 70% slopes	Used for steep dissected areas larger than 30 acres
Rough Broken	RB5	Undifferentiated soils on slopes affected by slumping	Clay loam to clay till and residual, rolling to steep, 15 - 70% slopes	Less than 10% exposed bedrock
Rough Broken-Alluvium	RBAV1	Undifferentiated well-drained soils as per RB1 with significant undifferentiated Gleysols along floodplain channels	Clay loam till or residual with variable texture fluvial, level to steep, 0 - 70% slopes	Inclusions of exposed bedrock, less than 10%
Scollard	SCD1/3,4	Orthic Dark Brown Chernozemic (SCD)	Gravelly glaciofluvial outwash, gently undulating to gently rolling, 2 - 8% slopes	Minor inclusions of sandy glaciofluvial with Orthic and Rego Dark Brown Chernozemics (WWT, HCH)

Appendix C. (continued)

Unit name	Map symbol	Soil components	Landform	Comments
Sullivan Lake-Torlea	SUTL1/3,4,2 (E,P,D)	Dark Brown Solodized Solonetz, dominant Sullivan Lake (SUL) with significant Torlea (TLA)	Sandy loam to loam glaciofluvial veneer (0.5m) over clay loam to clay residual, gently undulating to rolling, 2 - 9% slopes	Inclusions of Leithead (LHD); eroded phase has more than 30% eroded pits; stony phase has more than 15% stones and boulders
Sullivan Lake-Torlea	SUTL2/2,3,4 (E,P,D)	Dark Brown Solodized Solonetz (SUL, TLA) with significant Gleyed and Gleysolic soils	Sandy loam to loam glaciofluvial veneer (0.5m) over clay loam to clay residual, level to gently rolling, 0 - 9% slopes	Inclusions of Leithead (LHD), Gleddies (GLS) and Victor (VTR); stony phase has more than 15% stones and boulders
Torlea	TLA1/3,2,4 (E,P,D)	Dark Brown Solodized Solonetz (TLA) with inclusions of Halkirk (HKR)	Clay loam to clay discontinuous till veneer overlying residual, very gently undulating to rolling, 2 - 9% slopes	Eroded phase (E) has more than 30% eroded pits; stony phase more than 15% stones and boulders
Torlea-Scollard	TLSC1/3,4	Dark Brown Solodized Solonetz (TLA) with significant Orthic Dark Brown Chernozemic (SCD)	Clay loam residual and discontinuous gravelly glaciofluvial veneer, gently undulating to rolling, 2 - 8% slopes	Inclusions of Halkirk (HKR), more than 15% stones and boulders
Torlea-Scollard	TLSC2/3,2	Dark Brown Solodized Solonetz (TLA) and Orthic Dark Brown Chernozemic (SCD) with significant Gleysols and Gleyed subgroups	Clay loam residual and discontinuous gravelly glaciofluvial veneer, gently undulating, 0 - 4% slopes	Inclusions of Halkirk (HKR), more than 15% stones and boulders
Victor-Gleddies	VTGL1/2	Dark Brown Solonetz (VTR) with significant saline Rego Gleysol (GLS)	Silty clay glaciolacustrine, level to very gently undulating, 0 - 2% slopes	Inclusions of Dark Brown Solodized Solonetz (WES)
Wainwright-Fenner	WWFN1/3	Orthic Dark Brown Chernozemic (WWT) with significant Dark Brown Solodized Solonetz (FNR)	Loamy sand to sand glaciofluvial and eolian blanket and veneer, gently undulating, 2 - 5% slopes	Inclusions of Metisko (MET) and Sullivan Lake (SUL)
Wainwright-Fenner	WWFN2/3	Orthic Dark Brown Chernozemic (WWT) and Dark Brown Solodized Solonetz (FNR) with significant Gleyed and Gleysolic soils	Loamy sand to sand glaciofluvial and eolian blanket and veneer, gently undulating, 0 - 4% slopes	Inclusions of Metisko (MET) and Sullivan Lake (SUL)
Wainwright-Houcher	WWHC1/3,4,5	Orthic Dark Brown Chernozemic (WWT) with significant Rego Dark Brown Chernozemic (HCH)	Loamy sand to sand glaciofluvial and eolian, gently undulating to rolling, 3 - 15% slopes	Inclusions of Edgerton (ERT)
Wainwright-Houcher	WWHC2/3	Orthic Dark Brown Chernozemic (WWT) and Rego Dark Brown Chernozemic (HCH) with significant Gleyed and Rego Humic Gleysol (INS)	Loamy sand to sand glaciofluvial and eolian, gently undulating, 0 - 5% slopes	Inclusions of Orthic Regosol (ERT) on eolian materials
Wainwright-Scollard	WWSC1/3,4	Orthic Dark Brown Chernozemic, dominant Wainwright (WWT) with significant Scollard (SCD)	Loamy sand to sand glaciofluvial, eolian and gravelly outwash, gently undulating to rolling, 2 - 7% slopes	Frequent occurrence of soils intermediate in texture between WWT and SCD

Appendix D. Soil maps

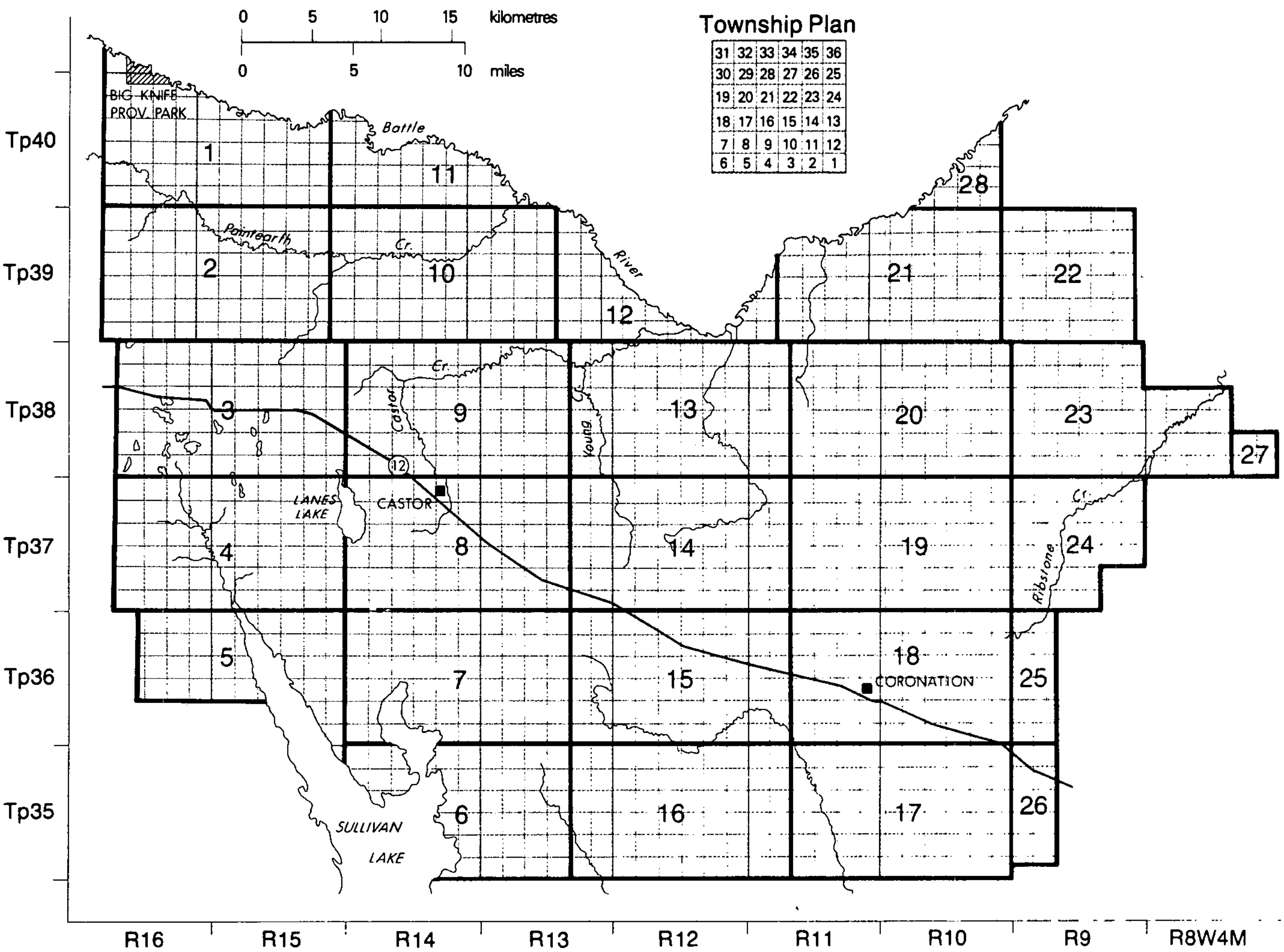

Figure 8. Index to map sheets.

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Scale 1:50 000 (approximate)

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0 1 mi

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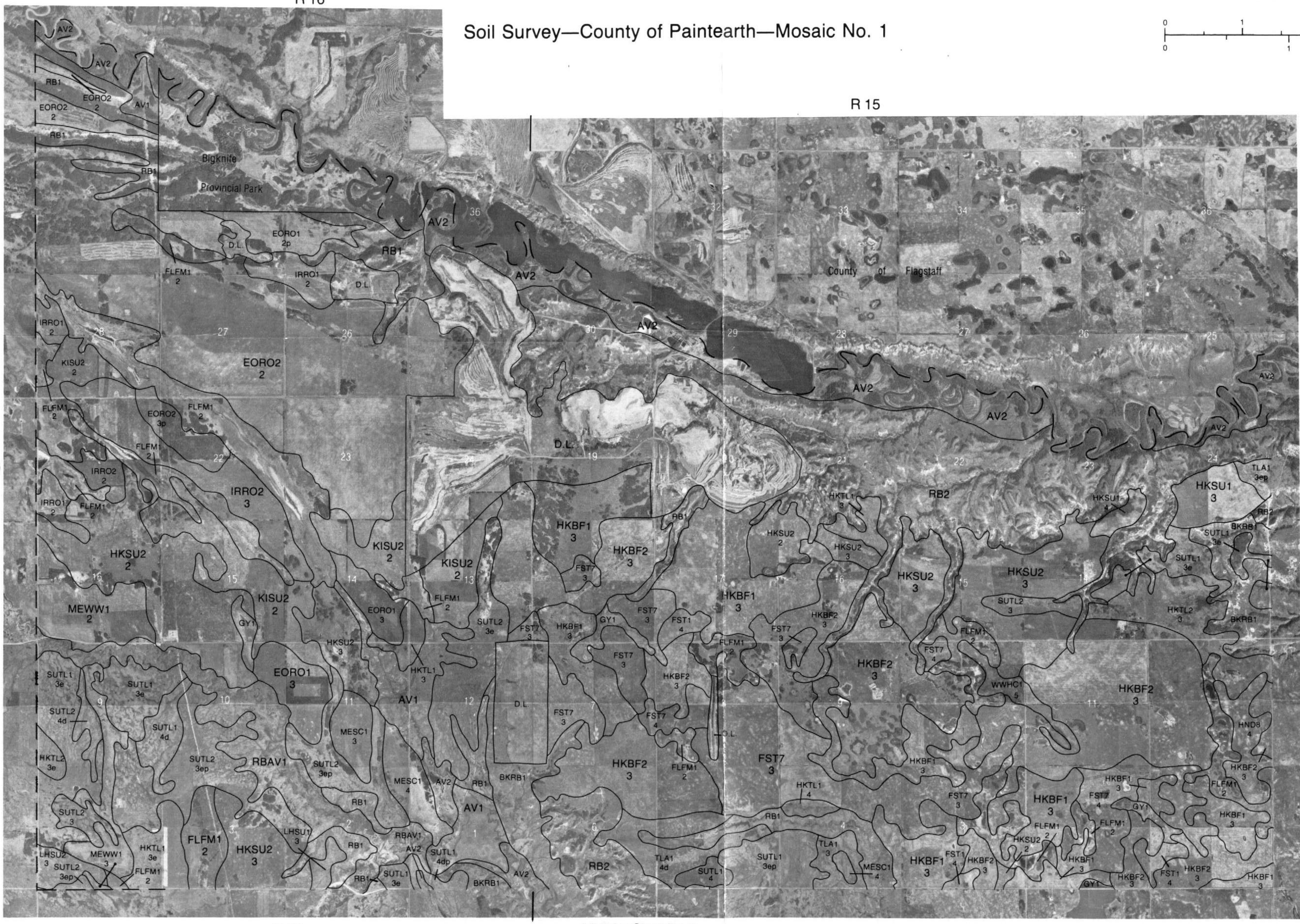
R 15

Tp 40



Tp 40

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R 16

Adjoining Sheet No. 2

R 15

R 16

Adjoining Sheet No. 1

R 15 W4M

Tp 39

Tp 39

Adjoining Sheet No. 10

Adjoining Sheet No. 3

R 16

R 15

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 2

R 16 R 15 W4M

Adjoining Sheet No. 2

Tp 38

Tp 38

Adjoining Sheet No. 9

Adjoining Sheet No. 4

R 16 R 15

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 3

R 16

R 15 W4M

Adjoining Sheet No. 3

Tp 37

Tp 37

Adjoining Sheet No. 8

Adjoining Sheet No. 5

R 16

R 15

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 4

R 16

R 15 W4M

Adjoining Sheet No. 4

Tp 36

R 16

R 15

Adjoining Sheet No. 7

Tp 36

Scale 1:50 000 (approximate)

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0 1 mi

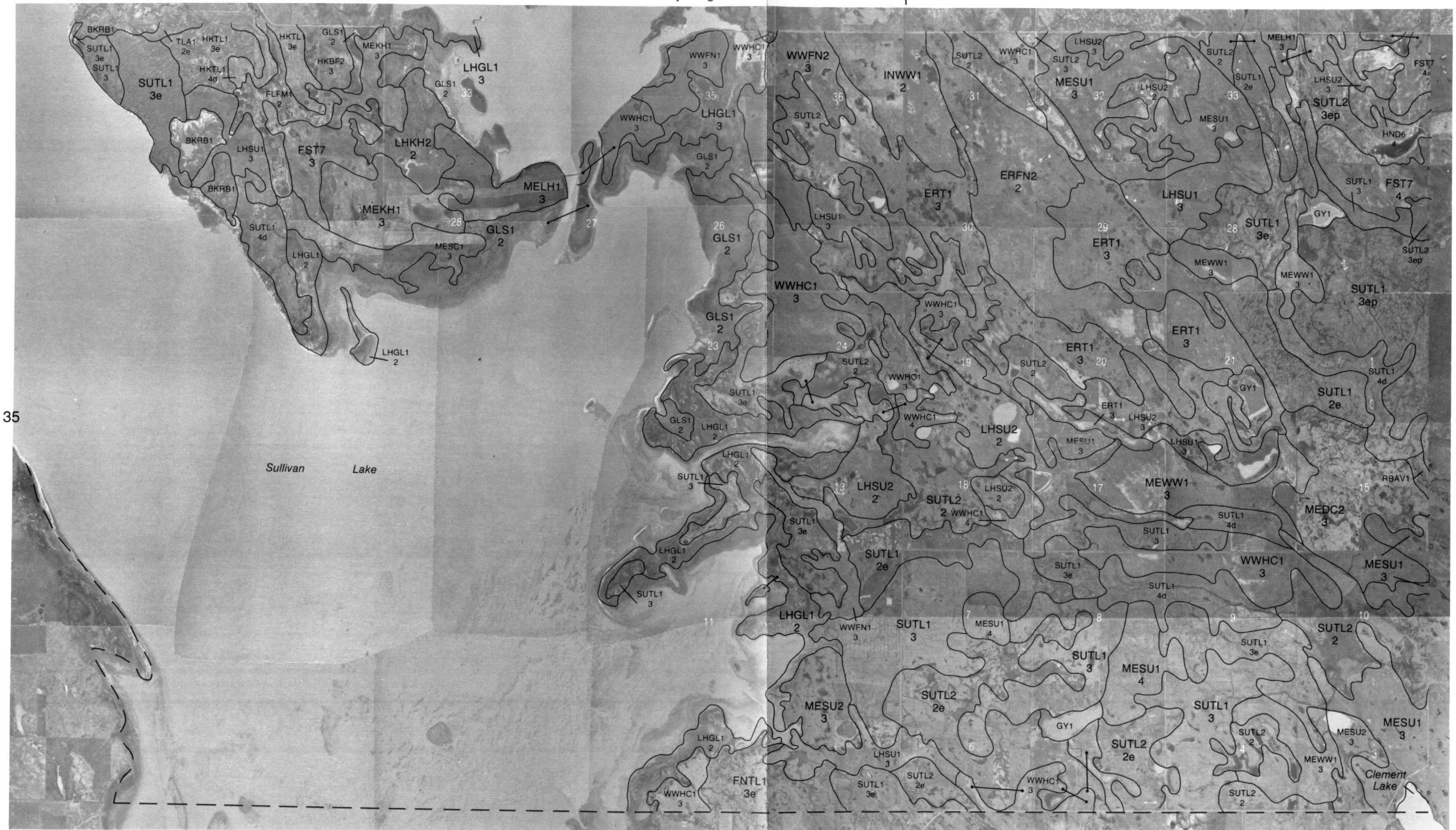
Soil Survey—County of Paintearth—Mosaic No. 5

R 14

Adjoining Sheet No. 7

R 13 W4M

Tp 35



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R 14

R 13

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0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 6

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 7

R 14 R 13 W4M

Adjoining Sheet No. 9

Tp 37 Adjoining Sheet No. 4

Adjoining Sheet No. 14 Tp 37

Adjoining Sheet No. 7

R 14 R 13

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 8

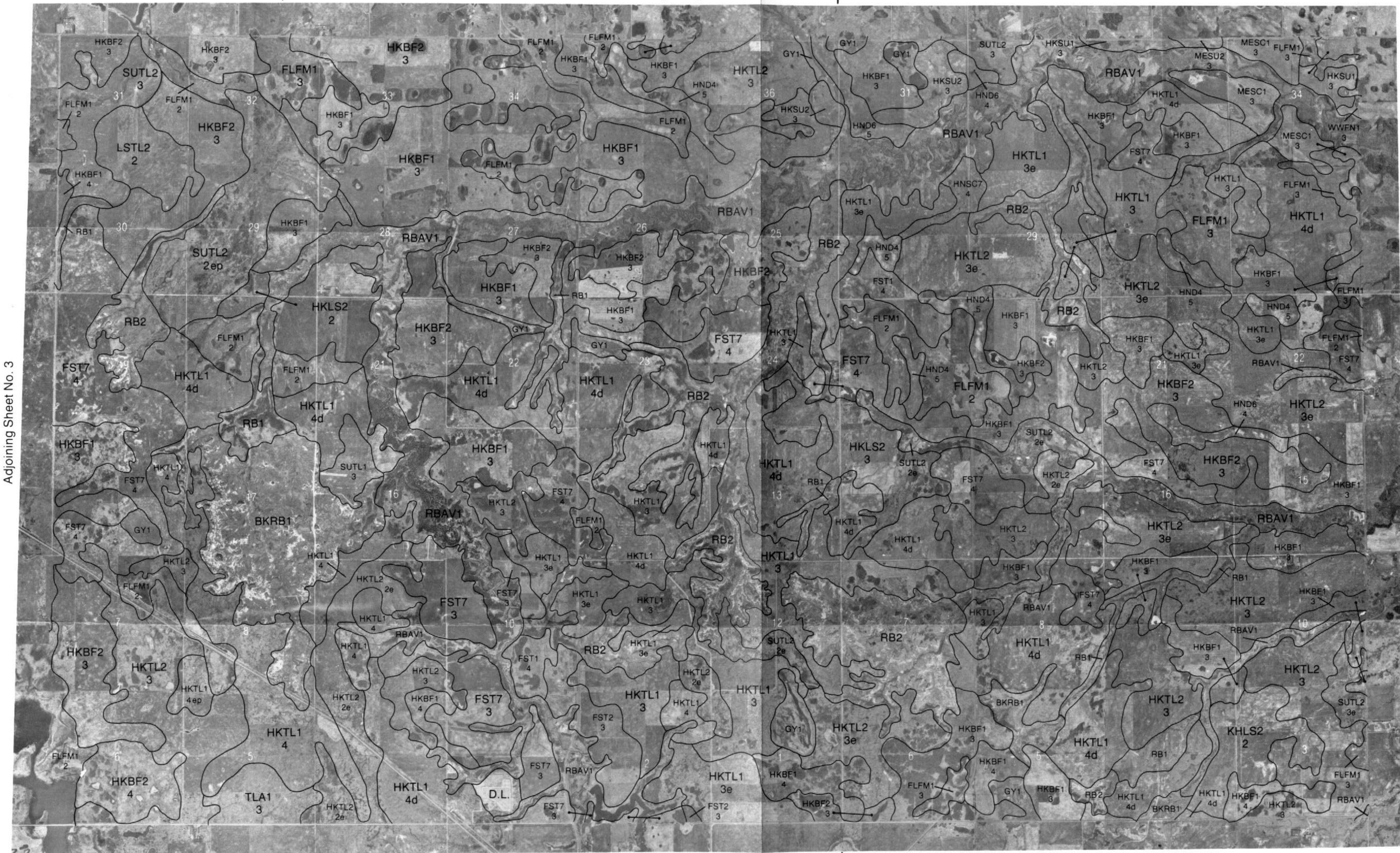
R 14

R 13 W4M

Adjoining Sheet No. 10

Adjoining Sheet No. 3

Tp 38



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Adjoining Sheet No. 8

R 14

R 13

Scale 1:50 000 (approximate)

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0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 9

R 14

R 13

W4M

Adjoining Sheet No. 11

Tp 39

Adjoining Sheet No. 2

Adjoining Sheet No. 12

Tp 39

R 14

Adjoining Sheet No. 9

R 13

Scale 1:50 000 (approximate)

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0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 10

R 14 R 13 W4M

Tp 40

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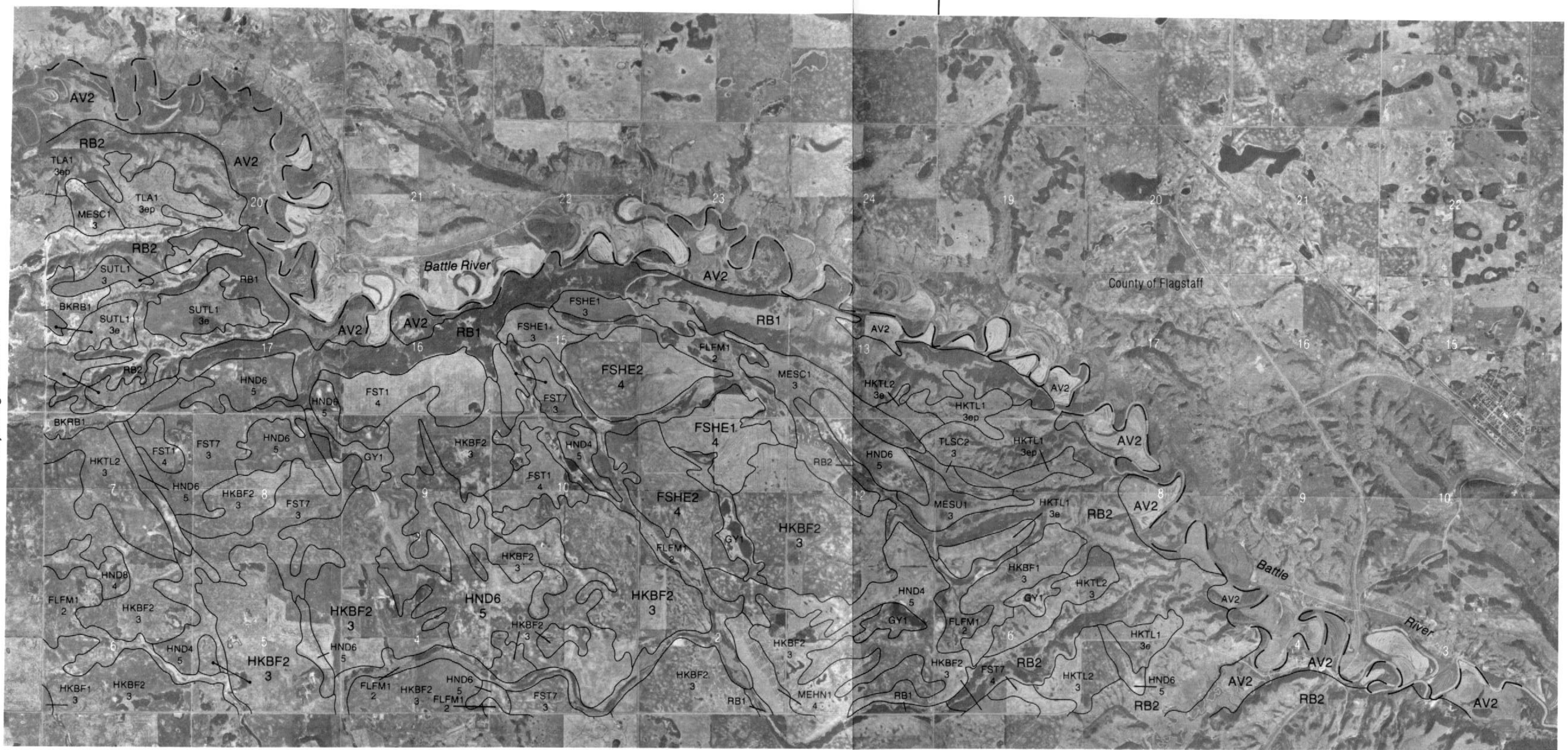

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R 14 R 13

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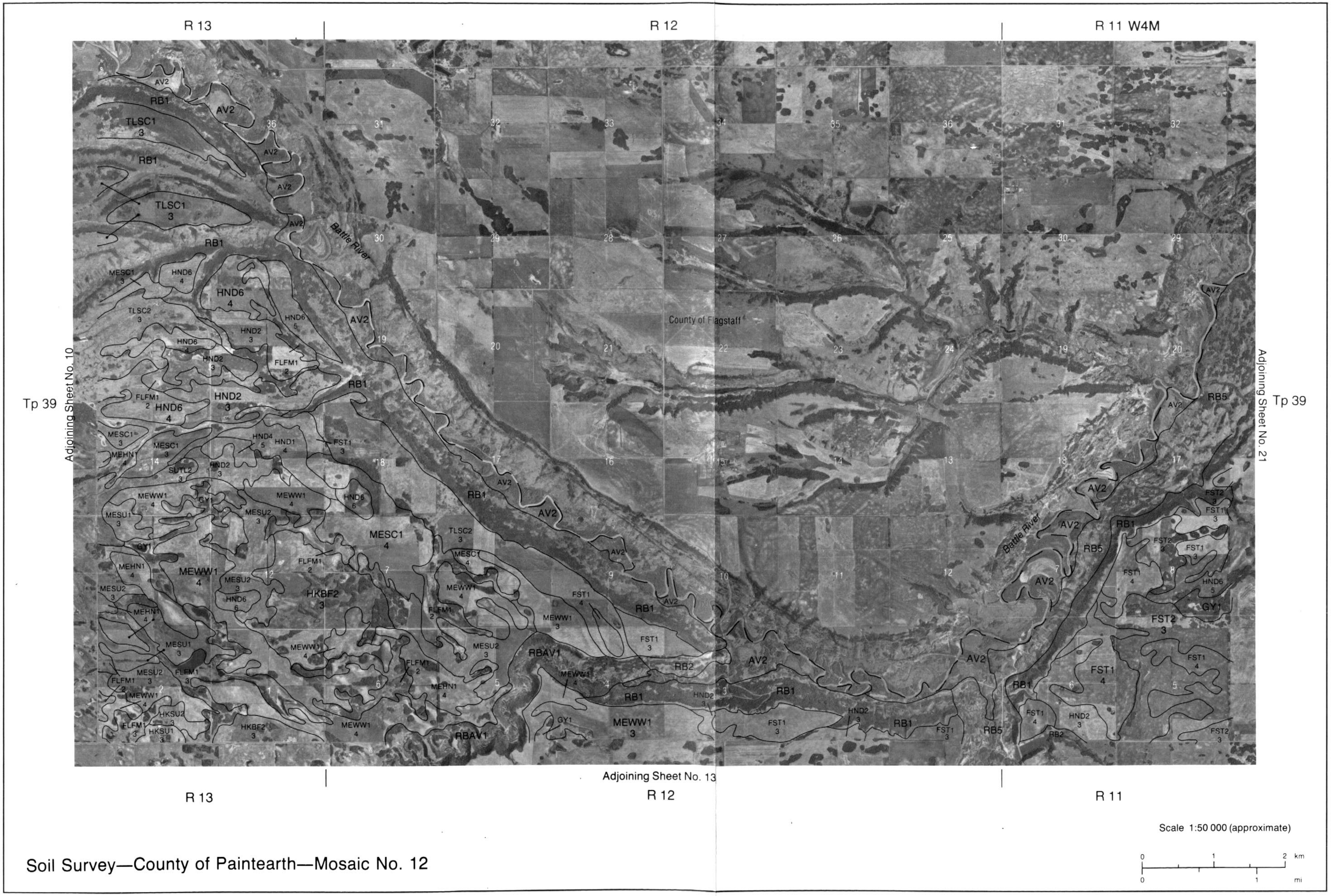


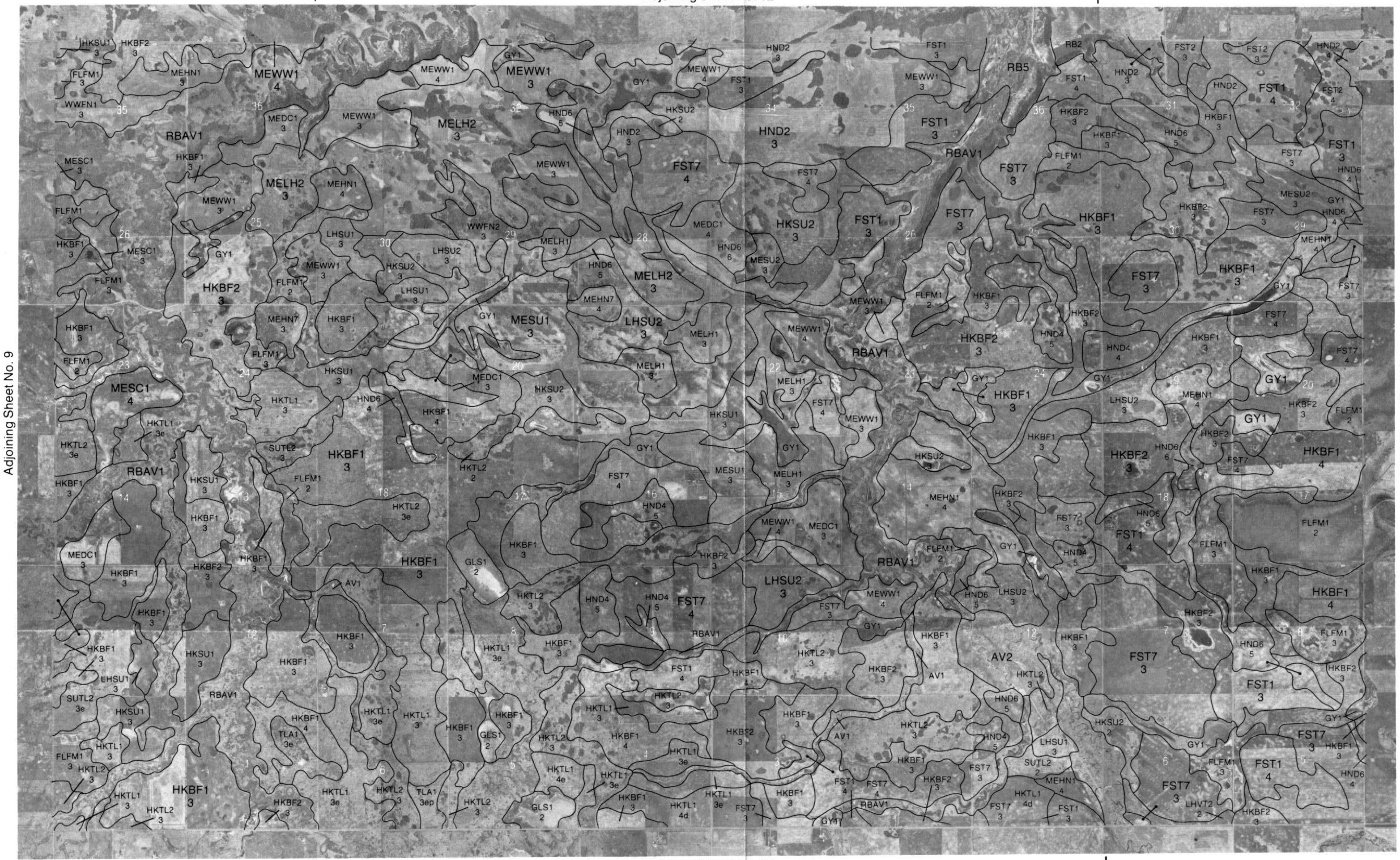
Soil Survey—County of Paintearth—Mosaic No. 12

R 13 R 12 R 11 W4M

Adjoining Sheet No. 12

Adjoining Sheet No. 9

Tp 38



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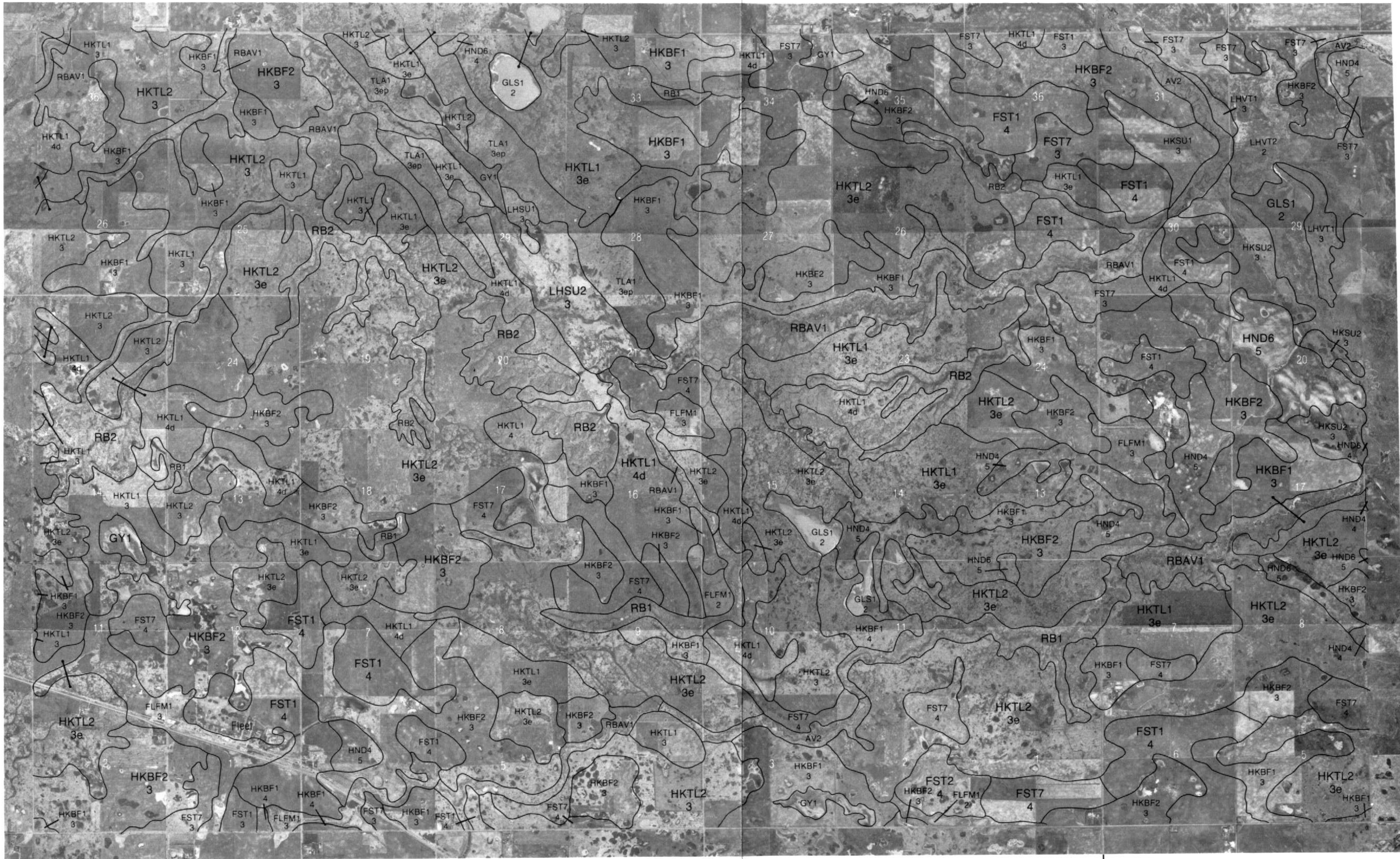
Soil Survey—County of Paintearth—Mosaic No. 13

R 13 R 12 R 11 W4M

Adjoining Sheet No. 13

Tp 37 Adjoining Sheet No. 8



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Soil Survey—County of Paintearth—Mosaic No. 14

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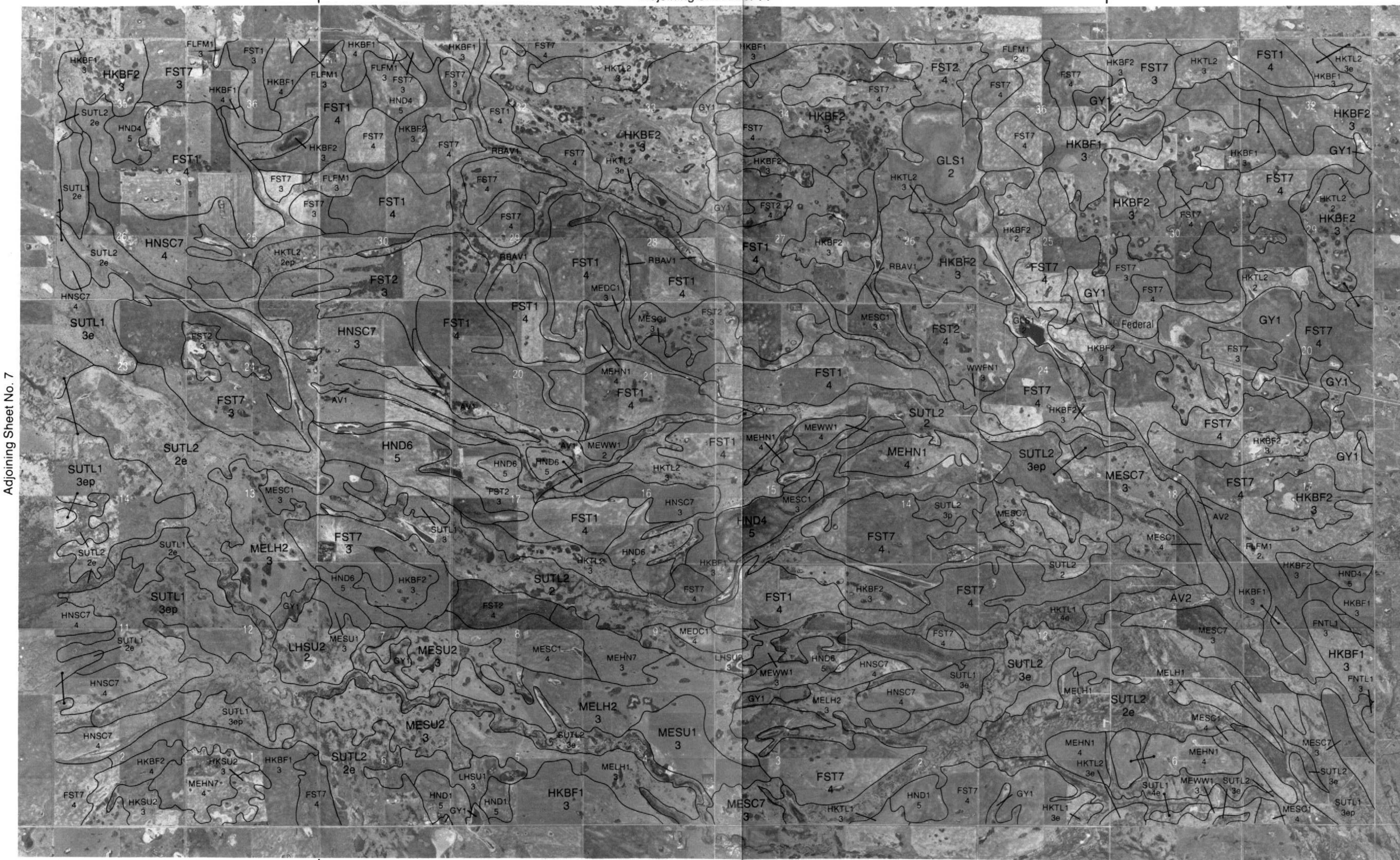

Adjoining Sheet No. 18 Tp36

Adjoining Sheet No. 16

R 13 R 12 R 11

Scale 1:50 000 (approximate)

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0 1 mi

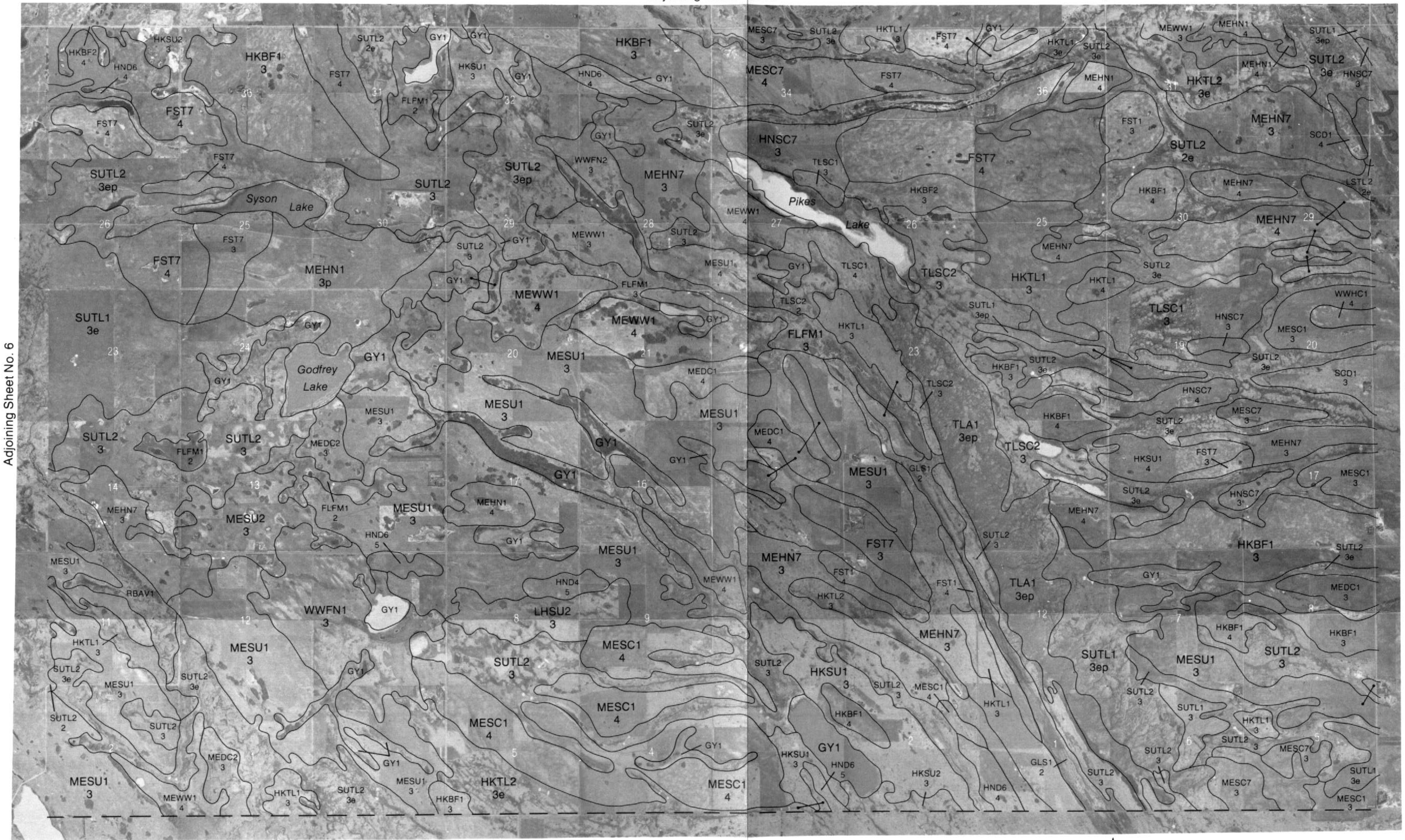
Soil Survey—County of Paintearth—Mosaic No. 15

R 13 R 12 R 11 W4M

Adjoining Sheet No. 15

Adjoining Sheet No. 6

Tp 35



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Tp 35

R 13 R 12 R 11

Scale 1:50 000 (approximate)

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0 1 mi

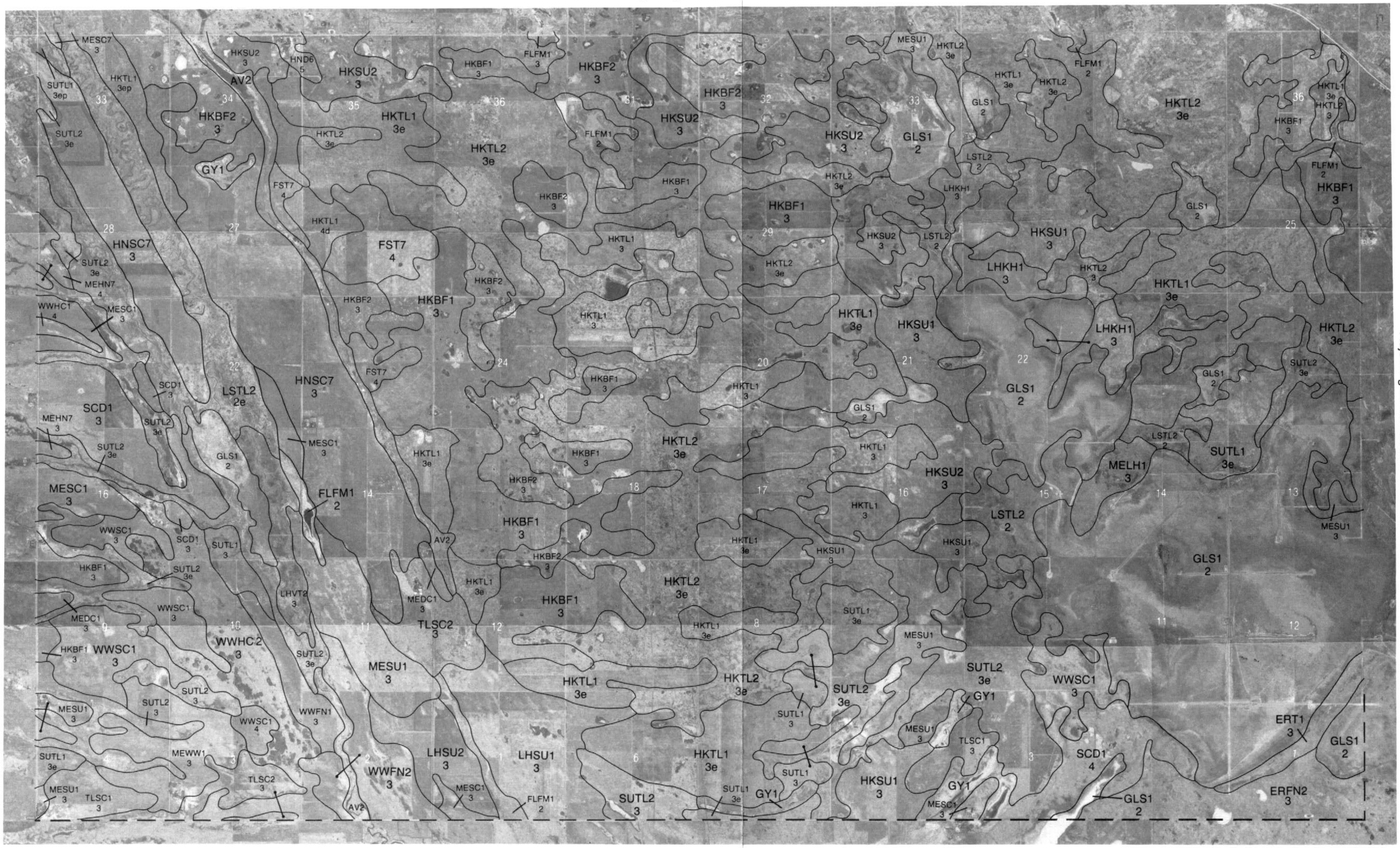
Soil Survey—County of Paintearth—Mosaic No. 16

R 11 R 10 W4M

Adjoining Sheet No. 18

Adjoining Sheet No. 16

Tp35



Tp 35

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R 11 R 10

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 17

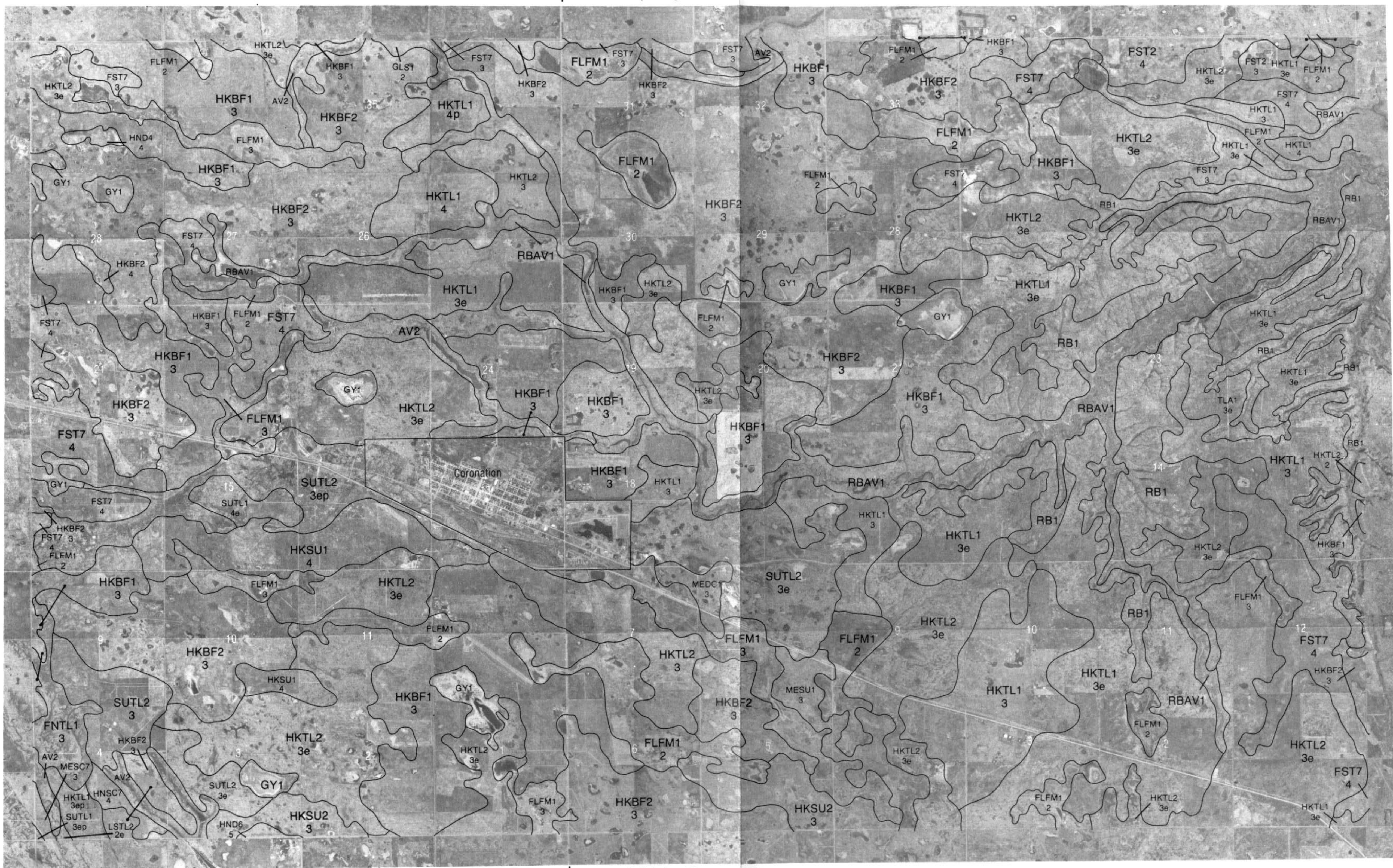
R 11

R 10 W4M

Adjoining Sheet No. 19

Tp36

Adjoining Sheet No. 15



Tp36

Adjoining Sheet No. 25

Adjoining Sheet No. 17

R 11

R 10

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 18

R 11

Adjoining Sheet No. 20

R 10 W4M

Tp 37 Adjoining Sheet No. 14

Adjoining Sheet No. 24 Tp 37

R 11

Adjoining Sheet No. 18

R 10

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 19

R 11 R 10 W4M

Adjoining Sheet No. 21

Tp 38 Adjoining Sheet No. 13

Adjoining Sheet No. 23 Tp 38

Adjoining Sheet No. 19

R 11 R 10

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 20

R 11 | Adjoining Sheet No. 28 | R 10 W4M

Tp 39 | Adjoining Sheet No. 12

Adjoining Sheet No. 22 | Tp 39

R 11 | Adjoining Sheet No. 20 | R 10

Scale 1:50 000 (approximate)

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0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 21

R 9 W4M

Adjoining Sheet No. 21

Tp 39

Tp 39

Adjoining Sheet No. 23

R 9

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 22

R 9

Adjoining Sheet No. 22

Tp 38

Adjoining Sheet No. 20

Adjoining Sheet No. 24

R 9

R 8

Tp 38

Adjoining Sheet No. 27

Scale 1:50 000 (approximate)

0 1 2 km

0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 23

R 9 W4M

Adjoining Sheet No. 23

Tp 37

Adjoining Sheet No. 19

Tp 37

Adjoining Sheet No. 25

R 9

Scale 1:50 000 (approximate)

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0 1 mi

Soil Survey—County of Paintearth—Mosaic No. 24

R 9 W4M

Adjoining Sheet No. 24

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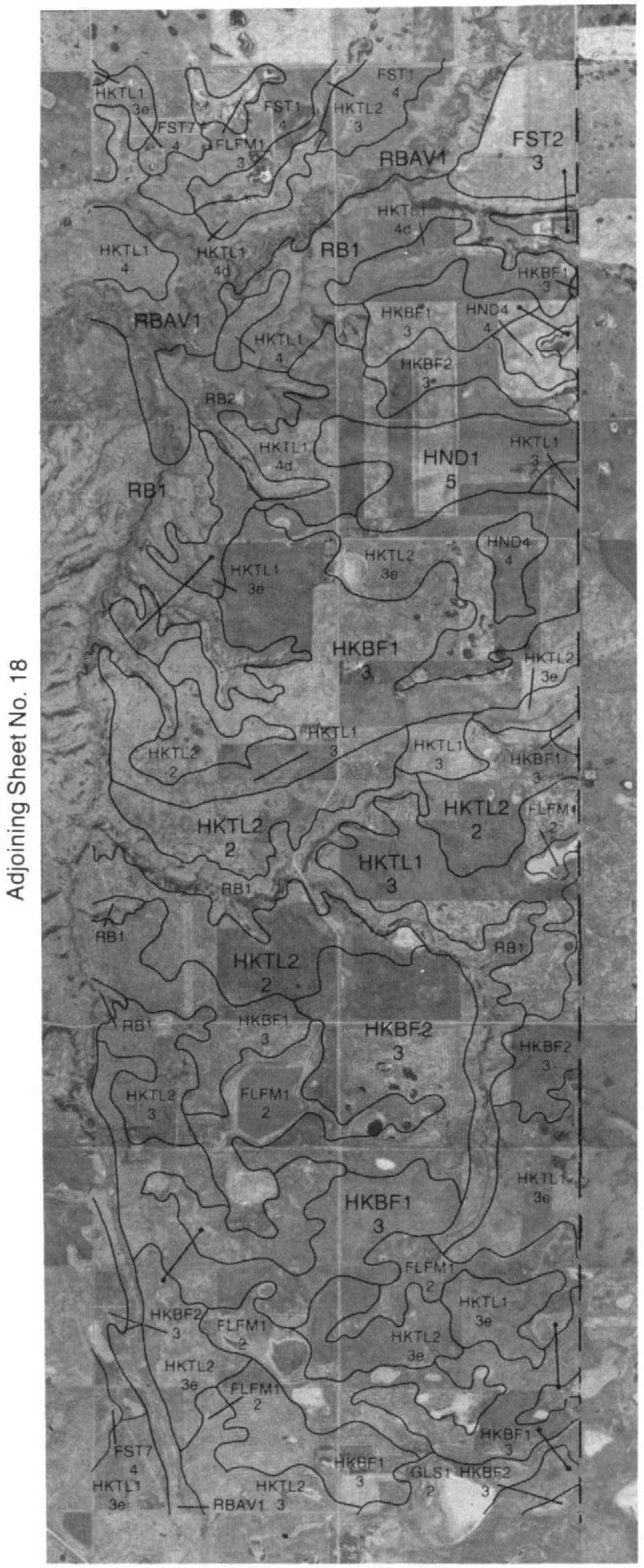
Adjoining Sheet No. 18



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R 9

Soil Survey—
County of Paintearth—
Mosaic No. 25

Scale 1:50 000 (approximate)

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R 9 W4M

Adjoining Sheet No. 25

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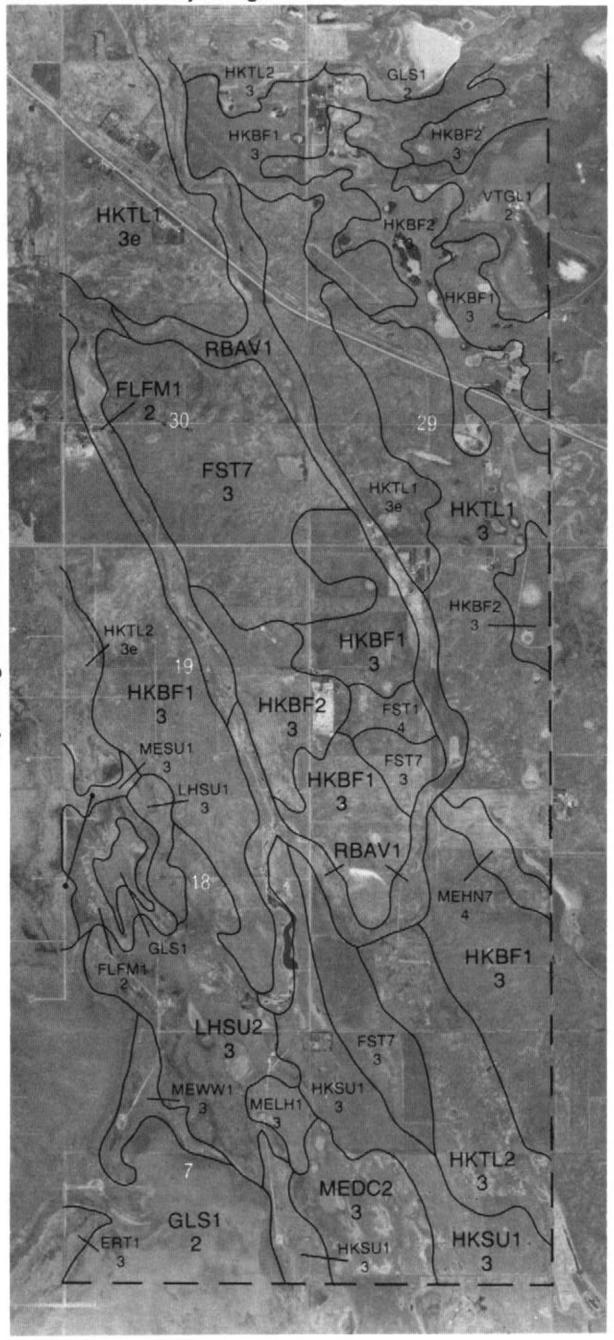

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Soil Survey—
County of Paintearth—
Mosaic No. 26

Scale 1:50 000 (approximate)

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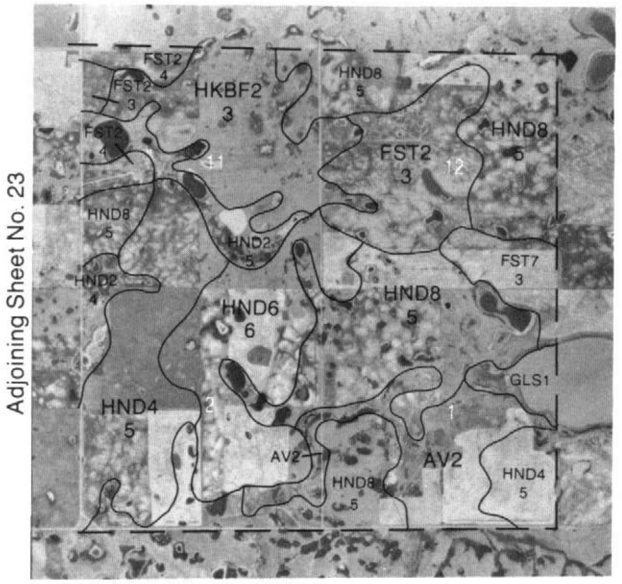
R 8 W4M

Tp 38

Adjoining Sheet No. 23



Tp 38

R 8

Soil Survey—
County of Paintearth—
Mosaic No. 27

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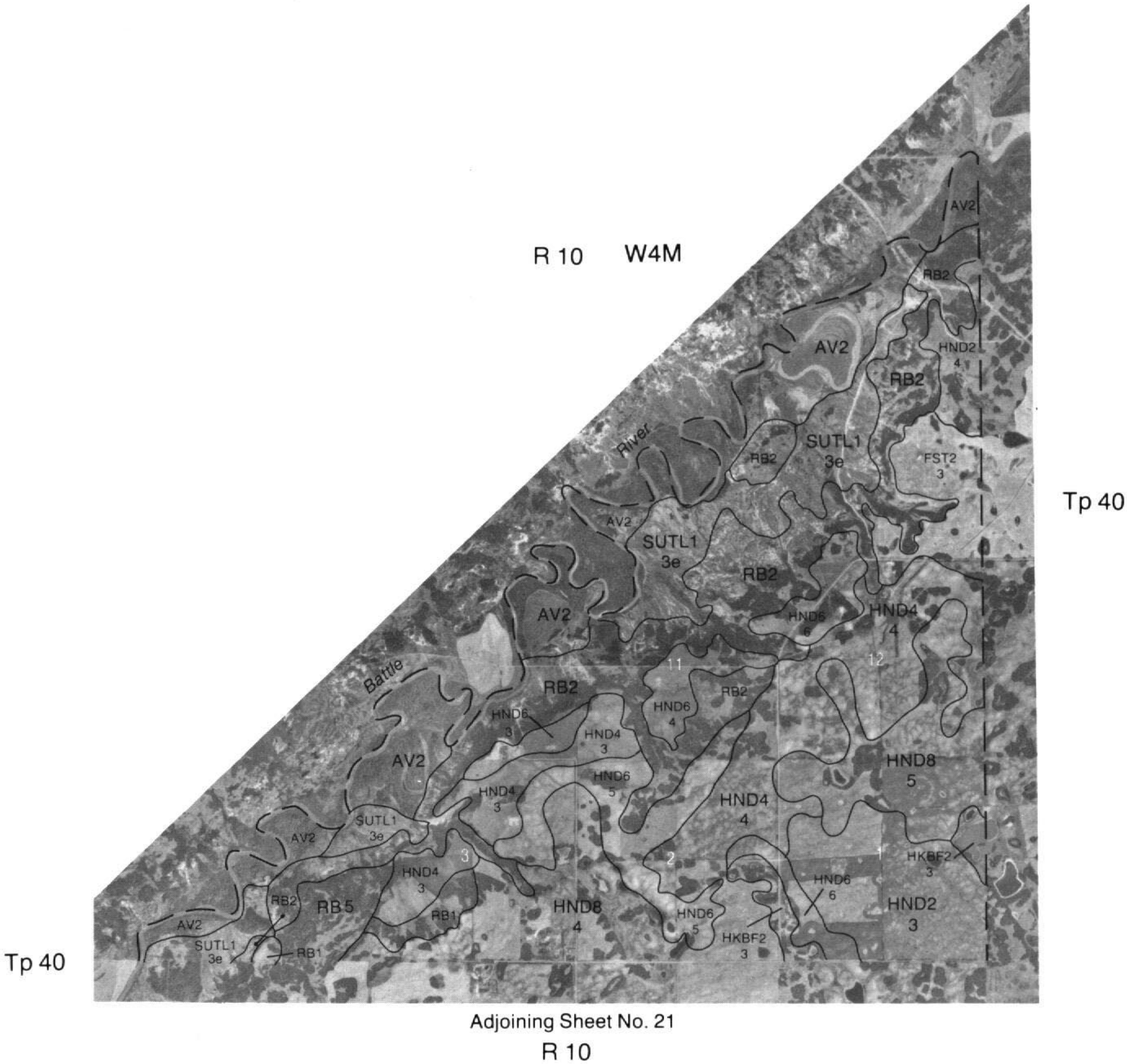

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Soil Survey—County of Paintearth—
Mosaic No. 28